HUMAN BODY

Specific Objectives
By the end of this topic, the learner should be able to:

- Identify some of the reproductive systems
- Describe physical changes during adolescence
- Identify parts of the circulatory system
- Describe the components of blood and their functions
- Identify the types of blood vessels and their functions
- Describe the structure of and functions of the heart
- Explain fertilization, development of foetus and birth process
- Identify the main excretory organs and their waste products

Revision Notes 1

1.1 Reproductive System

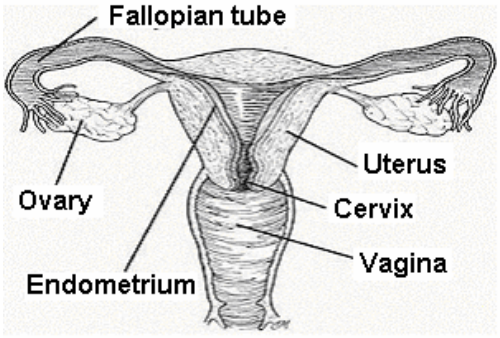
This part presents two kinds of reproductive system, namely female and male reproductive systems.

a) Female Reproductive System

The system by which human beings are enabled to produce young ones is called **reproductive system**. As shown by Figure 1.1, the system consists of different parts. These include: Vagina, Cervix, Uterus, Ovaries and Fallopian tubes.

Ovary: There are two ovaries in the female body. There are several eggs in each ovary called **ova.** At puberty, that is 12-16 years the ova mature monthly and set free from the ovary into the oviduct. This is called **ovulation.**

Figure 1.1: Parts of a Female Reproductive System



Oviduct/fallopian tube: The tube from ovary to the uterus. There are two types one from each ovary. Ovum is released into this.

Uterus: The walls develop a thick lining every month. Fertilized ovum attaches its self in this lining and grows into an embryo. The lining sheds off if there is non fertilization and flows off with the unfertilized ovum via the virginal. This is called **menstruation.**

Vagina: this is canal from the outside. The sperms are deposited here in the time of sexual intercourse. At birth the baby passes out through here

b) Parts of Male Reproductive System

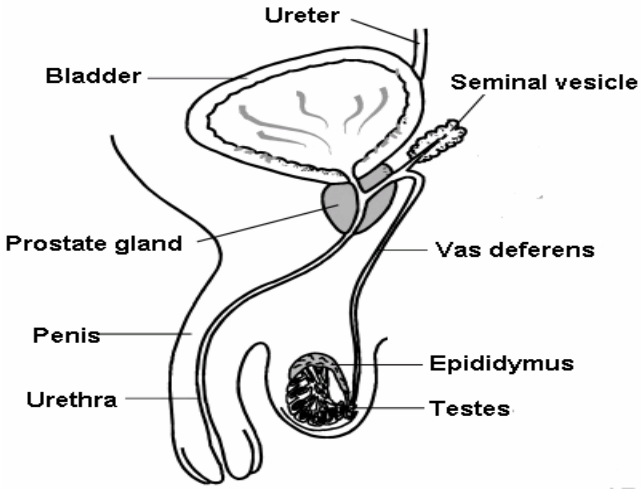
Male Reproductive System consists of various parts. These include penis, testis, urethra, prostrate and bladder.

Penis: tube like structure through which sperms are released. Also in this structure urine is passed outside the body.

Testis: Male human beings have two testes they are called testis in plural. They are enclosed in a bag called scrotum.

Urethra: a tube passing through the centre of penis. The sperms and urine pass through here.

Figure 1.2: Male reproductive parts



1.2 Changes during Adolescence

The period in a persons' life when developing from a child into an adult is referred to as **adolescence.** The stage is usually between the age of 12 and 19 years. During this time, many changes take place in terms of growth and physical changes.

a) Physical Changes in Boys

- Broader chest and shoulders
- Breaking voice to become deeper
- Growing of hair in part of the body (around sex organs, pubic hair, chest hair, beards on the face and armpits.
- Sperms mature in the testis experiences ejaculation, which is release of sperms through penis. At times this can happen during the night and is called **wet dreams.**
- Boys eat more because height and weight are increasing and becoming muscular
- At times development of pimples on the face may occur.

b) Physical Changes in Girls

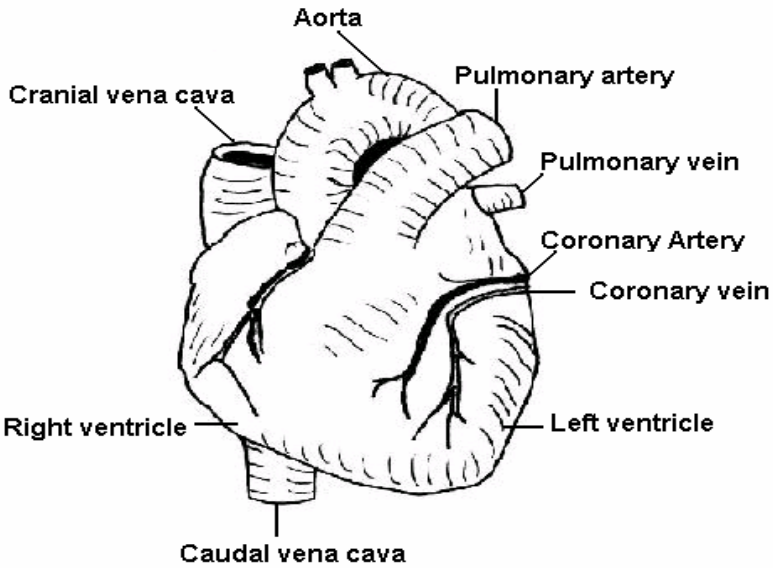
- Growth of breasts,
- Hair grows in the armpits and around sex organs(pubic hair)
- Hips become broader,
- Release an egg by ovaries after 28 days (ovulation). This happens if the egg (ovum) is not fertilized. The lining that had been formed in the uterus along with the egg breaks down and flows out of the body through vagina as blood. This process is called **menstruation.** It occurs once a month and may last 4-5 days,
- Pimples may appear on the face,
- Rapid increase of weight and heights and may cause them to eat more.

1.3 The Circulatory System

The heart, blood and the blood vessel make up the circulatory system

a) The Heart

Figure 1.3: External view of the human heart



This is the organ that pumps blood through out the body. It is muscular and placed between the lungs somewhere slightly to the left side of the body. The strong muscles of the heart can relax or contract when contracting the heart pumps blood with force. When the heart relaxes, the blood flows into chambers of the heart.

The contracting and relaxing of the heart is what is known as the **heart beat.**

b) Blood

When we are cut or injured there is a liquid which is red that flows out of the cut or injured part of the body. This is blood which contains water, blood cells, digested food, waste products and hormones which control growth and the other body activities

c) Blood Tissues

The tubes that contain the blood are called **blood vessels.** They carry blood to all parts of the body.

1.4 Components of Blood

Blood is made up of the following components:

- Plasma
- Red blood cells
- White blood cells and Platelets

a) Plasma

This is the liquid part of the blood and most of it is water. Plasma of the blood of human beings and other mammals is pale-yellow.
It is made up of the following: Hormones, Urea, Salts, Food substance, Digested food, Carbon dioxide.

Functions of Plasma

- To transport red blood cell, white blood cells, digested food, hormones and waste products to all around the body.

b) Red Blood Cells
They contain red pigments giving them the red color. They are disc-shaped and are smaller than the white blood cells because of their red pigments, they give the blood color.

Functions of Red Blood Cells
Main function of the red blood cell is to carry oxygen from the lungs to all other parts of the body. In them is chemical called **hemoglobin** which carries oxygen within the red blood cells. **Oxygenated** blood is the blood rich in oxygen and is bright. Blood with little or without oxygen is dull red and is said to be **deoxygenated** blood.

c) White Blood Cells
They do not have a fixed shape since they keep on changing their shapes. They have no color but do have a dark part at the centre called **nucleus.** In size are larger than red blood cells. They are fewer than red blood cells.
Functions
The main function is protection of body from germs. They move to the attacked body part and fight the germs. They change the shape while fighting the germs and this way are able to engulf and destroy the germs.

d) Platelets
These are tiny cell fragments found in the blood. They are smaller than either white or red blood cells.
Functions
These help in the clotting of the blood. They prevent further loss of the blood from the part that was injured. They help to stop bleeding from cuts and wounds.

Table 1.1: Summary of blood components and their functions

Components	Functions
Plasma	Carry blood cells, digested food and hemoglobin around the body
Red blood cells	Carry oxygen from lungs to the rest of the body
White blood cells	Protect the body from germs
Blood platelets	Help in clotting of blood

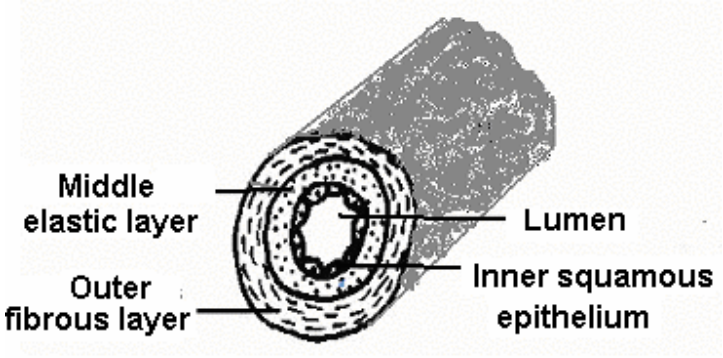
1.5 Types of Blood Vessels and their Functions

There are three main types of blood vessels. These include:

- Arteries
- Veins
- Capillaries

a) Arteries

Figure 1.4: An artery



An artery is a blood vessel that carries blood from the heart to the rest of the body. Arteries have thick walls to withstand the high pressure at which the heart pumps the blood. Pushed under pressure, blood cannot flow backwards.

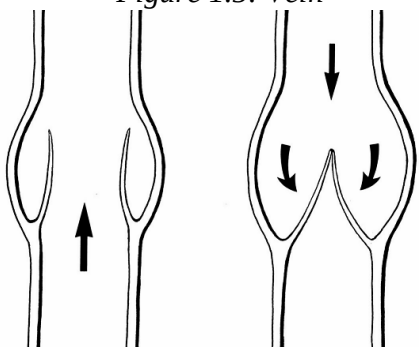
Function

Arteries carry oxygenated blood from the heart to all parts of the body. An exception case is for the **pulmonary artery** which carries deoxygenated blood from the heart to the lungs for purification (to receive oxygen).

b) Veins

They carry blood towards the heart and they have thin elastic walls. They have valves to prevent blood from flowing backwards into the heart. They are found near the body surface.

Figure 1.5: Vein



Valve A shows a vein with **open valve** to allow blood to pass through it while valve B shows a vein with **closed valve** to prevent blood from flowing backwards.

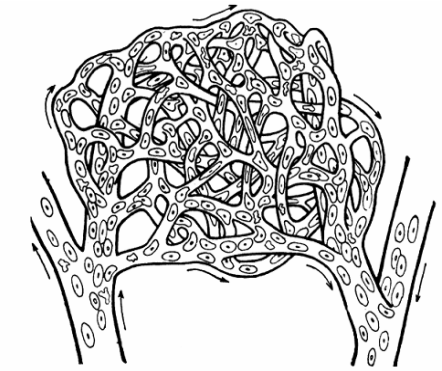
Functions

All except pulmonary vein carry deoxygenated blood from the lungs to the heart

c) Capillaries

These are the smallest blood vessels whose walls have tiny holes (pores). They are narrow and thin and form network in every organ and tissue in the body. They are link between veins and arteries.

Figure 1.6: Network of capillaries



Functions

Capillaries thin walls let food and oxygen leave blood and enter the tissues. This way waste material leaves the tissues and enters the blood to be transported to the excretory organs.

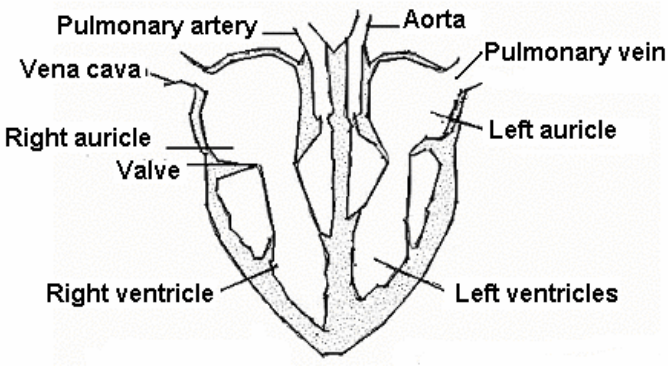
Table 1.2: Blood vessels and their functions

Blood vessel	Structure	Function
Arteries	Have thick walls, Have no valves	Carry blood rich in oxygen from the heart to all parts of the body but the pulmonary arteries.
Veins	Have thin walls and elastic, Have valves	Carry blood with little or no oxygen from the blood to the heart except pulmonary veins.
Capillaries	Have thin walls, Are very narrow, Form network in every organ and tissue	They connect the veins to the arteries, Allow digested food substances and oxygen to leave the blood and enter tissues.

1.6 The Structure and Functions of the Heart

The heart consists of various components. Figure 1.7 shows the various parts.

Figure 1.7: Structure of the Heart



Parts of the Heart

Auricles and ventricles: The heart is divided into four parts called **chambers**. The upper chambers are called *auricle* while the lower chambers are called *ventricles*. On the left side of the heart are found left auricle and left ventricle while on the right side of the heart are found right auricle and right ventricle.

