THE REPUBLIC OF UGANDA

Ministry of Education and Sports

HOME-STUDY LEARNING

PRIMARY 7

SCIENCE

August 2020

NCDC
NATIONAL CURRICULUM DEVELOPMENT CENTRE

Save the Children

UGANDA NATIONAL EXAMINATIONS BOARD

NCDC
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DEVELOPMENT CENTRE

Published 2020

This material has been developed as a home-study intervention for schools during the lockdown caused by the COVID-19 pandemic to support continuity of learning.

Therefore, this material is restricted from being reproduced for any commercial gains.

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FOREWORD

Following the Outbreak of the CoVID-19 Pandemic, Government of Uganda closed all schools and other educational institutions to minimize the spread of the coronavirus. This has affected more than 36,314 primary schools, 3129 secondary schools, 430,778 teachers and 12,777,390 learners.

The COVID-19 outbreak and subsequent closure of all has had drastically impacted on learning especially curriculum coverage, loss of interest in education and learner readiness in case schools open. This could result in massive rates of learner dropouts due to unwanted pregnancies and lack of school fees among others.

To mitigate the impact of the pandemic on the education system in Uganda, the Ministry of Education and Sports (MoES) constituted a Sector Response Taskforce (SRT) to strengthen the sector's preparedness and response measures. The SRT and National Curriculum Development Centre developed print Home- Study Materials, radio and television scripts for some selected subjects for all learners from Pre-Primary to Advanced level. The materials will enhance continued learning and learning for progression during this period of the lockdown, and will still be relevant when schools resume.

The materials focused on critical competences in all subjects in the curricula to enable the learners to achieve without the teachers' guidance. Therefore effort should be made for all learners to access and use these materials during the lockdown. Similarly, teachers are advised to get these materials in order to plan appropriately for further learning when schools resume, while parents/guardians need to ensure that their children access copies of these materials and use them appropriately.

I recognise the effort of National Curriculum Development Centre in responding to this emergency through appropriate guidance and the timely development of these home study materials. I recommend them for use by all learners during the lockdown.



Alex Kakooza

Permanent Secretary

Ministry of EDUCATION AND SPORTS

ACKNOWLEDGEMENTS

National Curriculum Development Centre (NCDC) would like to express its appreciation to all those who worked tirelessly towards the production of home-study materials for Pre-Primary, Primary and Secondary Levels of Education during the COVID-19 lockdown in Uganda.

The Centre appreciates the contribution from all those who guided the development of these materials to make sure they are of quality; Development partners - SESIL, Save the Children and UNICEF; all the Panel members of the various subjects; sister institutions - UNEB and DES for their valuable contributions.

NCDC takes the responsibility for any shortcomings that might be identified in this publication and welcomes suggestions for improvement. The comments and suggestions may be communicated to NCDC through P.O. Box 7002 Kampala or email admin@ncdc.go.ug or by visiting our website at http://ncdc.go.ug/node/13.



Grace K. Baguma
Director,
National Curriculum Development Centre

ABOUT THIS BOOKLET

Dear learner, welcome to this home-study material which has been prepared for you. The material covers content for term 1, II and III.

The content covered has been carefully written covering the different topics in the syllabus. This is an addition to what you had learnt before schools were closed due to outbreak of COVID-19. The content is arranged using simple steps for your understanding. The activities provided in each topic are organised in such a way that they will enable you to relate with your local environment.

The content is organised into lessons. Each lesson has activities and summary notes that help you to understand the concepts. Some lessons have projects that you need to carry out at home during this period. You are encouraged to work individually as you do the practical and interactive activities.

Feel free to try out all the activities in this material.

Enjoy learning

Term 1

THEME: THE ENVIRONMENT

Topic : Energy Resources in the Environment

Dear learner, you are welcome to this P7 integrated Science lesson. You are aware that

all schools are closed and you are now learning from home because of Corona Virus Diseases (COVID-19). This disease is already within our communities and we therefore need to protect ourselves from it. We can do this by staying in our homes, washing hands with clean water and soap regularly for 20 seconds each time you do this, keeping a distance of 2 metres from other people and not touching the soft parts on the face (the nose, mouth and eyes).

Lesson 1: Energy Resources and their Sources

By the end of this lesson, you should be able to;

i) define the term energy resources.

ii) name some of the examples of energy resources in the environment.

iii) describe how different resources can be used to produce useful energy.

What you will need

Pen, notebook, plants, animals, kettle with water, dry maize cob, heat source, razor blade and other things in your environment

Introduction

In Primary Five, you learnt about energy and the different sources of energy. You must have realised that for all the activities we do in our daily life, we need energy and as work is done, energy is changed from one form to another. The different things or resources in the environment that provide us with energy are called **energy resources.**

The following are the examples of such energy resources; wind, water, plants, animals, sun and fossil fuels.

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Resources like wind, water, plants, and animals are called renewable resources because they are naturally replaced while fossil fuels are called non-renewable because they cannot be replaced once they are used up.

The table below shows the different sources of energy and their uses in the environment

Energy resources	Importance (uses)
Solar energy (Heat and light from the sun)	• People use heat from the sun to dry harvested crops and preserve other food by sun drying. • Heat from the sun helps in rain formation by causing evaporation of water bodies and transpiration in plants. • Solar energy is converted into solar electricity. This is done using solar panels or solar cells. Solar lamps, solar radios, solar cookers, and solar heaters and solar water pumps use solar electricity.
Wind energy	• Wind is used in winnowing. This is separating husks (chaff) from seeds or grains. • Wind energy helps in sailing dhows and small boats on water bodies. • Wind energy is used for turning or driving windmills to produce electricity. Electricity produced by windmills can be used to pump water from underground and also for powering grinding mills.
Energy resources from water	***a) For producing hydroelectricity*** Hydroelectricity is produced using kinetic energy from fast running water. Power dams are built with big wheel-like structures called turbines. These turbines are connected to generators. When water at the dam flows across the turbines, the turbines rotate causing the generators to start so that the kinetic energy from the water is changed to electric energy.
	b) For producing steam to run steam engines Steam is vapour from boiling water. Steam has the ability to move things since it possesses kinetic energy. Steam energy is used to power machines like steamboats, steam trains and steamships.
	c) Water tides are used for producing tidal energy A tide is a regular rise and fall in the level of water at the sea or ocean. It is caused by gravitational attraction between the moon and the sun. Turbines are built in places where water tides occur and they are connected to generators for producing electricity.

Energy resources from fossil fuels	• A fuel is anything that can be burnt to produce heat or light energy. Fossils are remains of animals and plants which died millions of years ago. • Petroleum (crude oil), coal and natural gas are fossil fuels because they are formed from the remains of plants and animals which died long ago • Petroleum is separated into different products like petrol, diesel, paraffin which are burnt to produce energy for running different machines. • Coal and natural gas are also burnt to produce heat energy which is used for cooking, boiling water, etc.
Energy resources from plants	• Plants provide us with food in form of fruits, leaves, root tubers and stem tubers. • Plants provide wood fuel. Firewood, charcoal, wood shavings and sawdust are examples of wood fuel which when burnt produce heat energy for cooking food, boiling water, and warming ourselves, etc. • Plants are a source of biofuel. This is fuel made directly from living matter. Bio diesel and bio ethanol are examples of bio fuels. • Plant residues like banana peelings, cassava peelings and potato peelings are used to produce biogas.
Energy resources from animals	• Some animals are used as means of transport, e.g. donkey, camel, horse and oxen. • Animals also provide us with food e.g. milk, meat, eggs from birds, honey from bees. • Animals like oxen are used for ploughing. • Animal dung, urine and droppings are used to produce biogas.

