



## Module 3

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# Upper Primary Science

## My Health

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THE COMMONWEALTH *of* LEARNING

**Science, Technology and Mathematics Modules**  
**for Upper Primary and Junior Secondary School Teachers**  
**of Science, Technology and Mathematics by Distance**  
**in the Southern African Development Community (SADC)**

**Developed by**  
**The Southern African Development Community (SADC)**

**Ministries of Education in:**

- **Botswana**
- **Malawi**
- **Mozambique**
- **Namibia**
- **South Africa**
- **Tanzania**
- **Zambia**
- **Zimbabwe**

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## SCIENCE, TECHNOLOGY AND MATHEMATICS MODULES

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This module is one of a series prepared under the auspices of the participating Southern African Development Community (SADC) and The Commonwealth of Learning as part of the Training of Upper Primary and Junior Secondary Science, Technology and Mathematics Teachers in Africa by Distance. These modules enable teachers to enhance their professional skills through distance and open learning. Many individuals and groups have been involved in writing and producing these modules. We trust that they will benefit not only the teachers who use them, but also, ultimately, their students and the communities and nations in which they live.

The twenty-eight Science, Technology and Mathematics modules are as follows:

### **Upper Primary Science**

Module 1: *My Built Environment*

Module 2: *Materials in my  
Environment*

Module 3: *My Health*

Module 4: *My Natural Environment*

### **Junior Secondary Science**

Module 1: *Energy and Energy Transfer*

Module 2: *Energy Use in Electronic  
Communication*

Module 3: *Living Organisms'*

*Environment and Resources*

Module 4: *Scientific Processes*

### **Upper Primary Technology**

Module 1: *Teaching Technology in the  
Primary School*

Module 2: *Making Things Move*

Module 3: *Structures*

Module 4: *Materials*

Module 5: *Processing*

### **Junior Secondary Technology**

Module 1: *Introduction to Teaching  
Technology*

Module 2: *Systems and Controls*

Module 3: *Tools and Materials*

Module 4: *Structures*

### **Upper Primary Mathematics**

Module 1: *Number and Numeration*

Module 2: *Fractions*

Module 3: *Measures*

Module 4: *Social Arithmetic*

Module 5: *Geometry*

### **Junior Secondary Mathematics**

Module 1: *Number Systems*

Module 2: *Number Operations*

Module 3: *Shapes and Sizes*

Module 4: *Algebraic Processes*

Module 5: *Solving Equations*

Module 6: *Data Handling*

## A MESSAGE FROM THE COMMONWEALTH OF LEARNING

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Junior Secondary Technology

*Dato' Professor Gajaraj Dhanarajan*  
President and Chief Executive Officer

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# UPPER PRIMARY SCIENCE PROGRAMME

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## Introduction

This series of four modules is designed to help you to strengthen your knowledge of science topics and to acquire more instructional strategies for teaching science in the classroom.

Each of the four modules in the science series provides an opportunity to apply theory to practice. Each module also explores several instructional strategies that can be used in the science classroom and provides you with an opportunity to apply these strategies in practical classroom activities.

The guiding principles of these modules are to help make the connection between theory and practice, apply instructional theory to practice in the classroom situation and support you, as you in turn help your students to apply science theory to practical classroom work.

## Programme Goals

This programme is designed to help you to:

- strengthen your understanding of science topics
- expand the range of instructional strategies that you can use in the science classroom

## Programme Objectives

By the time you have completed this programme, you should be able to:

- develop and present science lessons on environmental resources, needs, and conservation, materials in the environment, health issues and natural ecosystems
- guide students as they work in teams on practical projects in science, and help them to work effectively as a member of a group
- use questioning and explanation strategies to help students learn new concepts and to support students in their problem solving activities
- guide students in the use of investigative strategies to understand more about particular scientific concepts, and to find out how tools and materials are used in scientific inquiries
- prepare your own portfolio about your teaching activities
- guide students as they prepare their portfolios about their project activities

## How to work on this programme

As is indicated in the programme goals and objectives, this programme provides for you to participate actively in each module by applying instructional strategies when exploring science with your students and by reflecting on that experience. There are several different ways of doing this.

### ***Working on your own***

You may be the only teacher of science in your school, or you may choose to work on your own so you can accommodate this programme within your schedule. Establish a schedule for working on the module: choose a date by which you plan to complete the first module, taking into account that each unit will require between six to eight hours of study time and about 2 hours of classroom time for implementing your lesson plan. If you have not done so yet, choose someone (for example, a math or science teacher in your school) with whom you can discuss the module and some of your ideas about teaching science.

Your colleagues may be interested in hearing about some of your ideas from this course.

Your head teacher or the local area specialist in science may also be willing to take part in discussions with you about the programme.

### ***Resources available to you***

Although these modules can be completed without referring to additional resource materials, your experience and that of your students can be enriched if you use other resources as well. There is a list of resource materials for each module provided at the end of that module. You can also identify other resources that can enhance the teaching/learning experience, from among materials that may be locally available. These include:

- local examples of health issues and health care facilities and resources available in your region
- magazines that have articles about personal health
- books and other resources (including the internet) about health science that are in your school or community library
















# ICONS

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Throughout each module, you will find some or all of the following icons or symbols that alert you to a change in activity within the module.

Read the following explanations to discover what each icon prompts you to do.

	<b>Introduction</b>	Rationale or overview for this part of the course.
	<b>Learning Objectives</b>	What you should be able to do after completing this module or unit.
	<b>Text or Reading Material</b>	Course content for you to study.
	<b>Important—Take Note!</b>	Something to study carefully.
	<b>Self-Marking Exercise</b>	An exercise to demonstrate your own grasp of the content.
	<b>Individual Activity</b>	An exercise or project for you to try by yourself and demonstrate your own grasp of the content.
	<b>Classroom Activity</b>	An exercise or project for you to do with or assign to your pupils.
	<b>Reflection</b>	A question or project for yourself— for deeper understanding of this concept, or of your use of it when teaching.
	<b>Summary</b>	Synthesis of the module or unit
	<b>Unit or Module Assignment</b>	Exercise to assess your understanding of all the unit or module topics.
	<b>Suggested Answers to Activities</b>	Answer keys
	<b>Time</b>	Suggested hours to allow for completing a unit or any learning task.
	<b>Glossary</b>	Definitions of terms used in this module.

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# Module 3

## My Health

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### Module 3 Overview

The aim of this module is to create awareness of environmental factors that affect your health, to impart good health practices to students and to assess your learning.

This module has 5 units:

#### Unit 1: Keeping Healthy

This unit focuses on habits that promote good health. It also looks at how we should care for our bodies and the role that food and water plays in promoting good health.

#### Unit 2: Clean, Safe Drinking Water

The focus in this unit is on water and health. In this unit we look at the importance of clean, safe drinking water in promoting good health. We also look at a few water-borne diseases and how they can be eliminated.

#### Unit 3: Useful Drugs

The focus here is to find alternative materials that are locally available at low or no cost.

#### Unit 4: Drug Abuse

We examine a few of the drugs that are frequently abused and identify the types of abusers.

#### Unit 5: My Health and the Environment

In this unit we examine the negative effects of a dirty, polluted environment on health. We also look at ways in which we can improve our health through various campaigns.



### Learning Outcomes

After completing this module you should be:

- aware of good health habits and practices
- able to define what a drug is and drug abuse
- able to apply the knowledge and skills learned in the classroom

# Unit 1: Keeping Healthy

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## Introduction

In this module, you will look at health as an important topic that relates to the other topics which have already been discussed in Module One.

Health is important because it determines whether you are able to carry out your activities to sustain life. It is important to understand that both the natural and built environments play a role in determining the state of our health. In this module we will look at keeping healthy, the role that food plays in keeping our bodies healthy and the use and abuse of drugs.

Poor health can be brought about by disease, lack of a proper diet or misuse and/or abuse of chemical substances. In other words health is not just the absence of disease, but it is a state of physical and mental well being.

There is a lot that we can do to ensure that we remain healthy. We should ensure a regular supply of clean and adequate water and food, a clean environment and a well managed efficient health system.



## Objectives

By the end of this unit you should be able to:

- develop a sense of self awareness in caring for the body
- identify materials for cleaning the skin, teeth, nails, hair and ears
- demonstrate ways of cleaning the body
- state good hygienic habits
- name some foods that are good and bad for teeth
- show how flies can spread diseases
- state how flies can be kept off food
- discuss how drinking water can be made clean and kept safe
- describe how the environment can affect the state of health
- explain the consequences of rapid population growth in relation to health facilities
- explain why it is important to quickly replace water lost from the body
- prepare a rehydration drink for a diarrhoea patient
- state the effect of diarrhoea
- discuss the need for windows in houses/classrooms
- relate number of people to air requirements and need for fresh air



## Personal Hygiene

In order for us to keep our bodies and minds healthy we need to care for our bodies by observing good personal hygiene. Good personal hygiene helps us to reduce chances of infection thereby reducing incidences of diseases. There are many ways in which we can care for our bodies and adopt a lifestyle consistent with good hygiene habits.

### Good hygiene

What do you think good hygiene is? You will find a strong link between good hygiene habits and good health. It is important therefore to practice good habits. Some of good habits include:

#### ***Caring for Nails***

There are many ways in which you can care for your nails. What are some of the basic principles? You should be familiar with the following:

- Long dirty nails are more likely to harbour dirt and disease causing organisms known as pathogens. These pathogens can be transferred into your body when you eat or when you scratch yourself.
- You can prevent transmission of disease through dirty nails by always keeping nails short and clean. The area beneath the nails can be kept clean by washing the nails with a soft brush, soap and water.
- Do not try to remove dirt beneath the nail by using a sharp object which can cause injury. Germs can enter your body through the injury.