Auricles: Auricles pump blood to the ventricles, which in turn pumps the blood to all parts of the body. They therefore must have thick walls to provide the extra force needed.

Table 1.3: Functions of Auricles and Ventricles

	Structure	Function
Auricles	The walls of the auricles are thinner	Auricles pump blood to the ventricles. The left auricle gets oxygenated blood from the body while the right auricle receives deoxygenated blood from the body.
Ventricles	They are larger than the auricles and have strong muscular walls.	Blood to the lungs is pumped by the right ventricle and the left ventricle pumps the blood to all parts or the pump body. Thicker walls of the left ventricle help to pump blood longer distance while right ventricle pumps to a shorter distance i.e. to the lungs.

Blood Vessels of the Heart
The main blood vessels in the heart include: Pulmonary artery, Pulmonary veins, Vena cava and Aorta

Table 1.4: Main blood vessels of the heart

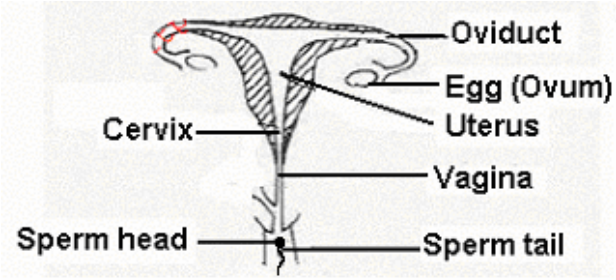
Part	Function
Pulmonary artery	Pulmonary artery carries deoxygenated blood from the right ventricle to the lungs.
Pulmonary vein	Pulmonary vein carries blood oxygenated blood from the lungs to the left auricle.
Vena cava	This is the main vein in the body which carries deoxygenated blood from all parts of the body to the heart.
Aorta	Aorta is the main artery in the body. It carries oxygenated blood from the left ventricle to all parts of the body
Valves	The work of the valves in the heart is to prevent back flow of the blood. They ensure that the blood goes from the heart only through the pulmonary artery and does not come back through the pulmonary vein.

1.7 Fertilization, Development of Foetus and Birth Process

a) Fertilization Process

Sperms produced by testis which travel through the epididymis, sperm duct and then urethra and they are deposited in the vagina of the female by the penis during coitus. Ova (eggs) in woman are produced at intervals by the ovaries. Only one ovum is produced in turn by every ovary. This cycle lasts 28 days with every cycle the uterus undergoes major cyclical changes. The eggs are released onto the oviduct and then they move down to the uterus and to the outside after passage through vagina if not fertilized. Sperms deposited swim up the cervix into the uterus and **oviduct** where fertilization takes place.

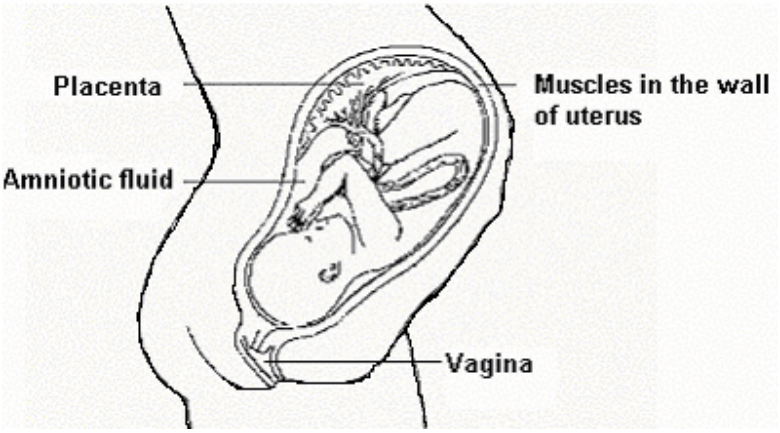
Figure 1.8: Fertilization in Human Beings



b) Development of Foetus

After fertilization in the oviduct, a zygote is formed by fusion of male and female nuclei. The **zygote** then moves down to the uterus and attaches to the walls of the uterine lining. The zygote develops into a foetus which is connected to the placenta (baby container) by an umbilical cord. Through this, food is provided to the foetus by the mother and waste products are removed from the other end.

Figure 1.9: Foetus in the womb



NB. By the end of 40 weeks all organs of the **foetus** have developed. The foetus is suspended in a fluid filled sac. It turns around so that the head is lying next to cervix. Birth is started by hard (vigorous) contraction of the uterus muscles which expels the foetus out of the uterus via the vagina (parturition).

c) Process of Birth

During pregnancy the breasts of woman increase in size and by the time of birth (parturition) are capable of producing milk for the breast milk for the nourishment of the baby. All nutritional requirements of the baby for the first months are met by the breast milk. The birth of human foetus is accompanied by loud cry and this reflex initiates spontaneous breathing by the lungs.

1.8 Excretory Organs and Waste Products

The working of our bodies produces unwanted substances (excreta). These unwanted substances are got rid off by a process known as **excretion**. Below are examples of excretory organs and the waste products they get rid of.

a) Skin

The skin covers the body and prevents dust and germs to enter the body. When the skin is broken by cut, scratch or bite, germs can enter. Skin also protects the body from drying up. The skin is made up of two layers namely: Epidermis (top layer) and Dermis (underneath layer).

Epidermis

This is the upper layer of the skin. It is made up of the dead cells on the top and below is living cells. The living cells contain pigment (colouring) which is different in different

areas. This colour of the pigment determines the colour of our skin. The cells die to replace the worn out cells.

Dermis
This is the lower part of the skin which contains many things

Figure1.10: Human Skin

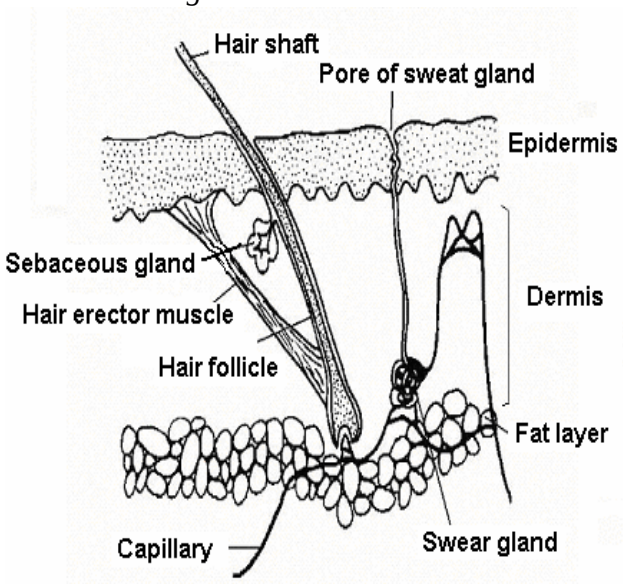


Table 1.5: Parts of Skin and Their Functions

Part	Function
Tinny blood vessels	For the supply of food and oxygen to the living parts of the skin.
Nerves	There are a number of nerves: e.g. for feeling cold, pain, touch, and pressure.
Oil glands	These make oil to oil the hair and keep the skin soft.
Glands	These are responsible for secreting sweat as a waste product.

Table 1.6: General Functions of Skin

	Functions
Excretion	Waste products from the blood are excreted from the capillaries surrounding the gland in form of sweat via pores.
Feelings	There are millions of nerve ends in the skin. There are different nerve ends for feeling e.g. touch, cold, pain and pleasure.
Maintaining Constant body temperature	The body vessels expand when the body is hot. This allows more heat to escape by radiation. Sweat glands produce sweat and when this sweat evaporates, cooling is produced. The blood vessels contract when the body is cold and glands secret less sweat. This way, the skin looses less heat.

UNIT 2
HEALTH EDUCATION

Specific Objectives
By the end of this topic, the learner should be able to:

- Describe causes, signs, symptoms and prevention of common communicable diseases
- Describe immunizable diseases
- Describe the immunization schedule for infants
- State the importance of HIV testing and the effects of HIV/AIDS infection on an individual, family and nation
- Dispel myths and misconceptions about HIV/AIDS
- Identify control measures for HIV/AIDS.
- Explain the meaning of sexually transmitted infections, describe causes and prevention of some sexually transmitted diseases
- Explain what is a drug, drug misuse and drug abuse
- Describe health and social effects of drug abuse

Revision Notes 2

2.1 Communicable Diseases and Immunizable Diseases

2.1.1 Communicable Diseases

Communicable diseases are those diseases that can be transferred from one person to another. Examples of these diseases are malaria and tuberculosis.

Tuberculosis

Tuberculosis is caused by a germ called bacterium in singular and bacteria in plural. Coughs and spits of an effected person have droplets which contains the germs that are released in the air. Another person breathing in those droplets he/she becomes infected.

Signs and symptoms
The following are signs and symptoms:

- Difficulty in breathing
- Simple coughs for a start and then persists
- Chest pains
- Person lose weight and becomes thin and weak
- Infected person may cough out blood
- The person can develop fever.

Table 2.1: Prevention of Tuberculosis

Considerations	Details
Immunization	This is where people especially young babies are given a vaccine which prepares the body to fight and defeat the diseases causing germs when they attack
Air	Tuberculosis likes where fresh air does not flow quickly e.g. In crowded places with poor ventilation. For prevention, we should always allow air to flow freely into the room.
Treatment	The infected person should be treated quickly to avoid further spread.
Health worker (Doctor/clinical officer	If coughs are noted to persist, the person should be advised to see a doctor or a clinical officer.
Separation	The infected ones should be advised to be away from other people for sometime until they are well.
Cleanliness	Always keep our environment clean and dust free
Proper hygiene	Practice proper hygiene by use of handkerchief when sneezing, coughing and cleaning the nose.

Malaria
Malaria is a vector based disease and is considered highly communicable meaning it can be spread though not directly from human to human.
The disease is caused by plasmodium. Plasmodium is a parasite carried by female anopheles mosquitoes. This mosquito bites a person with malaria and sucks the parasites when this mosquito bites another healthy person, the parasites are passed into his/her blood and becomes sick.

Signs and symptoms

- Dizzy feelings
- Loss of appetite
- Feeling weak
- Fever
- Cold and shivering feelings
- Headache
- Joint pains
- Sweating excessively

Prevention

The main prevention of malaria is destruction of places where mosquitoes live through the following methods:

- Removal of stagnant water from containers and getting rid of them. The places where we live should be free from stagnant water.
- Tall grasses and bushes should be cut around the houses we live.
- Cutting and disposing litters
- Spraying of oil on stagnant water
- Sleeping under mosquito nets – i.e. nets dipped into special chemicals that kill mosquitoes and so stop the spread of malaria parasite
- Taking of anti malaria drugs
- Burning mosquito coils to repel mosquitoes and spraying insecticides
- Applying mosquito repellants on the body. These are special chemicals that keep mosquitoes away, e.g. Doom

Other examples of communicable diseases are: Common cold, Hepatitis A to D, Chicken fox, Mumps, STDs and Measles.

2.1.2 Immunizable Diseases

The diseases that a person may need to be immunized against include the following: Tetanus, Typhoid, Yellow fever and Hepatitis B.

Table 1.2: Immunizable diseases

Disease	Details
Tetanus	Although this was vaccinated in the infant immunization schedule, it can still be done when a person suffers from an open would. This prevents the person to get tetanus disease through the open would.

Typhoid	The vaccine against typhoid can be administered any time there is an outbreak to protect people from getting the disease
Yellow Fever	The vaccine protects people from getting the disease and those who did not get at infancy will need to get it before traveling to countries outside.
Hepatitis B	Persons given vaccine against hepatitis B will not get the disease and those who did not get at infancy need to get

***Note**: Infant immunization against common childhood diseases ensures that the child's body is capable of fighting and defeating diseases. There is available schedule to strictly be followed. Other diseases like typhoid, yellow fever, tetanus and hepatitis B can be immunized against if need be.*

2.2 HIV/AIDS

2.2.1 Testing

So important is the activity of finding out whether a person has HIV by testing the blood. A special blood test is done and this can defect the presence of the virus in the blood. If the virus is detected, the person is said to be HIV-positive. If the virus is not detected the person is said to be HIV-negative.

Importance of HIV testing
Testing of HIV is important for all people, whether they are HIV-positive or negative. Incase one turns HIV-negative, one should still avoid activities which may lead to HIV infection.

If a person is HIV-positive, he/she should:

- Be careful not to infect others
- Avoid more infection from other HIV-positive people
- Be helped to continue living positively with HIV
- Know what type of food to eat and which type of drugs to use

Important also is to go for HIV test before engaging in marriage or having a baby.

2.2.2 Myths and Misconception about HIV and AIDs

Although many people know about HIV/AIDS, and the ways in which it is spread, there are many stories which are not true about HIV and AIDS. These untrue stories and

misconceptions are referred to as myths. Myths are stories that many people belief but these stories are untrue.

Misconception: This is a wrong or untrue idea which people believe because they do no have enough information or facts.

Table 2.3: Myths and misconception

Myths and misconception	The truth
HIV/AIDS is a curse and not a disease. It is as a result of breaking taboo in a community.	Aids is a disease caused by a virus called HIV
Aids is caused by witch craft	Aids is caused by HIV
Aids do not exist	Aids is real
Aids can be cured	AIDS has no cure as of now
Once one is affected by HIV/AIDS he/she dies immediately	People with HIV do not die immediately if they get proper care and medication.
Having sex with a young girl or boy can cure AIDS	Having sex with any age does not cure AIDS. It only spreads it
Healthy looking people cannot be suffering from HIV/AIDS	Many infected people with HIV/AIDS look unhealthy
Shaking hands with a person suffering from AIDS can spread HIV.	Shaking hands with infected person cannot spread HIV/AIDS. HIV is only spread through contact with body fluids which has the virus
NB: Learn about HIV/AIDS. This will help to drive away the myths and the misconception about it !!	