Follow-up activity

In your own free time, try out this experiment at home.

You will need the following materials

Metallic with water, dry maize cob, heat source, razor blade

You may need to do this activity with the guidance from your parents, area teacher or an adult person

Steps to follow

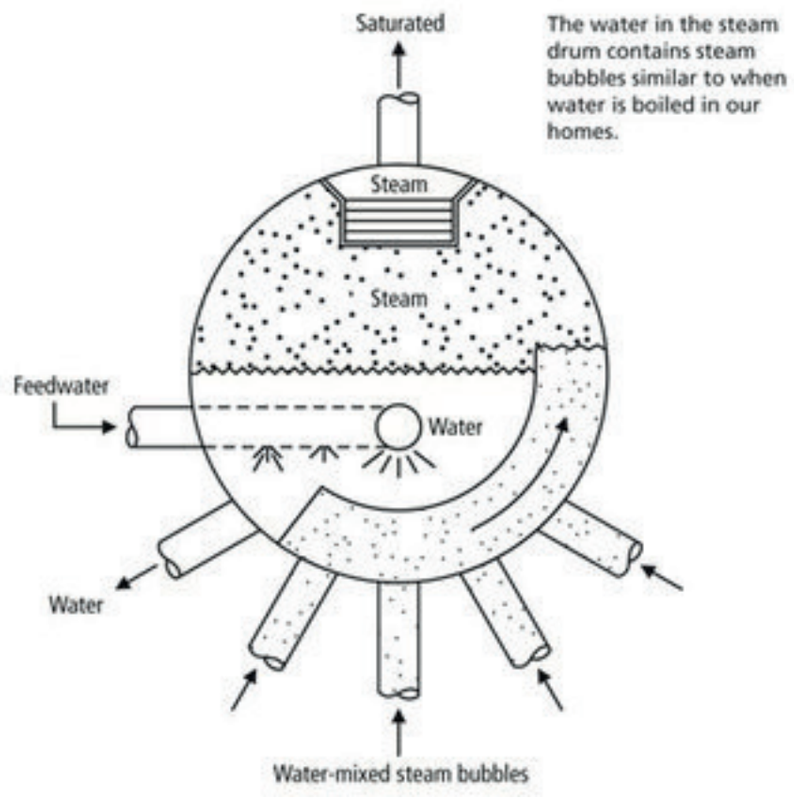
i) Get a kettle with water.

ii) Put it on a source of heat to make the water in the kettle boil.

iii) Observe what happens to the lid as the water keeps on boiling as you increase and reduce on the heat supply.

iv) Insert razor blades into a dry maize cob to make a propeller.

v) Place it near the nozzle of the kettle where the steam comes from.



In your notebook, write your observations.

1. What happened to the lid when;
   i) There was too much heat?
   ii) Heat was reduced?
2. What happened to the propeller as you put it near the nozzle of the kettle?
3. Why did that happen?
4. Share your experiment findings with your parent and teacher when government re-opens schools.

Lesson 2: Production of Biogas

Dear learner, you are welcome into our second lesson about energy resources. You are reminded to always protect yourself from getting the dangerous Corona Virus Diseases (COVID-19). Please follow the Ministry of Health guidelines, always keep a distance of 2 metres from other people, wash or sanitize your hands regularly and do not touch the soft parts on your face.

By the end of this lesson, you should be able to;

i) name the materials used in making biogas.

ii) describe the steps followed when making biogas.

iii) draw and label the structure of a biogas digester.

You will need the following materials

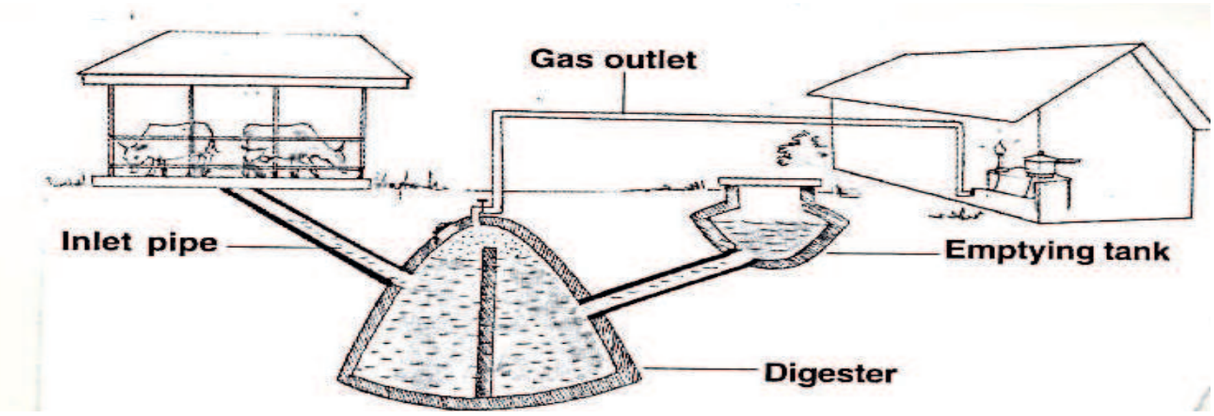
Cow dung, animal urine, animal droppings, peelings of banana, potatoes or cassava, water, a jerry can or tin with its lid and a knife

Introduction

In the previous lesson, you learnt about energy resources and their sources. In this lesson, you are going to learn about how animal wastes and plant residues can be used to produce biogas. The gas is called biogas because it is produced using materials from living things. These can be dead organisms, dead parts or wastes, materials such as cow dung, plant materials and animal urine.

Other than disposing of such materials, we can use them profitably to obtain biogas. These materials are put together in a buried, sealed, air-tight container called a ***digester***. They are left to decompose or ferment with the help of the bacteria upon which biogas is produced. This gas can be used for cooking, lighting or heating.

When the gas formation stops, the remains in the digester are called sludge and can be used as manure in the garden.



Uses of the parts

i) **Inlet pipe** is for putting the plant residues and animal wastes into the digester

ii) **Emptying tank** is where the used up matter is collected and removed then taken to the gardens as manure.

iii) **Digester** is where decomposition or fermentation by the help of bacteria takes place. Water is added into the digester to speed up the rate of decomposition.

iv) **Gas outlet** traps the biogas and directs it to where it is needed for use.

Advantages

1 Biogas burns very cleanly, and produces fewer pollutants during cooking than any other fuel except electricity.

2 Biogas provides heat immediately whenever it is lit no waiting time is required.

3 Most biogas burners can regulate the rate at which the gas burns and the amount of heat that is produced.

4 Biogas can be used for lighting as well.

5 The by-product (slurry) from the digester can be used as fertilizer.

6 Biogas is a renewable fuel.

Disadvantages

1 High costs of constructing the digester, tubes, gas stove, and pots.

2 Biogas can increase the workload of people as it is often made their task to run the digester. It is quite a physical burden to move all the biomass feedstock and water to feed the digester. Also the slurry must be removed and taken to the field.

3 It is not viable for elderly or sick people to run a biogas plant on their own, if they don't have labour to assist them in the maintenance of the digester.

4 Installations (depending on material and location) must be protected against theft and damages. Especially metal tubes are a valuable good and often prone to theft.

