REB RWANDA BASIC EDUCATION BOARD

PHARMACOLOGY

Associate Nursing Program

Teacher's Guide

SENIOR 5

First Edition

FOREWORD

Dear Teacher,

The Rwanda Basic Education Board is pleased to present this Teacher's Guide for the Associate Nursing Program. This guide is designed to support competence-based teaching and ensure consistency in delivering the Fundamentals of Nursing subject.The Rwandan educational philosophy aims to help student-associate nurses achieve their full potential, preparing them to address community health needs and pursue career opportunities.

To enhance education quality, the government of Rwanda emphasizes the alignment of teaching materials with the syllabus. Effective teaching relies on the relevance of content, pedagogical approaches, assessment strategies, and instructional materials. The guide focuses on activities that promote learning, allowing students to develop ideas and make discoveries.

In a competence-based curriculum, learning involves actively building knowledge and skills through activities, scenarios, and real-life applications. Your role as a teacher includes:

- Planning lessons and preparing teaching materials.
- Organizing group discussions and collaborative learning.
- Engaging students through active learning methods such as inquiry, research, and group work.
- Supporting and facilitating the learning process by valuing student contributions and guiding them towards integrating their findings.

This guide is divided into three parts:

1. Explains the book's structure and provides methodological guidance.
2. Offers sample lesson plans for reference.
3. Provides detailed teaching guidance for each concept in the student book.

Although the guide includes answers to student book activities, please review each question and activity before assessing student responses.

I extend my gratitude to everyone involved in developing this guide, including the Ministry of Health, University of Rwanda, and other institutions. Special thanks go to faculty members, nurses, midwives, teachers, illustrators, designers, Health Workforce development staff/MoH, and REB staff for their dedicated work.

Dr. MBARUSHIMANA Nelson

Director General, REB

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PART I: GENERAL INTRODUCTION

1.0. About the Teacher's Guide

This book is a teacher's guide for Pharmacology subject, for senior five in Associate Nursing program. It is designed to accompany student book and intends to help teachers in the implementation of competence based curriculum specifically Pharmacology syllabus.

As the name says, it is a guide that teachers can refer to when preparing their lessons. Teachers may prefer to adopt the guidance provided but they are also expected to be more creative and consider their specific classes' contexts and prepare accordingly.

1.1. The structure of the guide

This section presents the overall structure, the unit and sub-heading structure to help teachers to understand the different sections of this guide and what they will find in each section.

Overall structure

The whole guide has three main parts as follows:

- **Part I: General Introduction.**

This part provides general guidance on how to develop the generic competences, how to integrate cross cutting issues, how to cater for students with special educational needs, and guidance on assessment in the course of Pharmacology.

- **Part II: Sample lesson plan**

This part provides a sample lesson plan, developed and designed to help the teachers develop their own lesson plans.

- **Part III: Unit development**

This is the core part of the guide. Each unit is developed following the structure below. The guide ends with references.

Each unit is made of the following sections:

- **Unit title:** from the syllabus
- **Key unit competence:** from the syllabus
- **Prerequisites** (knowledge, skills, attitudes and values)

This section indicates knowledge, skills and attitudes required for the success of the unit. The competence-based approach calls for connections between units/topics within a subject and interconnections between different subjects. The teacher will find an indication of those prerequisites and guidance on how to establish connections.

- **Cross-cutting issues to be addressed**

  This section suggests cross cutting issues that can be addressed depending on the unit content. It provides guidance on how to come up with the integration of the issue. Note that the issue indicated is a suggestion; teachers are free to take another cross-cutting issue taking into consideration the learning environment.

- **Guidance on the introductory activity**

  Each unit starts with an introductory activity in the teacher's book. This section of the teacher's guide provides guidance on how to conduct this activity and related answers. Note that students may not be able to find the right solution but they are invited to predict possible solutions or answers. Solutions are provided by students gradually through discovery activities organized at the beginning of lessons or during the lesson.

- **List of lessons/sub-headings**

  This section presents in a table suggestion on the list of lessons, lesson objectives copied or adapted from the syllabus and duration for each lesson. Each lesson /subheading is then developed.

- **End of each unit**

  At the end of each unit the teacher provides the following sections:

  - Summary of the unit which provides the key points of content developed in the teacher's book.
  - Additional information which provides additional content compared to the student book for the teacher to have a deeper understanding of the topic.
  - End unit assessment which provides answers to questions of the end unit assessment in the teacher's book and suggests additional questions and related answers to assess the key unit competence.
  - Additional activities (remedial, consolidation and extended activities). The purpose of these activities is to accommodate each student (slow, average and gifted) based on the end of unit assessment results.

Structure of each sub heading

Each lesson/sub-heading is made of the following sections:

Lesson /Sub heading title 1: ……..

- **Prerequisites/Revision/Introduction:**

  This section gives a clear instruction to teacher on how to start the lesson.

- **Teaching resources**

  This section suggests the teaching aids or other resources needed in line with the activities to achieve the learning objectives. Teachers are encouraged to replace the suggested teaching aids by the available ones in their respective schools and based on learning environment.

- **Learning activities**

  This section provides a short description of the methodology and any important aspect to consider. It provides also answers to learning activities with cross reference to student's book.

- **Exercises/application activities**

  This provides questions and answers for exercises/ application activities.

1.2. Methodological guidance

1.2.1 Developing competences

Since 2015 Rwanda shifted from a knowledge based to a competence based curriculum for pre-primary, primary and general secondary education. For TTCs, it is in 2019 that the competence based curriculum was embraced. This called for changing the way of learning by shifting from teacher centered to a student centered approach. Teachers are not only responsible for knowledge transfer but also for fostering teacher's learning achievement, and creating safe and supportive learning environment. It implies also that a student has to demonstrate what he/she is able to do using the knowledge, skills, values and attitude acquired in a new or different or given situation.

The competence-based curriculum employs an approach of teaching and learning based on discrete skills rather than dwelling on only knowledge or the cognitive domain of learning. It focuses on what student can do rather than what students know. Students develop basic competences through specific subject unit competences with specific learning objectives broken down into knowledge, skills and attitudes. These competences are developed through learning activities disseminated in student-centered rather than the traditional didactic approach. The students are evaluated against set standards to achieve before moving on.

In addition to specific subject competences, students also develop generic competences which are transferable throughout a range of learning areas and situations in life.

Below are examples of how generic competences can be developed in Pharmacology:

Generic competence	Examples of activities that develop generic competences
Critical thinking	Describe the relationship and interdependence of sciences Observe, record, interpret data recorded during experiments Identify and use the applications of Pharmacology concepts to solve problems of life and society
Research and Problem solving	Research using internet or books from the library Design a project for making bioplastics Design a questionnaire for data collection during field visit
Innovation and creativity	Create an experiment procedure to prove a point Develop a graph to illustrate information Design a data collection survey/questionnaire Conduct experiments with objectives, methodology, observations, results, conclusions Identify local problems and ways to resolve them
Cooperation, Personal and Interpersonal management and life skills	Work in Pairs Small group work Large group work
Communication	Organise and present in writing and verbally a complete and clear report of an experiment Observe, record, interpret the results of a measurement accurately. Select and use appropriate formats and presentations, such as tables, graphs and diagrams.
Lifelong learning	Exploit all opportunities available to improve on knowledge and skills. Reading scientific journals to keep updated.

1.2.2. Addressing cross cutting issues

Among the changes in the competence based curriculum is the integration of cross cutting issues as an integral part of the teaching learning process-as they relate to and must be considered within all subjects to be appropriately addressed.

The eight cross cutting issues identified in the national curriculum framework are: genocide studies, environment and sustainability, gender, Comprehensive Sexuality Education (CSE), Peace and Values Education, Financial Education, standardization Culture and Inclusive Education.

Some cross cutting issues may seem specific to particular learning areas or subjects but the teacher needs to address all of them whenever an opportunity arises. In addition, student should always be given an opportunity during the learning process to address these cross cutting issues both within and out of the classroom so as to progressively develop related attitudes and values.

Below are examples on how crosscutting issues can be addressed in Pharmacology:

Cross-cutting issues	Examples on how to integrate the cross-cutting issues
Inclusive education	Involve all students in all activities without any bias. E.g.: Allow a student with physical disability (using wheelchair) to take notes or lead the team during an experiment.
Gender	Involve both girls and boys in all activities: No activity is reserved only to girls or boys. Teacher should ensure equal participation of both girls and boys during experiments as well as during cleaning and tidying up related activities after experiments.
Peace and Values Education	During group activities, debates and presentations, the teacher will encourage studentsto help each other and to respect opinions of colleagues.
Standardization culture	- Some lessons involve carrying out experiments. Instruction should be clear for students to always check if they are not using expired chemicals or defective apparatus. - In addition, when performing experiments students have to record data accurately. - For tasks involving calculations, they have to always present accurate results.
Environment and sustainability	- In order to avoid the environment pollution, before, during or after experiments students avoid throwing away chemicals anywhere; special places or appropriate containers should be used. - Students also have to be aware of the impacts of the use of hydrocarbons as fuels, halogen alkanes, and plastics on the environment.
Financial Education	When performing experiments, students are encouraged to avoid wasting chemicals by using the quantities that are just required. They are required to also avoid spoiling equipment and other material.

1.2.3. Attention to special educational needs specific to each subject

In the classroom, students learn in different ways depending to their learning pace, needs or any other special problems they might have. However, the teacher has the responsibility to know how to adopt his/her methodologies and approaches in order to meet the learning needs of each student in the classroom. Also teacher must understand that students with special needs need to be taught differently or need some accommodations to enhance the learning environment. This will be done depending on the subject and the nature of the lesson.

In order to create a well-rounded learning atmosphere, teacher needs to:

- Remember that students learn in different ways so they have to offer a variety of activities (e.g. role-play, music and singing, word games and quizzes, and outdoor activities).
- Maintain an organized classroom and limits distraction. This will help students with special needs to stay on track during lesson and follow instruction easily.
- Vary the pace of teaching to meet the needs of each student-teacher. Some students process information and learn more slowly than others.
- Break down instructions into smaller, manageable tasks. Students with special needs often have difficulty understanding long-winded or several instructions at once. It is better to use simple, concrete sentences in order to facilitate them understand what you are asking.
- Use clear consistent language to explain the meaning (and demonstrate or show pictures) if you introduce new words or concepts.
- Make full use of facial expressions, gestures and body language.
- Pair a student who has a disability with a friend. Let them do things together and learn from each other. Make sure the friend is not over protective and does not do everything for the student-teacher. Both students will benefit from this strategy
- Use multi-sensory strategies. As all students learn in different ways, it is important to make every lesson as multi-sensory as possible. Students with learning disabilities might have difficulty in one area, while they might excel in another. For example, use both visual and auditory cues.

Below are general strategies related to each main category of disabilities and how to deal with every situation that may arise in the classroom. However, the list is not exhaustive because each student is unique with different needs and that should be handled differently.

Strategy to help students with developmental impairment:

- Use simple words and sentences when giving instructions.
- Use real objects that the student can feel and handle, rather than just working abstractly with pen and paper.

- Break a task down into small steps or learning objectives. The student should start with an activity that s/he can do already before moving on to something that is more difficult.
- Gradually give the student less help.
- Let the student work in the same group with those without disability.

Strategy to help students with visual impairment:

- Help students to use their other senses (hearing, touch, smell and taste) to play and carry out activities that will promote their learning and development.
- Use simple, clear and consistent language.
- Use tactile objects to help explain a concept.
- If the students have some sight, ask them what they can see. Get information from parents/caregivers on how the student manages their remaining sight at home.
- Make sure the student has a group of friends who are helpful and who allow the students to be as independent as possible.
- Plan activities so that students work in pairs or groups whenever possible.

Strategy to help students with hearing impairment:

- Strategies to help students with hearing disabilities or communication difficulties
- Always get the students attention before you begin to speak.
- Encourage the student to look at your face.
- Use gestures, body language and facial expressions.
- Use pictures and objects as much as possible.
- Ask the parents/caregivers to show you the signs they use at home for communication use the same signs yourself and encourage other students to also use them.
- Keep background noise to a minimum.

Strategies to help children with physical disabilities or mobility difficulties:

- Adapt activities so that student who use wheelchairs or other mobility aids, or other students who have difficulty moving, can participate.
- Ask parents/caregivers to assist with adapting furniture e.g. The height of a table may need to be changed to make it easier for a student to reach it or fit their legs or wheelchair under.
- Encourage peer support friends can help friends.
- Get advice from parents or a health professional about assistive devices.

1.2.4 Guidance on assessment

Each unit in the teacher's guide provides additional activities to help students achieve the key unit competence. Results from assessment inform the teacher which student needs remedial, consolidation or extension activities. These activities are designed to cater for the needs of all categories of students; slow, average and gifted students respectively.

Assessment is an integral part of teaching and learning process. The main purpose of assessment is for improvement. Assessment for learning/ **Continuous/ formative assessment** intends to improve student-teachers' learning and teacher's teaching whereas assessment of learning/summative assessment intends to improve the entire school's performance and education system in general.

Continuous/ formative assessment

It is an ongoing process that arises out of interaction during teaching and learning process. It includes lesson evaluation and end of sub unit assessment. This formative assessment plays a big role in teaching and learning process. The teacher should encourage individual, peer and group evaluation of the work done in the classroom and uses appropriate competence-based assessment approaches and methods.

In Year two textbook, formative assessment principle is applied through application activities that are planned in each lesson to ensure that lesson objectives are achieved before moving on. At the end of each unit, the end unit assessment is formative when it is done to give information on the progress of students and from there decide what adjustments need to be done. Assessment standards are taken into consideration when setting tasks.

Summative assessment

The assessment done at the end of the term, end of year, is considered as summative. The teacher, school and parents are informed on the achievement of educational objectives and think of improvement strategies. There is also end of level/ cycle assessment in form of national examinations.

1.2.5. Student teachers' learning styles and strategies to conduct teaching and learning process

There are different teaching styles and techniques that should be catered for. The selection of teaching method should be done with the greatest care and some of the factors to be considered are: the uniqueness of subjects, the type of lessons, the particular learning objectives to be achieved, the allocated time to achieve the objective, instructional available materials, the physical/sitting arrangement of the classroom, individual student teachers' needs, abilities and learning styles.

There are mainly four different learning styles as explained below:

a) Active and reflective students

Active students tend to retain and understand information best by doing something active with it, discussing or applying it or explaining it to others. Reflective students prefer to think about it quietly first.

b) Sensing and intuitive students

Sensing students tend to like learning facts while intuitive students often prefer discovering possibilities and relationships. Sensors often like solving problems by well-established methods and dislike complications and surprises; intuitive students like innovation and dislike repetition.

c) Visual and verbal students

Visual students remember best what they see (pictures, diagrams, flow charts, time lines, films, demonstrations, etc); verbal students get more out of words (written and spoken explanations).

d) Sequential and global students

Sequential students tend to gain understanding in linear steps, with each step following logically from the previous one. Global students tend to learn in large jumps, absorbing material almost randomly without seeing connections, and then suddenly "getting it."

1.2.6 Teaching methods and techniques that promote the active learning

The different student learning styles mentioned above can be catered for, if the teacher uses active learning whereby students are really engaged in the learning process.

What is Active learning?

Active learning is a pedagogical approach that engages students in doing things and thinking about the things they are doing. In active learning, students are encouraged to bring their own experience and knowledge into the learning process.

The role of the teacher in active learning

- The teacher engages students through active learning methods such as inquiry methods, group discussions, research, investigative activities and group and individual work activities.
- He/she encourages individual, peer and group evaluation of the work done in the classroom and uses appropriate competence-based assessment approaches and methods.

- He provides supervised opportunities for students to develop different competences by giving tasks which enhance critical thinking, problem solving, research, creativity and innovation, communication and cooperation.
- Teacher supports and facilitates the learning process by valuing student-teachers' contributions in the class activities.

The role of students in active learning

Students are key in the active learning process. They are not empty vessels to fill but people with ideas, capacity and skills to build on for effective learning. A student engaged in active learning:

- Communicates and shares relevant information with other students through presentations, discussions, group work and other student-centred activities (role play, case studies, project work, research and investigation)
- Actively participates and takes responsibility for their own learning
- Develops knowledge and skills in active ways
- Carries out research/investigation by consulting print/online documents and resourceful people, and presents their findings
- Ensures the effective contribution of each group member in assigned tasks through clear explanation and arguments, critical thinking, responsibility and confidence in public speaking
- Draws conclusions based on the findings from the learning activities.

Some active techniques that can be used in Pharmacology

The teaching methods strongly emphasised in the competence Based Curriculum (CBC) are active methods.

Below are some active techniques that apply in sciences:

1) Practical work/ experiments:

Some activities suggested in Pharmacology curriculum as well as in the teacher'sbook are practical works or experiments.

Practical work is vital in learning Pharmacology; this method gives the student the opportunity to implement a series of activities and leads to the development of both cognitive and hands-on skills. This is particularly true when it comes to the need to prescribe and administer different drugs through a diversity of drug administration routes. The experiments and questions given should target the development of the following skills in student-teachers: observation, recording and report writing, manipulation, measuring, planning and designing.

A practical lesson/Experiment is done in three main stages:

- **Preparation of experiment:** Checking materials to ensure they are available and at good state; try the experiment before the lesson; think of safety rules and give instructions to lab technician if you have any.
- **Performance of experiment:** Sitting or standing arrangement of student-teachers; introduction of the experiment: aims and objectives; setting up the apparatus; performing the experiment; write and record the data.
- **Discussion:** Observations and interpreting data; make generalisations and assignment: writing out the experiment report and further practice and research.

In some cases, demonstration by the teacher is recommended when for example the experiment requires the use of sophisticated materials or very expensive materials or when safety is a major factor like dangerous experiments and it needs specific skills to be learnt first.

In case your school does not have enough laboratory materials and chemicals, experiments can be done in groups but make sure every student participates. You can also make arrangements with the neighbouring science school and take your students there for a number of experiments. The majority of the practical works will be carried out in the simulation lab.

2) Research work

Each student or group of students is given a research topic. They have to gather information from internet, available books in the library or ask experienced people and then the results are presented in verbal or written form and discussed in class.

3) Project work

Pharmacology teachers are encouraged to sample and prepare project works and engage their studentsin, as many as possible. Students in groups or individually, are engaged in a self-directed work for an extended period of time to investigate and respond to a complex question, problem, or challenge. The work can be presented to classmates or other people beyond the school. Projects are based on real-world problems that capture students' interest. This technique develops higher order thinking as the students acquire and apply new knowledge in a problem-solving context.

4) Field trip

One of the main aims of teaching Pharmacology in Rwanda is to apply its knowledge for development. To achieve this aim we need to show to students the relationship between classroom science lessons and applied sciences. This helps them see the link between science principles and technological applications.

To be successful, the field visit should be well prepared and well exploited after the visit:

Before the visit, the teacher and student:

- agree on aims and objectives
- gather relevant information prior to visit
- brainstorm on key questions and share responsibilities
- discuss materials needed and other logistical and administrative issues
- discuss and agree on accepted behaviours during the visit
- Visit the area before the trip if possible to familiarise yourself with the place

After the visit

When students come back from trip, the teacher should plan for follow-up. The follow-up should allow students to share experiences and relate them to the prior science knowledge. This can be done in several ways; either: Students write a report individually or in groups and give to the teacher for marking. The teacher then arranges for discussion to explain possible misconceptions and fill gaps. Or students write reports in groups and display them on the class notice board for everyone to read.

Main steps for a lesson in active learning approach

All the principles and characteristics of the active learning process highlighted above are reflected in steps of a lesson as displayed below. Generally, the lesson is divided into three main parts whereby each one is divided into smaller steps to make sure that students are involved in the learning process.

Below are those main parts and their small steps:

1) Introduction

Introduction is a part where the teacher makes connection between the current and previous lesson through appropriate technique. The teacher opens short discussions to encourage students to think about the previous learning experience and connect it with the current instructional objective. The teacher reviews the prior knowledge, skills and attitudes which have a link with the new concepts to create good foundation and logical sequencings.

2) Development of the new lesson

The development of a lesson that introduces a new concept will go through the following small steps: discovery activities, presentation of student-teachers' findings, exploitation, synthesis/summary and exercises/application activities, explained below:

- **Discovery activity**

  Step 1

  - The teacher discusses convincingly with students to take responsibility of their learning
  - He/she distributes the task/activity and gives instructions related to the tasks (working in groups, pairs, or individual to instigate collaborative learning, to discover knowledge to be learned)

  Step 2

  - The teacher lets the students work collaboratively on the task.
  - During this period the teacher refrains to intervene directly on the knowledge
  - He/she then monitors how the students are progressing towards the knowledge to be learned and boost those who are still behind (but without communicating to them the knowledge).

- **Presentation of student-teachers' productions**
  - In this episode, the teacher invites representatives of groups to present the student-teachers' productions/findings.
  - After three/four or an acceptable number of presentations, the teacher decides to engage the class into exploitation of the student-teachers' productions.
- **Exploitation of student-teachers's productions**
  - The teacher asks the students to evaluate the productions: which ones are correct, incomplete or false
  - Then the teacher judges the logic of the student-teachers' products, corrects those which are false, completes those which are incomplete, and confirms those which correct.
- **Institutionalization (summary/conclusion/ and examples)**
  - The teacher summarises the learned knowledge and gives examples which illustrate the learned content.

- **Exercises/Application activities**
  - Exercises of applying processes and products/objects related to learned unit/sub-unit
  - Exercises in real life contexts
  - Teacher guides students to make the connection of what they learnt to real life situations. At this level, the role of teacher is to monitor the fixation of process and product/object being learned.

3) Assessment

In this step the teacher asks some questions to assess achievement of instructional objective. During assessment activity, students work individually on the task/activity. The teacher avoids intervening directly. In fact, results from this assessment inform the teacher on next steps for the whole class and individuals. In some cases, the teacher can end with a homework assignment.

Term	Date	Subject	Class	Unit No.	Lesson No	Duration	Class Size
1	30/10/2021	Pharmacology	S_5 Ass. N.	1	1 of 12	80 Minutes	30 Students
Type of Special Educational Needs and number of students					2 students with mild hearing impairment will be assisted by ensuring that they occupy the front seats in the class to allow them to better understand. The teacher is requested to speak loudly to allow them capture the content taught. There is 1 student with mild visual impairment. This student will also occupy the front seat in the classroom, and the teacher will use big size letters during teaching. The teacher will also print the teaching material (case studies for example) with bigger font size.		

Topic area	Pharmacology
Sub-topic area	Applied Pharmacology
Unit Title	Antibiotics
Key Unit Competence	Manage different health conditions at the primary healthcare settings by utilizing antibiotics appropriately
Title of the Lesson	Definition of antibiotics and key concepts
Plan for this class(location: in / outside)	In the Class No.005
Instructional Objectives	By the end of the lesson, the students should be able to correctly define antibiotics and describe key concepts related to antibiotic therapy.
Learning Materials	Pharmacology textbooks, case studies, a sample of drug form for each class of antibiotics.
References	MedicineNet. (2021). Medical Definition of Antimicrobial. Retrieved from https://www.medicinenet.com/antimicrobial/definition.htm

Timing for Each step	Description of teaching and learning activity: The activities of this lesson will be conducted in groups in the classroom.		Competences and crosscutting issues to be addressed.
	Teacher's activities	Student's activities	
1. **Introduction** **5 Minutes**	**Ask some questions related to antibiotics:** - What do you mean by an antibiotic? - What is the importance of an antibiotic? - What do you think are the indications of antibiotics? - What do you understand by bacteriostatic and bactericidal antibiotics?	- Give answers - Listen attentively how the teacher defines the key concepts.	**Competences:** - Critical thinking - Communication
2. **Development of the lesson: in 45 minutes**			
2.1. Discovery activity	- Ask students to form five groups. - Provide materials and instructions to students. - Monitor how the students perform the group work and identify their different potentials towards the topic.	- Form five groups and randomly share responsibility. - choose group representative - Taking materials needed for this activity. - Students work in a participative manner on the assignment.	**Competences:** - Critical thinking - Communication - Collaboration - Problem solving **Crosscutting issues:** - Gender equality - Lifelong learning - Peace - Financial education
2.2. Presentation of findings	- Invite representatives of groups to presents their views.	- Representatives present group work - Other students follow the presentation attentively	**Competence:** - Communication

2.3. Exploitation of students' findings	- Ask the students to criticize the presentations one by one. - Ask students to identify correct, incomplete or false information. - Review the ideas of students' products, correct those which are false, complete those which are incomplete, and confirm those which are correct.	- Provide the comments to the presentations - Capture the corrections of the teacher	**Competence:** - Communication
2.4. Conclusion: In 20 minutes	- Summarize the knowledge learned - Give more clarifications on the content - Provide the harmonized content.	- Listen the clarification given by the teacher - Take summary	**Competence:** - Communication
3. **Assessment: in 10 minutes**	- Engage each student to work on self-assessment questions indicated in student 's textbook.	- Do the exercises required in student's textbook	**Competences:** - Creativity - Lifelong learning - Problem solving - Critical thinking
Comments on the lesson delivery			

PART III: UNIT DEVELOPMENT

UNIT 1 MEDICATIONS FOR PAIN, FEVER, SEIZURES, AND INFLAMMATION

1.1. Key Unit Competence:

Provide appropriate medication for pain, fever, seizures, and inflammation

1.2. Prerequisite (knowledge, skills, attitudes and values)

The learners should be introduced to the normal functions of human body and different body structures in the course of biology in the previous years, basic nursing skills in fundamentals of nursing; Surgical and medical pathologies including various ways of drug administration in senior four and five as well nurses' responsibilities and consideration for drug administration. Learnt in previously courses will help the students to acquire knowledge and skills related to inflammation, pain, fever, and seizures in senior six.

The tutor needs to ensure that this content has been covered

1.3. Cross-cutting issues to be addressed

a) Inclusive education

This unit involves the need to acquire knowledge to prescribe and administer anti-inflammation, pain, fever, and seizures drugs according to the standards and special considerations of patients' conditions. Prescription of drugs and analysis of each patient's specific condition requires critical thinking, and proper use of the brain. Critical thinking may be challenging for learners with mental disabilities, and this requires the teacher to assess the degree of mental disability to the concerned learners. Analysis of the teacher will help to see if the learners may be grouped with others who may critically think.

During teaching, ensure that learners with special needs are included throughout the course delivery. There may be for example learners with visual impairment, hearing impairment or even physical disabilities. For the learners with visual impairment, the teacher must ensure that they occupy the front seats in class, and they may be encouraged to report when they can't see well what is written or being presented. In case of class activities, these students may be grouped together with others who have healthy vision, and if there printed activities, ensure to use bigger font sizes. For learners with hearing impairment, these students must be included in the learning process. In this context, there is a need to for the teacher to speak loudly, help the learners occupy the front seats, and assess the degree of hearing impairment so that some may be guided to the healthcare settings to get medical care. The written points help students with visual impairment and speaking

aloud helps students with hearing impairment. Remember to repeat the main points of the lessons. Finally, for the learners with physical disability, the teacher needs to assess the degree of impairment, and check if it will be compatible with the professional requirements in later life or throughout the studies. In order to include such category of learners, the teacher must orient the learners on the requirements of the profession, and encourage them to come to class ahead of time to meet the time the course starts.

It is the responsibility of the teacher and teaching team to ensure that all learners with a diversity of disabilities are included in the learning process, and special considerations will be considered for each category of learners with special needs.

b) Gender education:

Emphasis throughout this unit has to be put on how both male and females have the same opportunities when it comes to generating pharmacology ideas and opportunities, there are no ideas/opportunities specifically reserved or meant for a particular gender but they can all choose whatever ideas they feel capable of.

Give examples of famous people who are successful in real life without considering their gender. Make sure that during different class activities, both boys and girls shares and participate equally in all activities. Bear in mind that they all have equal role in the smooth running of the class, and that the leaders of the class or group activities may be of either female or male gender. In addition to all having equal opportunities to generate ideas and opportunities to manage Pain ,Fever and Inflammation conditions , emphasis has to be put on how we all regardless of our background, economic or social setup have right to produce ideas that do not discriminate as our needs are the same. Learners need to understand that effective pharmacology ideas should not discriminate but promote inclusiveness of all patients' wellbeing etc.

c) Environment and sustainability:

Learners get basic knowledge from the natural sciences, so introduction to biodiversity is essential, the greatest source of pharmacology ideas and opportunities is the health environment and surrounding situations of what happens in daily living situation and the learners should be encouraged to maintain the biodiversity in order to keep the world safe. They also get skills and attitudes that will enable them in their everyday life to address the environment and climate change issues and to have a sustainable livelihood. Help the learners to know maximum skills and attitudes on the environmental sustainability and to be responsible in caring for students' environment.