2.2.3 Effects of HIV/AIDS infection

On Individual

people infected by HIV/AIDS have weak body and the person is sick most of the time. The person is not able to work properly and so this may lead to loss of job. A lot of money is spent on buying medicine. The person feels unwanted and ashamed, may find it very difficult to work with others and feels angry which may lead to self destruction. Due to anger the person may go out to infect others. Poor concentration is also another effect of HIV/AIDS infection.

On the Family

The effects here will depend on the number of family members affected. The following are some of the effects:

- Use of a lot of money for the family due to frequent illness.
- If the affected family member is the breadwinner i.e. the parent he/she will not get money to help the family and the family will likely face the following: move to a cheaper house, lack money for food, clothes, medical cover and school fees. The family will have no labour force to work on the farm and miss money to carry out farm activities such as buying seeds, fertilizers, animal feeds etc.

On children

Children of effected parent(s) may be affected in the following ways:

- Lack of someone to encourage them as they grow.
- Lack of someone to correct them in case need be.
- Feel insecure.
- Suffer from diseases caused by lack of proper nutrition.
- Older children drop out of school to look for younger brothers and sisters. They work for the family upkeep, wash and cook, and perform various other duties.
- Parents are frustrated in losing children to HIV/AIDS.

On Nation

The economy of the nation is affected by HIV/AIDS as follows:

- Medicine spends a lot of money.
- A lot of time is spend in hospital by people who would be working.
- A lot of money is spent by the nation on educating its people e.g. carpenters, teachers, doctors, nurses, engineers etc and when these die of HIV/AIDS, the nation will have lost the money used in their training.
- The HIV/AIDS affected are too weak to work and this affects the nation in terms of reduced labour force.

2.2.4 Care and Support of People Infected with HIV/ AIDS

Those who are infected with HIV/AIDS can live for many years if only they get proper care and support. It is possible for people with HIV/AIDS to live longer and normal lives. We can assist them by ensuring that they get the following from us:

- Love and care
- Adequate diet
- Good hygiene
- Medical care

Love and Care

People infected with HIV may feel isolated and may suffer shock, anger, loneliness, fear, and depression. We should make them feel they are loved and wanted as follows:

- Giving them company and kind talk.
- Visit them often.
- Allow them to express themselves and listen to them carefully and patiently.
- Feeding and keeping them company as they eat.
- Encourage them to keep on working or carrying out their normal business if they are able.
- Accept them in their places of work or school.

Adequate Food

- People with HIV/AIDS should always take balanced diet.
- Food given should be well cooked. This makes digestion easier.
- If unable to eat solid food, they should be given soft food.
- They should be provided with plenty of fluids e.g. milk, porridge, and soup.
- If the patients are too sick, they should be given small meals frequently.

Poor Hygiene

Persons with HIV/AIDS are prone to infections by other diseases. This is because body immunity is weakened.

The HIV/AIDS patients should:

- Stay in a clean environment.
- Have their hands washed properly before eating food and after visiting the toilet.
- Have their beddings and clothes changed frequently.
- Take bath everyday.

Medical Care

- Those infected with HIV/AIDS have weak immune system and therefore can suffer from opportunistic diseases from time to time. They therefore need medical care.
- They should be reminded to take medicine as directed by the health worker.

- They should be taken to hospital on the appointed time and date given by the doctor.
- They should be advised to visit the nearest health centre to be advised to take special drugs such as anti-retro virals (ARVs)

NB: *Aids so far has no cure but there are medicines to help those infected to live longer!*

2.2.5 Control Measures for HIV/AIDS

Control measures for HIV/AIDS may include:

- Creating public awareness on HIV/AIDS
- Campaigns through media
- mass education

Table 2.4: Control Measures of HIV and AIDS

Measure	Description (How)
Creating public awareness on HIV/AIDS	Through peer education on HIV/AIDS By training of VCT counselors Establishment and launching of VCT centres Provision of VCT (Counseling and Testing Services)
Campaign through media	Talking about it Creating a supportive and enabling environment promoting HIV/AIDS services Educating and entertaining
Mass education	HIV/AIDS prevalence among youth in Kenya Kenya music and behaviour change communication. Musician can serve as promoters of responsible sex

2.3 Sexually Transmitted Infections

Sexually transmitted infections are the infections whose ways of infecting involves sexual contacts, hence the term sexually transmitted infections (STI's). The germs enter the body through urinal passages. Some of these germs can not survive outside the body and therefore are only transmitted through sexual intercourse.

Examples of sexually transmitted infection are:

- Syphilis,
- Gonorrhea and
- Chancroid.

Table 2.5: Causes and prevention of STDs

Disease	Cause	Prevention
Syphilis	Syphilis is caused by bacteria called treponema, normally killed by soap and ordinary antiseptics. Indirect transmission therefore is not possible	Since sexual contact is the only mode of transmission we should abstain from sexual contacts with those

	so the only way is sexual contact.	who are infected.
Gonorrhea	Gonorrhea is caused by diplococcus bacteria called gonorrhea. It is transmitted only through sexual contacts.	To stop sexual contacts with those already infected.
Chancroid	It is transmitted in two ways: Sexual transmission through skin to skin contact with open pores. Non-sexual transmission when pus like fluids from the infected are moved to the other parts of the body or to another person	Being a bacteria infection that is spread by sexual contact with an infected person, avoid all forms of sexual activities. It is the only way absolute to prevent sexually transmitted diseases.

2.4 Drugs

Meaning of a Drug

Any substance taken into the body and affects the working of the body is called a drug. A drug can change e.g. the way of thinking, feeling, behaviour and actions. Some drugs can be used to prevent or treat diseases while others are taken to please people.
NB: All medicines are drugs but NOT all drugs are medicines.

Misuse of Drugs

Using drugs wrongly can as well mean using medicine wrongly. Drugs that are meant to prevent a disease or treat a disease are called medicines.

Ways of misusing medicines are as follows:

- Not following instructions given by a doctor e.g. taking more/less than instructed. Taking little amount is called under dose which can lead to germs to become resistant to an extent that the same medication can not cure a disease. Taking more amounts is called over dose which can cause poisoning or even death.
- When taking medicine not prescribed by a doctor.
- Share or take prescribed medicine meant for other people.
- If not complete taking all medicine given by a doctor.
- When taking medicine given to us, some other time in thought we are suffering from the same disease as before.
- Taking medicine not stored under the required conditions.
- Taking medicine when not sick.

Drug Abuse

Drug abuse is taking drugs for the wrong reason. Medicines can be misused as well. Misuse of drugs is as well drug abuse. Many other drugs are many times abused for the following reasons:

- To get pleasure.
- To forget problems.
- To become stronger.
- Because of peer pressure.
- To be like others i.e. to imitate.
- To become brave or courageous.

Continuous drug abuse can lead to drug addiction. One addicted to drugs cannot do without them and so never abuse any drug for what so ever reason. Drugs commonly abused include: Alcohol, Tobacco, Khat (miraa), Madrax, Cocaine, Heroine, Bhang, Petrol, glue called inhalants

Table 2.6: Effects of drugs on health and society

Health effects	Social effects
Tobacco	
• Smoking of tobacco may lead to problems and diseases that affect the breathing system • Smoke from tobacco can cause lung cancer • Tobacco smoking lead to condition for high blood pressure • Smoking slows digestion system. May increase stomach acids • Children born to smoking mothers are small and underweight	• Misuse of money meant for other things (needs) • Addiction • Smoking can cause fire • Smoking is bad to others who do not smoke • Smoke from cigarettes is unpleasant on clothes and pollutes the environment *NB: NEVER SMOKE, IT CAN KILL*
Alcohol	
• Loss of appetite may lead to poor health as a result of poor feeding • Causes stomach ulcers,	• Essential family needs e.g. food, clothing and shelter may miss because the money has been spent on alcohol

dehydration making one to be thirsty all the time • Causes diseases of the liver called liver cirrhosis • Affects the brain and the nervous system	• Family disputes and fighting likely to occur • Drunk drivers cause accidents due to poor vision and judgment Drunkards find it easy to get into bad activities e.g. stealing and poor sexual behaviour. This may lead to getting HIV/AIDS and other sexually transmitted diseases
Bhang	
• Loss of memory and inability to think well • Feeling confused and depressed • Mental disability • Feeling drowsy	• A person taking bhang is usually unfriendly • Quarrels and fights easily • Refuses to work or to go to school • has a false feeling of well being
Khat (Miraa)	
Use of miraa affects one's health and may cause: • Loss of appetite to lead to malnutrition • Lack of sleep	• Lots of money is spent to buy miraa at the expense of other needs • Chewing miraa encourages idleness making people unproductive
• Discolouring of teeth Damage of the reproduction system	• Chewing miraa makes people to spit now and then spitting is unhygienic.
Madrax	
It gives false feeling of relaxation. And after a long use the user is affected in many ways: • Walk unsteadily as if drunk • Unable to speak clearly • Breathing difficulties	• A person becomes depressed • A person may easily get into irresponsible sexual behaviour which can lead to getting infected with HIV/AIDS • Waste family income leading to

Develop convulsions when the drug is not taken	family suffering
Cocaine	
Can lead to: • Problems in breathing • Heart problems • Loss of appetite • Nervousness	• Cocaine users are violent and can fight anyone without a reason • Cocaine is very expensive. The users spend a lot of their money on it leaving them with no money for other needs
Inhalants	
Prolonged use of inhalants can lead to: • Forgetfulness • Not to think clearly • Disorders of nervous system • Damage of internal organs e.g. liver and kidneys • Poor vision • Uncontrolled body movements e.g. staggering • Poor speech e.g. stammering	• Those who get addicted to inhalants result to bad behaviours • Stealing e.g. money to buy inhalants • Idling and therefore depend other people • Dirty, unkempt and smelling bad • Fighting other people and among themselves

2.5 Effects of Drug Abuse

As we have studied from the table above, drug abuse has effects on health and social life.

Effects of drug abuse on health

People who abuse drugs suffer several effects:

Table 2.7: *Effects of drug abuse*

Effect	Description
Disease	People who abuse smoke can suffer from lung cancer. Those who abuse alcohol may suffer cirrhosis.
Poor health	Those abusing drugs suffer from malnutrition because of poor feeding
Lack of concentration	Persons abusing drugs do not concentrate on their work and school. Drivers who drive when drunk cause accidents because of lack of concentration.
Impaired judgment	Drugs affect the brain and make one not able to make accurate judgment.
Loss of consciousness	Taking too much of the drug may lead to loss of consciousness. The person becomes totally unaware of his/her surrounding, this is called blackout.
Addiction	Usually abuse of drugs lead to addiction or reliance
Fits	Fits are sudden body movements whereby the body twitches and shakes without control or violently. This is caused by the drug affecting the brain
Withdrawal	If a person addicted to a drug fails to take the drug, he/she suffers problems such as irritation, sudden change of mood, being too sensitive, sweating and trembling. All these changes are called withdrawal symptoms
Comma/ death	Drugs can lead to comma or death
Poor health of the unborn	Babies born to mothers who abuse drugs when they are pregnant are in many cases: More likely to be infected by diseases usually small at birth and underweight prematurely delivered

Table 2.8: *Social Effects of Drug Abuse*

Effect	Description
Marital conflicts	Abuse of drugs can lead to unnecessary fights, quarrels, separation and divorce.
Drug induced accidents	Drunk drivers are likely to cause accidents due to poor vision and judgment
Dropping out of school	Those pupils who abuse drugs perform poorly on school due to lack of concentration, poor memory and poor mission. This way the pupils lose interest in studies and eventually drop out of school
Truancy	Staying out of school without permission is termed as truancy. Pupils who take drugs will fail to go to school for no good reason. Being out of school for long may lead to poor performance and this as well may lead to dropping out of the school
Fighting	Some drugs make the users easily annoyed, irritable and quarrelsome which leads to fighting
Loss of income	Those who abuse drugs may be absent from work and perform poorly when at work. If in business, they fail to pay serious attention or serious effort in the business. This way the business collapses and they lose the income
Rape	Those who abuse drugs easily become victims of rape or become violent and attack others. This may lead to the spread of HIV/AIDS and other sexually transmitted diseases. Rape may also lead to unwanted pregnancy and hurts the victim emotionally

UNIT 3
ENVIRONMENT

Specific Objectives
By the end of this topic, the leaner should be able to:

- State the meaning of environment and major components of the environment
- Describe the meaning and effects of soil pollution on the environment
- Explain soil conservation methods
- Describe how air gets polluted
- State effects of air pollution
- Identify ways in which air pollution can be controlled

Revision Notes 3

3.1 The Meaning and Major Components of Environment

Environment describes all the things and conditions that make up our surroundings on earth.

The major natural components of environment consist of living things and non-living things i.e. **Water, Soil, Air, Plants and Animals**

Water

Water is a very important component of the environment in that all living things depend on water. Water forms part of the environment for fish as fish get oxygen from the water and feed on water plants or some other fish found in the water. All other living things that live in water get oxygen from the water.

Other water sources found in the environment is a dependent for other living things on the land e.g. animals get water from rivers, lakes, rain and dams. People also use rain water for domestic purposes. They harvest the water using tanks and drums. They also fetch water from rivers and wells.