5 Cultural rules might not accept the handling of dung or faeces and their use as fuel for cooking.

6 Biogas is difficult to store and to transport to other consumers.

Activity

1. Name any two animal wastes and two plant residues used in production of biogas.
2. State any two uses of biogas.
3. Give any two ways in which the use of biogas for cooking is better than using firewood.

Project work: Making your own biogas

i) Put some cow dung, leaves and other plant and animal materials into a jerry can.

ii) Pour water into the jerry can to make the jerry can half full.

iii) Stir the mixture.

iv) Close the jerry can tightly.

v) Leave the mixture for 3 – 7 days.

You will observe that the jerry can "swells" (becomes bigger). This is because the biogas that is produced accumulates in the jerry can.

Ask your parent or guardian in case you have cattle to access an expert to construct for you a biogas digester.

Term 2

Dear learner; you are welcome into this lesson

We would like to remind you that Corona Virus Disease (COVID-19) is still spreading in our communities. In order to avoid getting this deadly disease, do not get too close to people who are sneezing and coughing, always wear your mask when in public,

THEME: MATTER AND ENERGY

Topic 4: Simple Machines

Lesson 1: Friction

By the end of the lesson, you should be able to;

i) define friction.

ii) explain the usefulness of friction.

iii) describe the dangers of friction.

You will need the following materials

Sand papers, bicycle handles and tyres, shoes, rollers, ball bearings, grease and oil

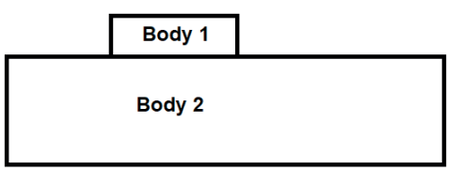
Introduction

Have you ever thought of why people slip easily on wet surfaces? Why can't your ball point pen write properly when there is oil on your paper? Why do you think football players put on boots with spikes? When walking on a marram road with small stones (pebbles), why do you slip easily? Why are the surfaces of the grinding stone made rough regularly? All these are related to friction. In this lesson, you are going to learn about friction.

What is friction?

Friction is a force that opposes movement of two surfaces that are in contact. The two surfaces should be touching each other. When you try to move two pieces of wood over each other, you will feel that it is difficult. That difficulty is because of a force. That force is called friction.

The **nature of the surface** and **weight of an object** are factors affecting friction.



Advantages/application of friction (Friction as a useful force)

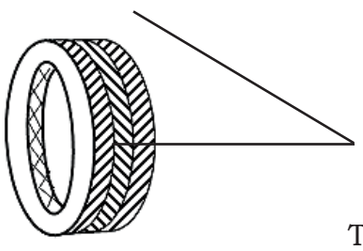
i) Friction helps in writing.
ii) Friction helps in stopping moving cars when the brakes are applied.
iii) Friction helps in sharpening tools.
iv) Friction helps in climbing trees and when moving uphill.
v) Friction helps in striking matchsticks on a matchbox.

Disadvantages of friction (Friction as nuisance)

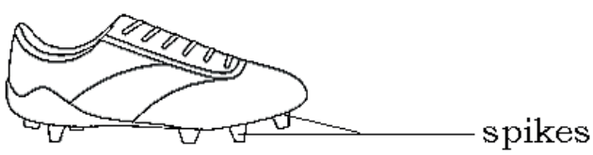
i) Friction causes wear of car tyres and shoe soles.
ii) Friction produces unnecessary heat and noise.
iii) Friction retards work done using machines as it makes people use a lot of force.
iv) Friction reduces the efficiency of machines.

Ways of increasing friction

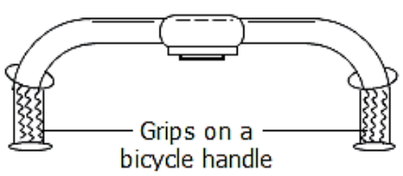
i) Putting treads on car tyres and shoe soles. Treads increase grip between the tyres and the road surface.



ii) Friction can also be increased by tarmacking or placing murram on slippery roads.
iii) Putting spikes on play boots. Spikes increase grip between shoe soles and the ground.

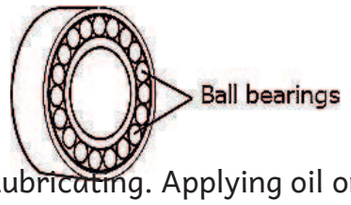


iv) Making bicycle handles with grips. This increases friction so as to prevent the rider's hands from sliding off.



Ways of reducing (decreasing) friction

i) Using ball bearings. They reduce friction by keeping moving parts separate.



ii) Lubricating. Applying oil or grease in moving parts of machines.

iii) Using rollers and wheels. They decrease areas of contact between moving parts.

iv) Streamlining the shape of objects like aeroplanes, cars and boats. The body of fish and birds are naturally streamlined in order to overcome viscosity friction.

Follow up activity

1. Define the term friction.
2. State three ways friction is applied in our daily life.
3. Give two ways in which friction is a nuisance.
4. State a reason why car tyres are made with threads.

Lesson 2: Moment of a Force and Simple Machines

Dear learner, you are welcome into this lesson. In order to avoid the deadly Corona Virus Disease (COVID-19) which is still spreading in our communities, do not get too close to people who are sneezing and coughing, always wear your face mask when in public, always wash your hands with clean water and soap and keep a social distance from other people.

By the end of this lesson, you should be able to;

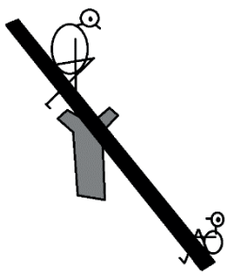
i) define the moment of a force.
ii) state the principle of moments.
iii) do simple calculations related to moments of a force.
iv) define a simple machine.
v) identify examples of simple machines.
vi) make simple machines using local materials.

You will need the following materials

Pair of scissors, seesaw, spade, wheelbarrow, bicycle, etc.

Introduction

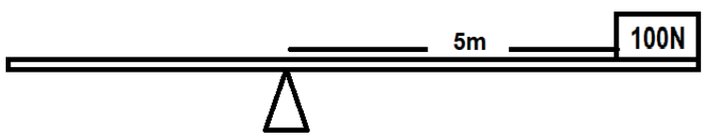
Have you ever seen children playing on a seesaw? Did you notice that a small child can actually lift a big child? When does this happen? Can one child also lift two children? What makes this possible?



In the lesson of today, you are going to explain how these things happen.

The moment of a force

When you try to close a door at a point very close to the hinge, you notice that you need to press very hard. This means you need to use a lot of force. However, if you try to close by pressing at a point far from the hinges, you apply just a small amount of force. The force causes the door to turn and close. This turning effect of a force is called the **moment of the force**. The moment of a force is the product of the force and the distance from the turning point.



For the force above, the moment can be calculated as

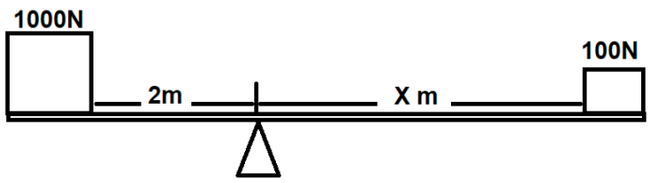
Moment = force x distance

Moment = 100 x 5

Moment = 500 Nm

The principle of moments

The principle of moments states that when a body is in equilibrium, the sum of clockwise moments is equal to the sum of the anticlockwise moments.