Peace and Values: You need to emphasize to students the need to live in peace and harmony with others. Learners need to appreciate the application of pharmacology ideas and opportunities that promote peace and are not against the

values of the community they want to serve. Learners also need to appreciate the importance of promoting positive health care values especially towards society, clients, stakeholders, settings, and government. Refer to other cross cutting issues as identified in the curriculum framework

1.4. Guidance on the introductory activity

This introductory activity helps you to engage learners in the introduction of medication for pain, fever, seizures, and inflammation and invite the learners to follow the next lessons. The teacher will orient the students on the introductory activity; guide them as they go through the pictures in the student book and ask to form groups of students with a determined number. Inform them that there will be representatives from the groups to present as the rest of the class will be listening attentively and complement their colleagues their observations.

This introductory activity is intended to:

- Motivate the students to learn about medications for pain, fever, seizures, and inflammation
- Offer curiosity and inspiration to the learners about drugs used to manage pain, fever, inflammation and seizures and opportunities to care for case management.
- Emphasis is made on learner's attention to various health conditions that requires pharmacological treatment of pain, fever, seizures, and inflammation.
- Its purpose is to guide the learners about what they will learn from this unit.
- It can build on previous knowledge, skills, values and attitudes to help the teacher to assess the learner's prior knowledge and help to link with the new content, or the new content can help to arouse learner's interest about what to expect in the new content. That can be answered in one lesson, or many

Gradually, over a period of time as the unit progresses. At this point, there is no right or wrong answers as learners will gradually get more appropriate answers progressively as they go through the unit.

Teacher's activities:

- The tutors are encouraged to promote learning in small groups or pairs of learners and provide learners with Unit 1 introductory activity, give clear instructions to the activity.
- Ask a determined number of students to brainstorm on introductory activity
- During grouping or pairing, there is a need to ensure that learners with different levels of knowledge and understanding are mixed.
- The teacher also has a responsibility to help learners with different problems.
- Possible answers for the Introduction Activity (1.0): Refer learner's book

The images on introductory activity show patients with fever, pain, inflammation and seizure.

- A is an image of a patient with fever the nurse is taking body temperature for the patient.
- B is an image of a man who is experiencing headache.
- C image showing a man who follow down and who have seizure.
- D image show a wound and someone who is administrating medication to relieve the pain
- E image show different medications used to manage pain, inflammation and seizure

1.5.List of lessons/sub-headings including assessments

No of lessons	Lesson title	Learning objectives (From the syllabus including knowledge skills, attitudes)	Periods
1	Overview on pathophysiology of fever	– Describe pathophysiology of fever	2
2	Medications for fever	– Choose an appropriate drug for managing fever – Appreciate the effective management of fever based on national guidelines.	2
3	Overview on pathophysiology of pain	– Describe the pathophysiology of pain – Utilize different tools for pain assessment and scoring.	2
4	Medications for pain	Diagnose pain of the patient Choose an appropriate drug for managing pain Manage appropriately acute and chronic pain Appreciate the effective management of pain,	2
5	Pain management Using the WHO Ladder	Demonstrate the appropriate use of WHO pain ladder in management of pain	2

6	Anesthetic drugs	Explain the mechanism of action of local anesthesia Identify types of local anesthesia Identify possible complications related to local anesthesia	2
7	Introduction to anti-inflammatory drugs	Describe physiology of anti-inflammatory drugs Explain characteristics and mode of action of non- steroid anti- inflammatory medications	2
8	Anti-Inflammatory Drugs	Choose an appropriate drug for managing of inflammation Describe the therapeutic and adverse effects of non- steroidal anti-inflammatory medications	2
9	Medications for common cold and rhinitis	Provide appropriate medications for rhinitis and common cold Manage effectively patients with rhinitis and common cold	2
10	Introduction to seizures associated with fever	Describe the management of seizures	2
11	Medication for seizures	Effectively manage seizures related to fever	2
12	End of Unit Assessment		2

Lesson 1: Overview on pathophysiology of fever

a) Learning objectives:

By the end of the session, the learners should be able:

To provide appropriate medication for fever

Choose an appropriate drug for managing fever

b) Prerequisites/Revision/Introduction:

Read the Key unit competence in the syllabus to determine what students will learn and be able to do by the end of the unit. Look at the action verb, concept and context of each learning objective. This will help you get the skills, knowledge and attitudes embedded in the learning objective. Remember the learning objectives

are linked to the key unit competence. This is the first lesson of the first unit medication for pain, fever, seizures, and inflammation. In this lesson you will be dealing with medication for fever. The first thing to do before starting teaching is to remind students that they have learnt about anatomy and physiology and divide them into working groups, and let them discuss on the pictures in students book (Figure…..,). After the introductory activity to assess how much students already know and what they would be interested in learning medications for fever.

c) Teaching aids

Basic materials for a class/ lesson to be conducted include: Desks, Learners books, computer, internet if needed, flipchart, projectors, case studies, sample of different forms of antipyretic drugs and any other trustworthy and reliable resources to enhance learning.

Possible methods:

Pairs, small group discussion, brainstorming, on field observation

d) Learning Activity 1.1 . Introduction to medications for fever

Learners analyze the given images, which relates to the medication of fever. In groups of 3 to 6 students, or in pairs and come with ideas that may help them understand the physiology of fever, diagnose fever to patient and medications for fever that will result in effective management of pain. Refer students to the textbook of pharmacology in library, indicate pages they will read, then instruct them that after 20 period the will bring their findings or answers to be presented in classroom. Harmonize their findings; help them to draw conclusion on physiology of fever and medication for fever.

Harmonize and conclude on the learned knowledge and still engage students in making that conclusion

Teacher' activities

- Splits learners into groups
- Provide the necessary guidance for library searching materials.
- Move around in silence to monitor if they are having some problems
- Remember to assist those who are weak but without giving them the knowledge.
- Invites any three students to present their findings to the rest of students.
- Ask other students to follow carefully the presentations
- Note on chalk board / Manila paper the student's ideas.
- Tick the correct findings and correct those ones which are incorrect and try again to complete those which are incomplete.

- Harmonize and conclude on the learned knowledge and still engage students in making that conclusion

Learner's Role

- learners form groups as instructed
- Go to Library to search information as the teacher guided them materials.
- Ask questions where it seems not clear
- Request assistant if necessary.
- Being ready to present their findings to the other students.
- To follow carefully the presentations and ask questions if any.
- Note on chalk board / Manila paper the student's ideas.
- Follow the teacher when ticking the correct findings and correcting those ones which are incorrect

Learning activities

- Learners analyze the given questions, which relates to the type of fever that is famous in the community, either in groups or in pairs and come with ideas that may result in opportunities to get introduced physiology of fever, signs and assessment of fever, and their intent.
- This activity may be given as a research question or homework. Depending on the purpose of the assessment activity, choose an appropriate method to assess learners' findings, answers or responses.
- Depending on the performance or results, you may decide to give remedial or extension activities.

Answers for learning activity 1.1

Fever is caused by substances called pyrogens. Exogenous pyrogens are usually microbes or their products. Fever is the result of exogenous pyrogens that induce release of endogenous pyrogens, such as interleukin-1 (IL-1), tumor necrosis factor-alpha (TNF-alpha), and IL-6 and other cytokines, which then trigger cytokine receptors, or of exogenous pyrogens that directly trigger Toll-like receptors. Fever results when something raises the hypothalamic set point, triggering vasoconstriction and shunting of blood from the periphery to decrease heat loss; sometimes shivering, which increases heat production is induced.

These processes continue until the temperature of the blood bathing the hypothalamus reaches the new set point.

Answers for self-assessment 1.1

Complete the following sentences

1. Triggering heat production and heat conservation
2. Heat loss mechanisms

Lesson 2: Medications for fever

a) Learning objectives:

By the end of the session, the learners should be able to:

- Choose an appropriate drug for managing fever
- Appreciate the effective management of fever based on national guidelines

b) Prerequisites/Revision/Introduction:

Read the syllabus to determine what students will learn and be able to do by the end of the lesson. Look at the action verb, concept and context of each learning objective. This will help you see the skills, knowledge and attitudes embedded in the learning objective. Remember the learning objectives are linked to the key unit competence. This is the second lesson of the second unit of medication for pain, fever, seizures, and inflammation. In this lesson you will be dealing with medication for fever. The first thing to do before starting teaching is to remind students that they have learnt about anatomy and physiology, medical and surgical pathologies and divide them into working groups, and let them discuss on the content from the student's book and library text book, after the introductory activity to assess how much students already know and what they would be interested in learning about medications of fever.

c) Teaching aids

Basic materials for a class/ lesson to be conducted include: Desks, Learners books, computer, internet, flipchart, projectors, case studies, sample of each form of antipyretic drugs and any other trustworthy and reliable resources to enhance learning.

d) Possible methods:

Pairs, small group discussion, brainstorming

e) Learning activities

Learners analyze the given images, which relates to the medication of fever. In groups of 3 to 6 students, or in pairs and come with ideas that may help them understand the physiology of fever, diagnose fever to patient and medications for fever that will result in effective management of pain. Refer students to the textbook of pharmacology in library, indicate pages they will read, then instruct them that after

20 period they will bring their findings or answers to be presented in classroom. Harmonize their findings; help them to draw conclusion on physiology of fever and medication for fever.

Teacher' activities

- Splits learners into groups
- Provide the necessary guidance for library searching materials.
- Move around in silence to monitor if they are having some problems
- Remember to assist those who are weak but without giving them the knowledge.
- Invites any three students to present their findings to the rest of students.
- Ask other students to follow carefully the presentations
- Note on chalk board / Manila paper the student's ideas.
- Tick the correct findings and correct those ones which are incorrect and try again to complete those which are incomplete.
- Harmonize and conclude on the learned knowledge and still engage students in making that conclusion

Learner's Role

- learners form groups as instructed
- Go to Library to search information as the teacher guided them materials.
- Ask questions where it seems not clear
- Request assistant if necessary.
- Being ready to present their findings to the other students.
- To follow carefully the presentations and ask questions if any.
- Note on chalk board / Manila paper the student's ideas.
- Follow the teacher when ticking the correct findings and correcting those ones which are incorrect

Answers for learning activity 1.2

1. Antipyretic are medications used to treat fever.
2. Paracetamol reduce fever by direct action at the level of the hypothalamus and dilation of peripheral blood vessels, which enables sweating and dissipation of heat.
3. Paracetamol is available in many forms. Acetaminophen is available as tablets, caplets, solutions, suppositories and injectable

Answers for self-assessment 1.2

1. Paracetamol, ibuprofen, aspirin
2. D
3. A, B, D, F

LESSON 3. Overview on pathophysiology of pain

a) Learning objectives:

By the end of the session, the learners should be able to:

- Describe physiology of pain
- Utilize different tools for pain assessment and scoring

b) Prerequisites/Revision/Introduction:

Read the syllabus to determine what students will learn and be able to do by the end of the lesson. Look at the action verb, concept and context of each learning objective. This will help you see the skills, knowledge and attitudes embedded in the learning objective. Remember the learning objectives are linked to the key unit competence. This is the third lesson of the first unit medication for pain, fever, seizures, and inflammation. In this lesson you will be dealing with physiology, assessment and diagnosis of pain. The first thing to do before starting teaching is to remind students that they have learnt about anatomy and physiology, medical and surgical pathologies and divide them into working groups, and let them discuss on the content from the student's book and library text book, after the learning activity to assess how much students already know and what they would be interested in learning about pathophysiology of pain.

c) Teaching aids

Basic materials for a class/ lesson to be conducted include: Desks, Learners books, computer, internet (if needed), flipchart, projectors, case studies, sample of each form of antipyretic drugs and any other trustworthy and reliable resources to enhance learning.

d) Possible methods:

Pairs, small group discussion, brainstorming

e) Learning activities

Teacher' activities

- Splits learners into groups
- Mention the part of the lesson in student book
- Provide the necessary guidance for library searching materials.

- Move around in silence to monitor if they are having some problems
- Remember to assist those who are weak but without giving them the knowledge.
- Invites students to present their findings to the rest of students.
- Ask other students to follow carefully the presentations
- Note on chalk board / Manila paper the student's ideas.
- Tick the correct findings and correct those ones which are incorrect and try again to complete those which are incomplete.
- Harmonize and conclude on the learned knowledge and still engage students in making that conclusion

Learner's Role

- Learners form groups as instructed
- Go to Library to search information as the teacher guided them and use the different materials to search for informations.
- Ask questions where it seems not clear
- Request assistant from the teacher where it is needed.
- Present their findings to the other students.
- Following carefully to the presentations and ask questions if any.
- Note on chalk board / Manila paper the student's ideas.
- Follow the teacher when ticking the correct findings and correcting those ones which are incorrect.

Possible answers for learning activity 1.3

a. Pain is a displeasing sensory and emotional experience related to real or potential tissue impairment

b. The pain is assessed using verbal rating scales, numeric scales, and analogues scales. The most commonly used is a numeric scale.

Answer for Self-assessment 1.3

1. Types of pain are neuropathic pain, nociceptive pain and sympathetic pain.
2. The patient has moderate pain3.
3. a. False

– Not only diseases lead to pain even damage, injuries, procedures may cause someone's pain

b. True

- The perception of pain is subjective

c. False

- Not all pain medication for pain lead to sedation

LESSON 4. MEDICATIONS FOR PAIN

a) Learning objectives:

By the end of the session, the learners should be able to:

- Diagnose pain of the patient
- Choose an appropriate drug for managing pain
- Manage acute and chronic pain appropriately

b) Prerequisites/Revision/Introduction:

Read the syllabus to determine what students will learn and be able to do by the end of the lesson. Look at the action verb, concept and context of each learning objective. This will help you see the skills, knowledge and attitudes embedded in the learning objective. Remember the learning objectives are linked to the key unit competence. This is the Fourth lesson of the first unit medication for pain, fever, seizures, and inflammation. In this lesson you will be dealing with medication for pain. The first thing to do before starting teaching is to remind students that they have learnt about anatomy and physiology, medical and surgical pathologies. Divide them into working groups, and let them discuss on the content from the student's book and library text book, after the introductory activity to assess how much students already know and what they would be interested in learning about medications for pain.

c) Teaching aids

Basic materials for a class/ lesson to be conducted include: Desks, Learners books, computer, internet, flipchart, projectors, case studies, sample of each form of antipyretic drugs and any other trustworthy and reliable resources to enhance learning.

d) Possible methods:

Working Pairs, small group discussion, brainstorming

e) Learning activities

Teacher' activities

Ask learners to form groups and read in student's books about different medications used to manage pain, indications forms with posology and different special considerations, indicates them the page, move around in silence to monitor if they are having some problems, remember to assist those who are weak but without

giving them the knowledge, invites any students to present their findings to the rest of students. Ask other students to follow carefully the presentations. Note on chalk board / Manila paper the student's ideas. Tick the correct findings and correct those ones which are incorrect and try again to complete those which are incomplete.

Harmonize and conclude on the learned knowledge and still engage students in making that conclusion

Learner's Role

- **learners form groups as instructed**
- **Go to Library to search information as the teacher guided them and use different materials to search for information.**
- **Ask questions where it seems not clear**
- **Request assistant if necessary.**
- **Present their findings to the other students.**
- **Following carefully to the presentations and ask questions if any.**
- **Note on chalk board / Manila paper the student's ideas.**
- **Follow the teacher when ticking the correct findings and correcting those ones which are incorrect**

Answer for learning activity 1.4

1. Analgesics are classified as Opioid analgesics (morphine), non-opioid analgesics that include salicylates (aspirin), non-steroidal ant inflammatory drugs (ibuprofen).
2. Morphine is indicated for relief of moderate and severe pain.
3. Tramadol is contra indicated for alcohol intoxication; excessive use of central- acting analgesics, hypnotics, opioids, or other psychotropic drugs; hypersensitivity to tramadol or its components.

Self-assessment 1. 4

1. C (Medications used to treat pain include morphine, ibuprofen and diclofenac
2. D (Contraindication of morphine is asthma and respiratory depression)
3. B (Tramadol is a weak opioid)

LESSON 5. WORLD HEALTH ORGANIZATION (WHO) PAIN MANAGEMENT LADDER

a) Learning objectives:

By the end of the session, the learners should be able to:

Demonstrate the appropriate use of WHO pain management ladder .

b) Prerequisites/Revision/Introduction:

Look at the action verb, concept and context of the learning objective. This will help you see the skills, knowledge and attitudes embedded in the learning objective. Remember the learning objectives are linked to the key unit competence. This is the **Fifth lesson** of the first unit medication for pain, fever, seizures, and inflammation. In this lesson you will be dealing with WHO pain ladder in management of pain with pain myths. The first thing to do before starting teaching is to remind students that they have learnt about pain physiology and its management discuss on the content from the student's book and library text book, after the introduction and assess how much students already know and what they would be interested in learning about WHO Pain Ladder. Also, the teacher needs to ask students what they know about myths some myths about pain

c) Teaching aids

Basic materials for a class/ lesson to be conducted include: Desks, Learners books, computer, internet, flipchart, projectors, case studies, sample of each form of antipyretic drugs and any other trustworthy and reliable resources to enhance learning.

d) Possible methods:

Pairs, small group discussion, brainstorming

e) Learning activities

Teacher' activities

Ask learners to form groups and read in student's books about and search on intent (Teacher will indicate the website updated) Move around in silence to monitor if they are having some problems, remember to assist those who are weak but without giving them the knowledge, invites any students to present their findings to the rest of students. Ask other students to follow carefully the presentations. Note on chalk board / Manila paper the student's ideas. Tick the correct findings and correct those ones which are incorrect and try again to complete those which are incomplete.

Harmonize and conclude on the learned knowledge and still engage students in making that conclusion

Learner's Role

- **learners form groups as instructed**
- **Go to Library to search information as the teacher guided them.**
- **Ask questions where it seems not clear**
- **Request assistant if necessary.**
- **Present their findings to the other students.**
- **To follow carefully the presentations and ask questions if any.**
- **Note on chalk board / Manila paper the student's ideas.**
- **Follow the teacher when ticking the correct findings and correcting those ones which are incorrect.**

Possible answers for learning activity 1.5.

1. According to WHO pain management ladder, the levels of pain are Mild pain, moderate pain and severe pain.
2. Management of pain

Mild pain: non-opioid analgesics only or plus adjuvant analgesics

Moderate pain: Weak opioid only or plus non-opioid analgesics or plus adjuvant analgesics.

Severe pain: Strong opioid only or plus non-opioid analgesic or plus adjuvant analgesics.

Possible answers for self-assessment 1.5

1. B (Tramadol)
2. B (Tramadol+ Buscopan)
   a. Adjuvant drugs are used to enhance the effects of pain medications
   b. To treat concurrent symptoms
   c. To provide analgesia for other types of pain

LESSON 6. ANESTHETICS

a) Learning objectives:

By the end of the session, the learners should be able to:

- Explain the mechanism of action of local anesthesia
- Identify types of local anesthesia
- Identify possible complications related to local anesthesia

b) Prerequisites/Revision/Introduction:

Look at the action verb, concept and context of the learning objective. This will help you see the skills, knowledge and attitudes embedded in the learning objective. Remember the learning objectives are linked to the key unit competence. This is the **sixth lesson** of the first unit medication for pain, fever, seizures, and inflammation. In this lesson you will be dealing with WHO pain ladder in management of pain with pain myths. The first thing to do before starting teaching is to remind students that they have learnt about medical pathology and surgical pathology discuss on the content from the student's book and library text book on local anesthetics, after the introduction and assess how much students already know and what they would be interested in learning anesthetics.

c) Teaching aids

Basic materials for a class/ lesson to be conducted include: Desks, Learners books, computer, internet, flipchart, projectors, case studies, sample of each form of anesthetic drugs and any other trustworthy and reliable resources to enhance learning.

d) Possible methods:

Pairs, small group discussion, brainstorming

e) Learning activities

Teacher' activities

- Ask learners to form groups and read in student's books about anesthetics.
- Move around in silence to monitor if they are having some problems, remember to assist those who are weak but without giving them the knowledge.
- Invites any students to present their findings to the rest of students.
- Ask other students to follow carefully the presentations
- Note on chalk board / Manila paper the student's ideas.
- Tick the correct findings and correct those ones which are incorrect and try again to complete those which are incomplete.
- Harmonize and conclude on the learned knowledge and still engage students in making that conclusion

Learner's Role

- Learners form groups as instructed
- Go to Library to search information as the teacher guided them
- Ask questions where it seems not clear
- Request assistant if necessary.
- Present their findings to the other students.

- Following carefully to the presentations and ask questions if any.
- Note on chalk board / Manila paper the student's ideas.
- Follow the teacher when ticking the correct findings and correcting those ones which are incorrect

Possible answers for learning activity 1.6

1. An anesthetic is a drug used to cause complete or partial loss of sensation
2. The wound is painful, before suturing there is a need to provide an anaesthetic drug as it blocks nerve preventing depolarization of nerve membranes, blocking the transmission of pain stimuli and causes the loss of reflexes to allow surgical procedure performance without feeling the pain.
3. There are two categories of anesthetics: Local anesthetics and general anesthetics

Answer for self-assessment 1.6

1. Advantages of using local anesthetics are simple, economical, and no expensive , equipment needed is minimal, postoperative recovery is brief, undesirable effects of general anesthesia are avoided. It is ideal for short and superficial surgical procedures
2. Complications of local anesthetics are discomfort at injection site, tingling sensation, minor bruising, bleeding or soreness where the injection was given, dizziness, headaches, blurred vision, twitching muscles, continuing numbness, weakness or pins, seizures or a cardiac arrest.
3. A. Tablet

LESSON 7. Overview on physiology of inflammation

a) Learning objectives:

By the end of this session, the learners should be able to:

Describe physiology of anti-inflammatory drugs.

Explain characteristics and mode of action of non- steroid anti- inflammatory medication.

Explain the therapeutic action of non- steroid anti- inflammatory medication.

b) Prerequisites/Revision/Introduction:

Read the syllabus to determine what students will learn and be able to do by the end of the lesson. Look at the action verb, concept and context of each learning

objective. This will help you see the skills, knowledge and attitudes embedded in the learning objective. Remember the learning objectives are linked to the key unit competence. This is the **seventh lesson** of the first unit medication for pain, fever, seizures, and inflammation. In this lesson you will be dealing with introduction to inflammation. starting teaching by reminding students that they have learnt about anatomy and physiology, medical and surgical pathologies and divide them into working groups or at individual task, and let them discuss on the content from the students book and library text book, after careful observing the image of introductory activity to assess how much students already know and what they would be interested in learning about inflammation.

c) Teaching aids

Basic materials for a class/ lesson to be conducted include: Desks, Learners books, computer, internet, flipchart, projectors, case studies, sample of inflammation image and any other trustworthy and reliable resources to enhance learning.

d) Possible methods:

Pairs, small group discussion, brainstorming

e) Learning activities

Teacher' activities

- **Ask learners to form groups and read in student's books about inflammation.**
- **Indicates them the page**
- **Move around in silence to monitor if they are having some problems**
- **Remember to assist those who are weak but without giving them the knowledge.**
- **Invites any students to present their findings to the rest of students.**
- **Ask other students to follow carefully the presentations**
- **Note on chalk board / Manila paper the student's ideas.**
- **Tick the correct findings and correct those ones which are incorrect and try again to complete those which are incomplete.**
- **Harmonize and conclude on the learned knowledge and still engage students in making that conclusion.**

The teacher refers students in their respective groups to texbooks of Biology,pathophysiology and pharmacology and instruct to read about physiology of inflammation and mode ofaction of anti-inflammatory drugs, then tell them when to come back for presentation.

Learner's Role

- Learners form groups as instructed
- Go to Library to search information as the teacher guided them.
- Ask questions where it seems not clear
- Request assistant if necessary.
- Present their findings to the other students.
- Following carefully to the presentations and ask questions if any.
- Note on chalk board / Manila paper the student's ideas.
- Follow the teacher when ticking the correct findings and correcting those ones which are incorrect.

Possible answers for learning activity 1.7

1. These images show person with swelling and redness. On image A, the person may be a having a contusion, on image B, the person may have had a burn, on image C, the person may be having an insect bite (redness on the affected area).
2. The causes of inflammation are: physical injury, exposure to toxic chemicals, extreme heat and invading microorganism or cell death.
3. Inflammation is defense mechanism which happen in case the body is exposed to various stimuli like physical injury, exposure to toxic chemicals, extreme heat, invading microorganism or cell death. The damaged tissue releases a number of chemical mediators (histamine, leukotrienes, bradykinin, complement, and prostaglandins) that act as an alarms to notify the surrounding area of the injury to destroy or neutralizing the foreigh body. it is characterized by pain, swelling, fever and change in skin color(redness).

Answers for Self-assessment 1.7

1. The inflammation becomes chronic
2. Chemical mediators of inflammation include histamine, leukotrienes, bradykinin, complement, and prostaglandins

LESSON 8. ANTI-INFLAMMATORY DRUGS

a) Learning objectives:

By the end of this session, the learners should be able to:

Choose an appropriate drug for managing inflammation

Describe the therapeutic and adverse effects of non- steroidal anti- inflammatory medications

b) Prerequisites/Revision/Introduction:

Read the syllabus to determine what students will learn and be able to do by the end of the lesson. Look at the action verb, concept and context of each learning objective. This will help you see the skills, knowledge and attitudes embedded in the learning objective. Remember the learning objectives are linked to the key unit competence. This is the eighth lesson of the first unit of medications for pain, fever, seizures, and inflammation. In this lesson you will be dealing with non-steroid anti-inflammation drugs. starting teaching by reminding students that they have learnt about anti-inflammation drugs and divide them into working groups or at individual task, and let them discuss on the content from the student's book and library text book assess how much students already know and what they would be interested in learning about inflammation.

c) Teaching aids

Basic materials for a class/ lesson to be conducted include: Desks, Learners books, computer, internet, flipchart, projectors, case studies, sample of inflammation image and any other trustworthy and reliable resources to enhance learning.

d) Possible methods:

Pairs, small group discussion, brainstorming

e) Learning activities

Teacher's activities

Ask learners to form groups and read in student's books about inflammation. Indicates them the page. Move around in silence to monitor if they are having some problems. Remember to assist those who are weak but without giving them the knowledge. Invites any students to present their findings to the rest of students. Ask other students to follow carefully the presentations. Note on chalk board / Manila paper the student's ideas. Tick the correct findings and correct those ones which are incorrect and try again to complete those which are incomplete.

Harmonize and conclude on the learned knowledge and still engage students in making that conclusion

Learner's Role

- Learners form groups as instructed
- Go to Library to search information as the teacher guided them.
- Ask questions where it seems not clear
- Request assistant if necessary.
- Present their findings to the other students.
- Following carefully to the presentations and ask questions if any.

- Note on chalk board / Manila paper the student's ideas.
- Follow the teacher when ticking the correct findings and correcting those ones which are incorrect.

Answers for learning activity 1.8

1. Ibuprofen, aspirin, diclofenac, indomethacin
2. Antinflammatory drugs act by blocking prostaglandin synthesis
3. The side effects of Nonsteroidal anti-inflammatory drugs are bleeding, gastric upset and reduced kidney function (the list is exhaustive).

Possible Answers for Self-assessment 1.8

1. Mr. H has an inflammation and pain; diclofenac and ibuprofen are drugs that act both on pain and inflammation).
2. a. Miss N has moderate pain, diclofenac suppository or 75mg in IM will be administered (acute pain needed to be managed as soon as possible that's why parenteral route is preferred for quick action, and for the continuation she has to take drugs per os), then diclofenac 50mg t.i.ds, prn or ibuprofen 400mg t.i.ds.

   b. Aspirin is contraindicated because she has active bleeding this may lead to more bleeding as aspirin interferes with platelets aggregation.

LESSON 9. MEDICATIONS FOR COMMON COLD AND RHINITIS

a) Learning objectives:

By the end of this session, the learners should be able to:

Provide appropriate medications for common cold and rhinitis

Manage effectively patients with rhinitis and common cold

b) Prerequisites/Revision/Introduction:

Read the syllabus to determine what students will learn and be able to do by the end of the lesson. Look at the action verb, concept and context of each learning objective. This will help you see the skills, knowledge and attitudes embedded in the learning objective. Remember the learning objectives are linked to the key unit competence. This is the ninth lesson of the first unit medication for pain, fever, seizures, and inflammation. In this lesson you will be dealing with medications for rhinitis and common cold. starting teaching by reminding students that they have

learnt about non- steroidal anti- inflammatory medication and divide them into working groups or at individual task, and let them discuss on the content from the student's book and library text book assess how much students already know and what they would be interested in learning about medications for common cold and rhinitis.

c) Teaching aids

Basic materials for a class/ lesson to be conducted include: Desks, Learners books, computer, internet, flipchart, projectors, case studies, sample of medications for rhinitis and common cold and any other trustworthy and reliable resources to enhance learning.

a) Possible methods:

Pairs, small group discussion, brainstorming

b) Learning activities

Teacher' activities

Ask learners to form groups and send them to library, indicate books to read and instruct them when to come back in class for presentation. Invites any students to present their findings to the rest of students. Ask other students to follow carefully the presentations. Note on chalk board / Manila paper the student's ideas. Tick the correct findings and correct those ones which are incorrect and try again to complete those which are incomplete.

Harmonize and conclude on the learned knowledge and still engage students in making that conclusion.