Without water plants can not grow well. We already know that the conditions necessary for germination are: water, air and warmth. During photosynthesis, plants use water to make their own food.

Soil

Another important component of environment is soil which makes the homes of some small animals. Plants get nutrients from the soil so as they can grow well, get water from the soil through absorption and are finally held by the soil. Also soil is important to animals in that they feed on plants that grow on the soil e.g. zebra, cows and goats. They are called herbivorous because they feed on green plants and vegetable materials that grow on the soil. Human beings cultivate the soil to produce food crops that they eat.

Many small animals live in the soil like ants, termites, moles, groundhogs and some bacteria which decompose dead plant and animal materials.

Air

One of the major components of the environment is air which all living things cannot survive without. We already know that air is a composition of many gases; oxygen which makes 21% of the air is needed for respiration.

Note that living things breath in oxygen and those animals that live in water get their oxygen from the dissolved oxygen in the water. Carbon dioxide in air is 0.03% which is used by plants in making their own food in presence of sunlight, a process called photosynthesis. These plants give out carbon dioxide. It is from the atmosphere where the plants and animals on the land get their oxygen and those in water get theirs in the water.

Animals take in oxygen through breathing and give out carbon dioxide. On the other hand plants take in carbon dioxide during photosynthesis and give out oxygen. Leguminous plants e.g. beans, ground nuts and peas use nitrogen which makes 78% part of the air to make proteins.

Plants

Another major component of the environment is plants. Trees provide shelter for some animals such as monkeys and insects. Animals get their food from plants either directly or indirectly. Plants do also hold soil together thus preventing soil erosion.

Plants give out oxygen to the atmosphere during photosynthesis and animals take in oxygen during breathing. Dead plants decay and decompose releasing nutrients to the soil making it fertile.

Animals

Some animals help in pollination such as bees and butterflies. They help in cross pollination of flowers in plants. Animals also help in seed dispersal. Waste matters from animals add nutrients to the plants and this way soil becomes fertile. Small animals like bacteria decompose materials in the environment to release nutrients to the environment. Animal breath out carbon dioxide into the atmosphere which in turn is used by plants to make food.

3.2 The Meaning and Effects of Soil Pollution

Soil pollution is the presence of substances that affect the quality of the soil also known as land pollution. It affects the usual use of soil and is dangerous to the health of human beings, other animals and plants. In other words, soil pollution means making soil impure. We say that when certain substances are present in the soil they pollute it. Substances that make soil or other components of the environment impure are called pollutants (contaminant). Some of examples of such pollutants are plastics, polythene papers, fertilizer, pesticides and herbicides.

***NB**: Pesticides kill pests while herbicides kill weeds.*

If oil is spilled on the soil it pollutes it. The following are some causes of soil pollution:

- Domestic waste disposal improperly
- Improper disposal of raw industrial waste
- Excess use of fertilizers, herbicides and pesticides in the activities of poor agriculture
- Spilling oil on the soil
- Mining activities destroys the soil structure and leave excess minerals on the top soil.

Effects of Soil Pollution

When soil is polluted, its fertility is affected and this too affects the soil productivity leading to the living components of the environment i.e. plants and animals getting affected as well.

Effects of soil pollution on plants

Dumping

Most materials such as plastics and polythene papers do not decay. If such materials are not properly dumped, they may cause damage to leaves and stems of plants when deposited on the soil as they decay. Through this way, they interfere with growth of the plants as follows:

- Absorption of water and mineral salts.
- Growth of roots of the plants since they block the roots.
- Air circulation in the soil.

Negative Effects of Soil Pollution on Animals

Soil being homes of many small animals, such as worms, ants and termites, they are negative affected when soil is affected (polluted). Some small animals like bacteria make soil to be rich by decomposing dead vegetable and animal materials. This is the way humus is added into the soil making it more productive. Other small animals like earthworms and millipedes dig in the soil and this allows air and water circulation in the soil. The improved soil aeration and drainage of the soil allows the roots of the plants to penetrate into the soil easily.

The presence of oil, chemicals in the soil such as herbicides and pesticides and other harmful pollutants make it difficult for the small animals to survive and when they die the soil loses its quality and lowers productivity.

NB: Small animals in the soil improve soil air aeration and drainage.

3.3 Methods of Soil Conservation

Animals and plants depend on soil. Plants grow on the soil while animals feed on the plants hence they need to conserve soil. To conserve soil means to protect it from losing its natural properties and productivity. There are various methods of conserving soil. This section briefly discusses these methods.

Table 3.1: *Summary of the main methods used in soil conservation*

Soil conservation methods	
Controlled use of agricultural chemicals	Planting trees
Ensuring proper disposal of waste	Afforestation
Avoid burning vegetable cover	Contour farming
Mulching	Building gabions
Planting ground cover	Proper stocking or controlled grazing
Terracing	

a) Control use of agricultural chemicals

Agricultural chemicals include the following: fertilizers, pesticides and herbicides. If used uncontrollably they can lead to soil pollution and even water pollution. Their use can also be harmful to crops and those who consume the crop which include animals and human beings.

Farmers should strictly follow the manufacturer's instructions while using the agricultural chemicals. The instructions which come with agricultural chemicals clearly advise on the following:

- Type of the chemical to use.
- Purpose of the chemical.
- Direction of use i.e. the amount to use and mode of application.
- Precautionary measures to observe.

b) Ensuring proper disposal of waste

A lot of waste is produced by domestic and industries. Both wastes can be harmful or useful. So that soil is not polluted by these wastes it is important to have good ways of disposing them. This is called waste management.

i) Domestic Waste

Domestic waste means the garbage people discard from their homes. This may be of organic refuse or inorganic refuse.

Organic refuse: This refers to those that can rot and includes food remains, vegetables, and fruit peelings.

Inorganic refuse: This does not rot and some may take long time to decay. Examples of such are plastics, broken glasses, metal parts and cans. Domestic waste should not be dumped on the soil surface.

Methods of disposing domestic waste

Converting waste into compost manure

A compost pit should be dug at home for all garbage that can rot e.g. food leftovers. This can be made into compost manure

Using local authority service

Waste in urban areas is deposited into the garbage bins provided by the local authorities who arrange for its collection and thereafter proper disposal.

Table 3.2: Common methods of waste disposal

Method	Description
Incinerator	this is burning the inorganic refuse at very high temperatures in a machine
Recycling	This is the most effective method. It involve collecting waste e.g. papers, plastics, broken glasses and food cans, treating them with chemicals and reusing them to make more of the same products
Depositing in pit latrines	Inorganic waste should be thrown into a pit latrine or buried deep in the soil. Also tit can be burnt in an improvised incinerator as shown below.
Reusing	Reusing means using an item more then once or for a different function from the one it was meant for at the beginning. Many such as cooking fat and oils, honey and jam are packed in reusable jars and cans. These can be used at home to store other products e.g. salt, sugar or small foods. Honey jars can be used as drinking glasses.

ii) Industrial Waste

A lot of waste is produced in the industries. Such wastes include oil, contaminated acids and metal waste. Water is contaminated with chemicals, waste rubbers and waste papers. Some of these chemicals are not only hazardous to the soil but to the living components in the environment.

Table 3.3: Various ways to manage industrial waste

Method	Description
On-site treatment	This is where waste is treated harmless at an industry at the point where it is produced. This in turn reduces the danger of polluting the environment during the transportation process to the point where it is appropriate to be disposed.
Reusing	Some industries use some products more than once or for different function from the initially meant for e.g. commercial industries, the solvent they use such as petrol to dry clean garments is not thrown away but filtered and reused.
Recycling	Companies that make bottles do not throw broken bottles away but recycle them to make new ones. There are other companies that buy waste paper and recycle them to make tissues e.g. toilet rolls, facial tissues and serviettes.
Waste Exchange Programme	One industry may produce waste that can or may be needed by another industry for its raw materials. This can be considered as useful waste. To explain this lets look at furniture manufacturer where the saw dust is produced and wood shaving as waste products. These can be used by a company that manufactures papers.
Treating hazardous waste	This is where the new methods are used to treat hazardous waste to make them non-hazardous. Harmful pollutants are destroyed so that they do not pose any danger to the environment.
Substituting raw materials	This is the process where the raw materials that produce harmful wastes are replaced with other that produces less harmful waste.
Changing Manufacturing process	A process or stage which produces waste during the manufacturing process may be changed or eliminated so that the waste is no longer produced.
Incineration	This is the process of burning waste using machines such as incerators and furnaces.
Reducing its generation	This is the best method of reducing waste. It involves simply preventing waste generation.
Government regulation	In this, government has put in place laws to control the disposal of waste. Such control aims at preventing illegal dumping of harmful waste.

c) Avoid burning vegetable cover

When we want to clear land for farming, we should slash or uproot the unwanted vegetations but not burning them. This is because cleared vegetation left to rot increase humus and adds nutrients to the soil.

NB: Vegetation cover guards soil against exposure to the agents of soil erosion.

When we burn vegetation, we kill the living organisms in the soil and no humus goes into the soil. Vegetation cover also prevents soil from agents of soil erosion such as wind, water and animals.

d) Mulching

This is covering the soil with dead plant materials such as dry grass and leaves. This prevents excess loss of water from the soil through evaporation. This also reduces splash erosion. The mulch decays afterwards and adds humus to the soil.

e) Planting ground cover

It is advisable to plant ground cover since land should not be left bear. Ground cover may include ground cover crops that spread out over the soil surface and cover it. Examples of such cover crops include grass and sweet potatoes. These crops or plants hold the soil firmly with their roots helping or preventing the soil from n being carried away by agents of soil erosion such as wind and rain. Cover crops also trap soil as water flows through the garden thus conserving soil.

f) Terracing

Terraces dug along the contours on the slopes reduce the speed of run-off water. This reduces soil erosion and this way soil is conserved.

g) Planting trees

Planting of trees can be either afforestation or re-afforestation.

h) Afforestation

This is planting of trees in areas where none has been planted**.**

i) Re-afforestation

This is planting trees where forests have been cleared. Trees are important in preserving soil:

- Reduce wind erosion by breaking the wind

- The roots hold soil particles firmly together. This helps the soil from being carried away by agents of soil erosion.
- They provide shade thus reducing the amount of water evaporation.
- They reduce the speed of running water. This reduces the strength of water to erode the soil.
- The leaves fall off and decompose thus increasing the amount of humus in the soil.

j) Contour farming

In this crops are planted along the contours on ridges. This helps reduce soil erosion thus conserving the soil.

k) Building gabions

As already known, gulley erosion where running water forms V or U - shaped channels. These gullies can be blocked by building structures called gabions across them. Gabions are heavy boxes made of wire mesh that are filled with stones. As water flows through the gabion, soil is trapped thus reducing soil erosion and repairs the soil structure.

l) Proper stocking or controlled grazing

Farmers should keep livestock that a piece of land can hold. This is called proper stocking which leads to soil conservation. When animals overgraze they uproot the vegetable cover e.g. grass. This way the soil becomes exposed to agents of soil erosion such as wind and water.

3.4 Air Pollution

Air is an important component of the environment. Pure air is a mixture of 21% oxygen, 78% nitrogen, 0.03% carbon dioxide and 0.97% rare gases, water vapour, and dust particles. Presence of harmful substances in the air is called air pollution. The substances are called pollutants. Pollutants endanger human health and also affect other living components in the environment i.e. plants and animals. Others which arte indirectly affected by air pollution are water and soil.

3.4.1 Major causes of air of Pollution

a) Tobacco smoking

This is one of the major forms of air pollution. It is normally smoked as cigarettes. In addiction to nicotine and tar, tobacco contains carbon monoxide as well which is a highly

poisonous gas as it interferes with the ability of the blood to transport oxygen to the body organs. Smoke from cigarettes does not only affect the active smoker but also the passive smoker i.e. any one who inhales the cigarette smoke (polluted air) unintentionally.

b) Burning tyres and plastic materials

The combustion of tyres and plastic materials produces harmful emissions and poisonous gases and especially when they do not completely burn. Incomplete combustion produces gases such as carbon monoxide which poses threat to humans health and to the survival of animals and plants. Similarly, carbon dioxide is a product of incomplete combustion. As we already know the normal carbon dioxide in the air is 0.03% excess carbon dioxide in the air as pollutant. Other pollutants from combustion are tiny particles of smoke and soot.

Rubber and plastics when burnt produces black sooty flame and emits smoke that makes the air smoggy and also emits a foul smell. Charcoal burning is also a threat to the environment

c) Emission of Gases from Vehicle Exhaust

Vehicles use fuels like petrol and diesel to run. The combustion of these fuels in the engine of the vehicles produces harmful gases e.g. carbon dioxide, carbon monoxide and other gases. These gases produced by vehicles contain poisonous gases then contribute to pollution of the air. Exhaust gases from vehicles thus contribute to pollution of air and especially in cities and big towns where traffic is heavy.

Another harmful substance that may be contained in burning fuels is lead which is dangerous to human health.

d) Spraying Farm Chemicals

Agricultural or otherwise farm chemicals include the following: *Herbicides, Acaricides and Pesticides*

Farm chemicals are dissolved in water and sprayed to either crops or animals using a sprayer. As spraying farm chemical is done, wind blows some of the chemicals thus polluting the air. The person spraying the chemicals should take the following precaution measures to avoid inhaling the chemicals:

- Wearing protective clothes such as gas mask, gloves and protective coats.
- Spraying in the same direction the wind is blowing to and not against the wind.

e) Aerosol sprays

These are packed in cans or other containers from which liquid is forced out in form of a fine mist. The perfume or pesticide is dissolved in solvent which remains in the atmosphere after spraying and pollutes it. The solvent may contain harmful chemical substances which interfere with the ozone layer.