The 1000 N force is an anticlockwise force

The 100N force is a clockwise force

From the principle, the sum of the clockwise moments is equal to the sum of the

anticlockwise moments.

1000 x 2 = 100 x

2000 = 100X

Simple machines

A **simple machine** is a device that makes work easier. Machines simplify work. In science, work is said to be done whne a force is moved through a distance. Therefore, work has two components; a force being moved and a distance through which the force is moved. Simple machines make work easier by;

i) Reducing the effort used to overcome the load.

ii) Moving the load over a longer distance when the effort moves through a short distance.

iii) Changing the direction in which the effort is applied.

Examples of simple machines

Hand axes, wheelbarrows, fishing rods, screwdrivers, car jacks and bottle openers are examples of simple machines

Types/classes of simple machines

There are many classes/types of simple machines. However, at our level, we shall discuss six (6) of them, and these are;

i) Levers

ii) Inclined planes

iii) Wedges

iv) Screws

v) Wheels and axles

vi) Pulleys

Follow-up activity

1. Define the term machine.
2. List any **two** ways in which machines make work easier.
3. Apart from levers and inclined planes, mention any **two** other classes of simple machines.

Project

Make a simple machine that can help you carry two jerry cans of water

Lesson 3: Levers

Dear learner; you are welcome into this lesson. You should be aware that Corona Virus Disease (COVID-19) is still spreading in our communities. This disease can be spread through close contact with infected people, saliva droplets from infected persons when they cough near you and mucus droplets or vapour breathed out by infected people. In order to avoid getting this deadly disease, do not get too close to people who are sneezing and coughing and always wear your mask when in public. Also, be aware that some of the infected people do not have signs of this disease.

By the end of this lesson, you should be able to;

i) state the meaning of a lever.
ii) name parts of a lever.
iii) distinguish between the three classes of levers.

You will need the following materials

Wheelbarrow, pliers, pair of scissors, claw hammer, seesaws, models of tools

Introduction

When somebody talks of "lever", I know that your mind goes to that soft internal body organ that you like eating. Indeed, it is nice to eat and has a lot of proteins and minerals. However, the lever you are going to learn about is a simple machine. The spelling is lever not liver, which is an organ.

So what is a lever as a simple machine?

Definition of a lever

A lever is a rigid rod or bar that turns at a fixed point called pivot or fulcrum. There are three main parts of a lever; the **load**, **effort** and **pivot** (**fulcrum**).

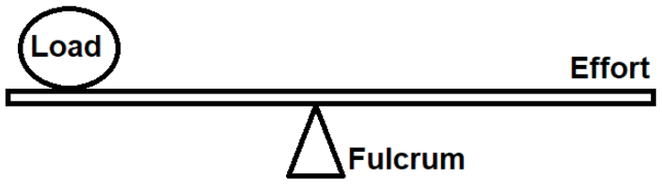
i) **Load** is the object being overcome (moved) by the machine.
ii) **Effort** is the force applied on a machine to overcome the load.
iii) **Pivot** (***fulcrum***) is the fixed point at which a machine turns or rotates.

Classes of levers

Levers are classified according to the position of the **load**, the **effort** and the **pivot** (fulcrum) on a machine.

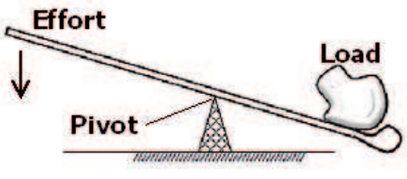
First Class Levers

These are levers in which the **pivot** (fulcrum) is between the **load** and the **effort**.

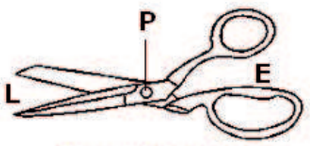


Note: When the effort arm is longer than the load arm, less effort is used to overcome the load. However, when the effort arm is shorter than the load arm, more effort will be needed to overcome the load but the load is moved through a longer distance.

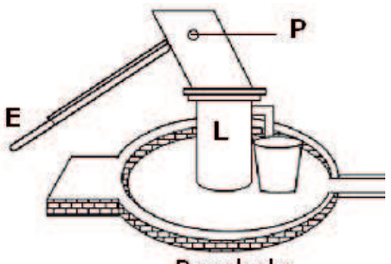
Examples of first class levers



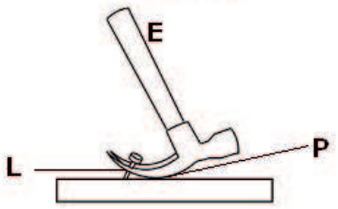
Crow bar



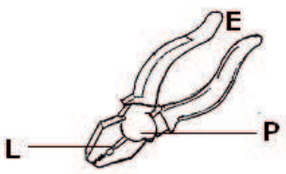
A pair of scissors



Borehole



Claw hammer

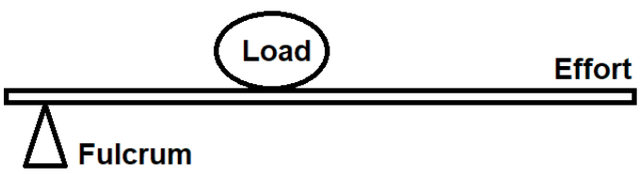


A pair of pliers

Other examples of first class levers are *pincers* and *seesaws*.

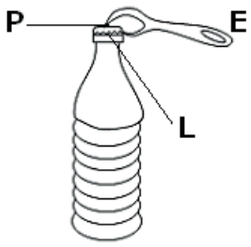
Second Class Levers

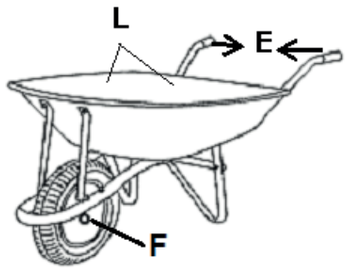
These are levers in which the ***load*** is between the ***effort*** and the ***pivot*** (fulcrum).

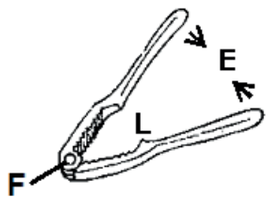


When using a second class lever, the effort is applied at a distance farther from the pivot than the load. First and second class levers are referred to as force multipliers because less effort is applied to overcome a bigger load.

Examples of second class levers







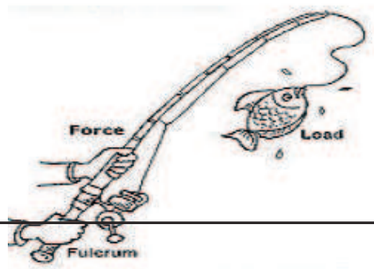
Third Class Levers

A third class lever machine is the one in which the ***effort*** is between the ***fulcrum*** and the ***load***.

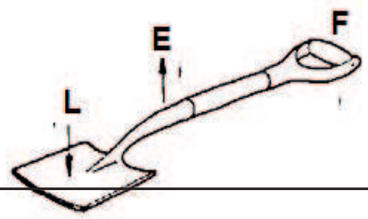


For the third class levers, the distance moved by the load is greater than the distance moved by the effort. The advantage of using third class levers is that they are ***distance multipliers***.