Learner's Role

- Learners form groups as instructed
- Go to Library to search information as the teacher guided them.
- Ask questions where it seems not clear
- Request assistant if necessary.
- Present their findings to the other students.
- Following carefully to the presentations and ask questions if any.
- Note on chalk board / Manila paper the student's ideas.
- Follow the teacher when ticking the correct findings and correcting those ones which are incorrect

Possible answers for learning activity 1.9

1. Medications for common cold are grouped into three groups.

A. Antihistamines Example Chlorpheniramine, promethazine, desloratidine, loratidine

B. Antinflammatory drugs: corticosteroids

C. Decongestants example: Beclomethasone

2. Antihistamines medications act by blocking the release or action of histamine, a chemical released during inflammation that increases secretions and narrows airways.

Possible answers for self assessment 1.9.

1. C
2. B
3. D

LESSON 10. OVERVIEW ON PATHOPHYSIOLOGY OF SEIZURES

a) Learning objectives:

By the end of this session, the learners should be able to:

Explain the mechanism of seizures related to fever

b) Prerequisites/Revision/ guidance to introductory activity:

Read the syllabus to determine what students will learn and be able to do by the end of the lesson. Look at the action verb, concept and context of each learning objective. This will help you see the skills, knowledge and attitudes embedded in the learning objective. Remember the learning objectives are linked to the key unit competence. This is the tenth lesson of the first unit of medication for seizures. In this lesson you will be dealing with introductory to anti-seizure medications. starting teaching by reminding students that they have learnt about non- medical pathology and neurological at individual task, and bring them to discuss on the content from the students book and library text book assess how much students already know and what they would be interested in learning about the pathophysiology seizures.

c) Teaching aids

Basic materials for a class/ lesson to be conducted include: Desks, Learners books, computer, internet, flipchart, projectors, case studies, sample of medication for seizures and any other trustworthy and reliable resources to enhance learning.

d) Possible methods:

Pairs, small group discussion, brainstorming

e) Learning activity 1.10. Medications for seizures

Teacher' activities

Ask learners to form groups and read in student's books about medication for seizures, indicates them the page. Move around in silence to monitor if they are having some problems, remember to assist those who are weak but without giving them the knowledge. Tick the correct findings and correct those ones which are incorrect and try again to complete those which are incomplete.

Learner's Role

- Learners form groups as instructed
- Go to Library to search information as the teacher guided them.
- Ask questions where it seems not clear
- Request assistant if necessary.
- Present their findings to the other students.
- Following carefully to the presentations and ask questions if any.
- Note on chalk board / Manila paper the student's ideas.
- Follow the teacher when ticking the correct findings and correcting those ones which are incorrect

Answers for learning activity 1.10

1. Someone is impressed struggling to handle the person with problems who is sleeping on floor. The person in red t-shirt is trying to hold the person with several abnormal body movements without success. Even the head of the person shown those abnormal movements. After occurrence of seizure the patient is very tired and weak.
2. Seizures are uncontrolled electrical activity in the brain that may lead to symptoms ranging from mild loss of attention to violent muscular contractions that can lead to death. Everyone has the potential to have seizures or convulsion. The seizures occur when there is an abnormal electrical activity in the brain.

Self -assessment 1.10

1. A
2. C

3. A. True

   B. True

   C. False

LESSON 11. MEDICATIONS FOR SEIZURES

a) Learning objectives:

By the end of this session, the learners should be able to:

Describe the management of seizures associated with high fever

b) Prerequisites/Revision/ Introduction:

Read the syllabus to determine what students will learn and be able to do by the end of the lesson. Look at the action verb, concept and context of each learning objective. This will help you see the skills, knowledge and attitudes embedded in the learning objective. Remember the learning objectives are linked to the key unit competence. This is the eleventh lesson of the first unit of medication for seizures. In this lesson you will be dealing with seizures related to fever. starting teaching by reminding students that they have learnt about non- medical pathology and neurological at individual task, and bring them to discuss on the content from the student's book and library text book assess how much students already know and what they would be interested in learning about medications for seizures.

c) Teaching aids

Basic materials for a class/ lesson to be conducted include: Desks, Learners books, computer, internet, flipchart, projectors, case studies, sample of medication for seizures and any other trustworthy and reliable resources to enhance learning.

d) Possible methods:

Pairs, small group discussion, brainstorming

e) Learning activities

Teacher' activity 1.11

Ask learners to form groups and read in student's books about medication for seizures, indicates them the page. Move around in silence to monitor if they are having some problems, remember to assist those who are weak but without giving them the knowledge. Tick the correct findings and correct those ones which are incorrect and try again to complete those which are incomplete.

Learner's Role

- Learners form groups as instructed
- Go to Library to search information as the teacher guided them.
- Ask questions where it seems not clear

- Request assistant if necessary.
- Present their findings to the other students.
- Following carefully to the presentations and ask questions if any.
- Note on chalk board / Manila paper the student's ideas.
- Follow the teacher when ticking the correct findings and correcting those ones which are incorrect

Possible answers for learning activity 1.11

1. There are four classes of drugs used as anticonvulsants and examples: Barbiturates (Phenobarbital), Hydantoins (Phenytoin, Carbamazepine, Valproic acid), Benzodiazepines (Diazepam, lorazepam) and Succinimides (Ethosuximide).
2. The common side effects of antiseizures drugs are: poor concentration, short term memory loss, drowsiness, fatigue, hyperactivity, Visual problems (blurred or double vision), speech problems, poor coordination and balance, dizziness and unsteadiness, nausea, vomiting and weight gain or loss.

Self-assessment 1.11

1. C (phenobarbital)
2. B. (benzodiazepines)
3. C. (Succinimides)
4. A. (Tegretol)

1.6. Unit summary

Fever is interceded by hypothalamus and it induces reactions depending on the status of body temperature.

- The accurate way of Fever diagnosis using the thermometer
- Paracetamol is the chief medication for fever management
- Ibuprofen and aspirin are both anti-inflammatory drugs and antipyretics
- Nonsteroidal anti-inflammatory drugs block prostaglandin and the result is relieving inflammation
- The common side effect of NSAIDs gastric upset in general and bleeding (aspirin)
- Pain is subjective perception in nature

- Numeric scale is the commonly used for pain assessment
- For better pain management WHO Ladder is considered
- NSAIDs, adjuvants, weak opioids, strong opioids are used to manage pain
- Lidocaine is a commonly used local anesthetic
- Fever induced seizure are very common in kids
- Antihistamine, decongestants are drugs used to treat common cold and rhinitis
- Phenobarbital, diazepam and phenytoin are commonly used antiseizure drugs

1.7. Additional information for teachers

Anti-inflammatory drugs

The steroids drugs like prednisolone, dexamethasone act as anti-inflammatory drugs.

Pain physiology and management

Nociceptive Pathways of pain

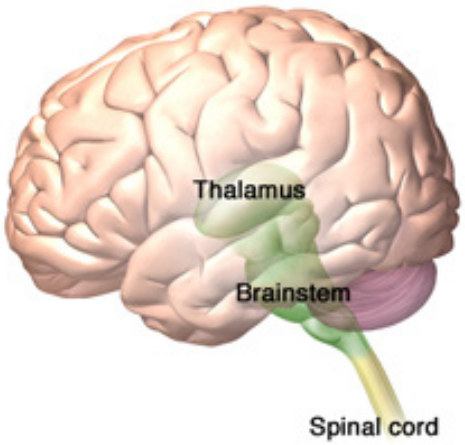
The classic nociceptive pathway involves three types of neurons:

- Primary sensory neurons in the peripheral nervous system, which conduct painful sensations from the periphery to the dorsal root of the spinal cord
- Secondary sensory neurons in the spinal cord or brainstem, which transmit the painful sensation to the thalamus
- Tertiary sensory neurons, which transmit the painful sensation from the thalamus to the somatosensory areas of the cerebral cortex.

There are two major classes of nerve fibers associated with the transmission of pain:

1. Unmyelinated C fibers
2. Myelinated A-delta fibers

Destinations of the Spinothalamic and Spinoreticular Tracts in the Brain



The thalamus is the destination of spinothalamic tract—the sensory pathway responsible for processing pain, temperature, and crude touch. The brainstem reticular formation, which forms a diffuse, central core within the brainstem is the destination of the spinoreticular tract. Source: 3DScience.com. Used by permission.

The C fibers are small and conduct impulses slowly. They respond to thermal, mechanical, and chemical stimuli and produce the sensation of dull, diffuse, aching, burning, and delayed pain. A-delta fibers, which are myelinated and thus conduct impulses rapidly, respond to mechanical (pressure) stimulus and produce the sensation of sharp, localized, fast pain.

One of the most important central pain pathways is the spinothalamic tract, which originates in the spinal cord and extends to the thalamus. This spinal tract transmits sensory information related to pain, temperature, and crude touch.

Another prominent pathway is the spinoreticular tract, which is involved in nociceptive processing. The spinoreticular tract is similar to the spinothalamic tract in that it is excited by similar sensory fibers. Rather than ascending to the thalamus however, spinoreticular neurons terminate within the brainstem.

The management of pain do not require only drugs. There are many non-pharmacology measures of managing pain. Researches have revealed that they stimulate descending inhibitory pathway and decreases afferent stimulation. These measures include but not limited to music, distraction, massage, positioning, aromatherapy, reflexology, warmth and for children swaddling, non-nutritive sucking etc.

Unrelieved pain

Unrelieved pain is a stressor that can lead to physiologic changes and negative effects on the endocrine, cardiovascular, gastrointestinal, and immune systems. The endocrine system reacts to unrelieved pain by releasing an excessive amount of hormones, ultimately resulting in carbohydrate, protein, and fat catabolism, poor glucose utilization, and other harmful effects. This reaction combined with inflammatory processes can produce weight loss, tachycardia, increased respiratory rate, fever, shock, and death.

The cardiovascular system responds to the stress of unrelieved pain by activating the sympathetic nervous system. Following a surgical procedure, for example, this can include hypercoagulation and increased heart rate, blood pressure, cardiac workload, and oxygen demand. Since the stress response causes an increase in sympathetic nervous system activity, intestinal secretions and smooth muscle sphincter tone increase, and gastric emptying and intestinal motility decrease. This response can cause temporary impairment of gastrointestinal function and increase the risk of ileus (intestinal obstruction). Aggressive pain control may be needed to reduce these effects and prevent thromboembolic complications.

Unrelieved pain may be especially harmful for patients with metastatic cancers. Stress and pain can suppress immune function, including the natural killer cells that play a role in preventing tumor growth and controlling metastasis.

Anesthetics drugs

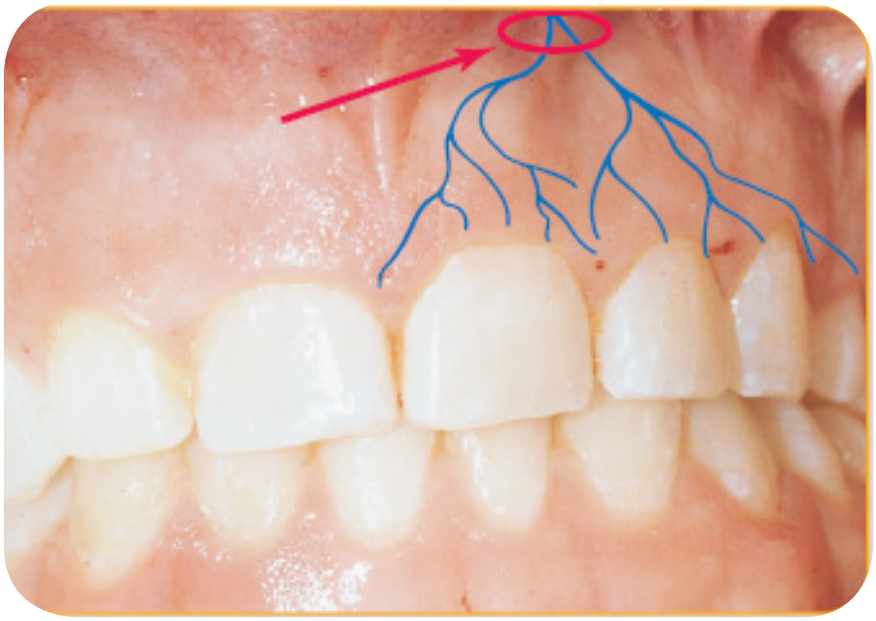
Apart from their classification as local and general anesthetics, anesthetics are also classified based on their chemical composition as follows:

Chemical class	Example
Esters	Benzocaine, chloroprocaine, cocaine, procaine Hydrochloride, tetracaine
Amides	bupivacaine hydrochloride, lidocaine hydrochloride, mepivacaine
Miscellaneous Agents	Dyclonine,(for ear, nose, and throat Procedures), pramoxine (for minor medical Procedures)

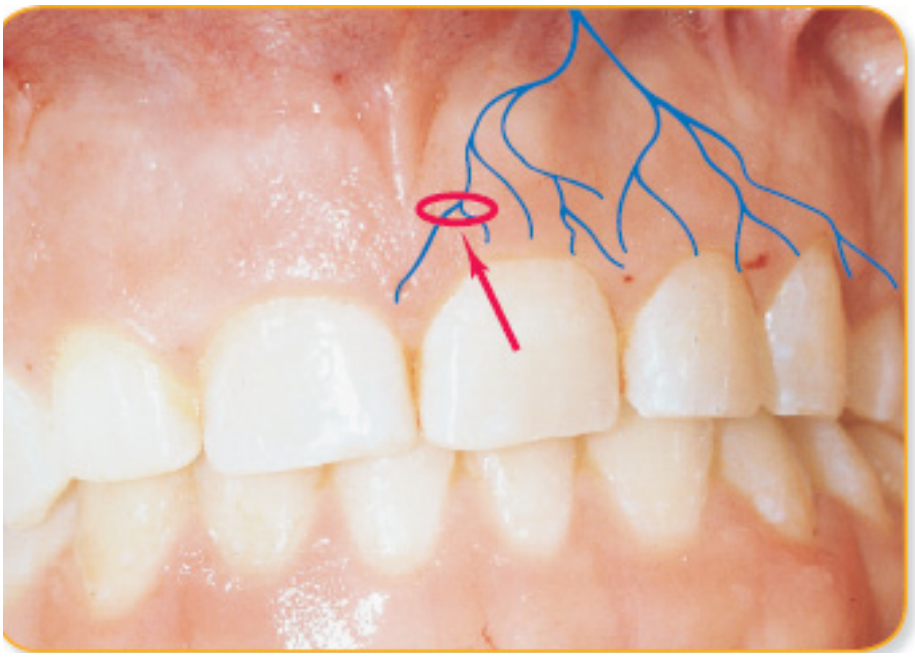
There are five major routes for applying local anaesthetics. These routes are summarized as follows:

Topical

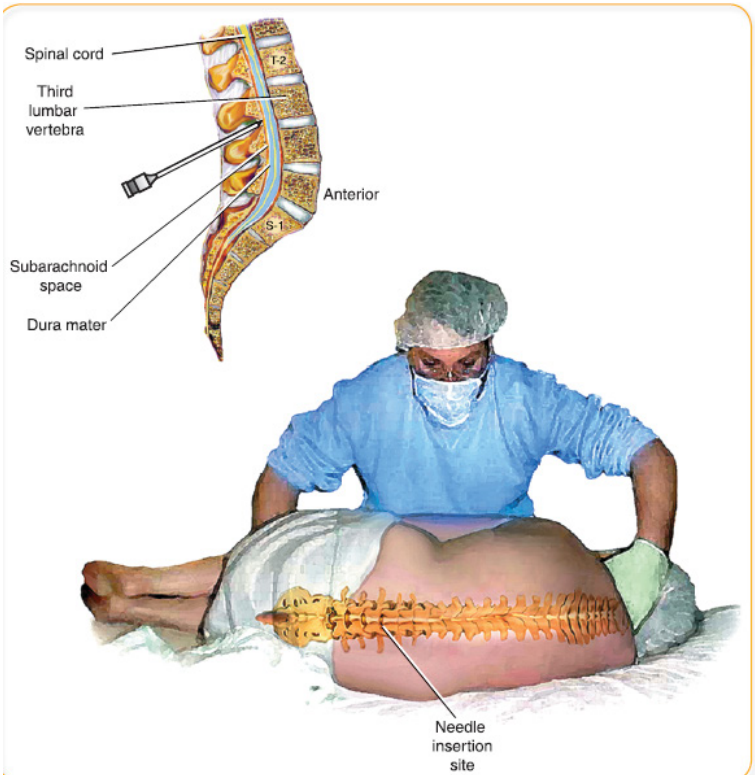
Nerve block



Infiltration



Spinal and Epidural



Answer for end unit assessment 1

1. B. Paracetamol is a commonly used antipyretic and may have an analgesic effect
2. True
3. nonsteroidal anti-inflammatory drugs (NSAIDs), salicylates, acetic acid classes
4. A. Cyclo-oxygenase
5. C. Aspirin
6. D. Phenobarbital
7. B. Antihistamines, anti-inflammatories and decongestant drugs .
8. A. Dizziness, ringing in ears, difficult in breathing, nausea, vomiting, diarrhea and mental confusion
9. D. Penicillin procaine
10. C. Aspirin
11. A. Destroy the cause of inflammation

12. Anti-inflammatory agents are drugs that block the effects of the inflammation. They act by blocking of prostaglandin mediators. They also reduce fever by direct effects on the thermoregulatory center in the hypothalamus

13. To manage Mr. the following class of medications are needed

i. Analgesic: Paracetamol 1G IV then 500mg tids

Antipyretics: Paracetamol

Antiseizures: Diazepam 2-10mg IM or Iv slowly repeat after 4 hrs if recurrence or phenobarbital sodium 30-320mg IM or IV repeat every 6hrs if recurrence.

ii. As the patient has history of gastritis, the salicylates and nonsteroidal antinflammatory drug like ibuprofen, diclofenac are contraindicated because they may worsen gastritis.

1.8. Additional activities

1.8.1. Remedial Activities

1. Fever and pain are a common sign for patients. The physiology of pain.
2. Describe the mechanism of action of NSAIDs anti-inflammatory drugs
3. NSAIDs and opioids can be combined (True or false)

Answers to remedial activities

1. **Physiology** of pain: pain occurs when sensory nerve endings called **nociceptors** (also referred to as pain receptors) come into contact with a painful or noxious stimulus. The resulting nerve impulse travels from the sensory nerve ending to the spinal cord, where the impulse is rapidly shunted to the brain via nerve tracts in the spinal cord and brainstem. The brain processes the pain sensation and quickly responds with a motor response in an attempt to cease the action causing the pain.
2. They act by blocking prostaglandin synthesis
3. True

1.8.2. Consolidation activities

1. Enumerate drugs used to treat fever, pain, inflammation, and common cold and rhinitis

Answers to consolidation activities

i. Fever: Paracetamol, aspirin, Ibuprofen

ii. Pain: Morphine, tramadol, paracetamol, aspirin, ibuprofen, diclofenac

iii. Inflammation: Ibuprofen, aspirin, diclofenac

iv. Common cold and rhinitis: Cholorpheniramin, desloratidin, ephedrine…..

1.8.3. Extended activities

1. Why are most of medications for inflammation treat at the same fever?
2. Opioids acts at

   A.Spinal cord and brain

   B.Spinal cord only

   C.Brain only

   D.Spinal cord and site of stimulation
3. NSAIDs causes stomach aches, give at least 2 reasons
4. Patients receiving ibuprofen on a regular basis should be told to contact nurse practitioner immediately if they note

   A.Slow heart rate

   B.Unusual bruising

   C.Upset stomach

   D.Slight dizziness
5. Antipyretic which causes decreased platelet aggregation and that causes gastric ulcers is

   A.Diclofenac

   B.Ibuprofen

   C.Aspirin

   D.Paracetamol
6. *Salicylates increase the clotting time by* **……..**

Answers to extended activities

1. Among the signs of inflammation, the hotness or fever is included
2. (A) Spinal cord and brain
3. (B) They are acidic and by their action of blocking cox 1, they block gastric mucosa turnover
4. Unusual bruising
5. (C) Aspirin
6. Inhibiting aggregation

UNIT 2 ANTIBIOTICS

2.1. Key Unit Competence:

Manage different health conditions at the primary healthcare settings by utilizing antibiotics appropriately.

2.2. Prerequisite (knowledge, skills, attitudes and values)

Students should have been introduced to course of human biology; ways of drug administration; bacterial multiplication and effects of bacteria to the host; infectious bacterial diseases; medical pathology; surgical pathology; principles of drug administration; and principles of pharmacokinetics as well as pharmacodynamics. This previously learnt courses will help the students to acquire knowledge and skills related to antibiotics, and be able to manage patients with bacterial conditions using antibiotics.

The tutor needs to ensure that this content has been covered in order to be able to use antibiotics appropriately, especially in the management of bacterial infectious diseases treated with antibacterials from different classes.

2.3. Cross-cutting issues to be addressed

a) Inclusive education

This unit involves the need to acquire knowledge and skills to apply the principles of pharmacology and administer drugs according to the standards and special considerations of patient's conditions. To administer the correct prescribed drugs and analysis of each patient's specific condition requires critical thinking, and proper use of the brain. Critical thinking may be challenging for students with mental disabilities, and this requires the teacher to assess the degree of mental disability to the concerned students. Analysis of the teacher will help to assess if the students may be grouped with others who may critically think.

During teaching, ensure that students with special needs are included throughout the course delivery. There may be for example students with visual impairment, hearing impairment or even physical disabilities. For the students with visual impairment, the teacher must ensure that they occupy the front seats in class, and they may be encouraged to report when they can't see well what is written or being presented.

In case of class activities, these students may be grouped together with others who have healthy vision, and if there printed activities, ensure to use bigger font sizes. For students with hearing impairment, there is a need to for the teacher to speak

loudly, help the students occupy the front seats. The written points help students with visual impairment and speaking aloud helps students with hearing impairment Remember to repeat the main points of the lessons. Finally, for the students with physical disability, the teacher needs to help them occupy the seats that make them comfortable.

b) Gender

Emphasize to students that anybody irrespective of their gender can present and report during group activities. Give examples of famous people who are successful in real life irrespective of their gender differences. Make sure that during different class activities, both boys and girls share and participate equally in all activities. Bear in mind that they all have equal role in the smooth running of the class, and that the leaders of the class or group activities may be of either female or male gender.

c) Environment and sustainability

Students get basic knowledge from the natural sciences, so introduction to biodiversity is essential, and the students should be encouraged to maintain the biodiversity in order to keep the world safe. They also get skills and attitudes that will enable them in their everyday life to address the environment and climate change issues and to have a sustainable livelihood. Help the students to know maximum skills and attitudes on the environmental sustainability and to be responsible in caring for students' environment.

2.4. Guidance on the introductory activity 2.0

This introductory activity is intended to:

- Motivate the students to learn about different classes of antibiotics
- Stimulate the students to search more information on the criteria to choose and use antibiotics
- To rise the curiosity on the content to cover as it relates to pharmacokinetics and pharmacodynamics of antibiotics.
- Build on previous knowledge, skills, values and attitudes to help the teacher to assess the Students prior knowledge and help to link with the new content that is related to antibiotics.

The progress in the learning is gradual. At this point, there are no right or wrong answers as students will gradually get more appropriate answers progressively as they go through the unit.

Teacher's activities:

- The tutors are encouraged to promote learning in small groups of students

and provide students with Unit 2 introductory activity, give clear instructions to the activity.

- Ask a determined number of students to present their findings after reading, while others are following, the teacher will be providing the guidance as needed.
- During grouping or pairing, there is a need to ensure that students with different levels of knowledge and understanding are mixed.
- The teacher also has a responsibility to help students with different problems.

Possible answers for the Introductory Activity 2.0: refer to the Student's book

1. Students may have different ideas. Some may say they saw similar patients while others may say they have not seen such kinds of patients. The essential information needed from the students is to recognize that patients have bacterial infections that are more likely treated by antibiotics.
2. The students do not have to necessarily provide the right answers. They may think of different drugs that have been provided. The intent of the teacher is to check if some students heard of, or saw the antibiotics which are the focus of the unit. Check if their answers reflect the topic of antibiotics.
3. The students may provide the ideas if they saw the drugs in the past. If it is the case, they may be in a position to recognize some of these drugs, and they recognize that these are the similar drugs (antibiotics) they saw.
4. Note: you may need to look at the views and ideas of the students in order to know how they will be facilitated in the unit, and throughout the entire course. They even be asked to say what they think will be learnt in the unit.
5. Get all the answers from some students, and congratulate them for the ideas provided. You then help them to get oriented on the main content to cover in the unit.

2.5. List of lessons/sub-headings including assessments

No of lessons	Lesson title	Learning objectives (from the syllabus including knowledge, skills and attitudes)	Number of Periods
1	Definition of antibiotics and key concepts	• Define antibiotics and key concepts related to antibiotic therapy	1
2	**Ideal antibiotics**	• Identify properties of ideal antibiotics • Provide the clinical rationale for selecting specific antibiotics. • Demonstrate understanding of the clinical importance of selecting the correct antibiotic for the individual patient.	2
	Mechanism of action **of antibiotics**	• Explain the mechanisms by which antibiotic drugs act to kill pathogens or restrict their growth.	
3	**Drug resistance** and prevention of antibiotic resistance	• Identify the mechanism of antibiotic resistance. • Recognize the clinical significance of bacterial resistance. • Utilize the Centers for Disease Control and Prevention (CDC) guidelines for preventing antimicrobial resistance in healthcare settings.	2
4	**Classification of** antibiotics with focus on antibiotics available in healthcare settings in Rwanda	• Classify antibiotics.	1
5	Class of Penicillins and **penicillinase** resistant antibiotics.	• Describe therapeutic actions, indications, pharmacokinetics, contraindications, most common adverse reactions, and important drug-drug interactions associated with the classes of penicillins. • Acknowledge the correct use of penicillins.	2

6	Class of Aminoglycosides	• Describe therapeutic actions, indications, pharmacokinetics, contraindications, most common adverse reactions, and important drug-drug interactions associated with the classes of aminoglycosides. • Acknowledge the correct use of aminoglycosides.	2
7	Class of Cephalosporins	• Describe therapeutic actions, indications, pharmacokinetics, contraindications, most common adverse reactions, and important drug-drug interactions associated with the classes of cephalosporins. • Acknowledge the correct use of cephalosporins.	2
8	Class of Fluoroquinolones	• Describe therapeutic actions, indications, pharmacokinetics, contraindications, most common adverse reactions, and important drug-drug interactions associated with the classes of fluoroquinolones. • Acknowledge the correct use of fluoroquinolones.	2
9	Class of Macrolides	• Describe therapeutic actions, indications, pharmacokinetics, contraindications, most common adverse reactions, and important drug-drug interactions associated with the classes of macrolides. • Acknowledge the correct use of macrolides.	2
10	Class of Tetracyclines	• Describe therapeutic actions, indications, pharmacokinetics, contraindications, most common adverse reactions, and important drug-drug interactions associated with the classes of tetracyclines. • Acknowledge the correct use of tetracyclines.	1

11	Class of Sulfonamides	• Describe therapeutic actions, indications, pharmacokinetics, contraindications, most common adverse reactions, and important drug-drug interactions associated with the classes of sulfonamides. • Acknowledge the correct use of sulfonamides.	1
12	Medications used in treatment of sexually transmitted diseases	• Manage bacterial infectious diseases. • Identify the antibiotic drugs and essential drugs list used at primary healthcare.	2
13	Medications used in treatment of tuberculosis	• Manage bacterial infectious diseases. • Identify the antibiotic drugs and essential drugs list used at primary healthcare.	2
14	End Unit Assessment		2

Lesson 1: Definition of antibiotics and key concepts

a) Learning objectives:

By the end of the session, the students should be able to explain correctly the antibiotics and the key concepts pertaining to antibiotics.

b) Prerequisites/Revision/Introduction:

Read the Key unit competence in the syllabus to determine what students will learn and be able to do by the end of the unit. Look at the action verb, concept and context of each learning objective. This will help you see the skills, knowledge and attitudes embedded in the learning objective. Remember the learning objectives are linked to the key unit competence.

Use K-W-L (What students already know-What they want to know-What they have learnt) after the introductory activity to assess how much students already know and what they would be interested in learning about antibiotics and their key concepts. Remind the students that this session is linked to other subjects, and the components related to this session include ways of drug administration; bacterial multiplication and effects of bacteria to the host; infectious bacterial diseases; medical pathology; surgical pathology; principles of drug administration; and principles of pharmacokinetics as well as pharmacodynamics.

c) Teaching resources:

Basic materials for a class/ lesson to be conducted include: Students' books, internet connectivity, case studies, projector, markers, chalks, different antibiotic drug forms and any other trustworthy and reliable resources to enhance learning.

d) Possible methods:

Pair share, small group discussion, brainstorming, short class presentation, research in the library textbooks or on the internet are the key teaching methods to use.

e) Learning activities 2.1. Definition of antibiotics and key concepts

Teacher's activities:

- Ask students to form small groups of 6 students each and do the activity 2.1 in their student books.
- Provide to the students the necessary materials or guide them where they can get the materials.
- Move around in silence to monitor if they are having some problems. In making small groups, ensure that the gender considerations are taken into account, and none is excluded based on gender.
- Guide the students, including those who are weak, without giving them the answers immediately.
- Invite randomly some students to present their findings to the rest of students.
- Ask other students to follow carefully the presentations.
- Those who are not acting may have to listen attentively without disturbing and should applaud the actors after.
- Note on chalk board / Manila paper or flip chart the students' ideas.
- Tick the correct findings and correct those ones which are incorrect and try again to complete those which are incomplete.
- Students may still have few things that are not clear. Answer or address any questions or challenges about the activity. Guide them to make notes in their notebooks referring to students' book.
- Harmonize and conclude on the learned knowledge.