NB: Ozone is a gas in the upper part of the atmosphere. It forms a protective blanket known as the ozone layer which protects the earth from harmful rays from the sun. Harmful gases result in tuning of the ozone layer. When this is depleted, the survival of human being, animals and plants is at a threat.

f) Industrial Waste Gases

Most industries release waste gases into the air which may be harmful. Some of these industries produce excess carbon dioxide which can pollute the air. Some other industries produce a gas called sulphur dioxide which is also harmful. Other industries too produce dust and small particles which are harmful. These waste industrial gases must be treated so that they are made safe.

3.4.2 Effects of Air Pollution on Living Things and Non-Living Things

Polluted air is a threat to human, animals and plant life. Also it is dangerous to nonliving components of the environment e.g. water and soil. It corrodes materials such as corrugated iron sheets and marble.

a) Effects of air pollution on living things

i) Effects of air pollution on plants

In order to grow healthy, plants need clean air. Polluted air affects plants in the following ways:

- Leaves are covered with dust particle and thus blocking the sunlight and so affecting photosynthesis, the process by which plants make their own food. Soot and dust block the stomata this may affects plants.
- Some waste gases such as sulphur dioxide dissolve in water droplets to form acidic solutions which damage leaves of plants. Presence of these gases in the air could also lead to formation of acid rain which make the soil to be acidic thus affecting the availability of nutrients to plants. High acidity on the soil may interfere with the survival of organisms that are very important to plants growth. When absorbed through root s, acid rain interferes with proper development of plant and it may wither and die. When deposited in water sources like pond, lakes and oceans, water plants that feed on water animals are affected.

ii) Effects of air pollution on animals

Air pollution is a threat to humans, domestic and wild animals through the following ways:

- Causes respiratory problems. When animals inhale dust and other harmful gases, they can develop respiratory such as coughing and sneezing which may result to respiratory diseases.
- May cause allergies resulting in coughing, sneezing, irritation of eyes and breathing problems.
- When acid rain gets deposited into water sources like lakes, ponds, and oceans, water animals e.g. fish are affected.

b) Effects of air pollution on non living things

- Sulphur and carbon dioxide are among gases that cause air pollution when dissolved in the rain water. They form acid rain which corrodes metals such as corrugated iron sheets and stones like marble.
- Acid rain causes weathering of rocks.
- The view of environment is also destroyed by smoke and smog which are a mixture of gas particles.
- Smog destroys materials made of rubber too.
- Dust particles soil our clothes and settle on surface of tables, window sills and furniture thus making then dirty.

3.4.3 Ways of Controlling Air Pollution

Air pollution is controlled in several ways: These include

- Avoid smoking cigarettes
- NOT burning tyres and plastic materials

Table 3.4: Air Pollution Control Measures

Measure	Description
Avoid smoking cigarettes	In an effort to control air pollution banning of cigarette smoking in public places e.g. hospitals, schools, and in public transport vehicles has been done. These areas have been declared smoking free zones and billboards displaying the ban in these areas have been erected.
NOT burning tyres and plastic materials	Polythene papers and tyres plus other plastics should be recycled or buried deep in the soil. They should not be burnt

UNIT 4

PLANTS

Specific Objectives
By the end of this topic, the learner should be able to:

- Describe pollination and fertilization
- Draw and label different parts of a flower
- Draw and label parts of a seed and Investigate conditions necessary for germination
- Explain interdependence between plants, interdependence between plants and animals and explain what is food chain
- Explain meaning of crop pests, identify some crop pests, their effects and control measures
- Explain how plants are adapted to their environments
- Identify signs of unhealthy crops
- State effects of crop diseases

Revision Notes 4

4.1 Parts of a Flower Notes on functions of the parts

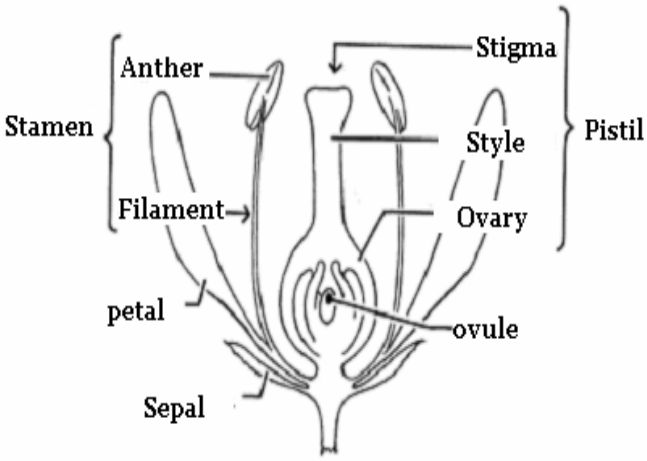
Functions of parts of flower

Stalk – the stalk supports the flower.

Sepals – The sepals protects parts of the flower at early stages of development called bud stage. The collective name for the sepals is the **calyx.**

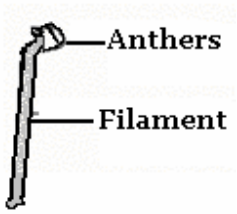
Petals – peals are the brightly coloured part of the flower. They attract insects to the flower for pollination. They are collectively called **corolla**

Figure 4.1: *Parts of a Flower*



Male reproductive parts

Figure 4.2: Male reproductive parts



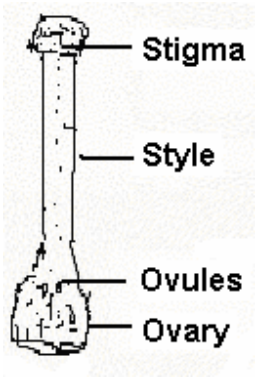
This is the male part of a flower which is called **stamen**. Filaments are joined together in same and in others they are separate. Anthers contain pollen grains.

Table 4.1: Male Parts of a Flower and Their Functions

Part	Function
Filament	It is the stalk that supports the anthers.
Anthers	The anther is the part that contains pollen grains.
Pollen grains	These are male sex cells and they fuse with ovules during fertilization to form seeds

Female reproductive parts

Figure 4.3: Female parts of a flower



Parts	Function
Stigma	The stigma is the part of a flower which receives pollen grains
Style	It supports the stigma and allows pollen grains to pass through to ovary from stigma.
Ovary	It is the part which later becomes the fruit.
Ovules	become seeds later after fertilization

Table 4.2: Types of Pollination

Types of pollination	Description
Self pollination	It is the transfer of pollen grains from the anthers to the stigma of the same flower in the same plant.
Cross pollination	This is transfer of pollen grains from the anthers to the stigma of different flower but of the same species.

4.2 Description of pollination and fertilization

Pollination

Agents of pollination

The transfer of pollen grains from the anthers to the stigma is done by wind or insects. Wind and insects are therefore agents of pollination.

Fertilization

After pollination what follows is known as fertilization as explained below.

Pollination takes place when pollen grain germinates on the stigma. Each pollen grain develops a tube through the style. At the top of the pollen grain is a male sex cell.

Once the pollen tube reaches the ovule, the tip breaks and the male sex cell is released. The male sex cell enters the ovule through a small opening and fuses with the female sex cell. This fusion of male and female sex cells is called **fertilization.**

After fertilization, other parts of flower wither and fall off. The ovary enlarges and becomes a fruit. The ovules become seeds.

4.3 The Seed

Types of seeds

There are two types of seeds, namely dicot and monocot.

The difference between the two is based on the number of cotyledons.

Part	Function
Epicotyl	It develops into shoot.
Hypocotyl	It develops into root
Cotyledon	It stores food for epicotyls and hypocotyls
Seed coat	It protects the inner parts of the seed.
Hilum	Allows water to pass through

Figure 4.4: parts of a seed and function

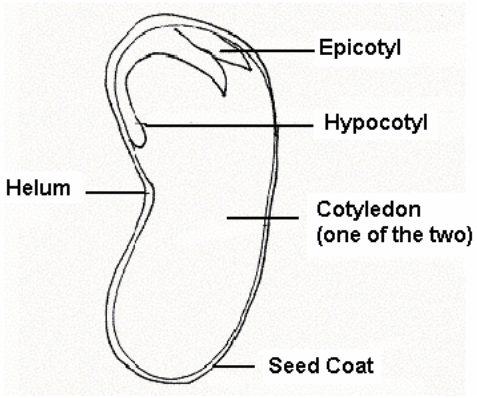


Table 4.3: Types of seeds

Types of seeds	Description
Dicot	This is a seed with two cotyledons. The best example is a bean seed.
Monocot	This kind of seed has one cotyledon. A good example is a maize seed.

Germination of seed

Table 4.5: *Experiment on conditions necessary for germination*

Steps	Details
Activity	Investigating conditions necessary for germination
Apparatus	Maize and bean seeds, transparent container, water, paper, oil and cotton wool.
Procedure	Place some dry seeds on dry cotton wool or sawdust in one container and label A. Place soaked seeds on wet cotton wool or wet sawdust in second container and label B. Boil some water in a container, cover the water with oil. Allow the water to cool. Put some seeds and label C. Put soaked seeds in wet cotton wool or wet sawdust and place them inside a container and label D. place the container in cool place e.g. in a refrigerator (charcoal cooler).
Results	After about a week each container to be observed will be found that: Seed in A did not germinate as there was no water. Seeds in B germinated as there was air and water. Seeds in C did not germinate. There was no air because boiling water makes air escape and oil prevents oxygen from getting into the water. Seeds in D germinated slowly. They lacked warmth. If the seeds were put in refrigerator, they will not germinate due to low temperatures.
Conclusion	Conditions necessary for germination are therefore **Water, air and warmth.**

4.4 Interdependence between Animals to plants and plants to plants

Plants and animals do depend on each other in various ways.

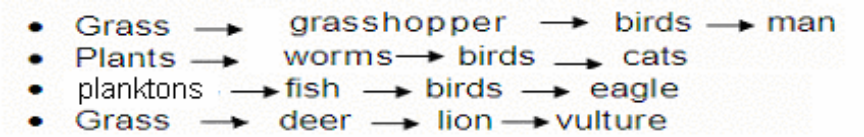
Table 4.6: Interdependence between animals and plants

Areas	Description
Food	Animals get food from plants and plants get manure necessary for well growth of the plants
Oxygen	Plants get carbohydrates from animals for photosynthesis (process by which plants makes food) and animals breath in oxygen from plants for respiration.
Shelter	Plants provide shade for the animals and mammals' e.g. man takes care of young by providing protection by mulching, seed beds e t c.
Pollination	Plants e.g. black jack will depend on the animals to transfer seeds to a place for germination
Medicine	Animals healed from medical plants and animals provide manure for healthy plants
Nutrients	Plants mostly depend on animals to maintain soil fertility. An animal on the other hand needs nutrients from plants to keep them alive.
Animal waste	Animal waste like feaces and urine, increases the amount of humus in the soil.
Decomposition of dead animals	bodies of dead animals increases humus in the soil thus supporting plant growth

Food Chain

Food chain is a linear sequence of links in food web starting from a tropical species that eats no other species in the web and ends with species that is not eaten by any other.

Examples are:



Some plants do also depend on other plants for the following:

- Support for creeping plants growing next to a big tree climbs up.
- Place of living (habitat) some plants live on others for food
- Shade that weak plants get shelter from big plants

4.5 Crop Pests effects, Types and control measures

These are organisms responsible of destroying crops.

Effects of Pests on Crops

- Lowers the yields
- Reduce quality of the produce
- Transmits diseases to crops
- Cause diseases to consumers

Types of pests

Table 4.7: Types of crop pests

Type	Example	Description
Field Pests	Aphids	They are very small and attack mostly kales, cabbages sucking the juice and destroying the plants
	Cut worms	They cut the stems of young plants this destroying the plants
	Stalk borers	They attack the plants' stalk stem e g maize
	Weevil birds	They eat the green maize in the garden this opening the green covering of the maize.

Storage Pests	Rodents	Like rats eat the grains in the granary or the store
	Weevils	They are very tiny they make holes in the grains such as maize, wheat e t c while in the store or granary.
	White ants	They attack the timbers unless treated with chemicals

Control Measures

These are ways and means to reduce or eradicate crop-pests. Below are some of them:

Table 4.8: Measures of Controlling Pests

Measure	Description
Trapping	It is done by poisoning what they like e.g. use of “red cat” in sugary solution to kill mites.
Hand picking	guarding then you catch and kill
Weeding	Involves clearing weeds in farm so that pests have no hiding places, because they don’t like to be seen in the open space.
Spraying	Use pesticides to eradicate them
Pruning	Involves removal of unwanted parts of the plants that can attract or affected by the pests to reduce their rate of spreading.

UNIT 5
WEATHER AND SOLAR SYSTEM

Specific objectives

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

- Name the eight planets in the solar system
- Make a model of planets

Revision Notes 5

5.1 The Solar System

The word solar means the sun. The solar system comprises of the sun at the centre, eight planets and other heavenly bodies.

The Sun

The sun is the star at the centre of solar system. It accounts for 86% of the system's mass.