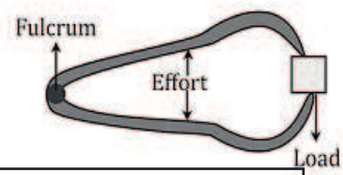
Examples of third class levers include: pair of tongs, tweezers, forceps



Fishing rod



Spade



Pair of tongs

Uses of levers in daily life

i) Pair of sugar tongs is used to hold glowing charcoal.
ii) Pair of scissors is used for cutting papers and clothes
iii) Claw hammers are used for driving nails into wooden materials.
iv) For fishing using fishing rods.
v) For opening bottles using bottle openers.
vi) For transporting things using a wheelbarrow.

Project work: Make your own simple machines

Use local materials from the environment to make different simple machines

Lesson 4: Inclined Planes and Wedges

Dear learner; you are welcome into this lesson

I would like to remind you that Corona Virus Disease (COVID-19) is still spreading in our communities. In order to avoid getting this deadly disease, do not get too close to people who are sneezing and coughing, and always wear your face mask when in public.

By the end of this lesson, you should be able to;

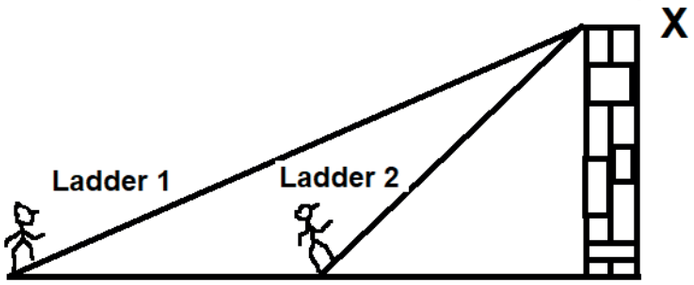
i) define an inclined plane.
ii) identify where inclined planes are used in daily life.
iii) define wedges.
iv) identify applications of wedges.

You will need the following materials

staircases, ladders, ramps, model of ladder from local materials, knives/ pangas, razor blades, wooden wedge, axe

Introduction

Below are two ladders used to climb a wall to point X.



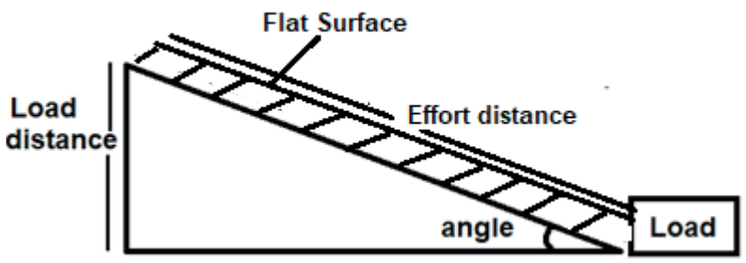
In case you were given these two ladders, which ladder will make you;

1. walk a longer distance to reach X?
2. Feel a lot of pain in your thigh muscles when climbing?

The two ladders represent a type of simple machines called inclined planes.

Inclined planes / slopes

An **inclined plane** is a simple machine made up of a flat surface raised at an angle.



Importance of inclined planes

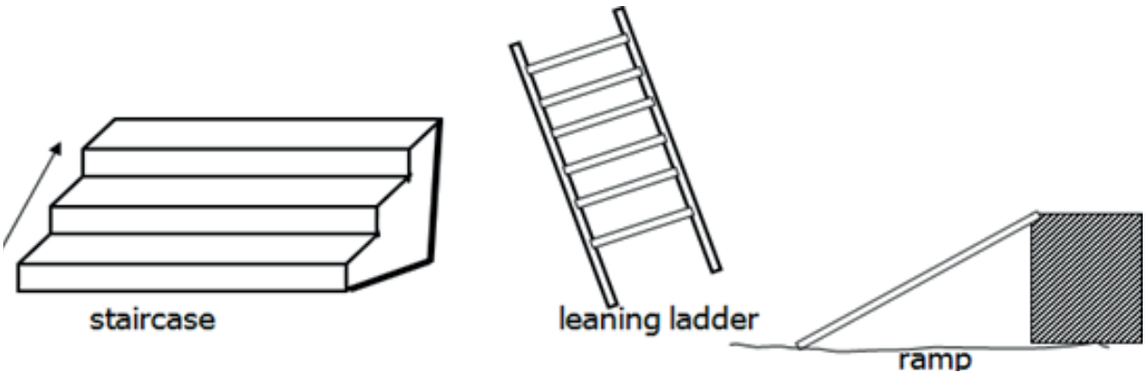
i) They are used for rolling heavy loads to higher levels.

ii) They are used to load and offload vehicles.

iii) They help people to climb raised places like storied buildings, hills, etc.

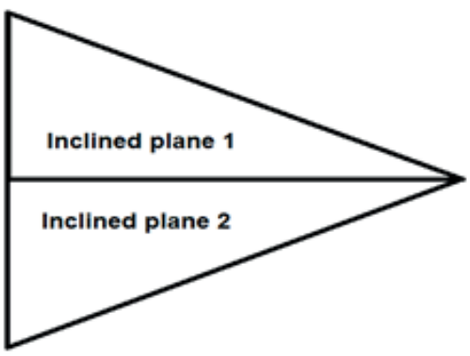
Note: Less effort will be used when the slope is longer and gentler.

Examples of inclined planes



Wedges

A wedge is a double inclined plane with a sharp edge. Cutting edges of most hand tools are the shape of a wedge. Knives, axes, hoes, nails and rakes, among others, have cutting edges in the shape of a wedge.



Uses of wedges

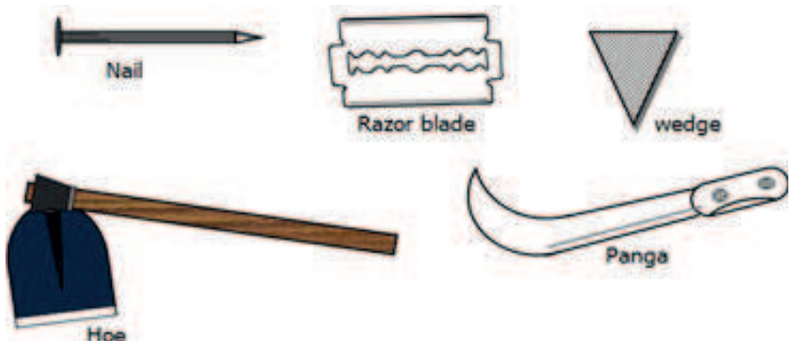
i) They are used for splitting some objects like wood into smaller pieces.

ii) They are used for cutting some objects into parts

iii) Some wedges are used for peeling

iv) They are used for piercing and widening holes on objects.

Examples of wedges



Lesson 5: Wheel and Axle Machines

Dear learner, you are welcome into this lesson. You are aware that all schools are closed and you are now learning from home because of Corona Virus Diseases (COVID-19). This disease is already within our communities and we therefore need to protect ourselves from it. We can do this by staying in our homes, washing hands with clean water and soap regularly for 20 seconds each time you do this, keeping a distance of 2 metres from other people and not touching the soft parts on the face (the nose, mouth and eyes).

By the end of this lesson, you should be able to;

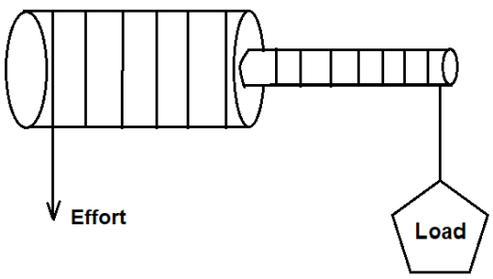
i) define wheels and axles.
ii) identify the parts of a wheel and axle machine.
iii) mention applications of wheel and axle machines in daily life.