#### ***Caring for Teeth***

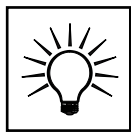
- The two dental diseases that we suffer from are caused by plaque. Plaque is a mixture of bacteria and saliva, which, if it is allowed to accumulate can cause inflammation of the gums and dental caries.
- Micro-organisms in dental plaque convert sugar into acid. Initially the **enamel** is painlessly and slowly dissolved by the acid. However when the **dentine** and the **pulp** are attacked, there is severe pain, often leading to loss of the tooth.
- Inflammation of the gums is a disease caused by micro-organisms normally present in dental plaque. The area that is usually affected is between the gums and teeth. If this condition is allowed to continue it spreads to the root of the tooth causing the tooth to become loose and it may have to be extracted.

What causes dental caries? These are cavities caused by several factors which include prolonged exposure to sugary foods, low levels of fluoride in drinking water, disturbance of saliva composition and lack of oral hygiene.

If we neglect oral hygiene we create favourable conditions for the spread of dental diseases. To prevent diseases you need to clean teeth after a meal to remove food remains, add fluoride to drinking water or to your food, take fluoride tablets, brush your teeth with fluoridated toothpaste. Good oral hygiene, good diet and regular visits to your dentist will help to prevent dental diseases.

## ***Caring for the Body***

- Our perspiration will tend to make dirt stick to our bodies and clothes. This mixture of sweat and dirt harbours microbes which can cause diseases.
- To prevent the body from harbouring disease causing organisms it is important to wash and scrub the body, hair, ears, armpits, and feet with soap and clean water. We should dry ourselves with a clean towel and take extra care to dry between our toes to prevent infection. We must wash our bodies regularly.
- While it is important to wash the ears, it is important that you do not poke the ears with any objects. You may perforate the eardrum which could lead to deafness. The ear produces natural wax which protects it from possible infection, so wax should not be removed. If there is excess wax, have a doctor remove it.
- Care must be taken when piercing ears because unsterilised piercing instruments may spread disease such as HIV/AIDS.
- Dirty clothes can harbour pathogenic microbes so it is important to wash and iron clothes and wear clean underwear everyday.
- What advice would menstruating women and uncircumcised men require? During menstruation, women need to wear clean sanitary towels which must be changed regularly. On the other hand, uncircumcised men should wash the underside of the foreskin of the penis regularly.



## **Individual Activity**

1. Identify common diseases that are a result of poor personal hygiene.
2. Visit your local clinic or health centre and identify the most common diseases in the area which are caused by poor hygiene.



## ***Good habits***

There are some good practices which are known as good hygiene habits which help to keep an individual healthy.

- (a) Wash the body regularly.
- (b) Brush your teeth after each meal. The teeth can be brushed with a tooth brush and fluoridated toothpaste.
- (c) Using a handkerchief to blow your nose or to cover your mouth when sneezing or coughing helps to prevent spread of disease.
- (d) Avoid spitting carelessly.
- (e) Wash hands before eating, when preparing or serving food.
- (f) Wash hands with soap and water after using the toilet.
- (g) Cover food or keep it hot to prevent flies settling on it.
- (h) Boil and cover drinking water.
- (i) Avoid overcrowded, poorly ventilated rooms. Keep windows open when the place has a lot of people to avoid the spread of air borne diseases.

## ***Food and water***

Clean food and water are important factors in our health.

Microbes do not only contaminate food but they also cause it to decompose and make it unsuitable to eat.

After food has been prepared it must be carefully preserved to avoid contamination. All food should be covered.

When water is drawn from rivers, streams, wells and lakes it must be boiled. Tapped water should also be boiled if you are in doubt about its treatment, or if it comes from leaking water pipes.

Contaminated food and water can cause diseases such as diarrhoea. Severe diarrhoea causes dehydration which may lead to death. To prevent dehydration, a person suffering from diarrhoea should be given oral rehydration solution (ORS).

## ***Clean environment***

We know microbes are present in our environment, but to prevent disease and to keep them under control it is important to keep our surroundings clean at all times. Dust, litter and dirt are a sanctuary for all kinds of microbes, including pathogens.

Some of our activities contaminate our environment and make it unsafe. One example of contaminating the environment is pollution of the air and water. We have discussed pollution and conservation of the environment in Module 1 “My Built Environment”, Unit 4.

We need to develop good habits in caring for our environment and keeping it clean.



## **Individual Activity**

1. Build a model of your local area which shows the various activities carried out. Use appropriate materials to construct the model.
2. Explain how your area is environmentally friendly or how it contributes to environmental degradation and pollution.



## Individual Activity

In this unit the teaching strategy that is developed is “assessment for learning”.

When teaching you are constantly assessing your pupils’ performance. There are many reasons why you assess your pupils, some of which are:

- To find out what your pupils already know prior to instruction.
- To find out what your pupils don’t know.
- To determine how much your pupils have learned, and what they have not learned.
- To determine the effectiveness of teaching methods you have used.

These are but a few reasons why you assess pupils. Can you think of other purposes for assessment?



## More on Assessment

The type of assessment we use usually depends on the purpose or reason for assessing. That, in turn, stems directly from your teaching goals.

There should be a “clear line of sight” to your teaching goals, to the assessment tools and exercises that you employ, and to the marking schemes that you give to your students so they know what you consider important for them to learn.

If your assessment is going to be meaningful, it is important that you give immediate feed back which you can use to improve their learning, and also to adjust your teaching!

Here is an example of things to consider in assessing a learning activity:

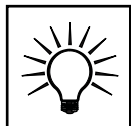
In the following activity your pupils will be involved in research, collecting data, reporting and discussion. You could assess the quality of the research, or of their reports (which is not the same as how well they researched), or their ability to discuss. Which assessment best fits your classroom goals? Why?

Arrange for your pupils to visit a local clinic or dentist in groups of four, and have them find out the total number of people who visit the dentist in a year.

- The pupils should identify the most common dental diseases and possible causes.
- Pupils should also find what other means can be used to clean teeth in the absence of a tooth brush and tooth paste.
- Pupils should write a report on their findings.
- Pupils should be told what needs to be included in the report and the assessment criteria.
- Collect the pupils reports to mark. Remember that when you are marking them, you want to find out about your pupils’ learning and performance in relation to the effectiveness of your teaching.



- In marking each individuals' work you should be planning how to give useful feedback.
- If you notice that several pupils have made the same mistakes this may suggest your teaching needs improvement. The details of assessment may help to improve your techniques on how to teach this topic.
- If the mistakes do not help you identify the problem you may find it helpful to discuss the reports with your pupils.
- Whenever you assess your pupils using any types of assessment you should always allow discussion so that you can help them as much as possible.



## Individual Activity

For the following activity (Classroom Activity) design an assessment that is appropriate. The assessment instrument should be able to measure the pupils' learning experiences and the quality of learning.

Help students plan their research/field trip and discussions: provide the learners with feedback on the assessment once they complete the activity. You should then use the information that you obtain to plan the next learning experiences. You should also evaluate the type of assessment to determine its appropriateness.

Using information you will obtain from the Classroom Activity, plan a lesson in which you will include the aspect of assessment. Select the most appropriate method/type of assessment.



## Classroom Activity

1. Ask pupils to carry out a mini-research to determine the common cause of diarrhoea and the effects of dehydration. The pupils should also find out how oral rehydration solutions (ORS) are prepared.
2. Arrange a field trip to the nearest water-works and see how water is treated.
3. In groups, have pupils discuss how drinking water can be made clean and kept soft.



## Self Mark Exercise

1. What are the purposes of assessment?
2. List at least five habits that promote good health.
3. Give at least three habits that may help spread diseases and give reasons why.
4. How does a dirty environment contribute to poor health?
5. List some foods that are good for teeth.
6. How do you decide which is the most appropriate method of assessment?

Check your answers at the end of the Module.



## Reflection

Having looked at the topic on keeping healthy, think of other things that are important for keeping healthy.

With your colleagues, discuss how you would disseminate information to the local community on how to keep healthy.

How can the school help to monitor and promote good habits for the pupils' health?



## Unit Assignment

1. List some habits that promote good health.
2. What bad habits promote poor health?
3. How should teeth be cared for?
4. In which ways does a dirty environment contribute to poor health?
5. Why is it important to have regular assessments?
6. How can assessments be made more effective?

Check your answers at the end of the Module.

## Unit 2: Clean, Safe Drinking Water

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### Introduction

All individuals, populations and communities depend directly on their physical environment. The environment influences animals and plants in many ways and it sets the stage for life.

The environment of living organisms includes the hydrosphere which includes all liquid components. The hydrosphere supplies liquid water to living organisms, which use it as one of the raw materials necessary for life.

In Unit One we looked at the ways in which we keep healthy and for the body to remain healthy it is important to have a clean, safe water supply.

In this Unit we will consider why it is important to have a clean supply of water and how to keep water clean.



### Unit Objectives

By the end of this unit you should be able to:

- demonstrate how to make drinking water safe
- state how water can be made clean and kept safe
- state the sources of water
- discuss the biological and physical uses of water
- observe and state the properties of water
- state the domestic uses of water
- explain the importance of conserving water
- discuss how water can be conserved
- state the effect of water pollution on the quality of human life
- describe the different methods of collecting and storing water for household and farm use
- describe how a particular type of human settlement depends on water supply
- discuss the effect of air on the environment
- describe the rain cycle
- state how water pollution can be reduced
- suggest ways in which water-borne diseases can be prevented
- name some water-borne diseases
- describe a water supply system of a village and a town
- explain how water is purified at a water purification plant



### Water and My Health

Water is the most abundant substance on the planet; it covers 73% of the earth's surface and it is the most abundant component of living matter. Water is an odourless, tasteless and colourless liquid that boils at 100°C and freezes at 0°C (at sea level). Water has a density of 1.00 g/cm<sup>3</sup> (at 4°C) and in it,

many substances dissolve. No other substance exists as a solid, liquid, and vapour in nature.