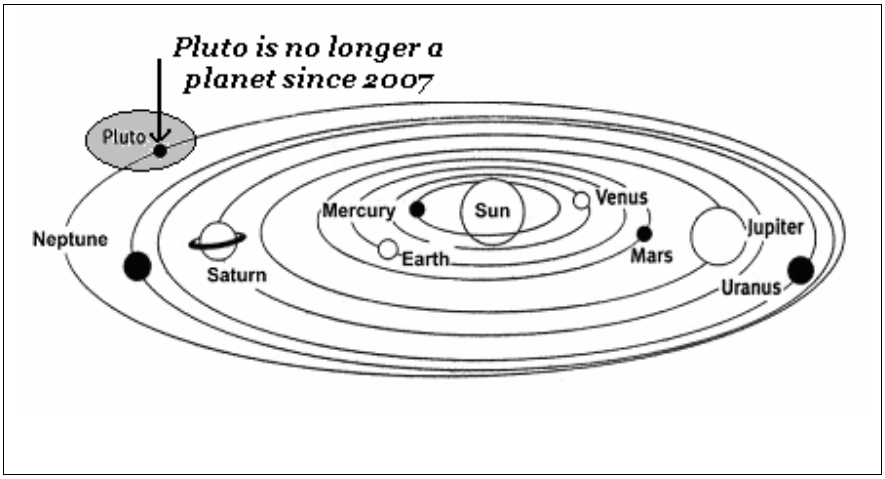
Planets

Table 5.1: List of Planets

Planets			
1	Mercury	5	Jupiter
2	Venus	6	Saturn
3	Earth	7	Uranus
4	Mars	8	Neptune

Planets are celestial bodies orbiting a star or Stella remnants. A planet is massive enough to be rounded by its own gravity, but not too massive to cause thermonuclear fusion. It must also have cleared its neigbouring region of planetesimals.

Figure 5.1: The Solar System showing the eight planets



NB.

(i) Pluto NOT there since 2007.

(ii) The order of the solar system begins with one closest to the sun.

UNIT 6
ANIMALS

Specific Objectives
By the end of this topic, the leaner should be able to:

- Identify types of feeds for livestock, different grazing methods and list the composition of balanced diet in animal feeding
- Name some internal and external parasite, state their effects on livestock and control of some livestock parasites and some human intestinal worms
- Explain how animals adapt to the environment
- Identify signs of ill health in livestock and state effects of ill health

Revision Notes 6

6.1 Animal Feeds and Methods of Grazing

There are many different types of animals starting from simplest with only a single cell to most highly develop like man. Animals are found in many places e.g. above and underground, in the soil and water e t c. What animal is found where is determined by climate and food supply and geographical conditions

Types of feeds for livestock
Domestic animals kept for commercial purposes are called **livestock.** Examples of livestock are: Cows, Goats, Pigs e t c. Their feeds include:

- Pastures
- Fodder crops
- Commercial feeds concentrates

a) Pastures

A pasture is a land set a side for grazing animals. Animals feed mainly on grass in pastures.

b) Fodder Crops

Fodder crops are crops grown in the garden for feeding animals. Examples are:

- Beef rots
- Mangoes
- Lucerne and Napier grass

c) Concentrates of a Balanced Diet in Livestock

A diet is said to be balanced when it contains: **protein, carbohydrates, vitamins, fats and oils.** The table below explains the food giving classes above.

Table 6.1: Types of Concentrates

Type of food (Feeds)	Nutrients
Lucerne, Disodium	Proteins
Beef roots, Mango	Carbohydrates
Cabbages, Maize stalk	Vitamins
Egg shells, Salt	Minerals
Sunflower	Fats and Oils
Green grass, Tough of water	Water

Methods of Grazing

Zero grazing/spall feeding

This is where the livestock is fed in confinement, food and water is given to the animal in stalls and tanks respectfully. Diagram

Herding

It is one of the traditional methods of grazing where by a person moves after the livestock controlling the areas of feeding. It is both tedious and uneconomical and coming to extinct.

6.2 Parasites, Effects and Control Measures

Parasites depend on others for food. Many worms are parasites.

Table 6.2: External and internal types Livestock Parasites

Classification	Examples
External livestock parasites *found outside the bodies of animals*	Ticks, fleas and tsetse flies
Internal *(found inside the bodies of animals)*	Roundworms, tapeworm and liver flukes

Effects of Parasites on Livestock

- Loss of blood
- Loss of weight
- Low production
- May cause diseases e.g. sweating in calves
- Anemia brought by blood being sacked by these parasites
- May lead to death of the animal.

NB: it is very important to prevent our animals from being infected with parasites both internal and external as they have adverse effects on animals.

Control of Parasites

a) Control of Parasites in Livestock

Much is the need to control the livestock parasites if we are to benefit from these animals kept for commercial purposes.

Table 6.3: Methods and Activities involved in Controlling Parasites

Method	Activity involved
Rotational grazing	It involves grazing in an area then shifting to another where parasites are minimal or none at all and after sometime.
Dipping/spraying	Occasional spray or dip the animals to kill the parasite attached to the skin of the animals. This is done mostly after every 7 days by use of chemicals known as **acaricides** in water proportionally
Deworming	It involves administration of dosage of anti parasite chemicals through the mouth into the body of the animals to kill internal parasite such as: **round worms, and tapeworm etc.**

b) Control of Human Intestinal Worms

These walls of human intestines are more or less invested with worms which should be drenched out. Following are some of the methods of controlling human intestinal worms:

- Proper sanitation
- Flash the toilet
- Aerated latrine
- Wash raw food before eating
- Proper cooking
- Regular deworming

6.3 Adaptations of Animals and Birds

Table 6.4: Adaptation of Animals on Feeding

Type of animal	Adaptation
Herbivores e.g. cattle, goats & sheep	They feed on plant and have diastema (they lack lower front teeth). They have strong tongue to hold firmly leaves and small branches into their mouth.
Carnivores e.g. dog & lion	They feed only on flesh. They have strong jaws and canines to enable them to tear flesh.
Omnivores e.g. man	They feed on both animals and plants.
Birds	They feed on grains and others on flesh.
Earthworm	They feed on both dead plants and animals.

Table 6.5: Adaptation of Feeding of Birds

Type of bird	Diagram	Adaptation to Feeding
Grain eaters e.g. Chicken		They have short and pointed beak for peaking grains e.g. maize, wheat, and millet etc.
Filter eaters e.g. duck		Their beak made for shoving or sieving what is in the water or mud which can be eaten

Flesh eaters e.g. eagle		They have sharp and strong beaks for cutting and tearing the flesh.
Nectar feeder e.g. sun bird		They have slender, sharp and long beak such that it can go through the flower stalk to collect the nectar.

6.4 Signs and effects of ill health in Livestock

Table 6.6: Signs and Effects of Ill-health in Livestock

Item	Description
Signs	• Stagnant growth • Loss of weight brought about by inability to eat • The expected yields is drastically reduced • The skin coat becomes rough • Dry coughing • Blood stains found in the stool
Effects	• Evident of low yields e.g. milk production in case of daily cows • Reduced quality of products e.g. in case of beef cattle the quality of meat and hides is poor • Diseases may be transmitted from sick animals to the human beings. • Another load effective would be death of both human and animals

UNIT 7
WATER

Specific Objectives
By the end of this topic, the learner should be able to:

- Explain meaning of water borne diseases, causes, signs and symptoms and preventive measures
- State how water is polluted, effects and control measures
- Conserving water and the importance of conserving water.
- State the difference between soft and hard water, disadvantages of hard water and how to soften hard water by boiling.

Revision Notes 7

7.1 Causes, Symptoms and Preventive Measures of Waterborne Diseases

- Waterborne Diseases are brought about by taking contaminated water Examples are: Cholera, Typhoid, Bilharzias.
- Waterborne Diseases are caused by tiny living things(bacteria, virus, protozoa, and amoeba) in contaminated water.

Signs and Symptoms of Waterborne Diseases
Table 7.1: *Signs and Symptoms of Waterborne Diseases*

Waterborne Disease	Signs and Symptoms
Cholera	Stomachache, vomiting, muscle pains, loose stool, diarrhea.
Typhoid	Fever, weakness, stomach, headache, constipation, low heart beat.
Bilharzias	Abdominal pain, diarrhea, coughs, fever, fatigue.

Measures to Prevent Waterborne Diseases

Table 7.2: Measures of Preventing Water-borne Diseases

Measure	Description
Boiling water	Drinking water should be boiled to kill tiny living things called germs which may be in the water.
Use of chemicals	Water must be properly treated for safe use in homes holds and towns e.g. use of waterguard or chlorine.

Proper protective devices	They must be worn while handling stagnant water which is in most cases contaminated

7.2 Water pollution, its effects and control measures

Water pollution

Water pollution may mean interference with the make up of water by foreign bodies. There are many ways in which water can be polluted e.g. by:

- Inorganic matter, Organic matter, Waste water, Oil, Silt etc.

Effects of Water Pollution

Table 7.3: *Effects of Water pollution*

Effect	Description
On plants	Soil from eroded areas is brought to the surface of the oceans by the rivers. This muddy water kills marine plants e.g. mangroves, and polyps which form **corals**
On aquatic organisms	Untreated sewage containing organic matter at times is channeled into the rivers. It is composed by bacteria. The bacteria use much oxygen such that there is not enough for the fish and other aquatic organisms for they suffocate and die.
On soil	Fertile soil for crops is washed away into the rivers and oceans. This can be termed as soil erosion.

7.3 Water Conservation and its Importance

Water Conservation

Even though water is much on earth, only one percent is there as fresh water. No life is possible without water hence the need to conserve water.

Table 7.4: Ways of conserving water

Method	Description
Harvesting	It involves collecting rain water falling on sloping sheets (*mabati*) and then reserved e g stored water in tanks. Earth dams are constructed on seasonal rivers to trap water to be used during famine.
Recycling	Water from factories can be recycled to make it safe for some other good

	use e.g. through distillation.
Proper utilization	Use of mulching and shading, around the plant to avoid much evaporation. Watering plants individually, not sprinkling the whole area. Also water should be stored in dams during the rainy season so that if it can be used later when it is dry.
Re-using	It involves utilizing used water in another activity that is favourable to our environment e.g. using water used for washing clothes to water plants.

7.4 Soft and Hard Water

- Water which is natural contains no mineral salts and is hardly found because most of the common sources of water i.e. rain, dams, rivers, boreholes or wells, lakes and oceans have mineral salts. When rain water gets into the soil, mineral salts dissolves in addition to what had been already dissolved during the rainfall i.e. gases and dust particles present in the air.

- Water that contains large amounts of salts is **hard water** while that contains little or no dissolved salts is called **soft water.** So, content of mineral salts in water differentiate soft water from hard water.

- Another difference between hard and soft water is that soap lathers easily in soft water than hard water. Hard water can be softened by chemicals and in some cases by boiling. Main disadvantages of hard water is that it cannot do pass through the filter.

Disadvantages of Hard water

- It is wasteful to use hard water in laundry work because a lot of soap is used since soap does not lather easily. This leads to a lot of energy and time wastage.
- It discolourises white garments and also can deposit whitish particles on the coloured garment. This because scum is formed during washing and even when rinsing garments after washes with hard water.
- Water boilers and kettles get discoloured in the inside when used to boil water.
- It causes clogging of pipes. Pipes especially those used to transport hard water get blocked in areas of hard water especially when in long time, mineral salts in the hard water react with the inside of the pipe to form a chemical substance that is deposited on the inside of the pipe. This substance is called **scale** which appears as a coat inside the pipe. Scale clogs the pipe and so interferes with the water heating system of a building. The water thus takes long to be heated and this way a lot of heat is wasted.

Softening Hard Water

It is the activities in which mineral salts are removed from water are called softening. The mineral salts contained in water contain various chemical substances.
Some of these substances cause permanent hardness while others temporary hardness of water.

Methods

There are several methods involved in softening of hard water and what each method does is basically to remove the mineral salts. These methods include:

- Boiling hard water
- Distillation
- Lime softening

Softening hard water by boiling

Softening of hard water by boiling may be illustrated by the activity below.

Table 7.5: *Softening Hard Water by boiling*

Step	Description
Apparatus	• Some water from a hard water source e.g. bore hole or a well. • Source of heat • A container e.g. aluminum *sufuria* • A bar of soap • Two basins
Procedure/ method	• The water is divided into two equal amounts and some put in the aluminum sufuria and the other into the basin. • The water in the aluminium sufuria is boiled, then poured into the other basin and allow it to cool. The sufuria is used to boil is observed inside. • Use soap to lather with cool boiled water and the unboiled water. Observations recorded.
Observations	It may have been observed that the inside of the sufuria used to boil the water is stained. This is scale.
Conclusion	When water is boiled, the mineral salts present in the water are broken and are deposited in the container used for boiling as scale and this way the water becomes soft. This is why it was found that it was easier to form lather with cool boiled water. This shows that boiling is a simple method of softening hard water.

UNIT 8
SOIL

Specific Objectives
By the end of this topic, the learner should be able to:

- Explain soil erosion and identify types of soil erosion
- Explain the meaning of fertilizers and classify two types
- Explain the meaning of manures and different types
- State the advantages and disadvantages of manures and fertilizers.

Revision Notes 8

8.1 Soil Erosion and Types

- Soil being so important to us, let's see what it is meant by the term soil erosion and the agents/types of soil erosion. Many animals live in the soil and human beings grow food crops on soil.
- Soil erosion is the washing away of the covering top soil by agents like water and wind.
- Agents of Soil Erosion include wind, water and animals.