You will need the following materials

A model of a wheel and axle, a model of windlass, steering wheel, a screw driver, a door knob, a wheel spanner

Wheel and axle systems

A wheel and axle system consists of two cylinders connected together. The bigger cylinder is the wheel and the smaller one is the axle. The two cylinders are connected by a string. The load and effort are attached to the string. The two cylinders rotate together. Usually, the load is attached to the axle while the effort is attached to the wheel.



Applications of wheel and axle machines

i) They are used for drawing water from underground tanks using a windlass.
ii) For drilling holes on wooden materials using a brace.

iii) For fixing and removing screw nails using a screwdriver.
iv) They are used for preparing eggs for frying using an eggbeater.

Lesson 6: Pulleys

Dear learner, you are welcome into this lesson. I would like to remind you that Corona Virus Disease (COVID-19) is still spreading in our communities. In order to avoid getting this deadly disease, do not get too close to people who are sneezing and coughing, always wear your face mask when in public and drink plenty of boiled water or fruit juice regularly to boost your immunity.

By the end of this lesson, you should be able to;

i) describe what a pulley is.
ii) differentiate between the different types of pulleys.
iii) identify applications of pulleys in daily life.

You will need the following materials

Model of single fixed pulley; flag pole, curtain lines, clay or wooden models of pulleys, strings, a bucket of sand and a string

Introduction

When hoisting the school flag, does one person have to climb up to pull the flag? I guess not. So what makes it possible that a person standing on the ground pulls the flag upwards?

Up on the flag post is a pulley. This pulley helps to change the direction in which force is applied. In this lesson, you are going to learn about pulleys, what they are and how they work.

What a pulley is

A pulley is a wheel with a grove along which a string passes. The wheel rotates freely on a fixed axle. The groove prevents the rope or chain from sliding (slipping) off the rim. A frame holds or supports the pulley.

Types (Classes) of pulleys

There are three types of pulleys which include;

i) Single fixed pulleys
ii) Single movable pulleys
iii) Block and tackle pulleys

Single fixed pulleys

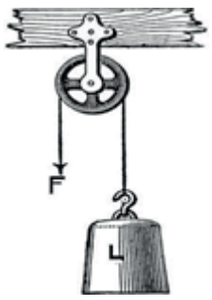
A single fixed pulley is a pulley system where the wheel is held in one position. In these pulleys, it is the load and the effort that move.

Characteristics of single fixed pulleys

i) The wheel does not move
ii) The effort applied is equal to the load.
iii) Single fixed pulleys change the direction of force.
iv) The mechanical advantage (M.A) of a single fixed pulley is one (1).

Note: Mechanical advantage of a machine is the ratio of load to the effort

Illustration of a single fixed pulley



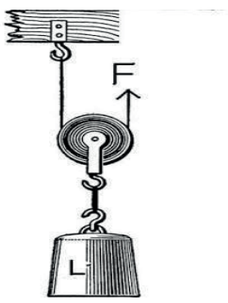
Uses of single fixed pulleys

i) They are used for hoisting flags.
ii) They are used to move window curtains.
iii) They are used to lift building materials on top of tall buildings.

Single movable pulleys

A single movable pulley is a pulley system where the wheel is attached to the load and moves with the load. The pulley is supported on two ropes and each rope shares a half of the force of the load. The effort needed is half the load. Therefore, the mechanical advantage and velocity ratio of a single movable pulley is two.

Illustration of a single movable pulley



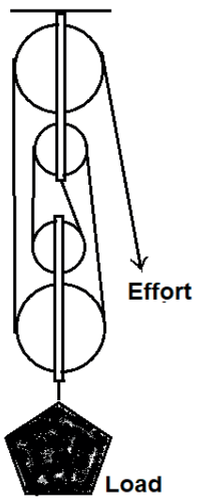
Uses of single moveable pulleys

- In lifting water from deep wells
- In carrying heavy materials in construction sites

Block and tackle pulleys

This is the pulley system where ***a* fixed block** and ***a* movable block** are joined together to do work. The load is attached to the moveable block. The mechanical advantage is determined by the number of pulleys. A block and tackle system reduces the effort needed to overcome the load.

Illustration of *a* block and tackle system



Uses (importance) of pulleys

i) They are used for hoisting flags on flagpoles.
ii) Pulleys are used to move window curtains.
iii) They are used in cranes for lifting heavy loads during building.
iv) Pulleys are used for towing vehicles with mechanical problems.
v) They are used in offloading heavy vehicles.
vi) Pulleys are used in scaffold to paint high rise buildings.

THEME 5: HUMAN BODY

Topic: Excretory System

Dear learner, you are welcome into this lesson. You are aware that all schools are closed and you are now learning from home because of Corona Virus Diseases (COVID-19). This disease is already within our communities and we therefore need to protect ourselves from it. We can do this by staying in our homes, washing hands with clean water and soap regularly for 20 seconds each time you do this, keeping a distance of 2 metres from other people and not touching the soft parts on the face (the nose, mouth and eyes).

Lesson 1: Excretion and Excretory Organs

By the end of this lesson, you should be able to;

i) define the term excretion.
ii) identify the excretory organs.
iii) name the excretory products.
iv) give the importance of excretion.

You will need the following materials

Pen, exercise book, pencil, models of excretory organs

Introduction

In P5 and P6, you learnt about different human body systems and their roles. When you eat food, it is digested and absorbed into the body. The carbohydrates are broken down to release energy by the process of respiration. During the process, the human body produces some waste materials.

These waste materials need to be removed from the body because when they are allowed to stay in our body for long, they can cause damage to the body organs or even poison our blood. The process of removing waste materials from the body is called ***excretion*** and the body system which removes waste materials is called ***excretory system***.

Importance of excretion in humans

i) Excretion helps to keep the internal body temperature (homeostasis) stable.
ii) Excretion prevents blood poisoning due to accumulation of wastes.
iii) Excretion prevents damage of body organs due to accumulation of wastes.

Excretory organs and excretory (waste) products in the human body

Excretory organ	Excretory products
Lungs	Carbon dioxide, water vapour
Kidneys	Urine (water, salts, nitrogenous wastes)
Skin	Sweat (water, salts and nitrogenous wastes)
Liver	Bile pigments

We cannot refer to faeces as an excretory product. This is because it is not produced by the body. Not all the food we eat can be broken down and absorbed by the digestive system. Faeces is the part of the food that could not be digested and absorbed.

Lesson Activity

1. Define the term excretion.
2. State any two importances of excretion to the human body.
3. Name the excretory organ which removes;
   i) urine
   ii) carbon dioxide and water vapour
   iii) bile pigments
   iv) sweat

Lesson 2: Human Skin

Dear learner, you are welcome into this lesson. Please be informed, "The Ministry of Health has confirmed that some people infected by the dangerous Corona Virus Disease do not show signs of sneezing or coughing. You are therefore encouraged to always keep a distance of 2 metres from other people and do not touch the soft parts on your face (nose, eyes and mouth) with unwashed hands in order to protect yourself from getting this disease that has killed millions of people across the world".