Student's role:

- Work in small groups on the activity 2.1 as it appears in the student books.
- Use the materials and resources provided by the teacher to give answers to the activity.
- Attempt all the questions ensuring that participation of each member is obvious.

- Assist one another as they may have different levels of understanding.
- Selected members present the findings of the activity to the rest of students.
- Other students follow carefully the presentation of the findings.
- Those who are not presenting have to listen attentively without disturbing and should applaud their colleagues after presentation.
- Ask for more clarifications from the teacher and take notes in their notebooks.

Answers for Activity 2.1

a. An antibiotic is a medicine that fights bacterial infections in people and animals. It works by killing the bacteria or by making it hard for the bacteria to grow and multiply.

An antimicrobial is a drug used to treat a microbial infection. “Antimicrobial” is a general term that refers to a group of drugs that includes antibiotics, antifungals, antiprotozoals, and antivirals. The antibiotics belong to the wide class of antimicrobials.

b. Narrow-spectrum antibiotics act against a limited group of bacteria while broad-spectrum antibiotics act against a larger group of bacteria

Answers for Self-Assessment 2.1

Students analyze the given questions in the case study which relates to the type of antibiotic (amoxicillin) that is famous in the community, either in groups or in pairs and come with ideas that may result in opportunities to get introduced to the antibiotics, and their intent. This activity may be given as a research question or homework. Depending on the purpose of the learning activity, choose an appropriate method to assess students’ findings, answers or responses. Depending on the performance or results, you may decide to give remedial or extension activities.

Expected answers for self-assessment 2.1

1. An antibiotic is a medicine that fights bacterial infections in people and animals. The antibiotic works by killing the bacteria or by making it hard for the bacteria to grow and multiply. It is used to treat local or systemic bacterial infections.
2. Yes. There is relevance in prescribing that drug (amoxicillin) to the colleague because the wound had developed pus, which is a feature (sign) of infection.
   Note: *The students may answer in a diversity of ways, but the key is to recognize occurrence of pus in the wound, that implies infection requiring antibiotic prescription or antibiotic therapy.*

Lesson 2: Ideal antibiotics, and mechanism of action of antibiotics

a. Learning objectives

By the end of this session, the students should be able to:

- Describe adequately the characteristics of an ideal antibiotic in order to choose appropriately the antibiotic which more likely to harm the patient less.
- Explain confidently the mechanisms antibiotics use to exert their effects.

b. Prerequisites/Revision/Introduction

In order to understand well this lesson, the students must have been introduced to basic principles of infectious bacterial diseases; medical pathology; surgical pathology; principles of drug administration; and principles of pharmacokinetics as well as pharmacodynamics.

Use K-W-L (What students already know-What they want to know-What they have learnt) to assess how much students already know and what they would be interested in learning about ideal antibiotics and mechanism of action of antibiotics. Remind the students that the current session needs to be linked to the introductory session on the definition of antibiotics and related key concepts.

c. Teaching resources

Basic materials for a class/lesson to be conducted: Students' books, internet connectivity, books or magazines, projector, markers, chalks, and any other trustworthy and reliable resources to enhance learning.

d. Possible methods

Think-pair-share, small group discussion, brainstorming, short class presentation, research in the library textbooks or on the internet are the main teaching methods that may be used.

Before the lesson, review the learning objective to determine what students will know and be able to do by the end of the lesson. This will help you to see the skills, knowledge, and attitudes embedded in the learning objective and prepare for your lesson appropriately. Remember the learning objectives link to the key unit competence. Ensure a conducive learning environment and lead a review of the previous lesson on definition of antibiotics and related concepts, handle any homework or assignments. Help students link the previous lesson to the current lesson using an appropriate discovery activity.

e. Learning activities 2.2: Ideal antibiotics and Mechanism of action of antibiotics

Teacher's activities:

- Ask students to do individually activity 2.2 in their student books.
- Provide the to the students the necessary materials or guide them where they can get the materials.
- Move around in silence to monitor if they are having some problems.
- Guide the students, including those who are weak, without giving them the answers immediately.
- Invite randomly two students to present their findings to the rest of students.
- Ask other students to follow carefully the presentations.
- Those who are not acting may have to listen attentively without disturbing and should applaud the actors after.
- Note on chalk board / Manila paper or flip chart the students' ideas.
- Tick the correct findings and correct those ones which are incorrect and try again to complete those which are incomplete.
- Students may still have few things that are not still clear. Answer or address any questions or challenges about the activity. Guide them to make notes in their books referring to students' book.
- Harmonize and conclude on the learned knowledge.

Student's role:

- Work individually on the activity 2.2 as it appears in the student books.
- Use the materials and resources provided by the teacher to give answers to the activity.
- Attempt all the questions ensuring that participation of each member is obvious.
- Assist one another as they may have different levels of understanding.
- Selected members present the findings of the activity to the rest of students.
- Other students follow carefully the presentation of the findings.
- Those who are not presenting have to listen attentively without disturbing and should applaud their colleagues after presentation.
- Ask for more clarifications from the teacher and take notes in their notebooks.

Answers for Learning Activity 2.2

a) An ideal antibiotic should be:

- Toxic to microbes and not to humans
- Bactericidal rather than bacteriostatic
- Effective against broad range of bacteria
- Should not cause allergic and hypersensitive reactions
- Should be active in plasma, and other body fluids
- Desired levels should be reached rapidly and maintained for adequate period of time
- Should not give drug resistance with long shelf life
- Cheaper or affordable

b) Mechanisms of action of antibiotics:

- Inhibition of bacterial protein synthesis
- Alteration of bacterial cell membranes
- Inhibition of bacterial cell wall synthesis
- Inhibition of bacterial nucleic acid synthesis
- Functioning as **antimetabolites**

c) Yes. It is always required tp consider the mechanism of action of an antibiotic during its prescriptuon, because this guides on the expected result from the antibiotic. As antibiotics work by exterting different mechanisms of action, this has a direct effect on the expectation from the antibiotics towards the bacterial (bactericidal vs bacteriostatic effects). **Note:** *The students may provide an explanation different from this, but the key message is that mechanism of action must always be considered because antibiotics provide effects through the mechanisms of action that differ.*

Expected Answers for Self-Assessment 2.2

A 25-year-old female patient comes to the health post where yo work. She comes 3 days after starting treatment with antibiotics, complaining of additional symptoms after starting the treatment. She reports severe diarrhea, nausea, vomiting, skin rashes, and difficult swallowing. The nurse receiving the patient decided to change the antibiotic for the patient, and managed the additional compalints. The patient recovered after a short period of time.

1. Yes. It was very necessary to come back to the health post because the drug might have caused hypersensitive reactions (skin rashes) and other many side effects.

2. No. The antibiotic was not ideal for this specific patient because it caused allergic reactions (skin rashes) and other additional side effects. The evidence that the antibiotic was not ideal is that, after changing the drug, the patient got well and recovered.

3. **(D) The antibiotics that have a link to metabolites act as antimetabolites, and not as metabolites**

4. **FALSE** (Human cells do not make peptidoglycan).

Lesson 3: Drug resistance and prevention of antibiotic drug resistance

a) Learning objectives

By the end of this session, the students should be able to:

- Describe confidently different types of antibiotic drug resistance.
- Explain adequately the mechanism of development of antibiotic resistance.
- Describe accurately the ways antibiotic drug resistance can be prevented.

b) Prerequisites/Revision/Introduction

In order to understand well this unit, the students should have covered infectious bacterial diseases; medical pathology; surgical pathology; principles of drug administration; and principles of pharmacokinetics as well as pharmacodynamics.

c) Teaching resources

They include: Students' books, internet connectivity, books or magazines, projector, markers, flipchart, chalks, and any other trustworthy and reliable resources to enhance learning.

d) Possible methods

Think-pair-share, small group discussion, brainstorming, short class presentation, research in the library textbooks or on the internet are the methods to use.

Before the lesson, review the learning objective to determine what students will know and be able to do by the end of the lesson. This will help you to see the skills, knowledge, and attitudes embedded in the learning objective and prepare for your lesson appropriately. Remember the learning objectives link to the key unit competence. Ensure a conducive learning environment and lead a review of the previous lesson on ideal antibiotics and mechanism of action of antibiotics, handle any homework or assignments. Help students link the previous lesson to the current lesson using an appropriate discovery activity.

e) Learning activities 2.3: Drug resistance and prevention of antibiotic drug resistance

Teacher's activities:

- Ask students to do individually activity 2.3 in their student books.
- Provide the to the students the necessary materials or guide them where they can get the materials.
- Move around in silence to monitor if they are having some problems.
- Guide the students, including those who are weak, without giving them the answers immediately.
- Invite randomly three students to present their findings to the rest of students.
- Ask other students to follow carefully the presentations.
- Those who are not acting may have to listen attentively without disturbing and should applaud the actors after.
- Note on chalk board / Manila paper or flip chart the students' ideas.
- Tick the correct findings and correct those ones which are incorrect and try again to complete those which are incomplete.
- Students may still have few things that are not still clear. Answer or address any questions or challenges about the activity. Guide them to make notes in their books referring to students' book.
- Harmonize and conclude on the learned knowledge.

Student's role:

- Work individually on the activity 2.3 as it appears in the student books.
- Use the materials and resources provided by the teacher to give answers to the activity.
- Attempt all the questions ensuring that participation of each member is obvious.
- Assist one another as they may have different levels of understanding.
- Selected members present the findings of the activity to the rest of students.
- Other students follow carefully the presentation of the findings.
- Those who are not presenting have to listen attentively without disturbing and should applaud their colleagues after presentation.
- Ask for more clarifications from the teacher and take notes in their notebooks.

Answer for learning activity 2.3

a. She took the initially prescribed antibiotic inappropriately. She interrupted treatment after the first dose, and even after resuming the treatment, she stopped the treatment again. She did not complete the full course of treatment that was for 14 days, and she only took some doses followed by interruption of treatment. ***Note:*** *The students may answer differently, but the key answer is to recognize that the adolescent (patient) interrupted antibiotic treatment before completing the prescribed antibiotic for the entire period (all doses).*

b. Antimicrobial resistance may develop as a result of not responding around-the-clock dosing. In addition, the duration of the antibiotic use was not respected as the patient used to interrupt treatment after taking some doses of the treatment.

Antibiotic resistance develops because the patient was not convinced to take the antibiotic by respecting the timing of doses and the length of time to take the antibiotic was not respected.

c) What type of resistance did this adolescent develop?

The adolescent developed the acquired resistance.

Answers for Self-Assessment 2.3

1. Difference between acquired Resistance and Natural Resistance

Acquired Resistance is a type of drug resistance that microorganisms acquire after a certain period of time, yet, they were once very sensitive to the effects of these particular drugs.

Natural or Intrinsic Resistance is a type of preexisting resistance. This is for the microorganisms that do not use specific enzyme systems or biological processes that anti-infectives target, and they are not affected by a particular anti-infective drug.

2. Factors that can accelerate the occurrence of Antibiotic Resistance are:

- Widespread current use of antibiotics in humans and animals.
- Improper use of antimicrobial agents to the treatment of specific pathogens known to be sensitive to the drug being used
- Improper drug dosing
- Insufficient duration of antibiotic therapy
- Not respecting around-the-clock dosing

- Patients who do not respect timing of doses and the length of time to take the drug
- Health care providers who tend to try newly introduced, more powerful drugs when a more established drug may be just as effective.

3. **FALSE** (Around-the-clock dosing rather prevents the risk of antibiotic resistance)

Lesson 4: Classification of antibiotics with focus on antibiotics available in healthcare settings in Rwanda

a) Learning objectives

By the end of this session, the students should be able to:

- Assign correctly antibiotics to their respective classes.
- Characterize confidently antibiotics in different classes.
- Identify appropriately main common side effects of antibiotics.

b) Prerequisites/Revision/Introduction

In order to successfully compete this lesson, the students should have been introduced to the topics related to infectious bacterial diseases; medical pathology; surgical pathology; principles and ways of drug administration; and principles of pharmacokinetics as well as pharmacodynamics. The students need also to have been introduced to key concepts of antibiotics.

Use K-W-L (What students already know-What they want to know-What they have learnt) to assess how much students already know on the precious sessions as well as the current topic, and what they would be interested in learning about classification of antibiotics.

c) Teaching resources

Basic materials for a class/lesson to be conducted: Students' books, internet connectivity, books or magazines, projector, markers, flipchart, sample of the antibiotic for each class of antibiotics, chalks, and any other trustworthy and reliable resources to enhance learning.

d) Possible methods

Think-pair-share, small group discussion, brainstorming, short class presentation, research in the library textbooks or on the internet are the key teaching methods to use.

Before the lesson, review the learning objective to determine what students will know and be able to do by the end of the lesson. This will help you to see the skills, knowledge, and attitudes embedded in the learning objective and prepare

for your lesson appropriately. Remember the learning objectives link to the key unit competence. Ensure a conducive learning environment and lead a review of the previous lesson on antibiotic resistance and prevention of antibiotic drug resistance, handle any homework or assignments. Help students link the previous lesson to the current lesson using an appropriate discovery activity.

e) Learning activities 2.4: Introduction to antibiotics

Teacher's activities:

- Ask students to form small groups of 6 students each and do the activity 2.4.1 in their student books.
- Provide the to the students the necessary materials or guide them where they can get the materials.
- Move around in silence to monitor if they are having some problems. In making small groups, ensure that the gender considerations are taken into account, and none is excluded based on gender.
- Guide the students, including those who are weak, without giving them the answers immediately.
- Invite randomly four students to present their findings to the rest of students.
- Ask other students to follow carefully the presentations.
- Those who are not acting may have to listen attentively without disturbing and should applaud the actors after.
- Note on chalk board / Manila paper or flip chart the students' ideas.
- Tick the correct findings and correct those ones which are incorrect and try again to complete those which are incomplete.
- Students may still have few things that are not still clear. Answer or address any questions or challenges about the activity. Guide them to make notes in their books referring to students' book.
- Harmonize and conclude on the learned knowledge.

Student's role:

- Work in small groups on the activity 2.4.1 as it appears in the student books.
- Use the materials and resources provided by the teacher to give answers to the activity.
- Attempt all the questions ensuring that participation of each member is obvious.
- Assist one another as they may have different levels of understanding.
- Selected members present the findings of the activity to the rest of students.
- Other students follow carefully the presentation of the findings.

- Those who are not presenting have to listen attentively without disturbing and should applaud their colleagues after presentation.
- Ask for more clarifications from the teacher and take notes in their notebooks.

Answers for learning activity 2.4

a. Names of antibiotic drugs observed in the image:

- Ciprofloxacin
- Erythromycin
- Gentamicin
- Ceftriaxone
- Tetracycline (Eye ointment)
- Amoxicillin
- Cotrimoxazole

b. Antibiotics and their respective classes:

DRUG IDENTIFIED (ANTIBIOTIC)	RESPECTIVE CLASS
Ciprofloxacin:	Fluoroquinolones
Erythromycin	Macrolides
Gentamicin	Aminoglycosides
Ceftriaxone	Cephalosporins (third generation)
Tetracycline (Eye ointment)	Tetracyclines
Amoxicillin	Penicillins
Cotrimoxazole	Sulfonamides

c. Common side effects of antibiotics:

- Ocular damage,
- Superinfections (GI and Genito-urinary tract),
- Allergic reactions,
- Bone marrow depression,
- GI effects,
- Dermatological reactions,
- Auditory damage and
- Renal damage

Answers for Self-Assessment 2.4

1. Advantage of using synergistic drugs

It allows the patient to take a lower dose of each antibiotic to achieve the desired effect. This helps to reduce the adverse effects that a particular drug may have.

2. **FALSE** (It rather helps to decrease the dose of each drug).

Lesson 5: Class of penicillins and penicillinase resistant antibiotics

a) Learning objectives

By the end of this session, the students should be able to:

- Describe confidently the mechanism of action of penicillins and penicillinase resistant antibiotics.
- Identify correctly different drugs in the class of penicillins and penicillinase resistant antibiotics.
- Explain confidently indications and contraindications of penicillins and penicillinase resistant antibiotics.
- Identify correctly main common side effects associated with penicillins and penicillinase resistant antibiotics.

b) Prerequisites/Revision/Introduction

Read the content in the syllabus to determine what students will learn and be able to do by the end of the lesson. Look at the action verb, concept and context of each learning objective. This will help you to see the skills, knowledge and attitudes embedded in the learning objective. Remember the learning objectives are linked to the key unit competence, and target the specific learning objectives of the lesson.

Use K-W-L (What students already know-What they want to know-What they have learnt) after the previous activity to assess how much students already know and what they would be interested in learning about penicillins and penicillinase resistant antibiotics, as one of the classes of antibiotics.

Help the students to link the session to other components such as infectious bacterial diseases; medical pathology; surgical pathology; principles of drug administration; and principles of pharmacokinetics as well as pharmacodynamics.

c) Teaching resources

Basic materials for a class/lesson to be conducted: Students' books, internet connectivity, books or magazines, projector, markers, flipchart, sample of the antibiotic for class of penicillins and penicillinase resistant antibiotics, chalks, and any other trustworthy and reliable resources to enhance learning.

d) Possible methods

Think-pair-share, small group discussion, brainstorming, short class presentation, research in the library textbooks or on the internet are the main methods to use during teaching.

Before the lesson, review the learning objective to determine what students will know and be able to do by the end of the lesson. This will help you to see the skills, knowledge, and attitudes embedded in the learning objective and prepare for your lesson appropriately. Remember the learning objectives link to the key unit competence. Ensure a conducive learning environment and lead a review of the previous lesson on classes of antibiotics, handle any homework or assignments. Help students link the previous lesson to the current lesson using an appropriate discovery activity.

e) Learning activities 2.5: Class of Penicillins and penicillinase resistant antibiotics

Teacher's activities:

- Ask students to do individually activity 2.5 in their student books.
- Provide the to the students the necessary materials or guide them where they can get the materials.
- Move around in silence to monitor if they are having some problems.
- Guide the students, including those who are weak, without giving them the answers immediately.
- Invite randomly four students to present their findings to the rest of students.
- Ask other students to follow carefully the presentations.
- Those who are not acting may have to listen attentively without disturbing and should applaud the actors after.
- Note on chalk board / Manila paper or flip chart the students' ideas.
- Tick the correct findings and correct those ones which are incorrect and try again to complete those which are incomplete.
- Students may still have few things that are not still clear. Answer or address any questions or challenges about the activity. Guide them to make notes in their books referring to students' book.
- Harmonize and conclude on the learned knowledge.

Student's role:

- Work individually on the activity 2.5 as it appears in the student books.
- Use the materials and resources provided by the teacher to give answers to the activity.
- Attempt all the questions ensuring that participation of each member is obvious.
- Assist one another as they may have different levels of understanding.
- Selected members present the findings of the activity to the rest of students.

- Other students follow carefully the presentation of the findings.
- Those who are not presenting have to listen attentively without disturbing and should applaud their colleagues after presentation.
- Ask for more clarifications from the teacher and take notes in their notebooks.

Answers learning for Activity 2.5

a. Yes. It is relevant to treat syphilis with the drugs in the class of penicillins, given that the strain that causes syphilis is susceptible to penicillins.
b. Examples of antibiotics in the class of penicillins: Amoxicillin, Penicillin V, Penicillin G procaine, Penicillin G benzathine, Cloxacillin.
c. No. It is not advisable to combine penicillins and parenteral aminoglycosides. This is because when the parenteral forms of penicillins and penicillinase-resistant drugs are administered in combination with any of the parenteral aminoglycosides, inactivation of the aminoglycosides occurs.

Answers for Self-Assessment 2.5

1. **(B)** Inhibition of bacterial cell wall synthesis
2. **(A)** Cloxacillin
3. **(D)** Penicillin G benzathine
4. **TRUE** (Penicillins are contraindicated in patients with allergies to penicillin or cephalosporins).

Lesson 6: Class of aminoglycosides

a) Learning objectives

By the end of this session, the students should be able to:

- Describe appropriately the mechanism of action of aminoglycosides.
- Identify correctly different drugs in the class of aminoglycosides.
- Explain adequately indications and contraindications of aminoglycosides.
- Identify accurately main common side effects associated with aminoglycosides.

b) Prerequisites/Revision/Introduction

In order to successfully complete this lesson well, the students need to have been introduced to other components, and help the students link the session to other components such as introduction to antibiotics; infectious bacterial diseases;

medical pathology; surgical pathology; principles of drug administration; and principles of pharmacokinetics as well as pharmacodynamics.

Use K-W-L (What students already know-What they want to know-What they have learnt) to assess how much students already know on the previous topics or current topic, and what they would be interested in learning about aminoglycosides, as one of the classes of antibiotics. The first thing to do before starting teaching is to remind students that they have learnt about peniccilins and penicillinase resistant antibiotics and make a brief recall about the previous session.

a) Teaching resources

Basic materials for a class/lesson to be conducted: Students' books, internet connectivity, books or magazines, projector, markers, flipchart, sample of the antibiotic for class of aminoglycosides, chalks, and any other trustworthy and reliable resources to enhance learning.

b) Possible methods

Think-pair-share, small group discussion, brainstorming, short class presentation, research in the library textbooks or on the internet will be used as teaching methods.

Before the lesson, review the learning objective to determine what students will know and be able to do by the end of the lesson. This will help you to see the skills, knowledge, and attitudes embedded in the learning objective and prepare for your lesson appropriately. Remember the learning objectives link to the key unit competence. Ensure a conducive learning environment and lead a review of the previous lesson on classes of antibiotics, handle any homework or assignments. Help students link the previous lesson to the current lesson using an appropriate discovery activity.

c) Learning activities 2.6: Class of Aminoglycosides

Teacher's activities:

- Ask students to form small groups of 6 students each and do the activity 2.6 in their student books.
- Provide the to the students the necessary materials or guide them where they can get the materials.
- Move around in silence to monitor if they are having some problems. In making small groups, ensure that the gender considerations are taken into account, and none is excluded based on gender.
- Guide the students, including those who are weak, without giving them the answers immediately.
- Invite randomly four students to present their findings to the rest of students.
- Ask other students to follow carefully the presentations.

- Those who are not acting may have to listen attentively without disturbing and should applaud the actors after.
- Note on chalk board / Manila paper or flip chart the students' ideas.
- Tick the correct findings and correct those ones which are incorrect and try again to complete those which are incomplete.
- Students may still have few things that are not still clear. Answer or address any questions or challenges about the activity. Guide them to make notes in their books referring to students' book.
- Harmonize and conclude on the learned knowledge.

Student's role:

- Work in small groups on the activity 2.6 as it appears in the student books.
- Use the materials and resources provided by the teacher to give answers to the activity.
- Attempt all the questions ensuring that participation of each member is obvious.
- Assist one another as they may have different levels of understanding.
- Selected members present the findings of the activity to the rest of students.
- Other students follow carefully the presentation of the findings.
- Those who are not presenting have to listen attentively without disturbing and should applaud their colleagues after presentation.
- Ask for more clarifications from the teacher and take notes in their notebooks.

Answers for learning activity 2.6

a. Drugs in class of aminoglycosides: Amikacin, Gentamicin, Kanamycin, Neomycin, Streptomycin, Tobramycin, Promomycin and Plazomycin.

b. Mechanism of action of aminoglycosides: inhibition of protein synthesis

Answers for Self-assessment 2.6

1. Aminoglycosides inhibit protein synthesis by binding to the 30S subunit of bacterial ribosomes, causing misreading of mRNA. This leads to the production of faulty proteins, which ultimately results in bacterial cell death, making them bactericidal.
2. a. Aminoglycosides are preferred over penicillin in cases where penicillin is contraindicated, such as in patients with penicillin allergies.

b. They are used in severe infections, particularly those caused by gram-negative bacteria, and are often employed empirically when immediate treatment is required before culture and sensitivity results are available.

3. a. Aminoglycosides are rapidly absorbed after intramuscular injection, with peak levels reached within an hour. This rapid absorption makes them suitable for treating severe infections where quick therapeutic action is necessary.

   b. because they cross the placenta and enter breast milk, caution is required when prescribing them to pregnant or breastfeeding patients due to potential harm to the fetus or infant.

4. Response: Aminoglycosides are effective against a range of gram-negative bacteria, including Pseudomonas aeruginosa, E. coli, Proteus species, Klebsiella, Enterobacter, Serratia, and Citrobacter species. They are also effective against some gram-positive bacteria like Staphylococcus aureus. This broad spectrum of activity makes them valuable for treating serious infections caused by these pathogens.

5. a. Major adverse effects of aminoglycosides include nephrotoxicity (kidney damage) and ototoxicity (hearing loss). These risks make it necessary to monitor patients closely during treatment.

   b. Aminoglycosides are contraindicated in patients with renal or hepatic disease because these conditions can exacerbate the toxic effects of the drug and interfere with its metabolism and excretion, leading to higher toxicity.

Lesson 7: Class of cephalosporins

a) Learning objectives

By the end of this session, the students should be able to:

- Describe correctly the mechanism of action of cephalosporins.
- Identify appropriately different drugs in the class of cephalosporins.
- Explain appropriately indications and contraindications of cephalosporins.
- Identify accurately main common side effects associated with cephalosporins.

b) Prerequisites/Revision/Introduction

Use K-W-L (What students already know-What they want to know-What they have learnt) to assess how much students already know about the and what they would be interested in learning about cephalosporins, as one of the classes of antibiotics. Before starting to teach, remind the students that they have learnt about aminoglycosides, and make a brief recall about the previous session.

Help the students to link the session to other components such as key concepts pertaining to antibiotics; infectious bacterial diseases; medical pathology; surgical pathology; principles of drug administration; and principles of pharmacokinetics as well as pharmacodynamics.

c) Teaching resources

Basic materials for a class/lesson to be conducted: Students' books, internet connectivity, books or magazines, projector, markers, flipchart, sample of the antibiotic for class of cephalosporins, chalks, and any other trustworthy and reliable resources to enhance learning.

d) Possible methods

Think-pair-share, small group discussion, brainstorming, short class presentation, research in the library textbooks or on the internet are the methods to use in teaching.

Before the lesson, review the learning objective to determine what students will know and be able to do by the end of the lesson. This will help you to see the skills, knowledge, and attitudes embedded in the learning objective and prepare for your lesson appropriately. Remember the learning objectives link to the key unit competence. Ensure a conducive learning environment and lead a review of the previous lesson on classes of antibiotics, handle any homework or assignments. Help students link the previous lesson to the current lesson using an appropriate discovery activity.

e) Learning activities 2.7: Class of Cephalosporins

Teacher's activities:

- Ask students to form small groups of 6 students each and do the activity 2.7 in their student books.
- Provide the to the students the necessary materials or guide them where they can get the materials.
- Move around in silence to monitor if they are having some problems. In making small groups, ensure that the gender considerations are taken into account, and none is excluded based on gender.
- Guide the students, including those who are weak, without giving them the answers immediately.
- Invite randomly four students to present their findings to the rest of students.
- Ask other students to follow carefully the presentations.
- Those who are not acting may have to listen attentively without disturbing and should applaud the actors after.

- Note on chalk board / Manila paper or flip chart the students' ideas.
- Tick the correct findings and correct those ones which are incorrect and try again to complete those which are incomplete.
- Students may still have few things that are not still clear. Answer or address any questions or challenges about the activity. Guide them to make notes in their books referring to students' book.
- Harmonize and conclude on the learned knowledge.

Student's role:

- Work in small groups on the activity 2.7 as it appears in the student books.
- Use the materials and resources provided by the teacher to give answers to the activity.
- Attempt all the questions ensuring that participation of each member is obvious.
- Assist one another as they may have different levels of understanding.
- Selected members present the findings of the activity to the rest of students.
- Other students follow carefully the presentation of the findings.
- Those who are not presenting have to listen attentively without disturbing and should applaud their colleagues after presentation.
- Ask for more clarifications from the teacher and take notes in their notebooks.

Answers for activity 2.7

a. Drugs in class of cephalosporins: Cefadroxil, Cefazolin, Cefoxitin, Cefuroxime, Ceftriaxone and Cefotaxime
b. Mechanism of action of aminoglycosides: inhibition of bacterial cell wall peptidoglycan synthesis.

Answers for Self-assessment 2.7

1. **(C)** Cefotaxime
2. **(B)** Allergy to aspirin

Lesson 8: Class of fluoroquinolones

a) Learning objectives

By the end of this session, the students should be able to:

- Describe confidently the mechanism of action of fluoroquinolones.
- Identify correctly different drugs in the class of fluoroquinolones.