Types of Soil Erosion

There are different types of soil erosion.
Table 8.1: Types of Soil erosion

Types	Description
Splash soil erosion	This is caused by the falling water droplets making small holes.
Sheet soil erosion	This is the removal of the thin uniform layer off the top by either wing or water
Rill soil erosion	Running water removes top soil to form small channels called **rills.**
Gulley soil erosion	This occurs when more water run carrying soil from the rills thus widening the channels to form gullies as shown in the diagram below.

8.2 Meaning of Fertilizers and Types

Soil fertility is the ability of soil to produce high yields for a long time. It is affected by soil erosion. The fertility of the soil must be improved by use of either fertilizers or manures.

The soil has to be fertile to maintain high production of crop i.e. the soil has to be rich in nutrients to be absorbed by the plants through roots.

Soil that have lost their fertility are improved by adding organic or inorganic substances known as fertilizers which are grouped into natural fertilizers or artificial (chemical) fertilizers.

Types of Fertilizers

Fertilizers are artificial manures. They are manufactured chemicals which supply nutrients into the soil to be absorbed by the plants through roots. They are classified according to the nutrients they supply supply as follows:

- Straight fertilizers
- Compound fertilizers

a) Straight fertilizer

Straight fertilizers contain only one macronutrient which may be nitrogen, phosphorous, or potassium.
Note that the fertilizers is named according to the nutrient it contains.

Table 8.2: Examples of Straight Fertilizer

Fertilizer	Content
Nitrogen fertilizers	Nitrogen nutrients.
Potassium fertilizers	Potassium nutrients.
Phosphoric fertilizers	Phosphorus nutrients.

b) Compound fertilizers

Compound fertilizers contain two or three macronutrients. They are also called mixed fertilizers.

8.3 Meaning of Manures and Different Types

Manures are added to the soil to provide plant nutrients. Manures are also known as **natural** or **organic fertilizers** .
They are classified according to the method of preparation and the materials used in the preparation. Different types of manures include the following:

a) Green manure
b) Farm manure (FYM)
c) Compost manure
d) Organic manure

a) Green manures

Green manures are prepared from green plants such as crops mainly grown for this purpose are cut before flowering, chopped into the smaller pieces and ploughed into the soil where they decompose and rot in the soil.
The plants used to prepare green manures must have a lot of leaves i.e. they must be leafy and they include the following: maize, sorghum, nappier grass and plants that are leguminous e.g. cowpeas, beans, sunflower and lucern which are able to grow quickly, rot quickly and contain a high amount of nitrogen.

b) Farm/ animal manures (FYM)

This type of manure is made from animal waste such as urine, dung, poultry dropping and animal beddings e.g. layers of grass, wood shavings or sawdust are a good source of plant nutrient since they add organic matter to the soil. These type manures should not be exposed to the direct rain or sunshine because this way they lose the nutrients.

c) Compost manure

This is a mixture of plants i.e. decayed leaves and peeling from vegetables from kitchen before and leftovers and animal waste. This manure is used to improve soil fertility preparation of compost manure is by pilling plant materials in heap or pit in areas which are not wet. The compost heap is decomposed by activities of bacteria. Fast decomposition is encouraged by:

- Keep the heap moist but not wet
- Add layer of decayed materials rich in bacteria e.g. farm yard manure
- Add a layer of top soil to introduce decomposers in the heap
- Cover the heap at least for three or four weeks so that air can circulate freely.

8.4 Advantages and Disadvantages of using Manures and Fertilizers

Advantages

Since plants need both inorganic and organic manures, below is a list of advantages in the use of organic manures and fertilizers:

- High rate of crop growth results.
- High quality of crop yields.
- Leads to growth of plants that are deep green in colour.
- Increase in size of seed, grain and fruit.
- Strengthen the plant stem that supports the plant.
- Provide necessary nutrients for growth and development of crops.
- Leads to quick ripening of fruits.
- Encourages vegetative growth of crops e.g. kale, cabbage and lettuce where the leaves are harvested.
- Improved the circulation of the air in the soil.
- Releases nutrients to the soil.
- Builds the soil particles.
- Improves the ability to hold water.

Disadvantages

- The leaves get burnt by the fertilizers when they fall on them when meant to be applied on the soil.
- Green manure is expensive to prepare. Most of the farmers grow food crops in their farms and would not like to cut down the crops before maturity so that they can plough them into the soil.
- Green and compost manures take time to decompose thus a delay in planting.
- Bacteria decomposing the materials when preparing manure use the nutrients from the decaying materials and they release these nutrients when they die.
- Crops grown for green manures use most of the water in the soil and leave little for the plants to be planted.
- If the plants do not use them immediately, inorganic manures will pollute the environment.
- If applied in large quantities, some of manures and fertilizers burn (scorch) plants.
- Some fertilizers absorb water in the atmosphere if exposed and stick together.
- Some fertilizers are corrosive and so can affect the hands of users if handled with bare hands.
- Some fertilizers evaporate and escape into the atmosphere when exposed to the sunlight.

UNIT 9
FOOD AND NUTRITION

Specific Objectives
By the end of this topic, the learner should be able to:

- Describe traditional and modern methods of preserving food:
  - Smoking, Salting, Drying, Use of honey
  - Use of low temperatures, Canning
- Name causes of food poisoning and how to prevent food poisoning
- Identity nutritional requirements for special groups

Revision Notes 9

9.1 Traditional and Modern Methods of Preserving Food

Food is any thing taken by an organism to yield energy, growth, and repair without harming it. There are traditional and modern methods that are used to preserve food (especially for human consumption) to avoid contamination by germs.

Traditional Methods of Preserving Food
These are methods that were used earlier before much of advancement in society to keep food in a way that it will not go bad.

Table 9.1: Traditional Methods of Preserving Food

Method	Description
Smoking	This is done to keep e g meat and fish stay longer without going bad. These methods remove water from the food.
Drying/salting/use of honey	Food was dried by these methods and kept in granaries. Drying removes water preventing things to spoil food. It was also smeared honey to avoid rotting. This way it stayed for long period without going bad.

Modern Methods of Preserving Food
These are methods developed with the advancement of science and technology.

Table 9.2: Modern Methods of Preserving Food

Method	Description
Use of low temperatures (fridges)	Food is kept in very low temperatures where it stays longer because germs bacteria are killed by the cold and so rotting does not take place.
Canning	Canned and boiled foods are preserved by adding small amounts of special chemicals called preservatives which kill bacteria.

Both traditional and modern methods lead to proper storage of food because the places foods are kept are free from dirt, filth and darkness.

9.2 Causes and Prevention of Food Poisoning

Causes of Food Poisoning

- Not cooking food at right temperature
- Not chilling food to the correct temperature
- Not maintaining proper hygiene when handling food
- Eating expired food
- Spraying crops with chemicals e.g. pesticides and herbicides
- The general cause of food poisoning is microorganisms like bacteria

Ways of Preventing Food Poisoning

- Cooking food at the right temperature
- Proper storage of food e.g. in refrigerator
- Maintaining good hygiene when handling food
- Taking caution when while handling packed or canned food.
- In general food poisoning can be prevented by keeping food free from germs

9.3 Nutritional needs for special groups
Special groups like pregnant and lactating mothers, infants and the sick (HIV/Aids) need balanced food for growth and development.

Table 9.3: Categories of special groups and their requirements

Category	Description
Pregnant mothers	Balanced diet for the well growth and proper development of the child in the womb.
Lactating mothers	Food rich in calcium to share with the sucking baby for the formation of strong bones, nails and teeth.
Infants	Infants are those aged from 0-4 years. They should be breast fed for at least six months after birth because they are unable to digest food.
HIV/Aids Patients	They need balanced diet to increase their immunity.

UNIT 10
ENERGY

Specific objectives
By the end of this topic, the learner should be able to:

- Describe how light travels, identify transparent, translucent and opaque materials,
- Demonstrate reflection of light and investigate refraction of light
- Name sources of electricity and make simple circuit and investigate good and poor conductors of electricity
- Identify electrical appliances found at home and their uses and safety measures when dealing with electricity and safety measures when there is lighting
- Explain what energy is and different types of energy
- Explain what energy is and different types of energy
- Describe transformation of energy,
- State methods of conserving energy and the need to conserve energy

Revision Notes 10

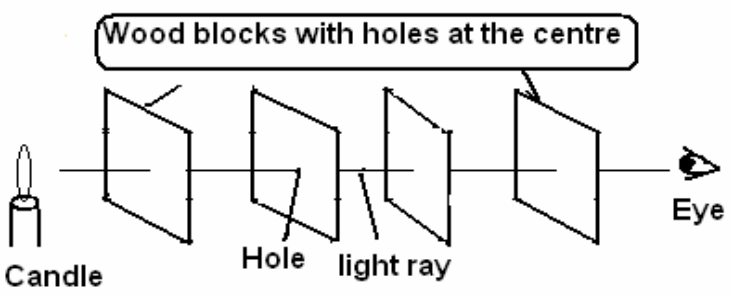
10.1 Light

Traveling of Light

One of the properties of light is traveling in a straight line. But how can we know light travels in a straight line. This can be demonstrated using a set of simple apparatus like a candle and wood blocks with holes at the center.

To investigate whether light travels in a straight line, see the following diagram.

Figure 10.1: Light travel through straight line



Transparent, Translucent and Opaque materials

Various materials are classified under three categories depending on the extent to which light passes through them.

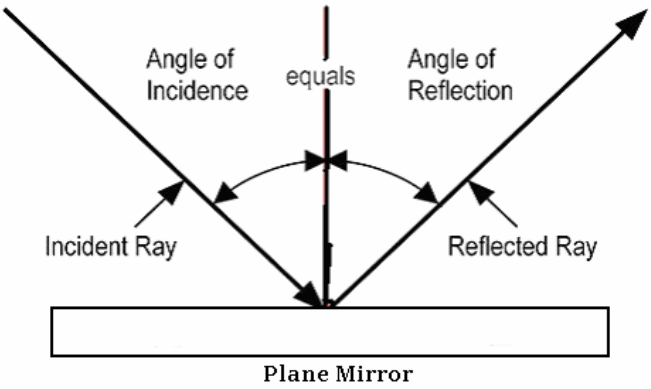
Table 10.1: Transparent, translucent and Opaque materials

Material	Description	Example
Transparent materials	Light passes through some materials	Glass
Translucent materials	These allow only a small amount of light to pass through	Glass used in toilet and shower rooms.
Opaque	materials which do not allow any amount of light to pass through	Wood and stone

Reflection and Refraction of Light

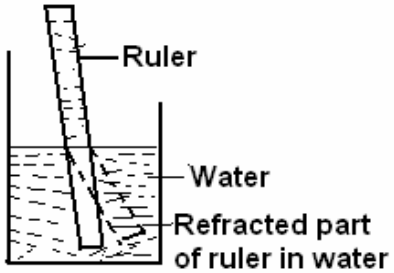
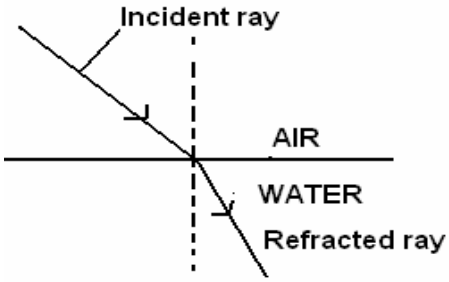
Reflection
Light is reflected when it falls on shiny surfaces. It is reflected at the same angle of indented.

Figure 10.2: Reflection of light



Refraction
It is the apparent bending of light when passing through different transparent mediums e.g. Air to water, Glass to water, Air to glass

Figure 10.3: Demonstration of apparent bending of light in water

a) Refraction ruler in water	*b) Refraction of Light Ray in Water from Air*
	

10.2 Electricity

Electricity is form of energy that is used for lighting, boiling, heating and driving machines in homes, industries and factories

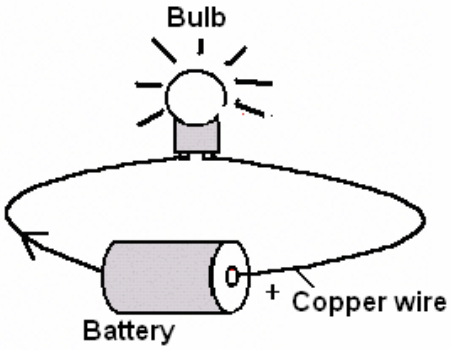
Sources of electricity

This is the major source of energy. Its sources of include the following:

- Hydro-electric power
- Geothermal electricity
- Wind driven turbines
- Solar energy (panels)
- Petrol diesel driven generators
- Thermal electricity
- Batteries e.g. torch and car batteries. They store electricity and simple to carry and can be used to charge small electrical devices
- Bicycle dynamos
- Hydrogen

Demonstration of a simple Electric Circuit

Figure 10.4: Demonstration of Simple Electric Circuit



NB.
As demonstrated by the simple circuit, a copper wire (or any other good conductor) is used to connect the battery and the bulb. It conducts energy from the battery (source of energy). The energy is transformed into light energy.

Good and poor conductors of electricity
Conductors: materials that allow electricity to pass through them. All metals are conductors. The best of all the conductors being:

- Silver
- Copper and Aluminum

Insulators: these are materials which do not allow electricity to flow through them. They are called **non conductors.** Most non-conductors materials that fall in this class are: Rubber, wood, glass, silk and cotton.