By the end of this lesson, you should be able to;

i) name the parts of the skin.
ii) give the functions of the parts of the skin.
iii) give the general functions of the skin.

You will need the following materials

Pen, pencil, exercise book, model of the human skin

Introduction

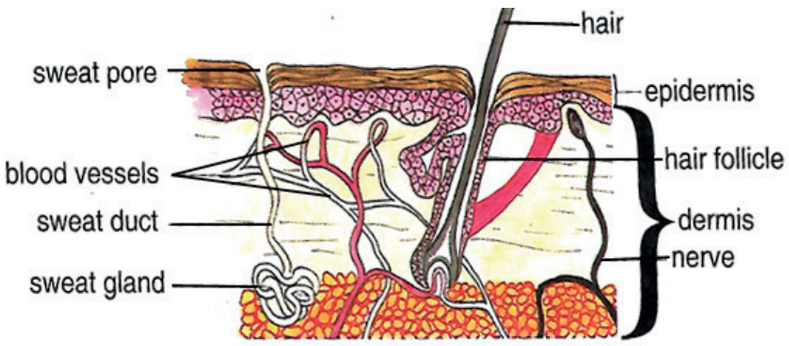
Imagine what your body would look like without any outer covering, would the meat and other organs inside your body be in one place? What about your blood? Think about

what would happen when you pass through water or a bush. Have you ever participated in any physical exercise such as playing football, netball, running and other heavy work? What happens when you play those games for a long time?

The human skin is the sense organ for feeling. It covers almost all parts of the body except the eyes, toenails and fingernails. The skin is therefore the largest organ of the human body. The human skin removes sweat from your body. This helps your body to cool when the sweat evaporates from the skin surface. Sweat is formed by ***excess water, excess salts, urea*** and ***lactic acid.***

The skin has two layers, the upper layer is called epidermis and the inner layer is called dermis. These layers are sometimes seen when a wound on your body is healing.

The structure of the human skin



Functions of the parts of the skin

i) **Blood vessels** supply food and oxygen to the skin and transport waste products to their organs of excretion.

ii) **Sweat glands** produce, store and secrete sweat.

iii) **Sweat duct** transports sweat to the skin surface.

iv) **Sweat pores** let out sweat.

v) **Hair follicles** produce body hair. Hair stands upright on cold days to trap escaping heat. This prevents heat loss from the body.

vi) **Nerves** transmit impulses for heat, touch and enable the skin to detect change in temperature.

Functions of the human skin

i) The skin is the sense organ for feeling.

ii) The skin excretes sweat from the body.

iii) The skin regulates body temperature.

iv) It manufactures vitamin **D** by the help of sunlight energy.

v) It protects the body against germ invasions.

vi) The skin stores fats which keep the body warm.

Lesson Activity

i) Name the sensory organ for feeling in the human body.

ii) What is the source of the energy used by the skin to make vitamin D?

iii) In which way is sweating important to the human body?

Lesson 3: Diseases and Disorders of the Skin

Dear learner, you are welcome into this lesson. Corona Virus Disease (COVID-19) is real and it exists in different parts of Uganda. You should take care of yourself because this disease is still spreading and new cases are still being reported every day from different communities. Always wash your hands with clean water and soap, maintain social distancing of 2 metres from other people and stay at home.

By the end of this lesson, you should be able to;

i) name the diseases and disorders of the human skin.

ii) explain how skin diseases can be prevented / treated.

iii) describe ways of taking good care of the human skin.

You will need the following materials

Pen, exercise book, pencil, model of the skin, bathing soap, sponge and clean water

Introduction

You have already learnt about various diseases and disorders affecting the different body organs and systems in the previous classes. Some of these diseases are caused by different types of germs such as bacteria, fungi and viruses which you learnt in P4. Diseases harm our body and every organ of the human has its own diseases.

In this lesson, you are going to learn about different diseases affecting the human skin and the skin disorders. The table below shows the common diseases affecting the human skin, their causes, ways through which they can be spread among people and the safety measures that we need to take to avoid getting them.

Disease	Cause(s)	How it spreads	Signs and symptoms	Prevention, control and treatment
Athlete's foot	Fungus	• Through sharing shoes or stockings with an infected person • Wearing dirty stockings for long	• Peeling of skin between toes • Wounds between toes	• Apply anti-fungal powder to absorb the fluid between toes • Avoid sharing shoes and stockings • Wash stockings regularly
Ringworm infections	Fungus	• Through sharing clothes, beddings, sponges and combs with an infected person	• Round white patches on the skin	• Avoid sharing clothes, beddings and sponges with an infected person
Impetigo	Bacteria	• Through body contact with an infected person	• Red skin sores • Yellowish-brown crust	• Early treatment of infected people using antibiotics • Avoid body contact with infected persons
Chicken pox	Virus	• Through body contact with an infected person • Through sharing clothes, basins and beddings with an infected person	• Small blisters on the skin	• Avoid sharing clothes, basins and beddings with an infected person • Avoid body contact with infected people

Disorders of the human skin

i) **Albinism**: Lack of colour in the skin. When a person lacks melanin pigment, he or she becomes an albino.
ii) **Burns**. Skin injuries caused by dry heat.
iii) **Scalds**. Skin injuries caused by wet heat.
iv) **Cuts** and **wounds**. These are caused by sharp objects

Ways of caring for the human skin

i) Bathing with clean warm water and soap regularly.
ii) Smearing the skin with Vaseline to keep it soft.
iii) Doing regular physical exercises.
iv) Do not bleach your skin. Chemicals for bleaching increase chances of getting skin cancer

v) Avoid sharing clothes, bed sheets, basins and sponges with other people.

vi) Avoid playing with sharp objects and fire.

Lesson activity

i) State the cause of athlete's foot in humans.
ii) Apart from athlete's foot, name two other diseases which affect the human skin.
iii) Give three ways of caring for your skin.

Lesson 4: The Human Kidneys and the Urinary System

Dear learner, you are welcome to this lesson. COVID-19 is still spreading in our communities. In order to avoid getting this deadly disease, do not get too close to people who are sneezing and coughing, always wear your face mask when in public, always wash your hands with clean water and soap.

By the end of this lesson, you should be able to;

i) draw and label the human urinary system.
ii) describe the functions of the kidneys.
iii) practice proper ways of caring for the kidneys and the urinary system.

You will need the following materials

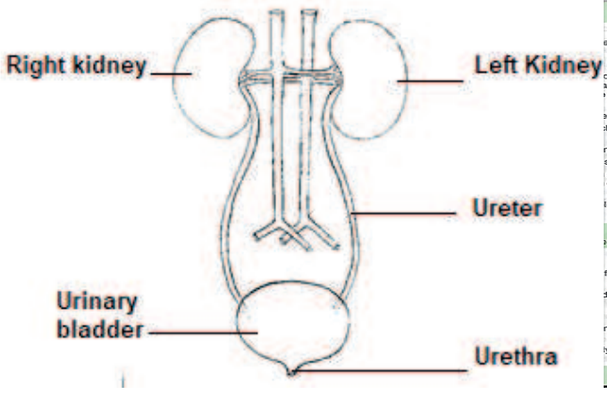
Pen, pencil, exercise book, model of the kidney

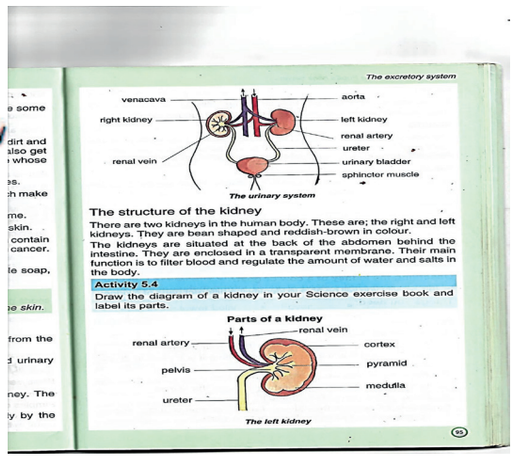
In P4, you learnt about kidneys as organs in the human body whose function is to filter blood. The kidneys also regulate the amount of water and salts in blood and produce a hormone which helps in production of red blood cells.