- Explain accurately indications and contraindications of fluoroquinolones
- Identify correctly the main common side effects associated with fluoroquinolones

b) Prerequisites/Revision/Introduction

Help the students to link the session to other components such as key concepts pertaining to antibiotics; infectious bacterial diseases; medical pathology; surgical pathology; principles of drug administration; and principles of pharmacokinetics as well as pharmacodynamics.

Use K-W-L (What students already know-What they want to know-What they have learnt) after the previous activity to assess how much students already know and what they would be interested in learning about fluoroquinolones, as one of the classes of antibiotics. The first thing to do before starting teaching is to remind students that they have learnt about cephalosporins, and make a brief recall about the previous session.

c) Teaching resources

They include: Students' books, internet connectivity, books or magazines, projector, markers, flipchart, sample of the antibiotic for class of fluoroquinolones, chalks, and any other trustworthy and reliable resources to enhance learning.

d) Possible methods

Think-pair-share, small group discussion, brainstorming, short class presentation, research in the library textbooks or on the internet are the main teaching methods to use.

Before the lesson, review the learning objective to determine what students will know and be able to do by the end of the lesson. This will help you to see the skills, knowledge, and attitudes embedded in the learning objective and prepare for your lesson appropriately.

Remember the learning objectives link to the key unit competence. Ensure a conducive learning environment and lead a review of the previous lesson on classes of antibiotics, handle any homework or assignments. Help students link the previous lesson to the current lesson using an appropriate discovery activity.

e) Learning activities 2.8: Class of Fluoroquinolones

Teacher's activities:

- Ask students to form small groups of 6 students each and do the activity 1.4.5 in their student books.
- Provide the to the students the necessary materials or guide them where they can get the materials.

- Move around in silence to monitor if they are having some problems. In making small groups, ensure that the gender considerations are taken into account, and none is excluded based on gender.
- Guide the students, including those who are weak, without giving them the answers immediately.
- Invite randomly four students to present their findings to the rest of students.
- Ask other students to follow carefully the presentations.
- Those who are not acting may have to listen attentively without disturbing and should applaud the actors after.
- Note on chalk board / Manila paper or flip chart the students' ideas.
- Tick the correct findings and correct those ones which are incorrect and try again to complete those which are incomplete.
- Students may still have few things that are not still clear. Answer or address any questions or challenges about the activity. Guide them to make notes in their books referring to students' book.
- Harmonize and conclude on the learned knowledge.

Student's role:

- Work in small groups on the activity 2.8 as it appears in the student books.
- Use the materials and resources provided by the teacher to give answers to the activity.
- Attempt all the questions ensuring that participation of each member is obvious.
- Assist one another as they may have different levels of understanding.
- Selected members present the findings of the activity to the rest of students.
- Other students follow carefully the presentation of the findings.
- Those who are not presenting have to listen attentively without disturbing and should applaud their colleagues after presentation.
- Ask for more clarifications from the teacher and take notes in their notebooks.

Answers for Learning Activity 2.8

a. Drugs in class of fluoroquinolones: Ciprofloxacin, gemifloxacin, levofloxacin, moxifloxacin, norfloxacin, and ofloxacin.

b. No. It is not advisable to administer fluoroquinolones. They are contraindicated in pregnant or lactating patients because potential effects on the fetus and infant are not known.

Answers for Self-assessment 2.8

Nursing **considerations**: Assess for possible contraindications or cautions. Perform physical assessment to establish baseline data for assessing the effectiveness of the drug and the occurrence of any adverse effects associated with drug therapy. Examine the skin for any rash or lesions to provide a baseline for possible adverse effects. Perform culture and sensitivity tests at the site of infection to ensure appropriate use of the drug. Perform renal function tests, including blood urea nitrogen and creatinine clearance, to evaluate the status of renal functioning and to assess necessary changes in dose. Conduct assessment of orientation, affect, and reflexes to establish a baseline for any central nervous system (CNS) effects of the drug.

Lesson 9: Class of macrolides

a) Learning objectives

By the end of this session, the students should be able to:

- Describe confidently the mechanism of action of macrolides.
- Identify correctly different drugs in the class of macrolides.
- Explain appropriately indications and contraindications of macrolides.
- Identify correctly main common side effects associated with macrolides.
- Explain adequately nursing considerations for patients taking a macrolide.

b) Prerequisites/Revision/Introduction

In order to learn well this lesson, the students should have been introduced to key concepts on antibiotics; infectious bacterial diseases; medical pathology; surgical pathology; principles of drug administration; and principles of pharmacokinetics as well as pharmacodynamics.

Use K-W-L (What students already know-What they want to know-What they have learnt) after the previous activity to assess how much students already know and what they would be interested in learning about macrolides, as one of the classes of antibiotics. The first thing to do before starting teaching is to remind students that they have learnt about fluoroquinolones, and make a brief recall about the previous session.

c) Teaching resources

Basic materials for a class/lesson to be conducted: Students' books, internet connectivity, books or magazines, projector, markers, flipchart, sample of the antibiotic for class of macrolides, chalks, and any other trustworthy and reliable resources to enhance learning.

d) Possible methods

Think-pair-share, small group discussion, brainstorming, short class presentation, research in the library textbooks or on the internet are the teaching methods to use.

Before the lesson, review the learning objective to determine what students will know and be able to do by the end of the lesson. This will help you to see the skills, knowledge, and attitudes embedded in the learning objective and prepare for your lesson appropriately. Remember the learning objectives link to the key unit competence. Ensure a conducive learning environment and lead a review of the previous lesson on classes of antibiotics, handle any homework or assignments. Help students link the previous lesson to the current lesson using an appropriate discovery activity.

e) Learning activities 2.9: Class of Macrolides

Teacher's activities:

- Ask students to do in pairs activity 2.9 in their student books.
- Provide the to the students the necessary materials or guide them where they can get the materials.
- Move around in silence to monitor if they are having some problems. In making pairs, ensure that the gender considerations are taken into account, and none is excluded based on gender.
- Guide the students, including those who are weak, without giving them the answers immediately.
- Invite randomly four students to present their findings to the rest of students.
- Ask other students to follow carefully the presentations.
- Those who are not acting may have to listen attentively without disturbing and should applaud the actors after.
- Note on chalk board / Manila paper or flip chart the students' ideas.
- Tick the correct findings and correct those ones which are incorrect and try again to complete those which are incomplete.
- Students may still have few things that are not still clear. Answer or address any questions or challenges about the activity. Guide them to make notes in their books referring to students' book.
- Harmonize and conclude on the learned knowledge.

Student's role:

- Work in pairs on the activity 2.9 as it appears in the student books.
- Use the materials and resources provided by the teacher to give answers to the activity.

- Attempt all the questions ensuring that participation of each member is obvious.
- Assist one another as they may have different levels of understanding.
- Selected members present the findings of the activity to the rest of students.
- Other students follow carefully the presentation of the findings.
- Those who are not presenting have to listen attentively without disturbing and should applaud their colleagues after presentation.
- Ask for more clarifications from the teacher and take notes in their notebooks.

Answers for activity 2.9

a. Drugs in class of macrolides: erythromycin, azithromycin, clarithromycin, and dirithromycin
b. Macrolides use a mechanism of inhibition of protein synthesis in their mechanism of action.

Answers for Self-assessment 2.9

1. **(B)** Clarithromycin
2. **(D)** Streptomycin

Lesson 10: Class of tetracyclines

a) Learning objectives

By the end of this session, the students should be able to:

- Describe appropriately the mechanism of action of tetracyclines.
- Identify accurately different drugs in the class of tetracyclines.
- Explain adequately indications and contraindications of tetracyclines.
- Identify correctly main common side effects associated with tetracyclines.
- Explain confidently nursing considerations for patients taking a tetracycline.

b) Prerequisites/Revision/Introduction

In order to understand well this lesson, the students should have covered key concepts of antibiotics; infectious bacterial diseases; medical pathology; surgical pathology; principles of drug administration; and principles of pharmacokinetics as well as pharmacodynamics.

Use K-W-L (What students already know-What they want to know-What they have learnt) after the previous activity to assess how much students already know and what they would be interested in learning about macrolides, as one of the classes

of antibiotics. The first thing to do before starting teaching is to remind students that they have learnt about macrolides, and make a brief recall about the previous session.

c) Teaching resources

Basic materials for a class/lesson to be conducted: Students' books, internet connectivity, books or magazines, projector, markers, flipchart, sample of the antibiotic for class of tetracyclines, chalks, and any other trustworthy and reliable resources to enhance learning.

d) Possible methods

Think-pair-share, small group discussion, brainstorming, short class presentation, research in the library textbooks or on the internet will be used during teaching this session.

Before the lesson, review the learning objective to determine what students will know and be able to do by the end of the lesson. This will help you to see the skills, knowledge, and attitudes embedded in the learning objective and prepare for your lesson appropriately. Remember the learning objectives link to the key unit competence. Ensure a conducive learning environment and lead a review of the previous lesson on classes of antibiotics, handle any homework or assignments. Help students link the previous lesson to the current lesson using an appropriate discovery activity.

e) Learning activities 2.10: Class of Tetracyclines

Teacher's activities:

- Ask students to do individually activity 2.10 in their student books.
- Provide the to the students the necessary materials or guide them where they can get the materials.
- Move around in silence to monitor if they are having some problems.
- Guide the students, including those who are weak, without giving them the answers immediately.
- Invite randomly four students to present their findings to the rest of students.
- Ask other students to follow carefully the presentations.
- Those who are not acting may have to listen attentively without disturbing and should applaud the actors after.
- Note on chalk board / Manila paper or flip chart the students' ideas.
- Tick the correct findings and correct those ones which are incorrect and try again to complete those which are incomplete.

- Students may still have few things that are not still clear. Answer or address any questions or challenges about the activity. Guide them to make notes in their books referring to students' book.
- Harmonize and conclude on the learned knowledge.

Student's role:

- Work individually on the activity 2.10 as it appears in the student books.
- Use the materials and resources provided by the teacher to give answers to the activity.
- Attempt all the questions ensuring that participation of each member is obvious.
- Assist one another as they may have different levels of understanding.
- Selected members present the findings of the activity to the rest of students.
- Other students follow carefully the presentation of the findings.
- Those who are not presenting have to listen attentively without disturbing and should applaud their colleagues after presentation.
- Ask for more clarifications from the teacher and take notes in their notebooks.

Answers for activity 2.10

a. Drugs in class of tetracyclines: tetracycline, demeclocycline, doxycycline, and minocycline.
b. Tetracyclines use a mechanism of inhibition of protein synthesis in their mechanism of action.

Answers for Self-assessment 2.10

1. **(A)** Doxycycline
2. Tetracyclines are contraindicated in children aged less than 8 years because they can potentially damage developing bones and teeth.

Lesson 11: Class of sulfonamides

a) Learning objectives

By the end of this session, the students should be able to:

- Describe appropriately the mechanism of action of sulfonamides.
- Identify confidently different drugs in the class of sulfonamides.
- Explain correctly indications and contraindications of sulfonamides.

- Identify main common side effects associated with sulfonamides.
- Explain appropriately nursing considerations for patients taking a sulfonamide.

b) Prerequisites/Revision/Introduction

Use K-W-L (What students already know-What they want to know-What they have learnt) after the previous activity to assess how much students already know and what they would be interested in learning about sulfonamides, as one of the classes of antibiotics. The first thing to do before starting teaching is to remind students that they have learnt about sulfonamides, and make a brief recall about the previous session.

The students should have covered the key concepts related to antibiotics; infectious bacterial diseases; medical pathology; surgical pathology; principles of drug administration; and principles of pharmacokinetics as well as pharmacodynamics.

c) Teaching resources

Basic materials for a class/lesson to be conducted: Students' books, internet connectivity, books or magazines, projector, markers, flipchart, sample of the antibiotic for class of sulfonamides, chalks, and any other trustworthy and reliable resources to enhance learning.

d) Possible methods

Think-pair-share, small group discussion, brainstorming, short class presentation, research in the library textbooks or on the internet are the main methods to use during teaching.

Before the lesson, review the learning objective to determine what students will know and be able to do by the end of the lesson. This will help you to see the skills, knowledge, and attitudes embedded in the learning objective and prepare for your lesson appropriately. Remember the learning objectives link to the key unit competence. Ensure a conducive learning environment and lead a review of the previous lesson on tetracyclines, handle any homework or assignments. Help students link the previous lesson to the current lesson using an appropriate discovery activity.

e) Learning activities 2.11: Class of Sulfonamides

Teacher's activities:

- Ask students to do individually activity 2.11 in their student books.
- Provide the to the students the necessary materials or guide them where they can get the materials.

- Move around in silence to monitor if they are having some problems.
- Guide the students, including those who are weak, without giving them the answers immediately.
- Invite randomly four students to present their findings to the rest of students.
- Ask other students to follow carefully the presentations.
- Those who are not acting may have to listen attentively without disturbing and should applaud the actors after.
- Note on chalk board / Manila paper or flip chart the students' ideas.
- Tick the correct findings and correct those ones which are incorrect and try again to complete those which are incomplete.
- Students may still have few things that are not still clear. Answer or address any questions or challenges about the activity. Guide them to make notes in their books referring to students' book.
- Harmonize and conclude on the learned knowledge.

Student's role:

- Work individually on the activity 2.11 as it appears in the student books.
- Use the materials and resources provided by the teacher to give answers to the activity.
- Attempt all the questions ensuring that participation of each member is obvious.
- Assist one another as they may have different levels of understanding.
- Selected members present the findings of the activity to the rest of students.
- Other students follow carefully the presentation of the findings.
- Those who are not presenting have to listen attentively without disturbing and should applaud their colleagues after presentation.
- Ask for more clarifications from the teacher and take notes in their notebooks.

Answers for Self-assessment 2.11

a. Antibiotics that belong to the class of sulfonamides are: sulfadiazine, sulfasalazine, and cotrimoxazole (Bactrim).
b. Sulfonamides act by inhibiting folic acid synthesis

Answers for activity 2.11

1. **(D)** Cotrimoxazole
2. **FALSE**

Lesson 12: Medications used in Treatment of sexually transmitted diseases

a) Learning objectives

By the end of this session, the students should be able to:

- Describe accurately the main features of sexually transmitted diseases.
- Describe appropriately the syndromic approaches in the management of sexually transmitted diseases.
- Identify correctly the drugs suitable for each of the syndromes of sexually transmitted diseases.
- Explain correctly how sexually transmitted diseases are treated.

b) Prerequisites/Revision/Introduction

Read the Key unit competence in the syllabus to determine what students will learn and be able to do by the end of the lesson. Look at the action verb, concept and context of each learning objective. This will help you to see the skills, knowledge and attitudes embedded in the learning objective. Remember the learning objectives are linked to the key unit competence.

Use K-W-L (What students already know-What they want to know-What they have learnt) after the previous activities on antibiotics to assess how much students already know and what they would be interested in learning about treatment guidelines of sexually transmitted diseases. The first thing to do before starting teaching is to remind students that they have learnt about different classes of antibiotics, and make a brief recall about the previous sessions on antibiotics.

Help the students to link the session to other components such as key concepts pertaining to antibiotics; infectious bacterial diseases; medical pathology; surgical pathology; principles of drug administration; and principles of pharmacokinetics as well as pharmacodynamics.

c) Teaching Resources

Basic materials for a class/lesson to be conducted: Students' books, internet connectivity, books or magazines, projector, markers, flipchart, printed flowcharts on management of different syndromes of sexually transmitted diseases, chalks, and any other trustworthy and reliable resources to enhance learning.

d) Possible Methods

Think-pair-share, small group discussion, brainstorming, short class presentation, research in the library textbooks or on the internet are the main methods to use during teaching.

Before the lesson, review the learning objective to determine what students will know and be able to do by the end of the lesson. This will help you to see the skills, knowledge, and attitudes embedded in the learning objective and prepare for your lesson appropriately. Remember the learning objectives link to the key unit competence. Ensure a conducive learning environment and lead a brief review of the previous lessons on antibiotics, handle any homework or assignments. Help students link the previous lessons to the current lesson using an appropriate discovery activity.

e) Learning activities 2.12: Medications used in treatment of sexually transmitted diseases

Teacher's activities:

- Ask students to do in pairs activity 2.12 in their student books.
- Provide the to the students the necessary materials or guide them where they can get the materials.
- Move around in silence to monitor if they are having some problems. In making pairs, ensure that the gender considerations are taken into account, and none is excluded based on gender.
- Guide the students, including those who are weak, without giving them the answers immediately.
- Invite randomly four students to present their findings to the rest of students.
- Ask other students to follow carefully the presentations.
- Those who are not acting may have to listen attentively without disturbing and should applaud the actors after.
- Note on chalk board / Manila paper or flip chart the students' ideas.
- Tick the correct findings and correct those ones which are incorrect and try again to complete those which are incomplete.
- Students may still have few things that are not still clear. Answer or address any questions or challenges about the activity. Guide them to make notes in their books referring to students' book.
- Harmonize and conclude on the learned knowledge.

Student's role:

- Work in pairs on the activity 2.12 as it appears in the student books.

- Use the materials and resources provided by the teacher to give answers to the activity.
- Attempt all the questions ensuring that participation of each member is obvious.
- Assist one another as they may have different levels of understanding.
- Selected members present the findings of the activity to the rest of students.
- Other students follow carefully the presentation of the findings.
- Those who are not presenting have to listen attentively without disturbing and should applaud their colleagues after presentation.
- Ask for more clarifications from the teacher and take notes in their notebooks.

Answers for activity 2.12

a. The symptoms of the patient may be classified in the lower abdominal pain syndrome.
b. The antibiotics that can be used in the syndromic management of this client: Ceftriaxone and azithromycin.

Answers for Self-assessment 2.12

a. Diagnosis for this client basing on the syndromic management of STIs: Genital Ulcer Syndrome
b. The antibiotic that can be used in this case basing on the syndromic management of STIs is benzathine penicillin.

Lesson 13: Medications used in treatment of tuberculosis

a) Learning objectives

By the end of this session, the students should be able to:

- Describe appropriately main drugs used in the management of tuberculosis in Rwanda.
- Identify correctly the drugs suitable for primo-treatment and retreatment of tuberculosis in Rwanda.
- Explain correctly how tuberculosis is the treated in Rwanda.

a) Prerequisites/Revision/Introduction

The first thing to do before starting teaching is to remind students that they have learnt about different classes of antibiotics, and make a brief recall about the previous sessions on antibiotics. There is a need to also make a recall about the previous session on the medications used in treatment of sexually transmitted diseases.

Help the students to link the session to other components such as key concepts pertaining to antibiotics; infectious bacterial diseases; medical pathology; surgical pathology; principles of drug administration; and principles of pharmacokinetics as well as pharmacodynamics.

Read the Key unit competence in the syllabus to determine what students will learn and be able to do by the end of the lesson. Look at the action verb, concept and context of each learning objective. This will help you to see the skills, knowledge and attitudes embedded in the learning objective. Remember the learning objectives are linked to the key unit competence.

Use K-W-L (What students already know-What they want to know-What they have learnt) to assess how much students already know about antibiotics, and what they would be interested in learning about medications used in treatment of sexually transmitted diseases.

b) Teaching resources

Basic materials for a class/lesson to be conducted: Students' books, internet connectivity, books or magazines, projector, markers, flipchart, printed flowcharts on management of different phases of tuberculosis, chalks, and any other trustworthy and reliable resources to enhance learning.

c) Possible methods

Think-pair-share, small group discussion, brainstorming, short class presentation, research in the library textbooks or on the internet are the main teaching methods to use.

Before the lesson, review the learning objective to determine what students will know and be able to do by the end of the lesson. This will help you to see the skills, knowledge, and attitudes embedded in the learning objective and prepare for your lesson appropriately. Remember the learning objectives link to the key unit competence. Ensure a conducive learning environment and lead a brief review of the previous lessons on antibiotics and sexually transmitted diseases, handle any homework or assignments. Help students link the previous lessons to the current lesson using an appropriate discovery activity.

d) Learning activities 2.13: Medications used in treatment of tuberculosis

Teacher's activities:

- Ask students to form small groups of 6 students each and do the activity 1.5.2 in their student books.
- Provide the to the students the necessary materials or guide them where they can get the materials.

- Move around in silence to monitor if they are having some problems. In making small groups, ensure that the gender considerations are taken into account, and none is excluded based on gender.
- Guide the students, including those who are weak, without giving them the answers immediately.
- Invite randomly four students to present their findings to the rest of students.
- Ask other students to follow carefully the presentations.
- Those who are not acting may have to listen attentively without disturbing and should applaud the actors after.
- Note on chalk board / Manila paper or flip chart the students' ideas.
- Tick the correct findings and correct those ones which are incorrect and try again to complete those which are incomplete.
- Students may still have few things that are not still clear. Answer or address any questions or challenges about the activity. Guide them to make notes in their books referring to students' book.
- Harmonize and conclude on the learned knowledge.

Student's role:

- Work in small groups on the activity 2.13 as it appears in the student books.
- Use the materials and resources provided by the teacher to give answers to the activity.
- Attempt all the questions ensuring that participation of each member is obvious.
- Assist one another as they may have different levels of understanding.
- Selected members present the findings of the activity to the rest of students.
- Other students follow carefully the presentation of the findings.
- Those who are not presenting have to listen attentively without disturbing and should applaud their colleagues after presentation.
- Ask for more clarifications from the teacher and take notes in their notebooks.

Answers for activity 2.13

a. The names of antituberculosis drugs that must be used: isoniazid, rifampicin, pyrazinamide, and ethambutol.

b. The phases for treatment of tuberculosis are Phase 1(**$2HREZ/4HR_3$**) and phase2(**$2HREZ_7/4HR_7$**).

Answers for self-assessment 2.13

1. The main objectives of tuberculosis treatment are:
   - To cure TB patients and restore their quality of life and productivity.
   - To prevent death and long-term complications due to TB.
   - To prevent relapses of TB.
   - To reduce the transmission of TB within the community.
   - To prevent the development and transmission of drug-resistant TB strains.
2. The standard first-line treatment regimen for drug-susceptible TB in Rwanda consists of:
   - Intensive phase: 2 months with isoniazid (H), rifampicin (R), pyrazinamide (Z), and ethambutol (E), indicated as 2(HRZE).
   - Continuation phase: 4 months with isoniazid and rifampicin, indicated as 4(HR). This regimen is coded as 2(HRZE)/4(HR), with the numbers indicating the duration of each phase in months.
3. Tuberculosis treatment should be administered under Directly Observed Treatment (DOT) to ensure that patients take their medication completely. A trained community health worker (CHW) or nurse should observe the ingestion of each dose. DOT helps prevent the development of drug resistance and supports the patient in completing the treatment.
4. First-line anti-tuberculosis drugs can be safely administered during pregnancy. However, second-line drugs, particularly injectable agents like kanamycin and amikacin, should be replaced by linezolid due to the risk of teratogenic effects, such as potential deafness in the baby. The risks and benefits of treatment should be carefully evaluated to protect both the mother and the child.
5. For MDR-TB, Rwanda follows the WHO-recommended fully oral treatment regimens. There are two main regimens:
   - Short regimen: 9-11 months with drugs like bedaquiline, levofloxacin, prothionamide, clofazimine, and others.
   - Long regimen: 18 months for patients with more complex resistance patterns, such as pre-XDR and XDR-TB, using drugs like bedaquiline, linezolid, and clofazimine. The choice between these regimens depends on the patient's drug resistance profile and treatment history.

2.6. Summary of the unit

Antibiotics, sometimes referred to as antibacterials, are medicines used in the treatment of bacterial infections. They belong to the class of antimicrobials. Antibiotics exert their effects via a diversity of mechanisms intended to alter bacterial function which ends up with bacterial cell death.

Antibiotics exert these effects using the process of selective toxicity in which the medicine targets the bacterial cells, with less target to the human cells.

Despite this selective toxicity of antibiotics, they may still cause toxicity to human cells, especially because there are some resemblances that human and bacterial cells share.

There are many classes of antibiotics, and this course covered the common antibiotics available in healthcare settings in Rwanda, namely:

- Pencillins and penicillinase-resistant antibiotics,
- Aminoglycosides,
- Cephalosporins,
- Fluoroquinolones,
- Tetracyclines, and
- Macrolides
- Sulfonamides

Sexually transmitted diseases, and tuberculosis, some of the most common infectious bacterial diseases are also managed by different categories of antibiotics.

Tuberculosis, which is usually treated in a specific way is managed with a class of antimicrobials known as antituberculosis drugs. Given the length of its treatment, it is ideal to ensure that the patient takes the drugs as indicated, and ensure that the patient completes the full course of treatment.

Nurses are reminded to provide health education to patients taking antibiotics, with focus on the limitation in the use of antibiotics to avoid antimicrobial resistance, and to complete the full course of antibiotic therapy even when the patient feels better. They also need to remind patients that antibiotics may be associated with a diversity of side effects, some of them being severe requiring medical attention one they occur.

2.7. Additional information for Teachers

The students are required to come in class prepared, and they need to consult the textbooks of pharmacology available in the library. The students are requested to work on the homework given to them, and consider self-learning as an important component in their learning.

Pharmacology course equips the students with necessary knowledge and skills to administer drugs to patients and monitor their effects. In that context, all the students are required to be curious and creative when they meet the drugs they do know, and try to look for information pertaining to these drugs.

Remind the students that antibiotics are not a panacea. They need to be taken in bacterial conditions, and they need to always remind relatives or other people taking the antibiotics that they need to be taken as they have been prescribed and for the entire duration.

They are allowed to ask questions for clarifications about the content of pharmacology they didn't get well, and if required, they may even contact the teachers remotely via the email for example.

Answers for end unit assessment 2

1. **(D)** selective toxicity
2. Prokaryotic
3. **(A)** The anti-infective's effectiveness against different invading organisms.
4. **(C)** prevents the growth of any bacteria.
5. **(B)** a fluoroquinolone.
6. **(D)** Gentamicin
7. **(B)** Tetracyclines
8. **(C)** Streptomycin
9. Bacteriostatic antibiotic is the antibiotic that has ability to prevent the growth of bacteria while bactericidal antibiotic is the one that has ability to kill bacteria. However, several antibiotics are both bactericidal and bacteriostatic, depending on the concentration of the particular drug.
10. **Classes of antibiotics according to their mechanism of action:**
    - Protein synthesis inhibitors.
    - Nucleic acid synthesis inhibitors.
    - Cell wall synthesis inhibitors.
    - Antimetabolites.
    - Inhibitors of cell membrane function.

2.9. Additional activities

2.9.1. Remedial Activities

1. Differentiate the antibiotic from antimicrobial.
2. What do you understand by a selective toxicity of an antibiotic?
3. Give the difference between a narrow-spectrum antibiotic and broad-spectrum antibiotic.

Answers for remedial activities

1. Antibiotics are medicines that fight bacterial infections in people and animals. They work by killing the bacteria or by making it hard for the bacteria to grow and multiply.
2. An antimicrobial is a drug used to treat a microbial infection. “Antimicrobial” is a general term that refers to a group of drugs that includes antibiotics, antifungals, antiprotozoals, and antivirals. The antibiotics belong to the wide class of antimicrobials.
3. Selective toxicity of an antibiotic is its ability to strike foreign cells with little or no effect on human cells.
4. A narrow-spectrum antibiotic is an antibiotic that acts against a limited group of bacteria while a broad-spectrum antibiotic is the one that acts against a larger group of bacteria.

2.9.2. Consolidation activities

1. Antibiotics should be preferably prescribed in the treatment of viral infections or illnesses given their effectiveness in such infections. TRUE or FALSE
2. The healthcare providers should be encouraged to always use newly introduced powerful antibiotics in order to avoid antimicrobial resistance. TRUE or FALSE
3. Give at least 3 antibiotics in the class of fluoroquinolones.

Answers of consolidation activities

1. **FALSE** (Antibiotics are not effective against viral infections. They are rather effective in bacterial infections. Their use should be limited in viral infections, except when associated with bacterial infections).
2. **FALSE** (Health care providers tend to try newly introduced, more powerful drugs when a more established **drug may be just as effective.** Use of a powerful

drug in this way leads to the **rapid emergence** of resistant strains to that drug, perhaps limiting its potential **usefulness** when it might be **truly necessary).**

3. **Examples of fluoroquinolones are:** Ciprofloxacin, Gemifloxacin, levofloxacin, moxifloxacin, norfloxacin, and ofloxacin.

2.9.3. Extended activities

1. Give the most common side effects associated with antibiotics.
2. Name at least 5 classes of antibiotics.
3. What are the antituberculosis drugs used in the tuberculosis primo treatment?
4. Read the scenario below and answer the questions related to it.

Your classmate has a 35-year-old female relative who has difficulty swallowing and fever for the last 3 days. The classmate says that her relative went to the nearest health post and was diagnosed with streptococcal tonsillitis. She prescribed an antibiotic she cannot remember. She however doubts that the prescribed drug may belong to either the class of tetracyclines or penicillins.

a. What can be the class of an antibiotic would her relative have been prescribed among the two classes? Explain your answer.
b. What can be the advice to your classmate's relative regarding taking this antibiotic?