Electricity Appliances at Home and their uses

- Iron box: used to remove creases in clothes
- Radio/television: give latest news
- Cooker: for cooking food
- Electric kettle: for boiling water/tea

Safety When Dealing With Electricity

- Do not touch switches with wet hands
- Do not put sticks, pencils, wires in sockets
- Do not overload sockets
- Avoid naked wires
- Incase of a fault consult a specialist

Lighting and Safety Measures

- Fitting lighting arresters
- Do not walk in the open fields when it is raining
- Do not shelter under trees when it is raining

10.3 Meaning and Types of Energy

For many kind of work to be done, an effort must be applied. We apply some effort when we dig and the source of this energy comes from the food we eat i.e. food stored in the muscles.

Energy can be defined as the ability to do work.

There are various types of energy. These are as tabulated.

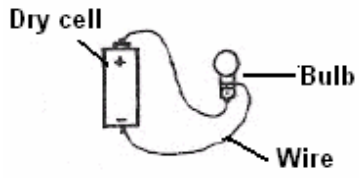
Table 10.2: Various Types of Energy

Type of energy	Description
Chemical energy	Chemical energy is also called stored energy. It is found in such substances such as food and fuel like firewood, charcoal and kerosene. Chemical energy is released when these substances burn or when food is digested.
Heat energy	Some of heat energy sources are: Electricity and burning fuels like gas, fire wood, charcoal and biogas. The main source of heat is sun. the difference in temperature makes the heat to travel from one region to another i.e. from region of high temperature to region of low temperature.
Light energy	Following are some identified sources of light which may e either natural or artificial sources. These sources include: the sun, stars, fire flies, glow worms, candles, fires, electric light bulbs and paraffin lamps.
Magnetic energy	Magnets are able to push or pull thus causing movement. This is called magnetic force. This magnetic force is only applied to magnetic materials. We say that magnets have the ability to do work and so magnetism is a form of energy.
Sound energy	This form of energy is produced when heat energy to light an object vibrates e.g. blowing, hitting or plucking an object produces sound. Musical instruments produce sound energy.

10.4 Transformation of Energy

Energy can be transformed from one state to another. When energy changes from one form to another, this is called transformation of energy.

Figure 10.5: *Transformation of Energy in an Electric Circuit*



This is a closed path which allows electric current to flow. In this the electric current flows through wire and makes the bulb to light and produces some heat. The chemical energy is converted to electrical energy. When the bulb lights, the electrical energy is converted to heat and light energy.

Energy transformation in the circuit can be represented as follows:

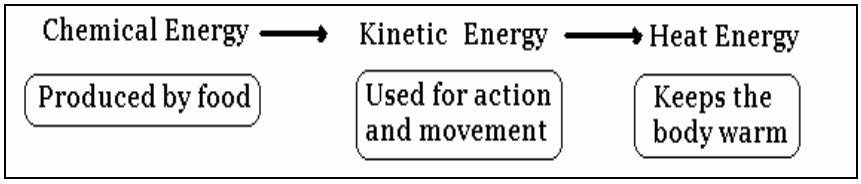
Chemical Energy ⟶ Electrical Energy ⟶ Heat Energy ⟶ Light Energy

Transformation of Food into Energy

Food stores energy. This stored energy is transformed into chemical energy during digestion and further into heat and kinetic energy. This keeps the body temperature constant and the kinetic energy work and to remain active. The surplus (excess) energy is stored inform of fat and is ready to be used where the need arises.

Below is a representation of how food is changed into energy.

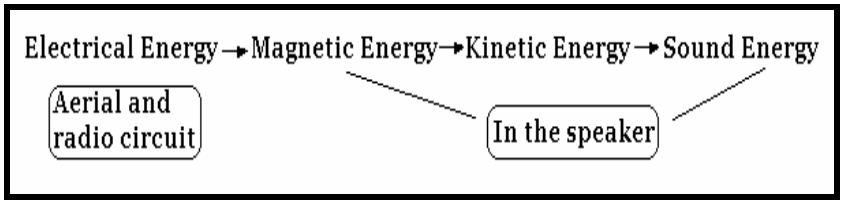
Figure 10.6: Transformation of Food into Energy



Transformation of energy in a radio

Sound from a broadcasting studio is picked by the aerial of the radio in form of electric signal and amplified by electric circuits in the radio. The dry cells in the radio provide the electric energy for amplification. In the speaker of the radio, electric signal is transformed into magnetic energy and moves the diaphragm in the speaker in the way it receives signal. This magnetic energy changes to kinetic (vibration) in the round speaker producing sound energy.

Figure 10.7: *Transformation of Energy in a Radio*



10.5 Methods of Conserving Energy and the Need to Conserve

There are a number of methods of conserving energy. These include:

a) Where possible use public means of transport
b) When traveling in the same direction share the means of transport
c) Use of low fuel consumption vehicles
d) Where possible it is good to use trains for transport of goods and people
e) Walk or cycle for short distances
f) Improvement of road network in the country

g) Light to be switched off when not in use
h) Make use of energy efficient devices like"
- Improved charcoal jikos, stoves
- Low fuel consumption vehicles

The Need to Conserve Energy
Energy needs to be conserved for the basic reason that there is energy that cannot be renewed. Once used, it is gone. This brings us to classification of energy into renewable and non-renewable energy.

Renewable sources
These are sources of energy that cannot be exhausted. Its source can be recycled or reused.

Table 10.3: Examples of Renewable Energy Source

Renewable source of energy	Usage
Solar energy from the sun	It is a natural source of energy. It's used to provide heat instead of wood fuels and petroleum e.g. diesel and paraffin
Wind energy	It is used to turn wind driven pumps. It also serves as an alternative to diesel and petrol. Wind can be used to generate electricity as well.
Biogas	It is produced from animal dung and is used instead of fire wood and kerosene
Planting trees	We need to plant trees since they are good sources of renewable energy. Planting trees improves through: • Wood energy source • Water catchment areas which boosts hydro electric power production and conserves the environment too.

Non-renewable sources
These are sources of energy that cannot be recycled or recovered i.e. once used up, it cannot be recovered.

Examples
Kerosene, petrol, and other petrol fuels
It is recommended that we use renewable sources of energy in order to be able to conserve energy. Unfortunately, most of developing nations still rely heavily on non-renewable sources of energy.

UNIT 11

PROPERTIES OF MATTER

Specific Objectives
By the end of this topic, the learner should be able to:

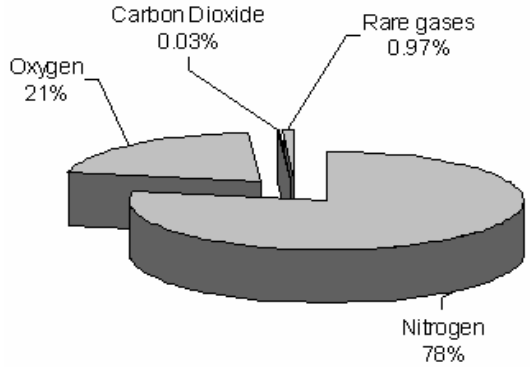
- The components of air and uses.
- Identify solids that dissolve and those that do not dissolve in water
- Identify liquids that mix and those do not mix.
- Identify magnetic and non-magnetic materials.
- Separate mixtures

Revision Notes 11

11.1 Components of Air and uses

There are various gases in the air, at varied percentage.

Figure 11.1: Composition of Air



Air is made up of various gases as listed:

- Nitrogen (78%)
- Oxygen (21%)
- Carbon dioxide (0.03%)
- Inner gas (0.97%)

Table 11.1: Uses of Air

Gas	Use
Oxygen	Burning, Breathing, Germination
Carbon Dioxide	Used during: photosynthesis in plants, respiration in animals and as fire extinguisher,
Nitrogen	Used in making proteins by leguminous plants and animal bodies.

11.2 Solids

Some solids dissolve in water while others do not.

Examples of solids that dissolve in water are:

- Sugar
- salt

Example of solids that do not dissolve in water are:

- Sand
- Flour

11.3 Liquids

Some liquids can be mixed with other liquids while others can not.

Examples of liquids that do mix are:

- Water and fresh milk

Examples of liquids that do not mix are:

- Water and kerosene
- Kerosene and cooking oil

11.4 Magnetic and Non-magnetic materials

Magnets are capable of attracting only some materials and not others. Those which attracts are called **magnetic** and those which do not are called **non-magetic.**

Table 11.2: Examples of magnetic and non-magnetic materials

Magnetic materials	Non-magnetic materials
Can of tin	Pen, paper, set square
Spoon	Copper, Zinc
Safety pin	A shilling coin
Paper clips	Rubber
Metals (Iron, Nickel, alloys (Magnelium, Brass, Bronze, Stainless steel)	

11.5 Separating mixtures

There are many different methods of separating mixtures depending on the mixtures. The methods are summarized in a table.

Table 11.3: *Separation of Mixtures*

Method	Description
Winnowing	It is used when separating solids where one is lighter than the other can be blown by wind e g husks from beans.
Sieving	It is used when separating insoluble solids from a liquid using a sieve e.g. sieving tea leaves from tea before taking it after preparation.
Picking	It is used when separating two solids e g small stones from maize grains or beans by use of hands.
Filtering	It is used when separating tiny insoluble solids from a liquid. It may involve a funnel, filter paper and the liquid e.g. muddy water.
Decanting	Used when separating an insoluble substances settling at the bottom the solvent. When the solvent is poured, the substance remains at the bottom of the container.
Use of magnets	Used in separation of magnetic materials from non-magnetic materials e.g. a mixture of iron-fillings with

	sand may be separated by use of a magnet
Evaporation	Used when separating a solution formed by mixing soluble solute and a solvent. e.g. dissolving salt in water, then heating the solution and cooling the vapour. Both water and salt are obtained separately in their original form without any chemical change.

UNIT 12
MAKING WORK EASIER

Specific Objectives
By the end of this topic the learner should be able to:

- Move objects and stop moving objects
- State what is force and investigate friction and state advantages and disadvantages of friction
- Demonstrate ways of reducing and increasing friction
- Identify positions of fulcrum, load, and effect in different levers,
- Investigate how inclined planes and single fixed pulley make work easier

Revision Notes 12

12.1 Ways of Moving and Stopping Objects

Figure 12.1: A man pushing a wheelbarrow

Ways of making objects move:

- Pushing
- Pulling
- By use of simple machine
  e.g. wheel barrow, as shown

Moving objects can also be stopped. For in stance:

- Stopping a rolling bell
- Stopping a rolling wheel
- Stopping an object pulled with a tied string

12.2 Force, Friction and advantages and disadvantage

- Force can be defined as push or pull.
- Force is measured in units called **Newton** (N in short form).
- We use a balance to measure force

Friction

- Two surfaces rub together creating a motion force called **friction** that comes in to stop the motion.

Disadvantages and Disadvantages of Friction

Advantages

- Walking: if no friction between our soles and the floor, walking would not be possible
- Causes a match to light: heat generated by the match head and the match box helps light the matchstick. The early man made fire by rubbing two dry pieces of wood together.
- Operation on brakes depends on friction.
- Friction between tyre of a car and road makes the car to move

Disadvantages

- Hinders work
- Cause tear and wear
- Friction causes heat ion car engines which if too much may lead the parts to seize up.

Ways of Reducing Friction

Friction can be reduced through the following ways:

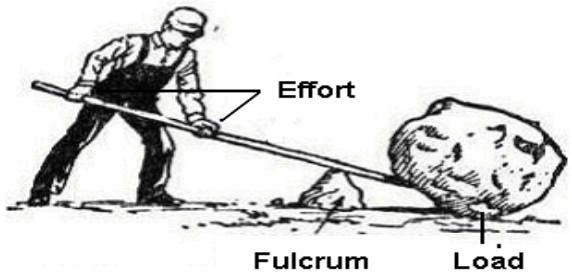
- Rubbing surfaces to make the smooth
- Oiling/greasing places between the surfaces
- Using rollers and ball bearing to reduce friction

12.3 Use of Levers, inclined plane and simple fixed pulleys

Use of Levers

Lever is one example of a simple machine. How levers can be used to make work easier is as illustrated.

Figure 12.2: A man uses lever

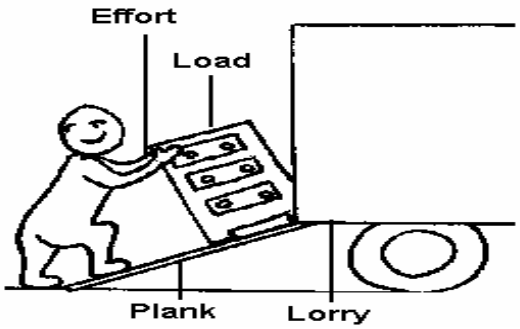


A man uses lever to roll a stone. The lever shows the position of fulcrum, load and effort.

A wheel barrow is also a good example of a simple machine which is used to make work easier.

Use of Inclined Planes

Figure 12.3: *Using a plank to load*



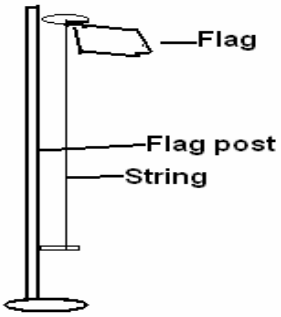
Heavy objects pushed up a sloping plank of wood when being loaded, for instance onto lorries or carts are easily done. We note here that the sloping plank of wood makes work easier. Other examples of inclined planes include ladder, stair case and a road winding up a hill.

Simple Fixed Pulley

A pulley is a wheel having a grooved tin and which can rotate freely about an axle through its centre.

One typical example of a simple pulley is a flag post. See the illustration.

*Figure 12.4**: Simple Pulley***



The single fixed pulley merely changes the direction of the force thus making the working convenient without increasing the force e.g. raising the Kenya National Flag up the flag post.