These physical properties of water are important to us because they determine the biological importance and use of water.

### ***Biological Importance and Use of Water***

1. Water is the most important biological solvent. Without water life could not exist.  
Water is an excellent solvent for polar or ionic substances. The majority of cell chemical reactions take place in water solution.  
Water solvent properties also mean that it acts as a transport medium for blood, lymph, excretory, and digestion in human beings, or xylem and phloem in plants.
2. The specific heat capacity of water is relatively high, and this means that a large increase in heat energy results in a relatively small rise in temperature. As a result, temperature changes in water solution are minimal. Thus water provides a very constant external environment for many cells and organisms.
3. A large amount of heat is required to vapourise water, hence water is said to have a high latent heat of vapourisation. Water also has, for a small molecule, an unusually high boiling point. The energy needed to vapourise water is often lost to the surrounding area, thus it has a cooling effect. Plants and animals make use of this to keep cool by transpiration, sweating and panting.
4. High heat of fusion is the measure of heat energy required to melt a solid. Water has a high heat of fusion and so requires a relatively large amount of heat to thaw. This means cell contents and their environment are less likely to freeze.
5. The density of water decreases below 4°C, therefore ice floats. Water is one of very few substances whose solid is less dense than its liquid form. Since ice floats, it means that lakes, ponds and water masses freeze on the surface but remain liquid under the surface. In cold climates, ice acts as an insulator for water below, thus allowing the survival of aquatic organisms.
7. Water is an important reagent and an essential metabolite. It is used as a source of hydrogen in photosynthesis, and its formation drives hydrolysis reactions.
8. When we examine how organisms have evolved, we find that shortages of water have led to major changes affecting both plant and animal species.

**NOTE:** All terrestrial organisms are adapted to obtaining and conserving water.



## Classroom Activities

### Activity 1

In groups of four identify other biological uses of water that have not been listed above.

Identify and list the biological importance of water in plants and animals.

### Uses of water in your community

List some common uses of water in your village.

Hint: Did you include the following important uses of water?

1. Villages and towns are built in areas where there is enough water for their use. Water is used for drinking, cooking and washing. Water for drinking must be pure and not polluted.
2. Water for industries is used as a solvent, and it is used for cleaning and for cooling. Bleaching and dyeing use large amounts of water.

### Activity 2

Visit a community and an industry in your locality. Identify the various ways in which water is used.



## Sources and Supplies of Water

Our main sources of water are rain, rivers, lakes, wells, springs and taps. In Module One you considered water sources, contamination, and the effect of contamination on human life. In this section you will consider the sources and supply of water in relation to its cleanliness and its contribution to health.

Human settlements such as villages and towns are built close to a water source. This water is then supplied to the village or town in various ways which include being carried in clay pots or buckets from rivers, boreholes or wells, or through pipes to taps into the houses.

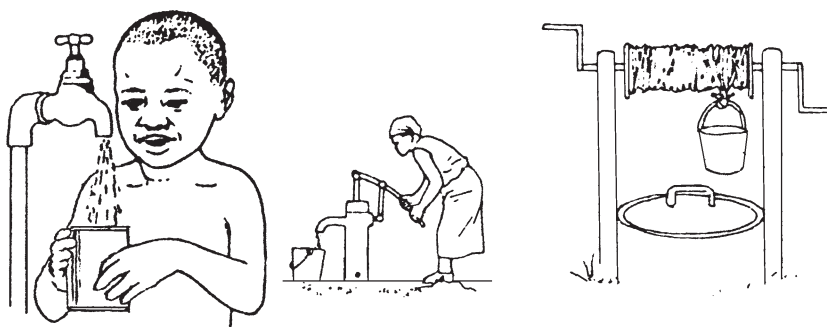


Figure 2.1: Sources of Water

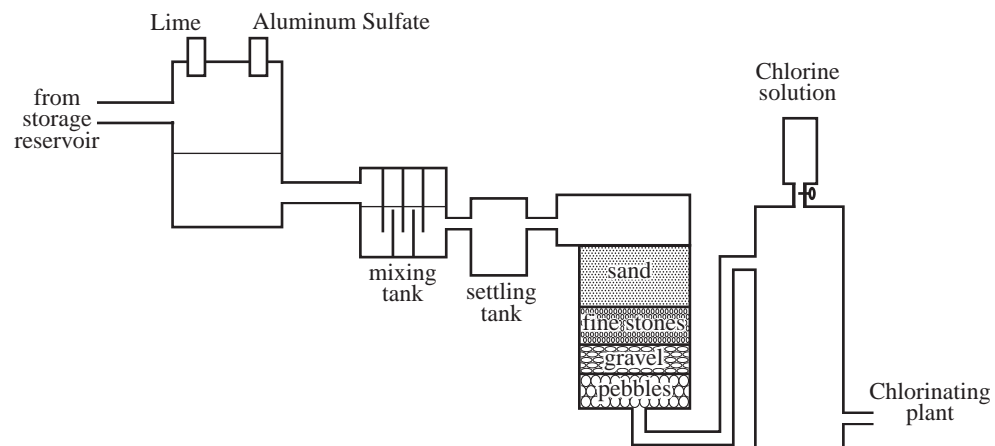
The source, supply, method of collection and storage of water plays an important role in its safety.

In towns and modern cities water is pumped to the homes in pipes. The source of water for these towns is usually rivers or lakes. Water is pumped to a water treatment plant where it is purified before being pumped to houses.

If you have a water treatment plant in your area, make arrangements to visit the plant. Identify the various stages that water passes through.

There are many ways that we can use to purify water, but at a water treatment plant the following method is commonly used:

Water is first collected and stored in a reservoir where it remains for many days. During this time the sunlight acts upon it killing harmful bacteria. Mud and silt brought from the river settles to the bottom. The water is then pumped into a tank where a solution of lime and aluminium sulphate is added. The water flows into a filter bed of sand where any remaining particles of sediment are moved.



*Figure 2.2: Purification of Water*

In modern water works, sand filters are replaced by rapid pressure, or “reverse osmosis” filters. Numerous plant bodies grow on top of sand filters and act as bacterial filters. After some time the slime becomes too compact to allow water to pass through and this has to be scraped off and a new layer grows in its place which takes about 2 days. The final stage in purification is chlorination which kills any remaining bacteria.

### ***Impurities in Natural Water***

From the investigation that you carried out you will have observed that even water that looks pure may have dissolved impurities.

We normally assume that rain water that falls to be pure, but as it passes through the atmosphere it collects dust, soot, gases and any other soluble substances that may be present.

More substances and various salts found in the earth will dissolve into the water as it flows over and through the ground. Any decaying organic matter, particularly sewage, will also be dissolved. In rivers, soil is added to water so that it is no longer a clear, pure liquid.

It is important therefore that we make the water safe for drinking and domestic use by purifying it. There are many ways of purifying water. Can you think of some of the methods used in your community?

## ***Diseases Associated with Water***

The water we drink is not always safe as it sometimes becomes contaminated. When we drink contaminated water we can become ill. Diseases can be passed from one person to another through water. Such diseases affect the digestive and urinary systems and are called waterborne diseases.

Examples of waterborne diseases are cholera, dysentery, bilharzia, and typhoid. In this section you will look at some waterborne diseases, what causes them and how to control them. You will also look at the effect of waterborne diseases on the human population. The table below shows the type of diseases, their causative agents, control and effect on humans. Read through it and make sure you understand it.

### **Waterborne Disease**

<b>Disease</b>	<b>Causative Agent</b>	<b>Control</b>	<b>Effect on Humans</b>
Cholera	Vibrio Cholerae	Treat with antibiotics. Control by high hygienic standards. Treat or boil drinking water. Cover food. Spread by vector like flies, need for clean surroundings.	This disease spreads rapidly to epidemic proportions and leads to death. Large sums of money are spent to contain the disease.
Typhoid Fever	Salmonella Typhoid	Same as cholera treatment – TAB vaccine.	Spreads rapidly throughout human population to epidemic levels.
Dysentery	Shingella Dysentery	Treat with antibiotics. Need for high standards of food and water handling. Cover all foods. Wash hands after using the toilet.	Spreads quickly resulting in poor quality of life. Income is spent on treatment rather than other needs.

Waterborne diseases prevail when unsanitary conditions exist such as contamination of food and water with faecal matter. These diseases can spread rapidly through the population to epidemic level. Many man hours are lost and valuable resources meant for other services must be diverted to contain the disease.



## Individual Activity

In this activity you will explore the scientific methods of investigation as a way of learning, and the use of a research report to assess learning. If you lack some of the materials, a field trip to your nearest water treatment centre, health centre or science laboratory may be an alternative.

Scientific investigations often begin as a response to an observation or a problem. In an observation you, as a scientist, want to see what happens and in investigating a problem you want to know the reasons or find the answers. If appropriate, you can also adapt and improvise for some of the materials and methods described below.

The statement of what you want to do is the title of the investigation you are about to do. “*An experiment to investigate the purity of water from various sources*”. A title should be a broad statement which is followed by the aim or hypothesis.

**Aim or hypothesis** is your statement of the problem or question. The intents are specific and can even include the variables being investigated and possible outcomes.

**The method or procedure** is the account of how you will carry out the investigation. You should present your method in a logical order and be concise and precise.

**Results or observations** are both qualitative and quantitative findings that you make. You can present them in a table, graph, histogram, diagram, chart or verbal description depending on what is most appropriate.

**Discussion** is often brief and it answers questions raised by your hypothesis or it confirms the aims. In it you attempt to relate theoretical knowledge to the results obtained. Discussion is not a verbal repetition of results.

**A conclusion** may be included when you verify the stated aims.

### Materials

In this activity you will need the following materials.