Answers for extended activities

1. **The most common side effects of antibiotics are:** Ocular damage, Superinfections (GI and Genito-urinary tract), Allergic reactions, Bone marrow depression, GI effects, Dermatological reactions, Auditory damage and Renal damage.
2. **Classes of antibiotics:** Aminoglycosides, carbapenems, cephalosporins, fluoroquinolones, penicillins (and penicillinase-resistant drugs), sulfonamides, tetracyclines, disease-specific antimycobacterials (antitubercular and leprostatic drugs), ketolides (E.g.: telithromycin), lincosamides, lipoglycopeptides (E.g.: televancin), macrolides, and monobactams (E.g.: aztreonam).
3. **Drugs used in tuberculosis primotreatment are:**
   - Ethambutol
   - Pyrazinamide
   - Isoniazid
   - Rifampicin
4. **A.** Her relative would have been prescribed an antibiotic in the class of penicillins? The streptococci which are responsible for streptococcal tonsillitis are susceptible to the antibiotics in the class of penicillins, including penicillin

V and both penicillin G procaine and penicillin G benzathine. Tetracyclines are less likely to treat streptococcal tonsillitis.

B. Advice to the classmate's relative regarding taking this antibiotic:

- Take the antibiotics as prescribed and use all pills even if she is feeling better. Insist that when she stops taking the pills before she has used them all, there's a likely chance that all of the bacteria have not been killed and the remaining bacteria will become stronger and replicate new bacteria that will be more resistant to the antibiotic next time around.
- Tell her not to share her antibiotics with someone else.
- Advise her to always take antibiotics with food to prevent stomach upset, except otherwise indicated.
- If the antibiotic is making her feel worse, she needs to talk this to her doctor about the symptoms. She may need a different antibiotic or something that will help with the side effects.
- Diarrhea is a common side effect of antibiotics. As a preventive measure, she can take an over-the-counter probiotic to help reduce diarrhea symptoms.

UNIT 3 ANTHELMINTIC (ANTIHELMINTHIC) DRUGS

3.1. Key Unit Competence:

Utilize appropriate anti-helminthic drugs to manage different health condition at the primary healthcare level.

3.2. Prerequisite (knowledge, skills, attitudes and values)

Students should have been introduced to course of human biology; ways of drug administration; worms' development and infestation and effects of parasites/ microorganisms to the host; medical pathology; surgical pathology; principles of drug administration; and principles of pharmacokinetics as well as pharmacodynamics. These previously learnt courses will help the students to acquire knowledge and skills related to anti-helminthics.

The tutor needs to ensure that this content has been covered in order to be able to use anti-helminthics appropriately, especially in the management of parasitic diseases treated with anti-helminthics from different classes.

3.3. Cross-cutting issues to be addressed

a) Inclusive education

This unit involves the need to acquire knowledge and skills to apply the principles of pharmacology and administer drugs according to the standards and special considerations of patient's conditions. To administer the correct prescribed drugs and analysis of each patient's specific condition requires critical thinking, and proper use of the brain. Critical thinking may be challenging for students with mental disabilities, and this requires the teacher to assess the degree of mental disability to the concerned students. Analysis of the teacher will help to assess if the students may be grouped with others who may critically think.

During teaching, ensure that students with special needs are included throughout the course delivery. There may be for example students with visual impairment, hearing impairment or even physical disabilities. For the students with visual impairment, the teacher must ensure that they occupy the front seats in class, and they may be encouraged to report when they can't see well what is written or being presented. In case of class activities, these students may be grouped together with others who have healthy vision, and if there printed activities, ensure to use bigger font sizes. For students with hearing impairment, there is a need to for the teacher to speak loudly, help the students occupy the front seats. The written points help students with visual impairment and speaking aloud helps students with hearing

impairment Remember to repeat the main points of the lessons. Finally, for the students with physical disability, the teacher needs to help them occupy the seats that make them comfortable.

b) Gender

Emphasize to students that anybody irrespective of their gender can present and report during group activities. Give examples of famous people who are successful in real life irrespective of their gender differences. Make sure that during different class activities, both boys and girls share and participate equally in all activities. Bear in mind that they all have equal role in the smooth running of the class, and that the leaders of the class or group activities may be of either female or male gender.

c) Environment and sustainability

Students get basic knowledge from the natural sciences, so introduction to biodiversity is essential, and the students should be encouraged to maintain the biodiversity in order to keep the world safe. They also get skills and attitudes that will enable them in their everyday life to address the environment and climate change issues and to have a sustainable livelihood. Help the students to know maximum skills and attitudes on the environmental sustainability and to be responsible in caring for students' environment.

3.4 Guidance on the introductory activity 3.0

This introductory activity is intended to:

- Motivate the students to learn about different classes of anthelmintic drugs
- Stimulate the students to search more information on the criteria to choose and use anthelmintic drugs
- To rise the curiosity on the content to cover as it relates to pharmacokinetics and pharmacodynamics of anthelmintic drugs.
- Build on previous knowledge, skills, values and attitudes to help the teacher to assess the students' prior knowledge and help to link with the new content that is related to anthelmintic drugs.

The progress in the learning is gradual. At this point, there are no right or wrong answers as students will gradually get more appropriate answers progressively as they go through the unit.

Teacher's activities:

- The tutors are encouraged to promote learning in small groups of students and provide students with Unit 2 introductory activity, give clear instructions to the activity.
- Ask a determined number of students to present their findings after reading, while others are following, the teacher will be providing the guidance as needed.
- During grouping or pairing, there is a need to ensure that students with different levels of knowledge and understanding are mixed.
- The teacher also has a responsibility to help students with different problems.

1. **Have you ever seen the same scenario in your community?**
2. **Which drugs have you seen being used in the same scenario?**

Possible answers for the Introductory Activity 3.0: refer to the Student's book

1. Students may have different ideas. Some may say they saw similar situation while others may say they have not seen such kinds of situation of mass deworming. The essential information needed from the students is to recognize that students in the mass deworming may have worm infections that are more likely treated by antihelminthics, and they are receiving anthelmintics for deworming (usually mebendazole and albendazole).
2. The students do not have to necessarily provide the right answers. They may think of different drugs that have been provided. The intent of the teacher is to check if some students heard of, took or saw antihelminthc which are the focus of the unit. Check if their answers reflect the topic of antihelminthics.

   The students may provide the ideas if they saw the drugs or have been in the situation in the past. If it is the case, they may be in a position to recognize some of these drugs, and they recognize that these are the similar drugs they saw.

   Note: you may need to look at the views and ideas of the students in order to know how they will be facilitated in the unit, and throughout the entire course. They may even be asked to say what they think will be learnt in the unit.

   Get all the answers from some students, and congratulate them for the ideas provided. You then help them to get oriented on the main content to cover in the unit.

3.5. List of lessons/sub-headings including assessments

No of lessons	Lesson title	Learning objectives (from the syllabus including knowledge, skills and attitudes)	Number of Periods
1	Introduction to anthelmintic drugs and deworming	• Define anthelmintic drug and mass deworming • Discuss the importance of mass deworming in the community • Appreciate importance of deworming across the lifespan • Demonstrate understanding of the importance deworming in nutrition	2
2	Anthelmintic medications	• Describe the therapeutic actions, indications, pharmacokinetics, contraindications, most common adverse reactions, and important drug–drug interactions associated with the anthelmintic drugs • Discuss the use of anthelmintic across the lifespan. • Outline the nursing considerations, including important teaching points to stress for patients receiving an anthelmintic.	2
3	National Guidelines and WHO Community Deworming	• Utilize National treatment guidelines to manage common worms	1
4	**End Unit Assessment**	**End Unit Assessment**	1

Lesson 1: Introduction to anthelmintic drugs and deworming

a) Learning objectives:

By the end of the session, the students should be able to:

- Define anthelmintic drugs and mass deworming
- Discuss the importance of mass deworming in the community

- Use effectively the drugs for deworming

b) Prerequisites/Revision/Introduction:

Read the key unit competence in the syllabus to determine what students will learn and be able to do by the end of the unit. Look at the action verb, concept and context of each learning objective. This will help you see the skills, knowledge and attitudes embedded in the learning objective. Remember the learning objectives are linked to the key unit competence.

Use K-W-L (What students already know-What they want to know-What they have learnt) after the introductory activity to assess how much students already know and what they would be interested in learning about introduction to anthelmintic drugs and deworming. Remind the students that this session is linked to other subjects, and the components related to this session include ways of drug administration; worm infection development and multiplication of worms and effects of the host; medical pathology; surgical pathology; principles of drug administration; and principles of pharmacokinetics as well as pharmacodynamics.

c) Teaching resources:

Basic materials for a class/ lesson to be conducted include: Students' books, internet connectivity, case studies, projector, markers, chalks, and any other trustworthy and reliable resources to enhance learning.

d) Possible methods:

Pair share, small group discussion, brainstorming, short class presentation, research in the library textbooks or on the internet are the key teaching methods to use.

e) Learning activities 3.1. Introduction to anthelmintic drugs and deworming

Teacher's activities:

- Ask students to form small groups of 6 students each and do the activity 3.1 in their student books.
- Provide to the students the necessary materials or guide them where they can get the materials.
- Move around in silence to monitor if they are having some problems. In making small groups, ensure that the gender considerations are taken into account, and none is excluded based on gender.
- Guide the students, including those who are weak, without giving them the answers immediately.
- Invite randomly some students to present their findings to the rest of students.
- Ask other students to follow carefully the presentations.

- Those who are not acting may have to listen attentively without disturbing and should applaud the actors after.
- Note on chalk board / Manila paper or flip chart the students' ideas.
- Tick the correct findings and correct those ones which are incorrect and try again to complete those which are incomplete.
- Students may still have few things that are not clear. Answer or address any questions or challenges about the activity. Guide them to make notes in their notebooks referring to students' book.
- Harmonize and conclude on the learned knowledge.

Student's role:

- Work in small groups on the activity 3.1 as it appears in the student books.
- Use the materials and resources provided by the teacher to give answers to the activity.
- Attempt all the questions ensuring that participation of each member is obvious.
- Assist one another as they may have different levels of understanding.
- Selected members present the findings of the activity to the rest of students.
- Other students follow carefully the presentation of the findings.
- Those who are not presenting have to listen attentively without disturbing and should applaud their colleagues after presentation.
- Ask for more clarifications from the teacher and take notes in their notebooks.

Answers for activity 3.1

1. The patient suffers from ascariasis (He lives in poor sanitary conditions, and the laboratory test revealed eggs of Ascaris).
2. (B): Mebendazole
3. Classes of helminthic parasites targeted in deworming are roundworms, flukes, and tapeworms.

Answers for self-assessment 3.1

1. Classes of anthelmintic drugs are:

- Piperazines
- Benzimidazoles
- Heterocyclics

- Natural products
- Vinyl pyrimidines
- Amide
- Nitro derivative
- Imidazo thiazole.

2. **False.** Deworming of children usually involves the use of mebendazole and albendazole.
3. **True.**

Lesson 2: Anthelmintic medications

a) Learning objectives

By the end of this session, the students should be able to:

- Describe adequately the characteristics of an ideal antehleminthic in order to prescribe confidently the drugs which are more likely to cause less harm.

b) Prerequisites/Revision/Introduction

In order to understand well this lesson, the students must have been introduced to basic principles of worm infectious diseases; medical pathology; surgical pathology; principles of drug administration; and principles of pharmacokinetics as well as pharmacodynamics.

Use K-W-L (What students already know-What they want to know-What they have learnt) to assess how much students already know and what they would be interested in learning about anthelmintic medications. Remind the students that the current session needs to be linked to the introductory session on the definition of helminths drugs and related key concepts.

c) Teaching resources

Basic materials for a class/lesson to be conducted: Students' books, internet connectivity, books or magazines, projector, markers, chalks, and any other trustworthy and reliable resources to enhance learning.

d) Possible methods

Think-pair-share, small group discussion, brainstorming, short class presentation, research in the library textbooks or on the internet are the main teaching methods that may be used.

Before the lesson, review the learning objective to determine what students will know and be able to do by the end of the lesson. This will help you to see the skills, knowledge, and attitudes embedded in the learning objective and prepare for your lesson appropriately. Remember the learning objectives link to the key

unit competence. Ensure a conducive learning environment and lead a review of the previous lesson on definition of antibiotics and related concepts, handle any homework or assignments. Help students link the previous lesson to the current lesson using an appropriate discovery activity.

e) Learning activities 3.2: Anthelmintic medications.

Teacher's activities:

- Ask students to do individually activity 3.2 in their student books.
- Provide the to the students the necessary materials or guide them where they can get the materials.
- Move around in silence to monitor if they are having some problems.
- Guide the students, including those who are weak, without giving them the answers immediately.
- Invite randomly two students to present their findings to the rest of students.
- Ask other students to follow carefully the presentations.
- Those who are not acting may have to listen attentively without disturbing and should applaud the actors after.
- Note on chalk board / Manila paper or flip chart the students' ideas.
- Tick the correct findings and correct those ones which are incorrect and try again to complete those which are incomplete.
- Students may still have few things that are not still clear. Answer or address any questions or challenges about the activity. Guide them to make notes in their books referring to students' book.
- Harmonize and conclude on the learned knowledge.

Student's role:

- Work individually on the activity 3.2 as it appears in the student books.
- Use the materials and resources provided by the teacher to give answers to the activity.
- Attempt all the questions ensuring that participation of each member is obvious.
- Assist one another as they may have different levels of understanding.
- Selected members present the findings of the activity to the rest of students.
- Other students follow carefully the presentation of the findings.
- Those who are not presenting have to listen attentively without disturbing and should applaud their colleagues after presentation.
- Ask for more clarifications from the teacher and take notes in their notebooks.

Answers for learning activity 3.2

1. The class of drugs used to manage the client's condition (hookworm infestation) is anthelmintic medications
2. The mechanism of action of mebendazole: Mebendazole interferes with the ability of the parasite to use glucose, leading to an inability to reproduce and cell death. Because very little of mebendazole is absorbed systemically, it retains high concentrations in the intestine where it kills the pathogens
3. The common side effects of albendazole: The most common side effects of albendazole are: Headache, neck stiffness, increased sensitivity to light, confusion; fever; nausea, vomiting, stomach pain; abnormal liver function tests; dizziness, spinning sensation; or temporary hair loss.

Answers for self-assessment 3.2

1. **(A):** Praziquantel
2. **Mechanism of action of albendazole:** As a vermicide, albendazole causes degenerative alterations in the intestinal cells of the worm by binding to the colchicine-sensitive site of β-tubulin, thus inhibiting its polymerization or assembly into microtubules (it binds much better to the β-tubulin of parasites than that of mammals). Albendazole leads to impaired uptake of glucose by the larval and adult stages of the susceptible parasites, and depletes their glycogen stores. Albendazole also prevents the formation of spindle fibers needed for cell division, which in turn blocks egg production and development; existing eggs are prevented from hatching.
3. **(D) To target intestinal parasites, albendazole is taken on an empty stomach to stay within the gut.**

Lesson 3: National Guidelines for Deworming and WHO Community Deworming

a) Learning objectives

By the end of this session, the students should be able to utilize appropriately the National treatment guidelines to manage common worms.

b) Prerequisites/Revision/Introduction

In order to understand well this lesson, the students must have been introduced to basic principles of worm infectious diseases; medical pathology; surgical pathology; principles of drug administration; and principles of pharmacokinetics as well as pharmacodynamics.

Use K-W-L (What students already know-What they want to know-What they have learnt) to assess how much students already know and what they would be interested in learning about National Guidelines for Deworming and WHO Community Deworming. Remind the students that the current session needs to be linked to the introductory session on the definition of helminths drugs and related key concepts.

c) Teaching resources

Basic materials for a class/lesson to be conducted: Students' books, internet connectivity, books or magazines, projector, markers, chalks, and any other trustworthy and reliable resources to enhance learning.

d) Possible methods

Think-pair-share, small group discussion, brainstorming, short class presentation, research in the library textbooks or on the internet are the main teaching methods that may be used.

Before the lesson, review the learning objective to determine what students will know and be able to do by the end of the lesson. This will help you to see the skills, knowledge, and attitudes embedded in the learning objective and prepare for your lesson appropriately. Remember the learning objectives link to the key unit competence. Ensure a conducive learning environment and lead a review of the previous lesson on definition of antibiotics and related concepts, handle any homework or assignments. Help students link the previous lesson to the current lesson using an appropriate discovery activity.

e) Learning activities 3.3: National Guidelines for Deworming and WHO Community Deworming

Teacher's activities:

- Ask students to do in pairs activity 3.3 in their student books.
- Provide the to the students the necessary materials or guide them where they can get the materials.
- Move around in silence to monitor if they are having some problems.
- Guide the students, including those who are weak, without giving them the answers immediately.
- Invite randomly two students to present their findings to the rest of students.
- Ask other students to follow carefully the presentations.
- Those who are not acting may have to listen attentively without disturbing and should applaud the actors after.
- Note on chalk board / Manila paper or flip chart the students' ideas.
- Tick the correct findings and correct those ones which are incorrect and try

again to complete those which are incomplete.

- Students may still have few things that are not still clear. Answer or address any questions or challenges about the activity. Guide them to make notes in their books referring to students' book.
- Harmonize and conclude on the learned knowledge.

Student's role:

- Work in pairs the activity 3.3 as it appears in the student books.
- Use the materials and resources provided by the teacher to give answers to the activity.
- Attempt all the questions ensuring that participation of each member is obvious.
- Assist one another as they may have different levels of understanding.
- Selected members present the findings of the activity to the rest of students.
- Other students follow carefully the presentation of the findings.
- Those who are not presenting have to listen attentively without disturbing and should applaud their colleagues after presentation.
- Ask for more clarifications from the teacher and take notes in their notebooks.

Answers for learning activity 3.3

1. The primary school students wearing uniform at school, and are performing hand washing using a pedal hand washing station, a car, and a person wearing the white coat with the bottles containing tablets on the table. The students wash their hand before receiving the tables from that person (the health care provider) in the exercise of deworming.
2. The WHO recommends Preventive chemotherapy (deworming), using annual or biannual single-dose albendazole (400 mg) or mebendazole (500 mg).
3. **True.**

Answers for self-assessment 3.3

1. The important part of a comprehensive package to eliminate morbidity due to soil-transmitted helminths at risk population is educate the high risk populations on preventive measures, like good hygiene and provision and administration of anthelmintic drugs.
2. In the community the deworming is organized in way that the population at risk is sensitized to attend that event and then the anthelmintic medication

is provided. Especially the children are found at school or at health centre during vaccination. Also this medication is provided to the pregnant women in second trimester.

3.6. Summary of the unit

There are three major groups of helminths: nematodes (roundworms), trematodes (flukes) and cestodes (tapeworms). They are divided into two phyla; nematodes (roundworms) and platyhelminths (trematodes and cestodes).

Anthelminthics are a group of antiparasitic drugs that expel parasitic worms (helminths) and other internal parasites from the body by either stunning or killing them and without causing significant damage to the host. They may also be called vermifuges (those that stun) or vermicides (those that kill).

According to their chemical structures, the anthelminthics may be classified into:

- Piperazines
- Benzimidazoles
- Heterocyclics
- Natural products:
- Vinyl pyrimidines
- Amide
- Nitro derivative
- Imidazothiazole

Deworming is the giving of an anthelmintic drug to a human to rid them of helminths parasites, such as **roundworm, flukes** and **tapeworm**. Mass deworming campaigns of school children have been used both as a preventive as well as a treatment method for helminthiasis, which includes soil transmitted helminthiasis in children. Children can be treated by administering, for example, mebendazole and albendazole.

3.7. Additional information for Teachers

Managing Pinworm Infections

Infestation with worms can be a frightening and traumatic experience for most people. Seeing the worm can be an especially difficult experience.

Pinworms can spread very rapidly among children in schools, summer camps, and other institutions. Once the infestation starts, careful hygiene measures and drug therapy are required to eradicate the disease. After the diagnosis has been made and appropriate drug therapy started, proper hygiene measures are essential.

Some suggested hygiene measures that might help to control the infection include the following:

- Keep the child's nails cut short and hands well-scrubbed because reinfection results from the worm's eggs being carried back to the mouth after becoming lodged under the fingernails when the child scratches the pruritic perianal area.
- Give the child a shower in the morning to wash away any ova deposited in the anal area during the night.
- Change and launder undergarments, bed linens, and pajamas every day
- Disinfect toilet seats daily and the floors of bathrooms and bedrooms periodically.
- Encourage the child to wash hands vigorously after using the toilet.

In some areas, parents are asked to check for worm ova by pressing sticky tape against the anal area in the morning before bathing. The sticky tape is then pressed against a slide that can be taken or sent to a clinical laboratory for evaluation. It may take 5–6 weeks to get a clear reading with this method of testing. Some health care providers believe that the psychological trauma involved in doing this type of follow-up, especially with a school-age child, makes this task too onerous to ask parents to do. Instead, many believe that the ease of treating this relatively harmless disease makes it more prudent to continue to treat as prescribed and to forgo the follow-up testing. It is important to reassure patients and families that these types of infections do not necessarily reflect negatively on their hygiene or lifestyle. It takes a coordinated effort among medical personnel, families, and patients to control a pinworm infestation.

Answer for end unit assessment 3

1. The major groups of helminths are: nematodes (roundworms), trematodes (flukes) and cestodes (tapeworms).
2. **(D)** Praziquantel
3. **True**
4. **(A)** Mebendazole and albendazole
5. **False**. Praziquantel has no effect on filariae.
6. **(B)** Roundworms, flukes and tapeworm

3.8. Additional activities

3.8.1. Remedial Questions

1. **Which of the following explains the mechanism of action of praziquantel?**
   A. Blocking acetylcholine transmission at the myoneural junction and paralysis of helminthes
   B. Inhibiting microtubule synthesis in helminthes and irreversible impairment of glucose uptake
   C. Increasing cell membrane permeability for calcium, resulting in paralysis, dislodgement and death of helminthes
   D. Inhibiting oxidative phosphorylation in some species of helminthes

2. **What is the mechanism of action of piperazine?**
   A. Inhibiting microtubule synthesis in helminthes and irreversible impairment of glucose uptake
   B. Blocking acetylcholine transmission at the myoneural junction and paralysis of helminthes
   C. Inhibiting oxidative phosphorylation in some species of helminthes
   D. Increasing cell membrane permeability for calcium, resulting in paralysis, dislodgement and death of helminthes

3. **Which of the following is a salicylamide derivative?**
   A. Praziquantel
   B. Piperazine
   C. Mebendazole
   D. Niclosamide

4. **Which of the following statements explains the mechanism of action of mebendazole?**
   A. Inhibiting oxidative phosphorylation in some species of helminthes
   B. Increasing cell membrane permeability for calcium, resulting in paralysis, dislodgement and death of helminthes
   C. Inhibiting microtubule synthesis in helminthes and irreversible impairment of glucose uptake
   D. Blocking acetylcholine transmission at the myoneural junction and paralysis of helminthes

Answers for remedial activities

1. **(D)** Inhibiting oxidative phosphorylation in some species of helminthes
2. **(C)** Inhibiting oxidative phosphorylation in some species of helminthes
3. **(B)** Piperazine
4. **(D)** Blocking acetylcholine transmission at the myoneural junction and paralysis of helminthes

3.8.2. Consolidation activities

1. **Tick the drug which inhibits oxidative phosphorylation in some species of helminthes:**
   A. Niclosamide
   B. Piperazine
   C. Praziquantel
   D. Mebendazole

2. **Which of the following drugs may be used in neurocysticercosis treatment?**
   A. Praziquantel
   B. Pyrantel
   C. Piperazine
   D. Bithionol

3. **Tick the drug, a benzimidazole derivative:**
   A. Praziquantel
   B. Mebendazole
   C. Suramin
   D. Pyrantel

4. **Which of the following diseases is caused by a nematode?**
   A. Amoebiasis
   B. Leprosy
   C. Poliomyelitis
   D. Filariasis

Answers for consolidation activities

1. (c) Praziquantel
2. (A) Praziquantel
3. (B) Mebendazole
4. (D) Filariasis

3.8.3. Extended activities

1. **Enterobiasis diseases is caused by**
   A. Hookworm
   B. Filarial worm
   C. Roundworm
   D. Pinworm
2. **Which of the following conditions is a helminthic disease?**
   A. Polio
   B. Filariasis
   C. Filaria
   D. Diphtheria
3. Albendazole (400 mg) or mebendazole (500 mg) may be used in deworming. **True or False.**
4. **Which of the following statements is true with regard to the WHO recommended deworming for all young children 12–23 months of age?**

   A. The WHO recommends deworming, using annual or biannual single-dose albendazole (200 mg) or mebendazole (200 mg)

   B. The WHO recommends deworming, using annual or biannual single-dose albendazole (2000 mg) or mebendazole (100 mg)

   C. The WHO recommends deworming, using annual or biannual single-dose albendazole (400 mg) or mebendazole (500 mg)

   D. The WHO recommends deworming, using annual or biannual single-dose albendazole (200 mg) or mebendazole (300 mg)

Answers for extended activities

1. **(D)** Pinworm
2. **(B)** Filariasis
3. **True**
4. **(C)**The WHO recommends deworming, using annual or biannual single-dose albendazole (400 mg) or mebendazole (500 mg)

UNIT 4 ANTIPROTOZOAL DRUGS

4.1. Key Unit Competence

At the end of this unit, the student will be able to utilize antiprotozoal drugs to manage different health condition at the primary healthcare settings.

4.2. Prerequisites

To succeed well this unit, and complete it confidently, the students need to have been introduced to basic pharmacological concepts. They should have been introduced to the key principles of pharmacology including drug names, the meaning of pharmacology, factors influencing drug prescription, drug dosage forms, and ways of drug administration. The students also need to have been introduced to human biology, basic chemical reactions, fundamentals of nursing, medical pathology, and surgical pathology. This previously learnt course will help the students to acquire knowledge and skills related to antiprotozoal drugs, and be able to manage patients with parasitic conditions. The tutor should recall the students the key topics of prerequisites courses that would be helpful to well understand antiprotozoal unit.

4.3. Cross cutting issues to be addressed

a) Inclusive education

This unit involves the need to use antiprotozoal drugs appropriately, and expect the potential results of these drugs on the client. This requires critical thinking for the students in order to administer drugs bearing in mind they need to exert effects while causing no or less harm to the patient.

During teaching, ensure that students with special needs are included throughout the course delivery. There may be for example students with visual impairment, hearing impairment or even physical disabilities. For the students with visual impairment, the teacher must ensure that they occupy the front seats in class, and they may be encouraged to report when they can't see well what is written or being presented. In case of class activities, these students may be grouped together with others who have healthy vision, and if there are printed activities, ensure to use bigger font sizes. For students with hearing impairment, these students must be included in the learning process. In this context, there is a need to for the teacher to speak loudly, help the students occupy the front seats.

The written points help students with visual impairment and speaking aloud helps students with hearing impairment. Remember to repeat the main points of the lessons.

It is the responsibility of the teacher and teaching team to ensure that all students with a diversity of disabilities are included in the learning process, and special considerations will be considered for each category of students with special needs.

b) Gender

Emphasize to students that anybody irrespective of their gender can present and report during group activities. Give examples of famous people who are successful in real life irrespective of their gender differences. Make sure that during different class activities, both boys and girls share and participate equally in all activities. Bear in mind that they all have equal role in the smooth running of the class, and that the leaders of the class or group activities may be of either female or male gender.

c) Environment and sustainability

Students get basic knowledge from the natural sciences, so introduction to biodiversity is essential, and the students should be encouraged to maintain the biodiversity in order to keep the world safe. They also get skills and attitudes that will enable them in their everyday life to address the environment and climate change issues and to have a sustainable livelihood. Help the students to know maximum skills and attitudes on the environmental sustainability and to be responsible in caring for students' environment.

4.4. Guidance on introductory activity 4.0

This introductory activity is intended to:

- Motivate the students to learn about antiprotozoal drugs.
- Stimulate the students to search more information pertaining to of pharmacokinetics and pharmacodynamics.
- To rise the curiosity on the content to cover as it relates to pharmacokinetics and pharmacodynamics of antiprotozoal drugs.
- Build on previous knowledge, skills, values and attitudes to help the teacher to assess the student's prior knowledge and help to link with the new content that is related to antiprotozoals.

The progress in the learning is gradual. At this point, there are no rights or wrong answers as students will gradually get more appropriate answers progressively as they go through the unit. You may even ask the students to guess what will be covered in the unit.

Teacher's activities:

- The teachers are encouraged to promote learning in small groups of students and provide students with Unit 4 introductory activity, give clear instructions to the activity.

- Ask a determined number of students to present their findings after reading, while others are following, the teacher will be providing the guidance as needed.
- During grouping or pairing, there is a need to ensure that students with different levels of knowledge and understanding are mixed.
- The teacher also has a responsibility to help students with different problems.