- 200 ml water sample
- test label
- bunsen burner
- red and blue litmus paper
- petri dish (two or more)
- nutrient agar
- sodium hydroxide
- ammonia solution
- sodium oxalate
- hydrogen sulphide
- potassium iodide
- evaporating dish
- matches
- spatula
- inoculating loop



*Inoculating Loop*

After collecting all the materials carry out the investigation.



## Investigation

**Title:** To investigate the purity of the water from various sources.

Collect samples of about 200 ml of water from as many different sources as possible. The water sources can be tap water, bore hole, well, a river near a densely populated human settlement and a river far from industry and human settlement. Carry out the tests as described in the table below. Write your observations in the space for observation. Use a separate sheet if needed.

Test	Method	Observations
Test the pH	Dip red or blue litmus paper in the water samples and observe any colour change.	
Test for suspended impurities	Allow the water to settle and observe if there are any suspended impurities.	
Test for the presence of bacteria	Prepare nutrient agar plates according to the water samples. Take an inoculating loop and place it in the Bunsen burner flame until it is red hot. Wait until it cools and dip it into a water sample. Lift the lid of the sterile agar in a petri dish and spread the content of the inoculating loop on the surface of the agar and label the plate. Repeat with other water samples and add them in different petri dishes. Place the plates (petri dishes) at 35°C for about three days. They should be upside down to prevent condensation. Record the appearance of the colonies. Compare the different water samples.	
Test for the presence of iron	<b>Calcium/Magnesium.</b> Add oxalate solution to the water sample. A white insoluble precipitate indicates the presence of either calcium or magnesium. To distinguish between the two, evaporate the water and pass the powder through a flame. If the colour of the flame is brick red then it is calcium, if there is no change in the flame colour then it is magnesium. <b>Zinc.</b> Add an alkali to the water sample (e.g. sodium hydroxide) and filter through hydrogen sulphide. A white precipitate indicates the presence of zinc.	

Test	Method	Observations
	<b>Lead.</b> Add potassium iodide solution, a yellow precipitate is formed if there is lead in the water. Add either sodium hydroxide or ammonia solution, if the precipitate is dark green then Iron II is present. If the precipitate is pale blue but soluble in ammonia solution copper is present.	
Test for soluble impurities	Evaporate water and observe any residue that is left. Compare which water samples leave the most residue.	

Write your findings in a laboratory report that was described at the beginning of this activity.

In this activity, you assess learning by looking at how the experiment was carried out, results and conclusions reached.



## Classroom Activity

In this activity have your pupils carry out a scientific investigation. Explain to the pupils the steps to take.

In groups, let your pupils work out what will be the aim of the investigation and what method they will use.

Let your pupils investigate the most common waterborne diseases, how they are spread, what are the signs and symptoms, how the diseases can be controlled and their effect on the human population.

After the investigation, let them write their observations and conclusions. Assess how they carry out their investigation, observations and conclusions.



## Self Mark Exercise

1. What opportunities for learning does scientific investigation provide for assessment?
2. Clean, safe drinking water is important for health. Suggest ways of:
  - keeping water safe for drinking
  - controlling waterborne diseases



## Summary

In this unit you have looked at safe, clean drinking water. You looked at what makes water unsafe for drinking by contamination. You also looked at how we can make our drinking water safe and how to store it in a safe manner.

In the activities you also looked at investigation as a way of assessing your pupils.



## Reflection

There are many teaching strategies that you can use to cover a topic like this one. With your colleagues discuss some other strategies that you can use and, how you can combine your strategies. If you were to introduce the scientific method to a lower class, how would you simplify it? What would you leave out and what would you add?

What other areas do you think need to be covered when you talk about safe, clean drinking water? What waterborne diseases are common in your area which you would need to include?



## Unit Assignment

1. Why is water said to be an important solvent for life?
2. Water is important for industries as well; list some of the uses in industries.
3. Discuss why clean, safe water is not readily available to the whole population.
4. List the main headings that you need to include in a scientific investigation.
5. What are some of the advantages of scientific investigation?

## Unit 3: Useful Drugs

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### Introduction

We often understand the term “drug” to mean harmful chemical substances only. Often, we have problems defining “drug”.

In this unit, we will look at the definition of “drug”. We will also identify the most common drugs that are medicines and how these drugs can sometimes be misused. We will further discuss the differences between drug abuse and misuse, illegal and legal drugs.

It is important for us to know the effects of drugs and drug misuse. In this way we will create awareness and reduce the misinformation which is sometimes prevalent.



### Unit Objectives

At the end of this Unit you will be able to:

1. define a drug
2. state the difference between drug abuse and drug misuse
3. describe the medical use of drugs
4. name drugs that are obtained from plants in your area



### Drugs and My Health

We often find it difficult to define what a drug is because the word is often used in many different ways. Many people do not think of alcohol, nicotine or aspirin as drugs. Instead they think drugs are substances such as cannabis, heroin and cocaine.

What do you think a drug is? Different people have defined drugs differently depending on the context. Some of the definitions that have been put forward are:

- any substance used in the composition of a medicine
- any chemical substance which alters the mood, perception and consciousness and is used to the apparent detriment of society
- any substance taken into the body which brings about a physiological change

How do these definitions compare with yours? You will realise that the above definitions of “drug”, include many of the common substances but exclude medically useful substances like nicotine and psychotropic drugs. We can define a drug as any substance which, when taken into the body, may modify one or more of its physical or mental functions.

Can you think of a definition that includes all possible drugs?

Many of the substances that we define as drugs are in use everyday and some of them in large quantities. In this unit we will consider drugs which are useful when taken under medical supervision.

## Medical Drugs

### Minor Pain Killers

Minor pain killers include aspirin, paracetamol or panadol. The class of drugs used to relieve pain are called **analgesic** drugs.

#### Aspirin (acetylsalicylic acid)

This is a very useful drug that is not only a minor pain killer but is also good for reducing temperature. You can buy it off the shelf from shops.

Aspirin has been used as a pain killer since the 18th century and is found in natural products such as willow bark. We use it to relieve minor pain for headaches, toothaches and pain in muscles and joints. However, insoluble aspirin is not recommended for use in about 70% of the population because it causes bleeding from the stomach lining. This is more likely to happen if aspirin is taken after consuming alcohol.

Some people are allergic to aspirin and develop symptoms such as nettle rash or asthmatic attacks.

In its action we think aspirin inhibits the synthesis of **prostaglandins** which are mediators and possibly pain transmitters. Aspirin prevents the production of prostaglandins at the site of injury by penetrating the cell membranes in an **insulin**-dependent process.

#### Paracetamol or Panadol

Paracetamol is a mild painkiller and **antipyretic** (agent/medicine that reduces fever) but, unlike aspirin, it does not have any anti-inflammatory properties. If taken in large overdoses, such as 40–50 tablets, it causes liver and kidney damage.

#### Caffeine

Caffeine is a drug we commonly find in drinks like tea, coffee, cola and cocoa. However, tea and cocoa also contain other drugs that have a similar effect. Tea contains theophylline and cocoa contains theobromine. Caffeine is a stimulant which acts on the brain by reducing the breakdown of **cyclic AMP** (adenosine monophosphate).

When we take caffeine it removes or reduces the feeling of sleepiness or tiredness, stimulates the body's nervous system, stimulates the heart muscles, relaxes the muscles of the bronchioles and also acts as a **diuretic**, a drug used to remove excess fluids from the body by increasing the flow of urine. Moderation is recommended.

The table on the following page shows you the amounts of caffeine in selected types of beverages, foods or medicine:

### Caffeine Content of Selected Foods and Beverages

Coffee (per 6 oz.)	mg
Drip	175
Percolated	131
Instant	79
Decaffeinated	5
Tea (per 6 oz.)	mg
5 minute brew	59
1 minute	36
Cocoa, Chocolate (per 6 oz.)	mg
Ovaltine	11
Chocolate (per 1 oz.)	mg
Baking chocolate	68
Sweet chocolate	45
Milk chocolate	20
Soft drinks (per 12 oz.)	mg
Coca-Cola	65
Dr. Pepper	61
Mountain Dew	55
Tab	49
Diet Rite	32
Gingerale, Grape	0
Rootbeer, 7-up	0
Orange, Pepsi Free	0
Medications (per pill)	mg
Vivarin	200
No Doz	100
Weight Control Aids	66-200
Cope, Midol, Anacin	33
Dristan, Sinarest	30

Caffeine can also be given medically. The usual dose is 100–300 mg a day (equivalent to three cups of coffee).



Pregnant women are advised not to drink coffee.

A dose of 100 mg produces sleep difficulties, restlessness, trembling and possibly seeing flashes of lights.

One other major effect of caffeine is that, like paracetamol, it does not damage the stomach lining.

Paracetamol has been replaced by phenacetin which is a good painkiller. Phenacetin is much more likely to cause kidney damage. Its mode of action is not known for certain, but like aspirin it may work by preventing prostaglandin.

## **Antibiotics**

This section gives you important information about antibiotics, so read it carefully.

There are different types of antibiotics on the market and a good number of these are misused. Some of these drugs are self administered.

Antibiotics are drugs that were developed by organic chemists. Penicillin is the first antibiotic which was commercially made in 1943.

Antibiotics were first made by extracting natural chemical substances from bacteria and fungi. Later on such substances were commercially made. These substances were used to inhibit growth or multiplication of, or kill, bacteria or other micro-organisms.

Antibiotics found application in medicine, veterinary science, agriculture, industry and pure research. Soil dwelling organisms are a rich source of antibiotics. Below we discuss some of the most common antibiotics.

**Penicillin** is produced by several species of the fungus *Penicillium*, notably *P. notatum*, *P. chrysogenum*. *P. chrysogenum* is now the current commercial source (*P. penicillium*). It was discovered by a British scientist, Sir Alexander Fleming, in 1929.