Possible answers for the Introductory Activity: refer to the student's book

1. Students may have different ideas. Some may say they used such kind of medication or saw someone taking such kind of drugs while others may say they have never used and/or seen someone taking such kind of drugs. The essential information needed from the students is to recognize that these kinds of drugs used to treat protozoal infestations.
2. The students do not have to necessarily provide the right answers. They may think of different conditions following their life experience including previous courses. The intent of the teacher is to check if some students heard of or experienced any disease treated by antiprotozoal drugs which is the focus of the unit.

4.5. List of lessons/ sub-headings including assessments

Content/lesson	Learning objectives	Numbers of periods
1. Definition and Classification of antiprotozoal medications	- Define and classify antiprotozoal drugs	1
2. Plasmodium's life cycle	Explain the importance of plasmodium's life cycle in pharmacotherapy of malaria.	2
3. Antimalarial medications	Describe antimalarial medications Use antimalarial medications Administer correctly the anti-malarial medications	2
4. Antimalarial drugs prototypes	Identify antiprotozoal medications from national essential drugs list and treatment guidelines	2
5. Antimalarial Drug Dosage	Administer the correct dosage	2
6. Treatment of simple malaria	Explain medications used in treatment of simple malaria	1

7. Treatment of severe malaria	Explain medications used in treatment of severe malaria	**2**
8. Treatment of malaria in pregnant women	Identify medications used in management of malaria for pregnant women	**2**
9. Non-malarial antiprotozoal medications (miscellaneous antiprotozoals)	Identify antiprotozoal medications from national essential drug list and treatment guidelines	**1**
10. Health Education About Malaria and Amebiasis Treatment	Provide patients with appropriate health education to prevent drug resistance and limit diseases transmission	**1**
11. End unit assessment		**2**

Lesson 1: Definition and Classification of antiprotozoal medications

a) Learning objectives:

By the end of the session, the students should be able to:

- Define antiprotozoal medications
- Classify the antiprotozoal medications

b) Prerequisites/Revision/Introduction:

This is the first lesson of the third unit **antiprotozoal drugs**, in this lesson you will be dealing with definitions of protozoans, and classification of antiprotozoal drugs. The first thing to do before starting teaching is to remind students what they have learnt about general pharmacology (principles of pharmacology), fundamentals of nursing, medical pathology, human biology (protozoal lesson) and surgical pathology, and let them discuss the meaning of protozoa so that they can prepare themselves for this antiprotozoal drugs lesson.

Use K-W-L (What students already know-What they want to know-What they have learnt) after the introductory activity to assess how much students already know and what they would be interested in learning about **definition and classification of antiprotozoal medications.**

c) Teaching resources:

They included: Pharmacology books, S5 pharmacology book guide for students, internet connectivity, projector, markers, chalks, and any other trustworthy and reliable resources to enhance learning.

d) Possible methods:

Pair share, small group discussion, brainstorming, short class presentation, research in the library textbooks or on the internet.

e) Learning activities 4.1 Definition and Classification of antiprotozoals medications

- Ask students to do in small groups, pairs activity 4.1 in their student books.
- Provide to the students the necessary materials or guide them where they can get the materials.
- Move around in silence to monitor if they are having some problems. In case of small groups, ensure that the gender considerations are considered, and none is excluded based on gender.
- Assist the students to identify key issues regarding the diagnosis, treatment and control of protozoan infections according to their level of practice.
- Remember to note any areas where students have problems and ensure that these are emphasized in the subsequent learning lessons.
- Discuss in detail the various issues raised but to assure the students that they will be discussed in the subsequent learning lessons.
- Remember to assist those who are weak but without giving them the knowledge.
- Invite randomly some students to present their findings to the rest of students.
- Ask other students to carefully follow the presentations.
- Those who are not acting may have to listen attentively without disturbing and should applaud the actors after.
- Note on chalk board / Manila paper or flip chart the student's ideas.
- Tick the correct findings and correct those ones which are incorrect and try again to complete those which are incomplete.
- Students may still have few things that are not clear. Answer or address any questions or challenges about the activity. Guide them to make notes in their notebooks referring to students' book.
- Harmonize and conclude on the learned knowledge.

Student's role:

- Work in small groups on the activity 4.1 as it appears in the student books.
- Use the materials and resources provided by the teacher to give answers to the activity.
- Attempt all the questions ensuring that participation of each member is obvious.

- Assist one another as they may have different levels of understanding.
- Selected members present the findings of the activity to the rest of students.
- Other students follow carefully the presentation of the findings.
- Those who are not presenting have to listen attentively without disturbing and should applaud their colleagues after presentation.
- Ask for more clarifications from the teacher and take notes in their notebooks.

Answers for learning activity 4.1

a. **Antiprotozoal drug:** a drug that destroys protozoans, inhibits their growth and ability to reproduce or prevents the development of protozoans in humans.

Antiprotozoal drugs are classified into 2 classes: antimalarial drugs and miscellaneous antiprotozoals

Antimalarial drugs example: Antimalarial drugs include mefloquine, chloroquine, proguanil with atovaquone and doxycycline, artesunate, artemether lumefantrine and Quinine

Miscellaneous antiprotozoals example: Commonly used miscellaneous antiprotozoals include metronidazole, tinidazole and so on.

b. **-The positive blood smear in the scenario indicates that the patient X has malaria disease. Patient X could receive any of antimalarial drugs like** Artemether, lumefantrine, artesunate, or quinine, etc depending on the corcumstances.

- The presence of entamoeba histolytica in the stool indicates that patient has amebiasis. Patient X may be treated by **miscellaneous antiprotozoals** drugs like Metronidazole, tinidazole, nitazoxanide among others.

Expected answers for self-assessment 4.1

1. **(D)** The physician is likely to prescribe Metronidazole for patient A
2. **(C)** The physician is likely to prescribe pentamidin for patient B
3. **(B)** The physician is likely to prescribe Metronidazole for patient C

Lesson 2: Plasmodium's life cycle

a) Learning objectives:

By the end of the session, the students should be able to explain the importance of Plasmodium's life cycle in pharmacotherapy of malaria.

b) Prerequisites/Revision/Introduction:

This is the second lesson of the third unit **"antiprotozoal drugs."** In this lesson, you will be explaining the **Plasmodium's life cycle.** The first thing to do before starting teaching is to remind students that they have learnt about medical pathology, human biology (protozoal lesson) and surgical pathology, and let them discuss the meaning of protozoan so that they can prepare themselves for this **Plasmodium's life cycle.**

Use K-W-L (What students already know-What they want to know-What they have learnt) after the introductory activity to assess how much students already know and what they would be interested in learning about **Plasmodium's life cycle.**

c) Teaching resources:

They included: Pharmacology books, S5 pharmacology book guide for students, internet connectivity, projector, markers, chalks, and any other trustworthy, illustrations and reliable resources to enhance learning.

d) Possible methods:

Pair share, small group discussion, brainstorming, short class presentation, research in the library textbooks or on the internet.

e) Learning activities 4.2: Plasmodium's life cycle

Teachers' activities:

- Ask students to do individually, pairs activity 4.2 in their student books.
- Provide to the students the necessary materials or guide them where they can get the materials.
- Move around in silence to monitor if they are having some problems. In case of small groups, ensure that the gender considerations are considered, and none is excluded based on gender.
- Assist the students to identify key issues regarding the Plasmodium's life cycle and malaria treatment.
- Remember to note any areas where students have problems and ensure that these are emphasized in the subsequent learning lessons.
- discuss in detail the various issues raised but to assure the students that they will be discussed in the subsequent learning lessons.
- Remember to assist those who are weak but without giving them the knowledge.
- Invite randomly some students to present their findings to the rest of students.
- Ask other students to carefully follow the presentations.

- Those who are not acting may have to listen attentively without disturbing and should applaud the actors after.
- Note on chalk board / Manila paper or flip chart the student's ideas.
- Tick the correct findings and correct those ones which are incorrect and try again to complete those which are incomplete.
- Students may still have few things that are not clear. Answer or address any questions or challenges about the activity. Guide them to make notes in their notebooks referring to students' book.
- Harmonize and conclude on the learned knowledge.

Student's role:

- Work individually on the activity 4.2 as it appears in the student books.
- Use the materials and resources provided by the teacher to give answers to the activity.
- Attempt all the questions ensuring that participation of each member is obvious.
- Assist one another as they may have different levels of understanding.
- Selected members present the findings of the activity to the rest of students.
- Other students carefully follow the presentation of the findings.
- Those who are not presenting have to listen attentively without disturbing and should applaud their colleagues after presentation.
- Ask for more clarifications from the teacher and take notes in their notebooks.

Answers for learning activity 4.2

1. **A)** The diagnosis for this case is malaria

   B) Malaria develops via two phases: an **exoerythrocytic and an erythrocytic phase.**

   C) Malaria is transmitted through mosquito bites. Malaria is transmitted from a sick person to a well person by mosquito.

   D) Yes. Malaria is preventable and treatable; but if a person with malaria does not receive appropriate treatment, it can lead to severe illness and death.

2) (C) Infective form of plasmodium for human is **sporozoites**

Expected answers for self-assessment activity 4.2

1. (C)During the phase of erythrocytic, the merozoites lyse the RBCs and this hemolysis is accompanied by the release **of HEMOZOIN pigment** which directly goes and disturbs the HYPOTHALAMIC functioning and causes the occurrence of fever.
2. a) **Exoerythrocytic phase** involves infection of the hepatic system, or liver.
   b) The erythrocytic phase involves infection of the erythrocytes, or red blood cells.
3. **(C)** Plasmodium malariae
4. **(D)** Plasmodium falciparum
5. **(D)** a and b

Lesson 3: Antimalarial medications

a) Learning objectives:

By the end of the session, the students should be able to explain antimalarial medications, and prescribe them confidently.

b) Prerequisites/Revision/Introduction:

This is the third lesson of the third unit, in this lesson you will be explaining the malaria treatment and describe antimalarial drugs prototypes. The first thing to do before starting teaching is to remind students that they have learnt about Plasmodium's life cycle and malaria treatment so that they can prepare themselves for antimalarial medications.

Use K-W-L (What students already know-What they want to know-What they have learnt) after the introductory activity to assess how much students already know and what they would be interested in learning about Antimalarial medications.

c) Teaching resources:

They included: Pharmacology books, S5 pharmacology book guide for students, internet connectivity, projector, markers, chalks, and any other trustworthy, illustrations and reliable resources to enhance learning.

d) Possible methods:

Pair share, small group discussion, brainstorming, short class presentation, research in the library textbooks or on the internet.

e) Learning activities

Teachers' activities:

- Ask students to do in small groups, pairs activity 4.3 in their student books.

- Provide to the students the necessary materials or guide them where they can get the materials.
- Move around in silence to monitor if they are having some problems. In case of small groups, ensure that the gender considerations are considered, and none is excluded based on gender.
- Assist the students to identify key issues regarding the antimalarial drugs prototypes.
- Remember to note any areas where students have problems and ensure that these are emphasized in the subsequent learning lessons.
- Discuss in detail the various issues raised but to assure the students that they will be discussed in the subsequent learning lessons.
- Remember to assist those who are weak but without giving them the knowledge.
- Invite randomly some students to present their findings to the rest of students.
- Ask other students to carefully follow the presentations.
- Those who are not acting may have to listen attentively without disturbing and should applaud the actors after.
- Note on chalk board / Manila paper or flip chart the student's ideas.
- Tick the correct findings and correct those ones which are incorrect and try again to complete those which are incomplete.
- Students may still have few things that are not clear. Answer or address any questions or challenges about the activity. Guide them to make notes in their notebooks referring to students' book.
- Harmonize and conclude on the learned knowledge.

Student's role:

- Work in small groups on the activity 4.3 as it appears in the student books.
- Use the materials and resources provided by the teacher to give answers to the activity.
- Attempt all the questions ensuring that participation of each member is obvious.
- Assist one another as they may have different levels of understanding.
- Selected members present the findings of the activity to the rest of students.
- Other students carefully follow the presentation of the findings.
- Those who are not presenting have to listen attentively without disturbing and should applaud their colleagues after presentation.
- Ask for more clarifications from the teacher and take notes in their notebooks.

Answers for learning activity 4.3

1. **(A) Plasmodium.**
2. **Three antimalarial medications you know used in Rwanda. Student may say but not limited to:**
   - Coartem (Artemether lumefantrine)
   - Quinine
   - Artesunate
3. **For the travellers visiting malaria endemic area are recommended to follow ABCD approach for malaria prevention (drug and non-drug measures):**
   - Awareness of risk (even if you grew up in a country where malaria is common, you still need to take precautions to protect yourself from infection if you're travelling to a risk area).
   - Bite prevention (avoid mosquito bites by using insect repellent, covering your arms and legs, and using a mosquito net. It's not possible to avoid mosquito bites completely, but the less you're bitten, the less likely you are to get malaria).
   - Check whether you need to take malaria prevention tablets (if you do, make sure you take the right antimalarial tablets at the right dose, and finish the course).
   - Diagnosis (Malaria can get worse very quickly, so it's important that it's diagnosed and treated as soon as possible).

Expected answers for self-assessment activity 4.3

1. Selection of drugs for malaria prophylaxis is based on the drug sensitivity of the plasmodial species found in the region to which travel is intended.
2. Once confirmed, appropriate antimalarial treatment must be initiated immediately.
3. **Three antimalarial therapy objectives are:**
   - treatment of an acute attack (clinical cure),
   - prevention of relapse (radical cure), and
   - prophylaxis (suppressive therapy).
4. **True**
5. Because the resistance patterns are constantly changing, depending on geographic location.

Lesson 4: Antimalarial drugs prototypes

a) Learning objectives:

By the end of the session, the students should be able to explain **antimalarial drugs prototypes**.

b) Prerequisites/Revision/Introduction:

This is the forth lesson of the third unit **antiprotozoal drugs,** in this lesson you will be dealing with **Antimalarial drugs prototypes** especially antiprotozoal medications from national essential drug list and treatment guidelines**.** The first thing to do before starting teaching is to remind students that they have learnt about pharmacology (principles of pharmacology senior 4 and Plasmodium's life cycle and malaria treatment in senior 5), fundamentals of nursing, medical pathology, human biology (protozoal lesson) and surgical pathology, and let them discuss so that they can prepare themselves for this **Antimalarial drugs prototypes** lesson.

Use K-W-L (What students already know-What they want to know-What they have learnt) after the introductory activity to assess how much students already know and what they would be interested in learning about **Antimalarial drugs prototypes**.

c) Teaching resources:

They included: Pharmacology books, S5 pharmacology book guide for students, internet connectivity, projector, markers, chalks, and any other trustworthy and reliable resources to enhance learning.

d) Possible methods:

Pair share, small group discussion, brainstorming, short class presentation, research in the library textbooks or on the internet.

e) Learning activities 4.4 Explain Antimalarial drugs prototypes

Teachers' activities:

- Ask students to do in small groups, pairs activity 4.4 in their student books.
- Provide to the students the necessary materials or guide them where they can get the materials.
- Move around in silence to monitor if they are having some problems. In case of small groups, ensure that the gender considerations are considered, and none is excluded based on gender.
- Assist the students to identify key issues regarding the Plasmodium's life cycle and malaria treatment.
- Remember to note any areas where students have problems and ensure that these are emphasized in the subsequent learning lessons.
- Discuss in detail the various issues raised but to assure the students that they

will be discussed in the subsequent learning lessons.

- Remember to assist those who are weak but without giving them the knowledge.
- Invite randomly some students to present their findings to the rest of students.
- Ask other students to carefully follow the presentations.
- Those who are not acting may have to listen attentively without disturbing and should applaud the actors after.
- Note on chalk board / Manila paper or flip chart the student's ideas.
- Tick the correct findings and correct those ones which are incorrect and try again to complete those which are incomplete.
- Students may still have few things that are not clear. Answer or address any questions or challenges about the activity. Guide them to make notes in their notebooks referring to students' book.
- Harmonize and conclude on the learned knowledge.

Student's role:

- Work in small groups on the activity 4.4 as it appears in the student books.
- Use the materials and resources provided by the teacher to give answers to the activity.
- Attempt all the questions ensuring that participation of each member is obvious.
- Assist one another as they may have different levels of understanding.
- Selected members present the findings of the activity to the rest of students.
- Other students carefully follow the presentation of the findings.
- Those who are not presenting have to listen attentively without disturbing and should applaud their colleagues after presentation.
- Ask for more clarifications from the teacher and take notes in their notebooks.

Expected answers for learning activity 4.4

1. **Antimalarial drugs are:** Artemether-lumefantrine, artesunate, mefloquine, amodiaquine, sulfadoxine-pyrimethamine, Chloroquine and Quinine.
2. **A.** The treatment is artemether-lumefantrine tablets.

   B. No, because it is recommended that the treatment should be initiated when the diagnosis has been confirmed by laboratory tests (positive blood smear results).

Expected answers for self-assessment activity 4.4

1. At usual therapeutic doses, quinine frequently causes:
   - mild cinchonism (a syndrome characterized by tinnitus [ringing in the ears]),
   - headache,
   - visual disturbances,
   - nausea, and
   - diarrhea.
2. Chloroquine can cause dizziness, headache, diplopia, disturbed visual accommodation, dysphagia, nausea, malaise, and pruritus of palms, soles and scalp. It can also cause visual hallucinations, confusion, and occasionally frank psychosis. Intra muscular injections of chloroquine can cause hypotension and cardiac arrest, particularly in children
3. True and false answers
   A. False
   B. True
   C. False
   D. True
   E. True
   F. True

Lesson 5: Anti-malarial drug dosage

a) Learning objectives:

By the end of the session, the students should be able to describe antimalarial drug dosage

b) Prerequisites/Revision/Introduction:

This is the fifth lesson of the third unit "**antiprotozoal drugs."** In this lesson, you will be dealing with **anti-malarial drug dosage.**The first thing to do before starting teaching is to remind students that they have learnt about general pharmacology (principles of pharmacology), Plasmodium's life cycle and malaria treatment, fundamentals of nursing, medical pathology, human biology (protozoal lesson) and surgical pathology, so that they can prepare themselves for this **anti-malarial drug dosage** lesson.

Use K-W-L (What students already know-What they want to know-What they have learnt) after the introductory activity to assess how much students already know and what they would be interested in learning about **Anti-malarial drug dosage.**

c) Teaching resources:

They included: Pharmacology books, S5 pharmacology book guide for students, internet connectivity, projector, markers, chalks, and any other trustworthy and reliable resources to enhance learning.

d) Possible methods:

Pair share, small group discussion, brainstorming, short class presentation, research in the library textbooks or on the internet.

e) Learning activities 4.5 Describe Anti-malarial drug dosage

Teachers' activities:

- Ask students to do in pairs activity 3.5 in their student books.
- Provide to the students the necessary materials or guide them where they can get the materials.
- Move around in silence to monitor if they are having some problems. In case of small groups, ensure that the gender considerations are considered, and none is excluded based on gender.
- Assist the students to identify key issues regarding the Plasmodium's life cycle and malaria treatment.
- Remember to note any areas where students have problems and ensure that these are emphasized in the subsequent learning lessons.
- discuss in detail the various issues raised but to assure the students that they will be discussed in the subsequent learning lessons.
- Remember to assist those who are weak but without giving them the knowledge.
- Invite randomly some students to present their findings to the rest of students.
- Ask other students to carefully follow the presentations.
- Those who are not acting may have to listen attentively without disturbing and should applaud the actors after.
- Note on chalk board / Manila paper or flip chart the student's ideas.
- Tick the correct findings and correct those ones which are incorrect and try again to complete those which are incomplete.
- Students may still have few things that are not clear. Answer or address any questions or challenges about the activity. Guide them to make notes in their notebooks referring to students' book.
- Harmonize and conclude on the learned knowledge.

Student's role:

- Work in pairs on the activity 4.5 as it appears in the student books.
- Use the materials and resources provided by the teacher to give answers to the activity.
- Attempt all the questions ensuring that participation of each member is obvious.
- Assist one another as they may have different levels of understanding.
- Selected members present the findings of the activity to the rest of students.
- Other students carefully follow the presentation of the findings.
- Those who are not presenting have to listen attentively without disturbing and should applaud their colleagues after presentation.
- Ask for more clarifications from the teacher and take notes in their notebooks.

Answers for learning activity 4.5

1. **A).** The dosage of oral quinine is prescribed basing on weight or age: Oral quinine: 10 mg/kg 8 hourly for 7 days.

   Therefore, the patient weighing 60 kilograms would receive:

   60x10=600mg every eight hours.

   B). The dosage of artemether -lumefantrine (COARTEM^{R}) is prescribed basing on body weight or age. Therefore, the patient whose weight ranges between 25 to 34 kilograms takes 3 tables of artemether-lumefantrine every 12 hours.

Answers for self-assessment activity 4.5

1. A) No. Because the treatment must be initiated after the diagnosis has been confirmed by laboratory tests. In addition, she did not respect the drug dosage calculation for antimalarials. The mother was giving 3 tables (overdose) instead of 2 tablets of coartem according to the protocol (patient's weight).

   B) No. Because it is recommended that the treatment should be completed once the treatment has been started. However, the mother needed to adjust the dosage according to the client's weight.

   C) The health care worker can manage this patient by:

   - Evaluating the patient carefully for other possible causes of illness.
   - Getting a blood film or Rapid Diagnostic Test done if possible.
   - Completing the full course of artemether-lumefantrine.

2. Artesunate dosage to be administered via IV indicated for initial treatment of severe malaria; should always be followed by a complete treatment course of an appropriate PO antimalarial regimen (Coartem).

   Artesunate dosages are: Child under 20 kg: 3 mg/kg/dose and Child 20 kg and over and adult: 2.4 mg/kg/dose.

3. Dosage calculation for quinine injection for an adult patient with severe malaria: **Quinine dihydrochloride IV is given** in infusion. It is administered as 10 mg per kg body weight per dose, diluted in 5 to 10 ml of 5% or 10% glucose per kg body weight, every eight hours (as a maintenance dose). Note that the treatment starts with a loading dose at 20mg/kg to run in 4 hours.

Lesson 6: Treatment of simple malaria

a) Learning objectives:

By the end of the session, the students should be able to explain how simple malaria is treated.

b) Prerequisites/Revision/Introduction:

This is the sixth lesson of the third unit "**antiprotozoal drugs."** In this lesson you will be dealing with treatment for simple malaria. The first thing to do before starting teaching is to remind students that they have learnt about general pharmacology (principles of pharmacology), Plasmodium's life cycle and malaria treatment, fundamentals of nursing, medical pathology, human biology (protozoal lesson) and surgical pathology, so that they can prepare themselves for this lesson on treatment for simple malaria.

Use K-W-L (What students already know-What they want to know-What they have learnt) after the introductory activity to assess how much students already know and what they would be interested in learning about treatment for simple malaria.

c) Teaching resources:

They included: Pharmacology books, S5 pharmacology book guide for students, internet connectivity, projector, markers, chalks, and any other trustworthy and reliable resources to enhance learning.

d) Possible methods:

Pair share, small group discussion, brainstorming, short class presentation, research in the library textbooks or on the internet.

e) Learning activities 4.6 Treatment of simple malaria.

Teachers' activities:

- Ask students to do in small groups activity 4.6 in their student books.

- Provide to the students the necessary materials or guide them where they can get the materials.
- Move around in silence to monitor if they are having some problems. In case of small groups, ensure that the gender considerations are considered, and none is excluded based on gender.
- Assist the students to identify key issues regarding the Plasmodium's life cycle and malaria treatment.
- Remember to note any areas where students have problems and ensure that these are emphasized in the subsequent learning lessons.
- Discuss in detail the various issues raised but to assure the students that they will be discussed in the subsequent learning lessons.
- Remember to assist those who are weak but without giving them the knowledge.
- Invite randomly some students to present their findings to the rest of students.
- Ask other students to carefully follow the presentations.
- Those who are not acting may have to listen attentively without disturbing and should applaud the actors after.
- Note on chalk board / Manila paper or flip chart the student's ideas.
- Tick the correct findings and correct those ones which are incorrect and try again to complete those which are incomplete.
- Students may still have few things that are not clear. Answer or address any questions or challenges about the activity. Guide them to make notes in their notebooks referring to students' book.
- Harmonize and conclude on the learned knowledge.

Student's role:

- Work in small groups on the activity 4.6 as it appears in the student books.
- Use the materials and resources provided by the teacher to give answers to the activity.
- Attempt all the questions ensuring that participation of each member is obvious.
- Assist one another as they may have different levels of understanding.
- Selected members present the findings of the activity to the rest of students.
- Other students carefully follow the presentation of the findings.
- Those who are not presenting have to listen attentively without disturbing and should applaud their colleagues after presentation.
- Ask for more clarifications from the teacher and take notes in their notebooks.

Answers for learning activity 4.6

1. **A)** It is indicated to prescribe the first line of treatment only after obtaining a positive blood smear or positive rapid diagnostic test. A negative blood smear or rapid diagnostic test excludes the diagnosis of malaria and the administration of an antimalarial. Another cause of the fever should be sought systematically and treated accordingly.

   The first line treatment recommended is an artemisinin combination therapy (ACT) of 2 molecules in one tablet. That is: Artemether 20 mg and Lumefantrine 120 mg to be taken preferably during meals.

   The combination of artemether – lumefantrine (COARTEM^{R}) is administered orally, twice a day for 3 days.

   Therefore, referring to the national treatment guidelines, a patient diagnosed with simple malaria (if not pregnant) are treated with COARTEM^{R}.

   B) Community health workers are responsible in the management of simple malaria at the community level.

   C) In case of contraindication to coartem, oral quinine sulphate is used

Answers for self-assessment activity 4.6

1. (A) Coartem
2. In case of pregnant woman during the 1st trimester of pregnancy, coartem is contraindicated. **Quinine dihydrochloride** is the medication of choice (in Rwanda).
3. For children with 28 kilograms, the dosage equals to: 3.2X28=89.6 mg.

Lesson 7. Treatment of severe malaria

a) Learning objectives:

By the end of the session, the students should be able to explain National treatment guidelines for severe malaria.

b) Prerequisites/Revision/Introduction:

This is the seventh lesson of the third unit on "**antiprotozoal drugs.**" In this lesson you will be dealing with treatment for severe malaria**.** The first thing to do before starting teaching is to remind students that they have learnt about general pharmacology (principles of pharmacology), Plasmodium's life cycle and malaria treatment,

fundamentals of nursing, medical pathology, human biology (protozoal lesson) and surgical pathology, so that they can prepare themselves for this lesson on national treatment guidelines for severe malaria.

Use K-W-L (What students already know-What they want to know-What they have learnt) after the introductory activity to assess how much students already know and what they would be interested in learning about treatment of severe malaria.

c) Teaching resources:

They included: Pharmacology books, S5 pharmacology book guide for students, internet connectivity, projector, markers, chalks, and any other trustworthy and reliable resources to enhance learning.

d) Possible methods:

Pair share, small group discussion, brainstorming, short class presentation, research in the library textbooks or on the internet.

e) Learning activities 4.7. Explain national treatment guidelines for simple malaria.

Teachers' activities:

- Ask students to do in small groups, pairs activity 4.7 in their student books.
- Provide to the students the necessary materials or guide them where they can get the materials.
- Move around in silence to monitor if they are having some problems. In case of small groups, ensure that the gender considerations are considered, and none is excluded based on gender.
- Assist the students to identify key issues regarding the Plasmodium's life cycle and malaria treatment.
- Remember to note any areas where students have problems and ensure that these are emphasized in the subsequent learning lessons.
- Discuss in detail the various issues raised but to assure the students that they will be discussed in the subsequent learning lessons.
- Remember to assist those who are weak but without giving them the knowledge.
- Invite randomly some students to present their findings to the rest of students.
- Ask other students to carefully follow the presentations.
- Those who are not acting may have to listen attentively without disturbing and should applaud the actors after.

- Note on chalk board / Manila paper or flip chart the student's ideas.
- Tick the correct findings and correct those ones which are incorrect and try again to complete those which are incomplete.
- Students may still have few things that are not clear. Answer or address any questions or challenges about the activity. Guide them to make notes in their notebooks referring to students' book.
- Harmonize and conclude on the learned knowledge.

Student's role:

- Work in small groups on the activity 4.7 as it appears in the student books.
- Use the materials and resources provided by the teacher to give answers to the activity.
- Attempt all the questions ensuring that participation of each member is obvious.
- Assist one another as they may have different levels of understanding.
- Selected members present the findings of the activity to the rest of students.
- Other students carefully follow the presentation of the findings.
- Those who are not presenting have to listen attentively without disturbing and should applaud their colleagues after presentation.
- Ask for more clarifications from the teacher and take notes in their notebooks.

Answers for learning activity 4.7

Treatment for severe malaria

1. **The following are the medications used in pretransfer treatment:**
    - Quinine, preferably by intravenous infusion as a loading dose of 20 mg per kg body weight to run in 4 hours (not exceeding a total dose of 1200 mg for the loading dose); or
    - Quinine by intrarectal route in children, as 20 mg per kg body weight diluted in 4 ml of distilled water or physiological solution, administered with a 5-ml syringe; or
    - Arthemether IM 3.2 mg per kg body weight administered as a single dose before transferring the patient.