This antibiotic was used in the 1940s against a wide range of gram positive bacterial infection and was virtually non-toxic to the patients.

It is still the most effective antibiotic, from which new synthetic derivatives are continually being introduced to improve effectiveness. For example:

**Griseofulvin** is an antibiotic obtained from *P griseofulvum*. It has anti-fungal properties and when taken orally it is especially effective for treating athletes foot and ring worms. It is also used to treat other fungal infections of the skin, hair, fingernail and toenails.

**Fumagilin** is an antibiotic obtained from *Aspergillus fumigatus* and it is frequently used for treating amoebic dysentery.

**Streptomycin, chloramphenicol and tetracyclines** are antibiotics that are obtained from the genus *streptomyces*. Streptomyces is a class of bacteria which resembles a miniature fungus, of which there are many species. From this bacteria over 500 antibiotics have been identified and more than 50 of these have practical applications.

Streptomycin is an antibiotic that was discovered soon after penicillin. It proved to be a success because it increased the range of pathogens that could be treated: for example it is active against *tuberculosis bacillus*, the causative agent of tuberculosis.

## **Interferons**

Interferons are chemical substances which have been developed to fight viral diseases. These substances have been developed using genetic engineering. However, research is still going on to find a cure for many viral diseases such as AIDS. The problem in finding a cure for viral diseases is to isolate a suitable **antigen**.

## **Vaccines**

Vaccines are substances that contain antigens which are normally protein in nature. These substances are able to induce immunity against specific diseases.

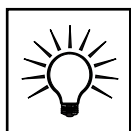
Vaccines are either antibodies or they induce the body to produce antibodies which fight disease causing organisms or substances.

Vaccines can be obtained from detoxified toxins, killed organisms, attenuated organisms or they can be genetically engineered.

## **Traditional Medicines**

There are many herbs and plants that have been used traditionally as a source of useful drugs. Some of these herbs and drugs have been used to cure a number of diseases.

However, most of these traditional medicines have been prepared and prescribed by a specialised group of people, who have guarded the secrets of the production of such medicines. Because of the secrecy in the preparation of these medicines there has been suspicion and mystery surrounding them.



## **Individual Activity**

Visit your local health centre, find out the following information and write a short report.

1. The five most common drugs that are prescribed to patients that visit that health centre.
2. Find out problems that are related with misuse of a particular drug.
3. Find out which of these are prescription drugs and also find out how easy it is to obtain them without a prescription.

The report should include measures that should be taken to prevent misuse of medicines, and measures that need to be taken to ensure that only qualified personnel dispense prescription drugs.



## **Classroom Activity**

In this activity you will assess your pupils' skills in planning and carrying out research.

Ask pupils to carry out research to find the most common plants and herbs that are used to cure some diseases.

Find out the source of such medicines, how they are prepared and administered.

From the surrounding community find out how many people prefer traditional medicine, how many prefer modern medicine and how many use both and why.

What advantages and disadvantages are associated with traditional medicines?



After the research, your pupils should write a report on their findings. Assess the quality of your pupils' research on planning, collecting and presenting information in a logical way and drawing appropriate conclusions.



### Self Mark Exercise

Having carried out research, you should be able to reflect on the exercise by answering the following questions.

1. Before carrying out research what things did pupils need to do?
2. What kind of preparations did they need to make?
3. What steps did pupils follow to ensure that their results and conclusions are valid?



### Summary

This unit has briefly defined “drug” and described a few common ones, and mentioned drugs from traditional sources. For assessment of learning, the unit has provided research projects and a sample research report.



### Reflection

In looking at useful drugs with your class, there are many teaching strategies that you can use. In this unit, you only looked at investigating and writing reports on useful drugs, especially the use of traditional medicine. In order to make an objective report it is important to have all the facts at hand. How easy was it for you to get all the information from “traditional doctors” on traditional African medicine as a way of treating disease?

With a colleague discuss how you can improve the instrument you used for investigation. Design another investigation exercise which your pupils can do.



### Unit Assignment

1. What is a drug?
2. What is the difference between drug abuse and drug misuse?
3. What leads to drug misuse?
4. Why is the use of traditional medicines often discouraged?
5. What preparations do you need to make when preparing to undertake research?
6. Briefly describe what should be contained in a research report.

## Unit 4: Drug Abuse

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### Introduction

In Unit Three we looked at drugs as substances when administered externally or when taken into the body modifies one or more of the body's physical, chemical or mental functions. We also considered the fact that many drugs are beneficial.

In this unit we will look at drugs that are abused and their effects on the human population.

Although there are many drugs that are abused we will only look at a few of them. We will look at narcotics, stimulants, depressants and hallucinogens as types of drugs that are commonly abused.

We will discuss the reasons why some people abuse drugs, type of drugs and their effects on people who use them.



### Unit Objectives

By the end of this unit you should be able to:

1. define drug abuse
2. define legal and illegal drugs
3. state why continued use of a particular drug leads to drug addiction
4. discuss the effects of drugs on various parts of the body, for example, lungs, kidneys, alimentary canal, liver and excretory organs
5. state behavioural changes that can result from drug abuse
6. recognise some typical behaviours of drug abusers
7. suggest some social and economic effects of drug abuse on the quality of life



### Drugs Can Be Harmful!

Many drugs come into the category of being socially acceptable and legally used. Drugs can either be soft drugs or hard drugs. Soft drugs include cannabis, marijuana, sedatives or amphetamines. Hard drugs, such as heroin and crack cocaine, are much more dangerous and more likely to cause dependency.

### ***Legal and Illegal Drug Use***

Drugs may be legal or illegal. Legal drugs are often medicines that are available for use under medical supervision. However, legal drugs can sometimes be obtained illegally. The most common drugs that are used illegally are sleeping tablets, barbiturates, amphetamines and morphine.

Society accepts the use of some drugs, so that these are not perceived as illegal drugs. However there have been changes over the years, and some legal and socially acceptable drugs have become less acceptable or illegal. For example, in the last twenty years tobacco has become less socially acceptable.

It is unlikely that illegal or socially unacceptable drugs will cease to be used entirely. Attempts to outlaw alcohol in the USA or opium in the far East have all failed. Once a drug is built into the fabric of society, it is difficult to completely eliminate it.

### ***Types of Drug Users***

There are many reasons why people become involved in drug abuse. For most young people, it is only a transient phase and they try drugs out of curiosity or because of peer pressure.

Some people remain occasional users. However, others become dependent on drugs. Although it is possible for us to categorise drug users, you must remember that people change their behaviour and move from one category to another.

The following are the categories:

#### **Experimental**

People who try a drug once or maybe a few times but stop, usually due to the fear of harmful effects or a bad experience.

#### **Occasional**

People who use drugs at irregular intervals. These people have no compulsion to use drugs, but when in a conducive situation they use drugs. Most people who use marijuana, amphetamines and the majority of alcohol drinkers fall into this category.

#### **Addicted**

This category includes many alcohol and tobacco users. This group includes people who use drugs on a regular basis, usually several times a day. This type of abuse often interferes with normal social and economic activities. These people develop a craving for the drug and if the drug is absent, they may experience unpleasant effects. If unable to stop using the drug, they often die from a *drug-induced* or drug-related disease.

### **Types of Drugs of Abuse**

Drugs can be classified according to their effect on the central nervous system and behaviour. Drugs of abuse are either:

- **Stimulants**—substances that stimulate the central nervous system. Examples are caffeine and amphetamines.
- **Intoxicants**—drugs that initially bring about behavioural excitement but this is followed by depression. Alcohols and many organic solvents are intoxicants.
- **Hypnotics or Relaxants**—sleep inducing agents which include anaesthetics, tranquilisers and sedatives.
- **Euphoriant or Narcotics**—blot out the perception of the real world and replace it with one in which the individual perceives no problems. The user experiences a sense of well being.

- **Phantasticants or Hallucinogens**—drugs which substitute an alternative for the present world, the new world characterised by abnormal sensory perception. Even after the effect of the drugs has worn off, the memory of the drug induced world remains. These drugs produce hallucinations.

### ***Size of Drug Abuse Problem***

It is often difficult to determine the size of a drug problem because the statistics that are kept are usually of drug abusers who come to the notice of the authorities. Statistics often represent a small proportion of the drug problem. Measures to limit drug abuse include taking away of drugs when discovered and this varies in amounts and types from year to year, but the general trend is upwards.

### ***Socially Acceptable Drugs***

Some of the substances that we define as drugs are in use everyday and many of them are present in large amounts.

Most of the socially acceptable drugs have little noticeable effect and do not cause severe physical effects unless taken in excess.

Most drugs are self-administered and are by far the most frequently used drugs in this category are minor painkillers such as Aspirin, Panadol/Paracetamol, Caffeine, Nicotine and Alcohol. Caffeine is a drug found in the most commonly used drinks in our society such as tea, coffee, cocoa, and cola.

### ***Effects of Drugs***



*Figure 4.1: What made this man look like this?*

Many of the drugs that are taken produce various levels of response in different people although the dosage may be the same. The effect of drugs is influenced by body mass, presence of other drugs, social setting, personality and mood of the user. The drugs will also change the physiological and mental state of the user.

### ***Alcohol***

There are many different alcohols but the alcohol commonly taken is ethyl alcohol (ethanol). Ethyl alcohol is produced by fermentation of sugars by

micro-organisms such as yeast. Almost any plant material can be fermented to make alcohol, but the most common materials are cereal grains and the sap from palm trees. Alcohol is a mind altering drug also known as a psychotropic drug.

Alcohol has many effects on the body and may cause changes of a behavioural patterns. For example, alcohol may calm a person who is stressed, but may stimulate the same person if he or she is among friends at a party.

A person's expectations alter the effect of alcohol. If the user anticipates getting "high" then the chances are that it will occur. Similarly if an unpleasant experience is anticipated, it is likely to be produced. Although alcohol is a socially acceptable drug believed to be beneficial because it helps us to relax, it can produce a physical or psychological dependence. Such alcohol users are known as alcoholics.

### **Nicotine**

In recent years the incidence of lung cancer has increased and scientists have sought some causative agents. It seems the likely cause is tobacco, as investigators have associated lung cancer with smoking. Tobacco contains a drug called nicotine which is a stimulant. It enables smokers to maintain performance in tiring and monotonous situations. Depending on the circumstances it also has a tranquillising effect alleviating stress and anxiety. The effect is immediate but short term and may cause people to become chain smokers. Dependence is easily and readily established and when one stops smoking, they experience withdrawal symptoms which include irritability and depression.



Tars and other tobacco components are carcinogenic (cancer causing), and smoke contains carbon monoxide. In pregnant women carbon monoxide is passed on to the unborn child which may inhibit growth.

In recent years, dangers of passive smoking (also called second-hand smoke) have been recognised and has led to banning smoking in public places as an infringement on human rights.

### **Amphetamines**

Amphetamines are medical drugs that are usually taken illegally. These drugs are stimulants and are known as "pep pills" (speed). Abusers can take amphetamines by mouth or injection or they can be smoked or sniffed. The user feels more energetic, confident and cheerful. This usually leads to psychological dependence but not physical dependence. Continued use of the drug may produce anxiety, irritability and tiredness. High dosage and long term use can produce delirium, panic, hallucination, paranoia and other mental and physical ill-effects.

### **Cocaine**

Cocaine is a white powder derived from coca leaves which is grown in South America. Please note that the coca plant is very different from the cocoa plant from which chocolate is manufactured.

Cocaine is more expensive than amphetamines and can be taken by sniffing, smoking or injection and has effects similar to amphetamines. Crack-cocaine is a less pure form of cocaine made by mixing cocaine with baking soda and water which is heated until white precipitates form and then dried to form “rocks”. Crack-cocaine is less expensive than cocaine. When cocaine or crack is sniffed the effect wears off quite quickly resulting in taking more of the drug in larger quantities and a drug dependence develops. Repeated sniffing of cocaine and crack causes physical damage to the inside of the nose.

### ***Cannabis***

Cannabis is a plant from which various preparations such as marijuana, hashish, and oil are obtained. Other terms for marijuana are “pot” and “grass”. Marijuana is generally rolled up and smoked while a pipe is generally used for smoking hashish. Some people combine cannabis with tobacco. Cannabis is an illegal drug which some people would like to see legalised because they claim it has no harmful effect, in fact they believe it to be beneficial. However, cannabis is known to cause chromosomal damage, interference with hormone function and brain damage. Cannabis promotes relaxation, talkativeness and heightened perception of sound and colour and the effect starts quickly and lasts several hours. Cannabis use does not produce physical dependence but psychological dependence and may cause users to become apathetic to external events and personal ambitions.

### ***LSD (Lysergic Acid Diethylamide)***

LSD is a white powder taken by mouth. It is a **hallucinogen** or **psychedelic** and its effects or “trip” generally starts one hour after ingestion, peaks after about six hours and fades after twelve hours depending on the dose taken. Some of the effects of LSD are intensified perceptions, heightened self-awareness, hallucinations and mystical experiences. A bad trip can cause depression, dizziness and panic. In some case death by suicide or accident can occur. Repeated use of LSD may cause psychological problems.

### ***Ecstasy***

Ecstasy contains MDMA (3,4-Methylenedioxy-methamphetamine). Ecstasy is both a hallucinogen and amphetamine, so it is called a hallucinogenic amphetamine. It produces combined effects of amphetamine and LSD.

A similar compound can be derived from natural products such as parsley and saffron, however MDMA is synthetically produced. It was originally developed for medical application but its widespread “recreational” use led it to be banned in 1985 in USA.

Ecstasy is usually impregnated into small bright coloured discs of paper. It is used in clubs and parties where “Acid House” music is enjoyed.

Effects of moderate doses stimulate the heart rate and lessen appetite. These effects are similar to the effects of amphetamines. A rush of euphoria followed by a feeling of calmness and heightened perception are experienced. It also tends to inhibit erection and orgasm. High doses of MDMA induces hallucinations and prolonged use may cause anxiety, confusion and insomnia.

Dangers of MDMA arise if the supply is not pure. There is a tendency to combine MDMA with other drugs.



## Individual Activities

### *Activity 1*

This activity will allow you to be involved in a group discussion with your colleagues. This discussion provides opportunities for you to assess pupils' understanding skills and attitudes to each other's contributions and ideas. In addition you must assess their classroom organisation and management by observing the pupils' involvement and participation. Arrange with two or more of your colleagues to have a group discussion. In small groups discuss steps that should be taken to create awareness of the problem of drug abuse.

### *Activity 2*

1. Can you list drugs that are legally used or are self-prescribed?
2. What are the common drugs in your country/locality which are often used illegally? How are these drugs obtained?
3. Why do people abuse drugs?
4. To what extent do people in your community abuse drugs?
5. Which drugs are socially acceptable in your country?
6. What is the strongest and most abused alcohol made in your community? What is it made from?
7. It has been suggested that sponsorship of sporting events by brewing companies promotes alcohol use and abuse. What do you think?
8. What do people in your community think about the use and legalisation of cannabis?



## Classroom Activity

Organise pupils into small groups to discuss a campaign strategy they could use to distribute information about drugs, drug abuse and its effects to the community. Assess the pupils' discussion.



## Self Mark Exercise

1. What did you do to encourage a good discussion?
2. What aspects of your normal teaching contribute to the success of group discussions?
3. What problems did you encounter during the pupils' group discussion?





## Summary

The focus of this unit was on drugs that are usually abused. Some commonly abused drugs are narcotics and some misused drugs are medicinal. Drugs are abused for various reasons, which include curiosity.

We also looked at some of the effects of drug abuse. In trying to find out the extent of the problem, we used the strategies of discussion and research.



## Reflection

With your colleagues reflect on the reasons for drug abuse and on the size of the drug problem in your country. Is research the best way of finding out, or there are other better methods?

Do you think your pupils have understood how research is done? Have they gained enough confidence to plan their own research?



## Unit Assignment

1. List the type of drug users that are commonly found in your society.
2. What makes teenagers experiment with drugs?
3. How does drug use disrupt normal social life?
4. Most users of soft drugs often change to hard drugs and a cocktail of drugs. Comment on this statement.
5. What makes drugs socially acceptable?
6. What are the common effects of drugs such as narcotics?
7. What kind of behaviour do drug abusers commonly display?



# Unit 5: My Health and the Environment

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## Introduction

In Unit One we looked at different ways which we apply to keep ourselves healthy. There are many hygiene practices and habits which promote good health. Food plays a significant role in keeping our bodies healthy.

However, there are other external factors in the environment that can affect us so that we become unhealthy.

In this Unit we will consider some of the things that affect our health. We will also look at some campaigns that have been carried out by various groups that are aimed at keeping us healthy.



## Unit Objectives

You should be able to:

- discuss how the environment contributes to health
- show that a dirty environment results in outbreaks of diseases such as cholera
- describe strategies that your local council has taken to keep the environment clean
- discuss strategies taken by the Health Department in keeping the nation healthy by addressing environmental issues
- develop awareness of healthy habits
- identify the various campaign strategies and organisations that promote good health
- define good health, not just as absence of sickness and disease
- state the importance of anti-drug commissions and clubs in the campaign for good health
- identify strategies taken by the Health Department that are aimed at keeping the nation healthy
- identify good hygienic habits such as use of the handkerchief, washing hands before eating, no careless spitting, preparing and serving food as ways of promoting good health



## Being Healthy in a Safe Environment

Being healthy is not just absence of disease, but it is also a state of well being. The state of well being is influenced by a number of factors some of which are emotional, environmental and biological.

### ***Effect of Environment on Health***

Our ancestors depended heavily on the environment for survival. They collected food from the forests, hunted and killed animals for meat and cut trees and grass for shelter. With developments in agriculture, we have used advanced methods and technologies to get an abundant yield of food and cash crops.

Our industrialisation has seen the increased use of the environment and this has had serious effects on the environment. One of the results of our activities on the environment is pollution.

### ***The Effect of Pollution on Health***

The ever increasing use of chemical fertilisers, pesticides and herbicides has resulted in an accumulation of chemicals in the soil.

These chemicals are absorbed by plants and because they do not metabolise, they accumulate in plant cells. The plants are eaten by animals who absorb these chemicals into their bodies where they accumulate. The amount of chemical accumulation increases from one level of the food chain to the next, the highest being the terminal consumer.

Some of these chemicals are poisonous and their accumulation can lead to death. The effects of CFCs (Chlorofluocarbons) is responsible for the depletion of the ozone layer which may result in warmer temperatures and flooding in coastal lowlands. This will have an effect on health and there may be an increase in waterborne diseases such as dysentery and cholera. Floods could adversely affect food production which would lead to food deficiency diseases and malnutrition.

The release of untreated sewage sometimes contaminates our sources of drinking water. As a result of contamination there are often outbreaks of waterborne diseases which may kill thousands of people.

When we discharge sewage into bodies of water it causes eutrophication which results in large numbers of fish being killed and depriving man of a source of food.

The release of harmful chemicals and fumes into the environment may cause respiratory disorders and poisoning of animals and plants. Pollution may cause health disorders and disease which may result in death.

### ***The Effect of a Dirty Environment on Health***

If we left the natural environment to follow its own course it would reach a state of equilibrium. In such a state there are usually many processes at work which maintain a clean environment that promotes good health. Decomposers are present that take care of dead and decaying plants, animals, and waste products.

This equilibrium is often disrupted by our activities which often interfere with the natural processes. Man's agricultural and industrial activities have disrupted the biological equilibrium, so that the "natural cleaning agents" are either not there or they can no longer cope with the kinds of wastes disposed.