2. **The minimum tests that the laboratory should be able to perform in order to confirm severe malaria are:**
   - peripheral blood smear,
   - haemoglobin and haematocrit,
   - blood sugar and
   - proteinuria
3. **Two antibiotic medications used to manage cerebral malaria are:**
   - Ampicillin
   - Chloramphenicol

Expected Answers for Self-Assessment 4.7

1. The management of this patient at the hospital

   Administer a loading dose of 20 mg/kg body weight of quinine dihydrochloride (do not exceed 1200 mg) diluted in an isotonic solution or 5 or 10% glucose on the basis of 5 to 10 ml/kg body weight to run for 4 hours in IV perfusion. Then run IV glucose 5 or 10% for 4 hours as maintenance drip.

   Thereafter, i.e. 8 hours after the beginning of the administration of the loading dose or 4 hours after the beginning of the maintenance drip, administer a maintenance dose of 10 mg/kg body weight of quinine dihydrochloride in infusion, to run for 4 hours. This maintenance dose of quinine will be repeated every 8 hours until the patient can swallow, normally within 48 hours at the most.

   If after 48 hours the patient's state doesn't permit the patient to take quinine orally, one may continue the drip of quinine by reducing the doses to 7 mg/kg every 8 hours to run for 4 hours.

   Change to oral quinine 10 mg/kg of quinine sulphate every 8 hours as soon as the patient can swallow, to complete the 7 days of treatment or oral Artemether 20 mg and Lumefantrine 120 mg, as recommended for the treatment of simple malaria.

2. **No.** For the anaemic form of severe malaria, antibiotherapy is not indicated.

Lesson 8: Treatment of malaria for pregnant women

a. Learning objectives:

By the end of the session, the students should be able to identify medication used in treatment of malaria for pregnant women

b. Prerequisites/Revision/Introduction:

This is the eighth lesson of the third unit "**antiprotozoal drugs."** In this lesson you will be dealing with treatment of malaria for pregnant women. The first thing to do before starting teaching is to remind students that they have learnt about general pharmacology (principles of pharmacology), Plasmodium's life cycle and malaria treatment, fundamentals of nursing, medical pathology, human biology (protozoal lesson) and surgical pathology, so that they can prepare themselves for this lesson on treatment of malaria for pregnant women.

Use K-W-L (What students already know-What they want to know-What they have learnt) after the introductory activity to assess how much students already know and what they would be interested in learning about thetreatment of malaria in pregnant women.

a. Teaching resources:

They included: Pharmacology books, S5 pharmacology book guide for students, internet connectivity, projector, markers, chalks, and any other trustworthy and reliable resources to enhance learning.

b. Possible methods:

Pair share, small group discussion, brainstorming, short class presentation, research in the library textbooks or on the internet.

c. Learning activities 4.8

Teachers' activities:

- Ask students to do in pairs activity 4.8 in their student books.
- Provide to the students the necessary materials or guide them where they can get the materials.
- Move around in silence to monitor if they are having some problems. In case of small groups, ensure that the gender considerations are considered, and none is excluded based on gender.
- Assist the students to identify key issues regarding the Plasmodium's life cycle and malaria treatment.
- Remember to note any areas where students have problems and ensure that these are emphasized in the subsequent learning lessons.
- Discuss in detail the various issues raised but to assure the students that they will be discussed in the subsequent learning lessons.
- Remember to assist those who are weak but without giving them the knowledge.
- Invite randomly some students to present their findings to the rest of students.

- Ask other students to carefully follow the presentations.
- Those who are not acting may have to listen attentively without disturbing and should applaud the actors after.
- Note on chalk board / Manila paper or flip chart the student's ideas.
- Tick the correct findings and correct those ones which are incorrect and try again to complete those which are incomplete.
- Students may still have few things that are not clear. Answer or address any questions or challenges about the activity. Guide them to make notes in their notebooks referring to students' book.
- Harmonize and conclude on the learned knowledge.

Student's role:

- Work in pairs on the activity 4.8 as it appears in the student books.
- Use the materials and resources provided by the teacher to give answers to the activity.
- Attempt all the questions ensuring that participation of each member is obvious.
- Assist one another as they may have different levels of understanding.
- Selected members present the findings of the activity to the rest of students.
- Other students carefully follow the presentation of the findings.
- Those who are not presenting have to listen attentively without disturbing and should applaud their colleagues after presentation.
- Ask for more clarifications from the teacher and take notes in their notebooks.

Answers for learning activity 4.8

1. Because Malaria during pregnancy can aggravate latent anaemia, it is recommended to do a complete clinical exam.

   The first line treatment of malaria in pregnancy is quinine sulphate peros 10 mg/kg/dose, 3 times a day for 7 days during the first trimester of pregnancy. COARTEM is indicated during the 2nd and 3rd trimesters of pregnancy only.

   In case of fever, administer paracetamol tablets, 500 mg three times per day

2. **False.** During second and third trimesters, coartem may be used for a pregnant woman.

Expected Answers For Self-Assessment 4.8

a. Management of simple malaria with minor digestive symptoms in pregnant women (IN FIRST TRIMESTER)

Administer Quinine dihydrochloride in intravenous infusion: 10 mg/kg/dose diluted in 10 ml of 5% or 10% glucose per kg, every eight hours until patient is able to take drugs orally making sure the treatment does not exceed 24 hours.

Once the patient can take orally, complete the remaining quinine 3 X10 mg/kg/day to make 7 days by oral route of drug administration.

b. Management of simple malaria with minor digestive symptoms in pregnant women (IN SECOND AND THIRD TRIMESTERS)

Depending on the general status and level of hydration of the patient, drugs may be administered as follows:

Artemether by intramuscular injection:

Administered as dose of 160 mg immediately after the diagnosis followed by 80 mg twelve (12) hours after.

If the patient's condition does not improve within 24 of treatment, refer the patient to the nearest district hospital. If the patient's condition improves, change to oral Artemether-lumefantrine twice a day for three consecutive days.

Quinine dihydrochloride by intravenous administration:

Administered as 10 mg per kg body weight per dose, diluted in 5 to 10 ml of 5% or 10% glucose per kg, every eight hours. If the patient's condition does not improve within 24 hours of treatment, refer the patient to the nearest district hospital. If the patient's condition improves, change to oral Artemether-Lumefantrine, twice a day for three consecutive days, or to oral quinine in case of contraindications to Artemether-Lumefantrine.

c. Symptomatic management of simple malaria with minor digestive symptoms in pregnant women

- In case of diarrhoea or vomiting:
  - Evaluate and monitor the state of hydration;
  - Rehydrate with ORS or other available liquids and even introduce nasogastric tube if necessary ;
  - Anti-emetics are not recommended.
- In case of fever, administer paracetamol 15 mg/kg orally or any other antipyretic that may be indicated.

Lesson 9: Non-malarial antiprotozoal medications (miscellaneous antiprotozoals)

a) Learning objectives:

By the end of the session, the students should be able identify antiprotozoal medications from national essential drugs list and treatment guideline

b) Prerequisites/Revision/Introduction:

This is the night lesson of the third unit on **antiprotozoal drugs.** In this lesson, you will be dealing with non-malarial antiprotozoal medications from national essential drugs list and treatment guide line

The first thing to do before starting teaching is to remind students that they have learnt about general pharmacology (principles of pharmacology), Plasmodium's life cycle and malaria treatment, fundamentals of nursing, medical pathology, human biology (protozoal lesson) and surgical pathology, so that they can prepare themselves for this lesson on non-malarial antiprotozoal medications.

Use K-W-L (What students already know-What they want to know-What they have learnt) after the introductory activity to assess how much students already know and what they would be interested in learning about non-malarial antiprotozoal medications.

c) Teaching resources:

They included: Pharmacol]ogy books, S5 pharmacology book guide for students, internet connectivity, projector, markers, chalks, and any other trustworthy and reliable resources to enhance learning.

d) Possible methods:

Pair share, small group discussion, brainstorming, short class presentation, research in the library textbooks or on the internet.

e) Learning activities 4.9

Teachers' activities:

- Ask students to do in small groups the activity 4.9 in their student books.
- Provide to the students the necessary materials or guide them where they can get the materials.
- Move around in silence to monitor if they are having some problems. In case of small groups, ensure that the gender considerations are considered, and none is excluded based on gender.

- Assist the students to identify key issues regarding the Plasmodium's life cycle and malaria treatment.
- Remember to note any areas where students have problems and ensure that these are emphasized in the subsequent learning lessons.
- Discuss in detail the various issues raised but to assure the students that they will be discussed in the subsequent learning lessons.
- Remember to assist those who are weak but without giving them the knowledge.
- Invite randomly some students to present their findings to the rest of students.
- Ask other students to carefully follow the presentations.
- Those who are not acting may have to listen attentively without disturbing and should applaud the actors after.
- Note on chalk board / Manila paper or flip chart the student's ideas.
- Tick the correct findings and correct those ones which are incorrect and try again to complete those which are incomplete.
- Students may still have few things that are not clear. Answer or address any questions or challenges about the activity. Guide them to make notes in their notebooks referring to students' book.
- Harmonize and conclude on the learned knowledge.

Student's role:

- Work in small groups on the activity 4.9 as it appears in the student books.
- Use the materials and resources provided by the teacher to give answers to the activity.
- Attempt all the questions ensuring that participation of each member is obvious.
- Assist one another as they may have different levels of understanding.
- Selected members present the findings of the activity to the rest of students.
- Other students carefully follow the presentation of the findings.
- Those who are not presenting have to listen attentively without disturbing and should applaud their colleagues after presentation.
- Ask for more clarifications from the teacher and take notes in their notebooks.

Answers for learning activity 4.9

Non-malarial antiprotozoal medications **(miscellaneous antiprotozoals)**

a. **Examples of medications for the first patient with giardiasis:**
   - Metronidazole,
   - Tinidazole,
   - Nitazoxanide.

b. **Examples of medications for second patient with amebiasis:**
   - Metronidazole,
   - Tinidazole
   - Iodoquinol,
   - Paromomycin

Expected answers for self -assessment 4.9

1. **(B)** Pentamidine
2. **(D)** Metronidazole
3. **(A)** Being active against trypanosomes
4. **(D)** Malaria

Lesson 10 Health education about malaria and amebiasis treatment

a) **Learning objectives:**

By the end of the session, the students should be able provide appropriate health education to prevent drug resistance and limit disease transmission.

b) **Prerequisites/Revision/Introduction:**

This is the tenth lesson of the third unit **antiprotozoal drugs,** in this lesson you will be dealing with health education about malaria and amebiasis treatment

The first thing to do before starting teaching is to remind students that they have learnt about general pharmacology (principles of pharmacology), Plasmodium's life cycle and malaria treatment, fundamentals of nursing, medical pathology, human biology (protozoal lesson) and surgical pathology, so that they can prepare themselves for this lesson on Health Education About Malaria and Amebiasis Treatment.

Use K-W-L (What students already know-What they want to know-What they have learnt) after the introductory activity to assess how much students already know and what they would be interested in learning about health Education about malaria and amebiasis treatment.

c) Teaching resources:

They included: Pharmacology books, S5 pharmacology book guide for students, internet connectivity, projector, markers, chalks, and any other trustworthy and reliable resources to enhance learning.

d) Possible methods:

Pair share, small group discussion, brainstorming, short class presentation, research in the library textbooks or on the internet.

e) Learning activities 4.10 Health Education About Malaria and Amebiasis Treatment

Teachers' activities:

- Ask students to do in small groups 4.10 in their student books.
- Provide to the students the necessary materials or guide them where they can get the materials.
- Move around in silence to monitor if they are having some problems. In case of small groups, ensure that the gender considerations are considered, and none is excluded based on gender.
- Assist the students to identify key issues regarding the Plasmodium's life cycle and malaria treatment.
- Remember to note any areas where students have problems and ensure that these are emphasized in the subsequent learning lessons.
- Discuss in detail the various issues raised but to assure the students that they will be discussed in the subsequent learning lessons.
- Remember to assist those who are weak but without giving them the knowledge.
- Invite randomly some students to present their findings to the rest of students.
- Ask other students to carefully follow the presentations.
- Those who are not acting may have to listen attentively without disturbing and should applaud the actors after.
- Note on chalk board / Manila paper or flip chart the student's ideas.
- Tick the correct findings and correct those ones which are incorrect and try again to complete those which are incomplete.
- Students may still have few things that are not clear. Answer or address any questions or challenges about the activity. Guide them to make notes in their notebooks referring to students' book.
- Harmonize and conclude on the learned knowledge.

Student's role:

- Work in small groups on the activity 4.10 as it appears in the student books.
- Use the materials and resources provided by the teacher to give answers to the activity.
- Attempt all the questions ensuring that participation of each member is obvious.
- Assist one another as they may have different levels of understanding.
- Selected members present the findings of the activity to the rest of students.
- Other students carefully follow the presentation of the findings.
- Those who are not presenting have to listen attentively without disturbing and should applaud their colleagues after presentation.
- Ask for more clarifications from the teacher and take notes in their notebooks.

Answers for learning activity 4.10

1) To be tested for malaria or other illness. The only way to be sure that the person has malaria is to be tested (blood smear or rapid diagnostic test).
   - If you test positive, then you can receive the proper treatment for malaria.
   - To get proper diagnosis and appropriate treatment to avoid complications that may even lead to death

2) This will ensure complete cure, on-going protection and will prevent the drug from becoming less effective to malaria infection (development of drug resistance).
   - Kills the parasite in the sick person and therefore stops transmission to healthy people
   - Treatment is important for saving the life of an infected person

3) **(D)** Both A and B

4) **(C)** To avoid alcoholic beverages

Expected answers for self –assessment 4.10

1. In the instance that you miss a dose, take it as soon as possible that day. For daily regimes, if you miss the dose completely for that day, skip the missed dose entirely and continue with your next dose. Never take a double dose to make up for a missed dose.

2. It's always advisable to purchase all necessary medication prior to your departure. However, in the event that you need antimalarial medication at your destination, you should only purchase medication from a reputable pharmacy

3. -Patients must seek immediate medical advice if they have malaria symptoms or if they become ill while travelling in an area where malaria is found, or after returning from travelling, even if they have been taking antimalarial tablets.

   – It's important that it's diagnosed and treated as soon as possible because malaria can get worse very quickly.

4) Even if you grew up in a country where malaria is common, you still need to take precautions to protect yourself from infection if you're travelling to a risk area.

   – Even if you have been infected, remember that nobody has complete immunity to malaria, and any level of natural protection you may have had is quickly lost when you move out of a risk area.

4.6. Summary of the unit

A protozoan is a parasitic cellular organism. Its life cycle includes a parasitic phase inside human tissues or cells. One of the greatest protozoal problems worldwide is the treatment and prevention of malaria.

Malaria is caused by Plasmodium protozoa, which must go through a cycle in the Anopheles mosquito before being passed to humans by the mosquito bite. Once inside a human the protozoa invade red blood cells. The characteristic cyclic chills and fever of malaria occur when red blood cells burst, releasing more protozoa into the bloodstream.

Antimalarials are agents used to attack Plasmodium at various stages of its life cycle. Sometime Malaria is treated with a combination of drugs that attack the protozoan at various stages in its life cycle. Antimalarial drugs can be classified according to antimalarial activity and according to structure. Most of the currently used antimalarials are caortem, quinine and artesunate.

Amebiasis is caused by the protozoan Entamoeba histolytica, which invades human intestinal tissue after being passed to humans through unsanitary food or water. Metronidazole or Tinidazole are the drugs of choice in the treatment of all tissue infections with E.histolytica. Neither drug is reliably effective against luminal parasites and so must be used with a luminal amebicide to ensure eradication of the infection. There are other antiprotozoals that can be used to manage amebiasis.

Leishmaniasis, a protozoan-caused disease, can result in serious lesions in the

mucosa, viscera, and skin. The infection is transmitted by sand-fly bite. It is treated with systemic pentamidine. Pentamidine is an alternative to sodium stibogluconate and newer agents for the treatment of visceral leishmaniasis. The drug has been successful in some cases that have failed therapy with antimonials. The dosage is 2-4 mg/kg intramuscularly daily or every other day for up to 15 doses and a second course may be necessary. Pentamidine has also shown success against cutaneous leishmaniasis, but it is not routinely used for this purpose.

Trypanosomiasis, which is caused by infection with a Trypanosoma parasite, may assume two forms. African sleeping sickness leads to inflammation of the CNS, and Chagas disease results in serious cardiomyopathy. These diseases can be treated with systemic pentamidine, and children with Chagas disease can be treated with benznidazole. Pentamidine has been used for long and is the drug of choice to treat the early hemolymphatic stage of disease caused by Trypanosoma brucei gambiense (West African sleeping sickness).

The drug is inferior to Suramin for the treatment of early East African sleeping sickness. Pentamidine should not be used to treat late trypanosomiasis with central nervous system involvement. A number of dosing regimens have been described, generally providing 2-4 mg/kg daily or on alternate days for a total of 10-15 doses. Pentamidine has also been used for chemoprophylaxis against African trypanosomiasis, with dosing of 4 mg/kg every 3-6 months.

Trichomoniasis is caused by Trichomonas vaginalis. This common cause of vaginitis results in no signs or symptoms in men but results in serious vaginal inflammation in women. It is treated with metronidazole and tinidazole. Metronidazole is the treatment of choice. A simple dose of 2 g is effective. Metronidazole-resistant organisms can lead to treatment failures. Tinidazole may be effective against some of these resistant organisms.

Giardiasis caused by Giardia lamblia. This disease may lead to serious malnutrition when the pathogen invades intestinal mucosa. It is treated with nitazoxanide, metronidazole, and tinidazole. Metronidazole is the treatment of choice for giardiasis. The dosage for giardiasis is much lower than that for amebiasis, and the drug is thus better tolerated. Efficacy after a single treatment is about 90 %. Tinidazole is at least equally effective, and can be used as a single dose.

Pneumocystis jiroveci is an endemic protozoan that does not usually cause illness in humans unless they become immunosuppressed. This is the most common opportunistic infection seen in AIDS patients. It is treated with inhaled pentamidine (300 mg inhaled monthly) and oral atovaquone. Pentamidine is a well-established alternative therapy for pulmonary and extra-pulmonary disease caused by P jiroveci. The drug has somewhat lower efficacy and greater toxicity than trimethoprim-sulfamethoxazole. The standard dosage is 3 mg/kg/daily intravenously for 21 days.

Patients receiving antiprotozoal agents should be monitored regularly to detect any serious adverse effects, including loss of vision, liver toxicity, and so on.

4.7. Additional information for Teachers

- *Treatment of amebiasis*

Clinical Classification of Antiamoebic Drugs

Mixed amebicides: both systemic and luminal: Metronidazole & Tinidazole

Luminal amebicides: treatment of the asymptomatic colonization state: Iodoquinol, Paromomycin & Diloxanide furoate

Systemic amebicides: These drugs are useful for treating liver abscesses and intestinal wall infections caused by amebas: Chloroquine, Emetine & Dehydroemetine

Chemical Classification of amoebicides

1. **Nitroimidazole derivatives:** Metronidazole, Tinidazole, Ornidazole , Secnidazole
2. **Dichloroacetamides:** Diloxanide Furoate, Etofamide, Clefamide, Teclozan
3. **Emetines:** Emetine, Dehydroemetine
4. **Halogenated 8 Hydroxyquinolines:** Clioquinol Iodoquinol
5. **4-amino quinoline derivatives:** Chloroquine
6. **Antibiotics :** Paromomycin, Tetracycline
7. **Nitrothiazolidines:** Nitazoxanide

CLINICAL SETTING	DRUGS OF CHOICE & ADULT DOSAGE	ALTERNATIVE DRUGS & ADULT DOSAGE
Asymptomatic intestinal infection	Luminal agent: Diloxanide furoate 500mg 3 times daily for 10 days or Iodoquinol, 650mg 3 times daily for 21 days or Paromomycin 10mg/kg 3 times daily for 7 days.	
Mild to moderate intestinal infection	Metronidazole 750mg 3 times daily (or 500mg IV every 6 hours) for 10 days or Tinidazole 2 g daily for 3 days plus luminal agent (see above).	luminal agent (see above) Plus either Tetracycline 250 mg 3 times daily for 10 days or Erythromycin 500 mg 4 times daily for 10 days
Severe intestinal infection	Metronidazole 750mg 3 times daily (or 500mg IV every 6 hours) for 10 days or Tinidazole 2 g daily for 3 days plus luminal agent (see above).	luminal agent(see above) Plus either Tetracycline 250 mg 3 times daily for 10 days or Dehydroemetine or Emetine 1 mg/kg SC or IM for 3-5 days
Hepatic abscess, ameboma and other extra-intestinal disease	Metronidazole 750mg 3 times daily (or 500mg IV every 6 hours) for 10 days or Tinidazole 2 g daily for 3 days plus luminal agent (see above).	Dehydroemetine or Emetine 1 mg/kg SC or IM for 8-10 days, followed by (liver abscess only) chloroquine 500mg twice daily for 2 days, then 500 mg daily for 21 days plus Luminal agent (see above)

- ***Treatment of African trypanosomiasis***

Disease	Stage	first-Line Drugs	alternative Drugs
west African	Early	Pentamidine	Suramin, eflornithine
	CNS involvement	eflornithine	Melarsoprol, eflornithine nifurtimox
East African	Early	Suramin	Pentamidine
	CNS involvement	melarsoprol	

- ***Treatment of other protozoal infections***

Organism or clinical setting	Drugs of choice	Alternative drugs
Giardia lamblia	Metronidazole 250mg 3 times daily or 500 mg twice daily for 5 days or tinidazole 2 mg once	Furazolidone 100mg 4 times daily for 7 days or albendazole 400mg daily for 5 days
Trichomonas vaginalis	Metronidazole 2g once or 250mg 3 times daily or tinidazole once	
Balantidium coli	Tetracycline 500mg 4 times daily for 10 days	Metronidazole 750mg 3 times daily for 5 days
Pneumocystis jiroveci, p.carinii	Trimethoprimsulfamethoxazole 15-20mg trimethoprim component/kg/d IV? Or two double strength tablets every 8 hours for 21 days	Pentamidine or trimothoprimdapsone or clindamycin plus primaquine or atovaquone
Toxoplasma gondii		
Acute, congenital, immunocompromised	Pyrimethamine plus clindamycine plus folinic Acid	Pyrimethamine plus sulfadiazine plus folinic Acid
Pregnancy	Spiramycin 3g daily until delivery	

Answers for end unit assessment 4

1. (C) Both A and B are correct
2. (B) Quinine
3. (D) Primaquine
4. (C) Mefloquine
5. (D) Malaria
6. (B) Pneumocystis carinii pneumonia
7. (D) Giardiasis
8. (D) pyrimethamine
9. (B) Tinidazole
10. (C) All are correct

4.8. Additional activities

4.8.1. Remedial Activities

1. How many days should the patient avoid alcohol after treatment with metronidazole?
   A. **1 day**
   B. **3 days**
   C. **5 days**
   D. **48 hours**

2. During clinical practice you are assigned to prepare a health education on malaria prevention, give instructions to the patients how to use the chemical diethyltoluamide (DEET) (often used in insect repellents).

3. Filling in the missing words to complete the sentence using the words below:

Gametocytocides, Blood schizonticides, Sporontocides, Tissue schizonticides for preventing relapse and Tissue schizonticides for causal prophylaxis

a) **……** these drugs act on the hypnozoites of P. vivax and P. ovale in the liver that cause relapse of symptoms on reactivation.

b) **……** these drugs destroy the sexual forms of the parasite in the blood and thereby prevent transmission of the infection to the mosquito.

c) **……** these drugs act on the blood forms of the parasite and thereby terminate clinical attacks of malaria.

E) ……..these drugs act on the primary tissue forms of the plasmodia which after growth within the liver, initiate the erythrocytic stage

F) …….these drugs prevent the development of oocysts in the mosquito and thus ablate the transmission.

Answers for Remedial Activities

1. (D) 48 hours
2. If the family of the patient has a baby who has less than 2 months inform that it's not recommended for babies who are less than 2 months old. Diethyltoluamide (DEET) is safe for older children, adults and pregnant women if you follow the manufacturer's instructions:
   - use on exposed skin

- don't spray directly on to your face – spray into your hands and pat on to your face
- avoid contact with lips and eyes
- wash your hands after applying
- don't apply to broken or irritated skin
- make sure you apply DEET after applying sunscreen, not before

3. Filling in the missing words to complete the sentence using the words below:

a) Tissue schizonticides for preventing relapse
b) Gametocytocides
c) Blood schizonticides
d) Tissue schizonticides for causal prophylaxis
e) Sporontocides

4.8.2. Consolidation activities

1. A patient traveling to an area of the world where malaria is known to be endemic should be taught to

A. Avoid drinking the water.
B. Begin prophylactic antimalarial therapy before traveling and continue it through the visit and for 4 weeks after the visit.
C. Take a supply of antimalarial drugs in case he or she gets a mosquito bite.
D. Begin prophylactic antimalarial therapy 2 weeks before traveling and stop the drugs on arriving at the destination.

2. Which of the following drugs is used for leishmaniasis treatment?

A. Pyrimethamine
B. Albendazole
C. Sodium stibogluconate
D. Tinidazole

3. Tick the drug used for trypanosomiasis treatment:

A. Melarsoprol
B. Metronidazole
C. Tetracyclin
D. Quinidine

4. Tick the drug used for trichomoniasis treatment

A. Suramin
B. Metronidazole
C. Pyrimethamine

D. Tetracycline

5. **During clinical practice you are assigned to prepare a health education for pregnant woman having malaria and her husband ask you why it is important for pregnant women to be protected against malaria.**

   a) Give explanation to the couple (husband and wife) why it is important for pregnant women to be protected against malaria

   b) Briefly prepare health education session on malaria prevention to the couple (husband and wife) on how can pregnant women protect themselves against malaria.

Answers for consolidation activities

1. **(D)** Begin prophylactic antimalarial therapy before traveling and continue it through the visit and for 4 weeks after the visit.
2. **(C)** Sodium stibogluconate
3. **(A)** Melarsoprol
4. **(B)** Metronidazole
5. **a)** For pregnant women it's advisable to avoid travelling to areas where there's a risk of malaria if you're pregnant because a pregnant women have an increased risk of developing severe malaria, and both the baby and mother could experience serious complications. Because of these risks it's very important to take the right prophylactic measures of malaria prevention (both drug and nondrug) if you're pregnant and unable to postpone or cancel your trip to an area where there's a malaria risk

   - Malaria is also particularly life-threatening and dangerous to pregnant women and their babies
   - Malaria is harmful to pregnant women and their babies as the malaria parasite destroys the blood cells and makes women anaemic
   - Anaemia in the mother and malaria parasites in the placenta can lead to women giving birth to babies early (pre mature) or born very small or die while still in the womb
   - Babies who are born too early or are very small at birth as less likely to survive and be healthy

   b). Educations session must emphasize on both drug and nondrug prevention measures by using the **using the ABCD approach (A**wareness of risk, **B**ite prevention, **C**heck whether you need to take malaria prevention tablets and **D**iagnosis**).**

4.8.3. Extended activities

1. **During clinical practice you are assigned to prepare a health education for patients having amebiasis.**

   a) Explain to the patient how is amebiasis spread?

   b) Explain what can be done to prevent the spread of amebiasis?

2. **How can malaria be prevented by mosquito bites prevention?**

3. All of the following antimalarial drugs influence blood schizonts, **Except:**
   A. Mefloquine
   B. Chloroquine
   C. Primaquine
   D. Quinidine

Answers for extended activities

1. **a).** Amebiasis is transmitted from person to person by the fecal-oral route. The spread of amebiasis can occur if an infected person does not wash their hands properly after going to the bathroom. When people touch objects or eat contaminated food they can get the parasite on their hands and into their mouths. People are infectious as long as the parasite is shed in the stool.

   b). Public education about the importance of hand hygiene (perform wash hand with soap and water) after defecation and before preparing or eating food. To prevent spreading the infection, every member of the household should wash their hands with soap and clean water often, especially at these times: before eating and drinking, or preparing food, before preparing baby formula, after contact with someone who is sick, after using the bathroom or changing diapers and after handling pets or animals.

   The risk of spreading infection is low if the infected person is treated with appropriate antiprotozoal drugs and they practice good personal hygiene.

2. **To avoid being bitten you have to follow these below instructions:**
   Stay somewhere that has effective air conditioning and screening on doors and windows. If this isn't possible, make sure doors and windows close properly.

   - If you're not sleeping in an air-conditioned room, sleep under an intact mosquito net that's been treated with insecticide.

- Wear light, loose-fitting trousers rather than shorts, and wear shirts with long sleeves. This is particularly important during early evening and at night, when mosquitoes prefer to feed.
- Use insect repellent on your skin and in sleeping environments. Remember to reapply it frequently. The most effective repellents contain diethyltoluamide (DEET) and are available in sprays, roll-ons, sticks and creams.

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