The disposal of non-biodegradable waste and huge tonnes of waste have resulted in mountains of waste, spoiling the natural beauty of our environment. More importantly, people from poor communities frequent these rubbish dumps, looking for anything of value. In the process they are much more likely to contract diseases.

Rapid rise in population has led to overcrowding which has made it almost impossible to keep the environment clean. The mushrooming of unplanned settlements has resulted in poor sanitation and lack of basic amenities. This, compounded with a lack of basic hygiene, has resulted in frequent outbreaks of deadly diseases such as cholera.

Rapid urbanisation, unplanned development and major financial crises have resulted in governments and councils failing to provide towns with safe drinking water and basic amenities. It is common to hear of outbreaks of epidemic disease in big cities and towns.

## **Campaign for Good Health**

So far you have looked at how the environment affects the health of people. There are various things in the environment that promote good health and there others that do not.

In this section you will look at various ways in which governments, NGOs, health institutions and pressure groups have campaigned to promote good health. Depending on the group promoting health these campaigns have been aimed at various groups of people, targeting specific areas of concern.

Our areas of concern have been:

### ***Good Nutrition***

Campaigns to promote good nutrition have taken various forms. Media such as radio, TV and newspapers have been used to target specific groups of people. Other media that have also been successfully used are:

#### **Women's Clubs**

Local councils in conjunction with the health department have organised Women's Clubs to promote good health. In these clubs women not only learn some life skills such as knitting and sewing, they also learn how to prepare nutritious foods. Women are taught the importance of a balanced diet, food value and correct food preparation. In addition they are taught some basic economics and how to budget for their families. The clubs also promote self-sufficiency, so that the women are able to supplement the family budget.

#### **Adult Literacy Clubs**

Adult literacy clubs take various forms. Some are aimed at promoting good farming practices while others promote literacy. The relevant material is written in such a way that it promotes good health through increased food production and food preparation.

Through clubs, radio and TV programmes, a deliberate effort is made to promote good nutrition. The value of food is explained and the audience is taught the correct way of handling and preparing food.

The nutrition group or organisation also organises functions such as competitions, displays of traditional food or a dinner at which only traditional foods are served. The idea is to promote readily available foods and show how they can be prepared in the most nutritious way.

## ***Clinical Campaign***

The Department of Health sometimes runs health campaigns. In such campaigns they promote good health through various ways. Some of these campaigns are described below.

*Anti-natal and Under-five Clinics.* Mothers are taught the correct ways of handling and preparing food. They are also taught what a balanced diet is.

*Epidemic Outbreak Clinics.* There are times when communities may experience an outbreak of an epidemic disease, for example cholera, dysentery or malaria. The various strategic persons and key stockholders get together and mount a campaign against the outbreak of an epidemic disease.

In a campaign against cholera, for example, the areas that are targeted are the most vulnerable ones.

The community is taught how the disease is caused, spread, diagnosed and treated. The emphasis is on high standards of personal and community hygiene as a way of keeping the disease from spreading.

The campaign is also aimed at maintaining high standards of hygiene in food preparation. This campaign includes checking on the standards of restaurants and other eating places. This also requires a ban on illegal eating places and street food vendors.

The campaign requires that the town/city council sweep streets, collect garbage and ensures that the water supply is clean and safe.

## ***Education Campaign***

The Departments of Health, Education and Community Services often mount joint educational campaigns that are aimed at promoting good health. These campaigns are often aimed at creating awareness and methods that the community should adopt to promote good health. They are presented in various forms which include national/local debates, radio and television programmes, door to door campaigns, dramas and teaching.

## ***Clean Environment Campaign***

The environment plays a significant role on health. A dirty, polluted environment will promote ill health while a clean one is important for good health.

Various campaigns have been launched to create awareness of the importance of a clean environment. Organisations such as the Rotary Club and the Lion's Club have donated dustbins, and swept townships and town centres as a cleanliness campaign. Schools and church organisations have taken advantage of special occasions and holidays to clean hospitals, markets etc.

The importance of a clean environment cannot be over emphasised. Which campaigns are carried out in your community?

## ***Laws and Legislations***

Various legislations and laws have been passed whose ultimate aim is to promote good health and contain the spread of disease. Laws and regulations that have a direct bearing on health include those that prohibit urinating in public, spitting and littering. In recent years laws have been passed which prevent smoking in public.



### **Individual Activity**

In this activity you are required to carry out a survey of the types of campaigns carried out in your community to promote good health.



### **Classroom Activity**

In this activity your pupils will be required to imagine that they are a member of a commission that has been formed to investigate a mysterious outbreak of an epidemic disease. The commission has come up with the following findings.

- All the people admitted to hospital come from the same residential area.
- All the people admitted display the same signs and symptoms. The hospital suspects that a poisonous substance must have contaminated the drinking water.
- There is a chemical manufacturing company within this community. This company disposes of its chemical waste into a river which is the only source of water for the community.
- The water treatment plant for this community broke down in the previous month. As a result the residents received untreated water which they were encouraged to boil before they used it for cooking, washing and drinking.

With these facts prepare a report for the Health Department. It should state the findings and recommendations.

Assess the report.



### **Self Mark Exercise**

1. What aspects would you be looking for in assessing the report in the practice activity?
2. Discuss the effect of the environment on health.
3. Describe at least three strategies that can be employed to campaign for good health.
4. Why is it important to keep our environment clean?



## Summary

In this unit we have looked at the role the environment plays in regard to our health. A clean, pollution-free environment promotes good health. This is one of the reasons why government and non-governmental organisations have, in recent years, intensified their environmental awareness campaigns and legislated against practices that harm the environment.

Recognising the fact that being healthy is more than just the absence of disease these organisations have mounted various campaigns aimed at promoting good health practices.



## Reflection

With one or two colleagues reflect on how you would teach this topic to your grade four class. What good hygiene habits would you encourage? How would you explain why it is important to keep the environment clean? What health campaign would you mount with this class so that you would make a difference? If you had to teach the same lesson to grades five and seven, how would you repackage the lesson so that it is most appropriate for that level?



## Unit Assignment

1. How does the environment affect health?
2. What are some of the steps that have been taken by your local council to keep the environment clean?
3. Explain the importance of awareness campaigns.
4. Why was smoking in public places banned?
5. Discuss at least three good hygiene habits/practices.
6. Describe at least two activities, whether agricultural or industrial, which have contributed to poor health.



## Module Test

1. Why is it important to keep windows open, especially when there are many people in the room?
2. Draw a sketch diagram to show the correct way of cleaning teeth.
3. Why do we always try to keep flies off our food?
4. What would happen if the skin, teeth, hair and ears are not cleaned regularly?
5. Explain what is meant by drug dependence or addiction.
6. List at least three disadvantages of “natural” or “traditional” medicines.
7. State the effect of alcohol on the liver.
8. Which drugs affect the kidneys?
9. Explain what is meant by the term “euphoria”.
10. Describe the social and economic effects of taking drugs such as excessive alcohol or heroin.
11. What general behaviour do drug abusers normally display?
12. Describe a health campaign that you would mount to eliminate waterborne diseases such as dysentery or cholera.
13. How does a dirty environment lead to ill health?
14. In what ways is borehole water safer than well water?
15. How does the quality of water affect the quality of human life?
16. Draw a diagram to show how water is treated in a modern purification plant.
17. List some of the ways in which water is conserved.
18. Discuss why good habits promote good health.
19. How can you know that your pupils are aware of good health habits?
20. List foods that promote good health.

## Module 3: Suggested Answers for Activities

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### Unit One

#### ***Possible Answers to Self Mark Exercise***

1.
  - To provide opportunities for the learner to assess their newly acquired skills.
  - To apply the knowledge the learner has acquired.
  - To determine what the learner does or does not know.
  - To help the teacher design appropriate assessments.
  - To determine effectiveness of the teaching method used.
  - To encourage the learner to reflect on what he/she has learned.
2.
  - Wash hands after using the toilet.
  - Cover the mouth with a handkerchief when coughing or sneezing.
  - Wash hands before eating or when preparing food.
  - Cover all food, keep food hot.
  - Boil drinking water.
3.
  - Tattooing or ear piercing using unsterilised needles.
  - Sleeping in a crowded poorly ventilated room.
4.
  - It encourages and harbours disease causing organisms.
  - A dirty environment leads to air and water pollution.
5. Fruits, vegetables.
6. Your goals will shape your assessing. Example: to foster the learning of facts, you may use fill-in-the-blanks worksheets. To foster thinking, you will tend to assess students' writing and classroom discussion.

#### ***Possible Answers to Unit Assignment***

1.
  - Wash hands after using the toilet.
  - Bathe regularly.
  - Brush teeth after meals.
  - Cover all food.
  - Boil drinking water and store in a covered container.
2.
  - Spitting.
  - Sleeping in overcrowded poorly ventilated room without openings or windows.
  - Coughing/sneezing without covering the mouth.
  - Keeping long dirty finger nails.
3.
  - Brush teeth with fluoridated toothpaste after each meal.
  - Avoid sugary foods.
  - Visit a dentist regularly.
  - Good hygiene.



4.
  - Dirty surroundings are a breeding place for microbes.
  - Water and food are easily contaminated by a dirty environment.
  - Diseases are easily spread by a dirty environment.
5.
  - Assessments allow teachers to evaluate what pupils have and have not learned.
  - Provides feedback.
  - Helps to decide on the effectiveness of the methods used.
  - Assessment should be frequent.
  - Feedback given immediately or as quickly as possible.
  - Type of assessment depends on what is being evaluated.
6.
  - Give immediate feedback.
  - Must fit the purpose for which it is meant.
  - Questions should be of quality.

## Unit Two

### ***Possible Answers to Self Mark Exercise***

1.
  - Provides opportunity for the teacher to discuss with pupils.
  - Provides insight of how pupils are thinking.
  - Provides opportunity for the teachers to see pupils learning from what they do.
2.
  - Drinking water can be made clean and safe by ensuring rivers are not contaminated, and pit latrines are dug far from water sources.
  - Encourage good hygienic practices like washing hands before handling food and after using the toilet, and washing fruits and vegetables.
  - Boil drinking water and store in a clean container that has a lid.

### ***Possible Answers to Unit Assignment***

1.
  - It has the capacity to dissolve a wide range of substances.
  - Dissolved substances are more chemically active.
  - It acts as a transport medium.
  - It is very stable/constant, there is little fluctuation of temperature, etc.
2.
  - Cooling
  - Cleansing
  - Bleaching
  - Solvent
  - Disposal of industrial waste
3.
  - Water treatment plants and piped water are found in towns.
  - Treatment plants are very expensive to run and maintain.
  - Water sources are sometimes limited.
  - Water is easily contaminated by domestic waste, industrial waste and faecal matter.

- Some human settlements are sparsely populated.
4.
    - Aim/hypothesis
    - Method/procedures
    - Result/observation
    - Discussion
    - Conclusion
  5.
    - They allow pupils to find out on their own.
    - Pupils are able to carry out an investigation in a standard way and they have a feel for what scientists do.
    - Pupils discover that it is not always straightforward, so they may have to repeat or redefine their aims or methods.

## Unit Three

### ***Possible Answers to Self Mark Exercise***

1. You will realise that before undertaking research, pupils must make adequate preparations that will include:
  - Clearly define what they want to find out. This can be either a hypothesis or a statement of a problem.
  - Write down the things they want to find out. Formulate the questions they need to ask in order to get this information. If it is necessary, prepare questionnaires.
  - Decide who is the target.
  - Get as much background information as possible.
2. While the research is going on the pupils need to be open minded and find out as much as possible. Collect as much information as possible, which can be tape recorded or written. Always check the information and find out from as many people as you can, as the larger the sample the better the results.
3. Write your findings in a report, and refer to as much related literature as possible. You may also need to go back into the field to verify some information or to consult an expert on the issue.

### ***Possible Answers to Unit Assignment***

1. A drug is any substance which, when taken into the body, may modify one or more of its physical, psychological or mental functions.
2. Drug abuse is the self administration of drugs which are not legal or socially acceptable to the majority of society – they are used for personal gratification. Some of these drugs are available for use under medical supervision, but they are often used without medical supervision. Drug misuse is medical use or lay use of drugs to treat disease, but the medicine used is considered inappropriate by most medical opinion.
3. Misinformation  
Self-administration  
Easy availability of medical drugs

- Dispensing of medical drugs by unqualified personnel
4. Most traditional medicines are not pure.  
There is no specific dosage.  
Their use is surrounded by mystery.
  5. Decide what you want to find out.  
Formulate the questions you will ask.  
Identify who is your target.  
Work out logistics.  
Ask for permission where necessary.
  6. A report should have:
    - Statement of problem/hypothesis.
    - Introduction.
    - Review of related literature.
    - Research method and limitation.
    - Research findings.
    - Interpretation of findings.
    - Conclusion.

## **Unit Four**

### ***Possible Answers to Self Mark Exercise***

1.
  - Make sure that pupils have information and clear instructions.
  - Arrange classroom to allow group privacy.
  - Encourage all pupils to participate.
  - Encourage pupils to respect each others opinion.
2. Pupils will only listen to each other if they are used to you listening to them. The same is true of respect, and taking turns in talking.
3. You may have encountered some of the following problems:
  - Some pupils dominate.
  - Some pupils are passive.
  - Activity is time consuming.
  - Discussion may wander from the point.
  - Discussion degenerates into an argument.

### ***Possible Answers to Unit Assignment***

1.
  - Experimental
  - Occasional
  - Addicted
2.
  - Curiosity
  - Peer pressure
  - To seek pleasure

3.
  - Users usually neglect families.
  - Users sometimes steal or sell household items to sustain their habits.
4.
  - They may take a concoction of drugs to counter the effect of other drugs.
  - Try another drug because of unwanted effects by one type of drug.
  - Because of addiction.
5.
  - They are used everyday.
  - Used by a large part of society.
  - Society does not see anything wrong.
  - Most are self-administered.
6.
  - Psychological and physical dependence.
  - Depression.
  - Hallucination.
  - Intoxication.
  - Apathy.
  - Talkativeness.
  - Heightened perception of sound and colour.
7.
  - Do not look after themselves.
  - Do not eat enough or eat healthy foods.
  - Irritable.
  - Depressed.
  - Rough behaviour.
  - Withdrawn.
  - Take to crime.

## Unit Five

### ***Possible Answers to Self Mark Exercise***

1. The report must be clear and objective, findings should be valid, assumptions should be clearly stated and recommendations should be realistic.
2. When the environment is polluted it has an adverse effect on health. It may cause outbreaks of epidemic disease which can lead to death. A clean environment promotes good health.
3. Campaigns for good health can be mounted in the area of:
  - Good nutrition and nutritional practices.
  - Health drives, promoting regular medical check ups.
  - Promoting clean and safe drinking water.
  - Promoting a safe, clean environment.
4. A dirty environment can result in disease.

### ***Possible Answers to Unit Assignment***

1.
  - A clean environment promotes good health.
  - A dirty environment breeds germs, leads to outbreak of disease.
2.
  - Collect refuse/garbage.
  - Sweep streets.
  - Prevent street vendors selling food stuff.
  - Institute penalties for littering.
  - Provide public toilets.
3.
  - Informed communities take necessary steps.
  - Promote good practices.
  - Provides information and assistance.
4.
  - Non-smokers inhale unfiltered “second-hand” smoke and may suffer from illnesses related to smoking.
5.
  - Wash hands after using the toilet and before eating or handling food.
  - Brush teeth after meals.
  - Keep nails short and clean.
  - Use handkerchief to blow nose or to cover mouth when coughing.
  - No careless spitting.
6.
  - Agricultural chemicals and fertilisers accumulate in plants and animals which are eaten by humans and this may lead to sickness or death.
  - Dumping toxic industrial waste into rivers can lead to water pollution, killing of fish and animals.

# Glossary

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## G

<b>Addict:</b>	a person who feels compelled to take drugs on a continuous basis.
<b>Amphetimine:</b>	a stimulant of the central nervous system.
<b>Antibiotic:</b>	chemical substances or artificially made substances that inhibit growth or multiplication of or kills other micro-organisms.
<b>Antigen:</b>	a substance capable of stimulating an immune response.
<b>Anti-pyretic:</b>	agent or drug that reduces fever.
<b>Attenuated:</b>	weakened, less virulent.
<b>Cohesion:</b>	is the force which causes individual molecules to stick together.
<b>Cyclic AMP:</b>	a cyclic mononucleotide of adenosine that is responsible for the intracellular mediation of hormonal effects on various cellular processes. Also called adenosine 3',5'-monophosphate.
<b>Dental caries:</b>	cavities caused by prolonged exposure to sugary foodstuff.
<b>Diuretic:</b>	agent or drug that induces urination.
<b>Drug:</b>	a substance which when taken may modify or change the body's physical or mental functions.
<b>Drug Abuse:</b>	occasional or persistent and excessive use of a drug for personal gratification.
<b>Eutrophication:</b>	a process through which chemicals and sewage added to a body of water encourages rapid multiplication of algae. The algae dies before being eaten, and the subsequent process of decomposition depletes water of oxygen.
<b>Hallucinogen:</b>	a drug that alters the 5 senses of perception, e.g., the way you see, feel, hear, smell, or touch. The extent of alteration is such that all senses can get mixed up, changed, or impaired. People under influence of hallucinogenic substances may see colours much more

	brightly or hear sounds differently than in reality, they may also claim to “hear” colours and “see” sounds! They may also claim to see things that aren’t there at all. Examples of such substances (drugs) are: LSD, strong types of cannabis, ecstasy, magic mushrooms.
<b>Health:</b>	the state of mental and physical well being.
<b>Immunity:</b>	the capacity of the body to produce cells to fight the intrusion of foreign material into the body.
<b>Insulin:</b>	a pancreatic hormone that is essential for the metabolism of carbohydrates and is used in the treatment and control of diabetes mellitus.
<b>Interferon:</b>	a substance that fights diseases due to viruses.
<b>Intoxicants:</b>	drugs that bring about behavioural excitement.
<b>Ionic substances:</b>	substances which form either positively or negatively charged particles.
<b>Latent heat of fusion or relative latent heat of fusion:</b>	the energy required to melt a solid.
<b>Latent heat of vaporisation:</b>	the measure of heat energy required to vapourise a liquid.
<b>Legal drugs:</b>	drugs available for use as medicine.
<b>Microbes:</b>	small microscopic organisms that can either be bacteria, virus or fungi.
<b>Pathogen:</b>	a disease-causing micro-organism or microbe.
<b>Plaque:</b>	a mixture of bacteria and salivary materials.
<b>Prostaglandins:</b>	any of various oxygenated unsaturated cyclic fatty acids that perform a variety of hormone-like actions (as in controlling blood pressure or smooth muscle contraction).
<b>Psychadelic:</b>	a drug that causes surreal sensory episodes, or hallucinations.
<b>Relaxants:</b>	drugs that induce sleep.

<b>Specific heat capacity:</b>	the amount of heat, measured in joules, required to raise the temperature of 1 kg of water by 1°C.
<b>Surface tension:</b>	inward cohesion forces that exist on the surface of a liquid cause surface tension.
<b>Toxin:</b>	a product of metabolic activities of a living organism that is capable of anti-body production.
<b>Vaccine:</b>	a substance that contains small amounts of antigens, used to induce immunity.



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