In this lesson, you are going to learn about the role of kidneys in removing waste materials from the body. Your heart pumps blood which goes to other body organs as it carries other materials like food. However, the excess salts and excess water in food and protein wastes (e.g. urea and uric acid) need to be removed from the blood and also out of the body.

The kidneys together with other organs like the ureter and urinary bladder make up a system called the "Urinary System" which helps to remove these waste materials as urine.

The Structure of the urinary system and a kidney




The excretory system

venacava
aorta
right kidney
left kidney
renal artery
renal vein
ureter
urinary bladder
sphincter muscle

The urinary system

The structure of the kidney

There are two kidneys in the human body. These are; the right and left kidneys. They are bean shaped and reddish-brown in colour.
The kidneys are situated at the back of the abdomen behind the intestine. They are enclosed in a transparent membrane. Their main function is to filter blood and regulate the amount of water and salts in the body.

Activity 5.4

Draw the diagram of a kidney in your Science exercise book and label its parts.

Parts of a kidney

renal vein
renal artery
cortex
pyramid
pelvis
medulla
ureter

The left kidney

95

Functions of the parts

i) ***Renal artery*** carries oxygenated blood to the kidney.
ii) ***Renal vein*** carries deoxygenated blood away from the kidney.
iii) ***Kidneys*** produce urine.
iv) ***Pelvis*** collects urine before it moves to the urinary bladder.
v) ***Ureter*** transports urine from pelvis to the urinary bladder.
vi) ***Urinary bladder*** stores urine before it is passed out of the body.

Project work

Design your own model of the urinary system. Include; the blood vessels, kidneys, ureter, and the urinary bladder

You can cut out this from a box or use clay and drinking straws to make it.

Ways of caring for the human kidneys

i) Having regular physical exercises.
ii) Feeding on a balanced diet regularly.
iii) Drinking plenty of safe water regularly.
iv) Avoid eating food that is too salty.
v) Avoid holding back urine.
vi) Going for medical check-ups regularly.

Diseases of the kidneys and the urinary system

i) Kidney stones
ii) Kidney failure
iii) Bilharzia
iv) Nephritis
v) Kidney cancer

THEME 6: MATTER AND ENERGY

TOPIC: LIGHT ENERGY

Dear candidate; you are most welcome to this lesson. You are aware that all schools are closed and you are now learning from home because of COVID-19. This disease is already within our communities and we therefore need to protect ourselves from it. We can do this by staying in our homes, washing hands with clean water and soap regularly for 20 seconds each time you do this, keeping a distance of 2 metres from other people and do not touch the soft parts on the face (the nose, mouth and eyes).

Lesson 1: Effects of Different Materials on Light

By the end of this lesson, you should be able to;

i) identify the beams of light.

ii) describe the effects of different materials on light.

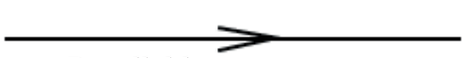
You will need the following materials

Glass, burning candle or torch, piece of wood, pen and book, oiled paper, black polythene paper

Introduction

You have already learnt about the natural and artificial sources of light in P3. You also learnt about the characteristics of the forms of energy in P5. In this lesson, you are going to learn about the behaviour of light when it meets different materials in the environment.

Light travels along a straight path and does not bend at corners. The path along which light travels is called "a ray of light". A ray of light is represented using an arrow. The head of the arrow shows direction of light.

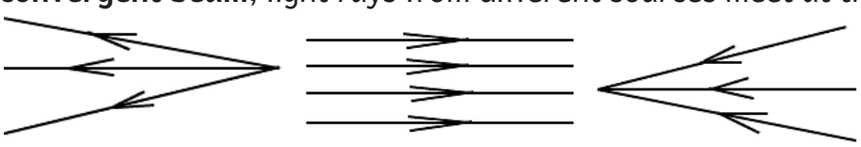


A ray of light

Parallel beam *Divergent beam* *Convergent beam*

A group of light rays travelling in the same direction is called beam. This can be ***parallel beam***, ***divergent beam*** and ***convergent beam.***

- In **parallel beam,** the light rays do not meet and have the same distance apart.
- **Divergent beam** is where light rays from the same source spread into different directions.
- In **convergent beam**, light rays from different sources meet at the same point.



You are aware that there are different objects in your environment. Some of them

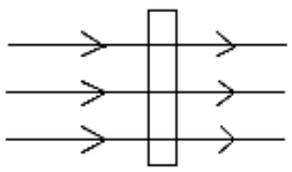
allow all the light to pass through them, others allow only less light to pass through and some block all the light.

i) Objects that allow light to pass through completely are called ***transparent objects.***

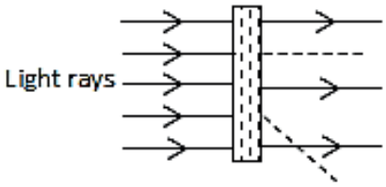
ii) Objects that allow light to pass through but you cannot see clear images through them are called ***translucent objects.***

iii) Objects that allow no light to pass through them are called ***opaque objects***. No image can be seen through an opaque object.

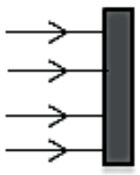
Diagrams showing effects of different materials on light



Transparent object



Translucent object



Opaque object

Lesson activity

1. Define the term beam of light.
2. Name any two types of beams of light.
3. Briefly explain the difference between opaque objects and transparent objects.
4. In this activity, you will flash light towards the objects in the table, one after the other, and record whether the light passes completely, partially (less light passes) or light is blocked (doesn't pass).

No.	Object	Can light pass through	Can clear images be seen through	Type of materials
1.	Clear glass			
2.	Colourless polythene bag	All light passes through	Clear images are seen through	transparent
3.	Piece of iron			opaque
4.	Piece of wood	No light passes through		
5.	Stone			
6.	Coloured polythene bag		No clear images are seen through	
7.	Oiled paper	Light can pass through		
8.	Light cloth			
9.	Piece of rubber	No light can pass through	Opaque object	

Lesson 2: How Shadows and Eclipses are Formed

Dear learner; you are most welcome. You are aware that the government of Uganda has closed all schools due to widespread of the Corona Virus Disease. This disease mainly spreads through saliva and mucus droplets from an infected person. You need to do the following in order to protect yourself against the virus; always wash your hands with clean water and soap, do not touch other people in the community and wear your face mask while in public.

By the end of this lesson, you should be able to;

i) define shadow and eclipse.

ii) explain how shadows are formed.

iii) name the parts of a shadow.

iv) identify types of eclipses.

You will need the following materials

Burning candle or torch, white sheet of paper, lemon fruit, stick, a tin (you can make your tin by cutting plastic water bottle

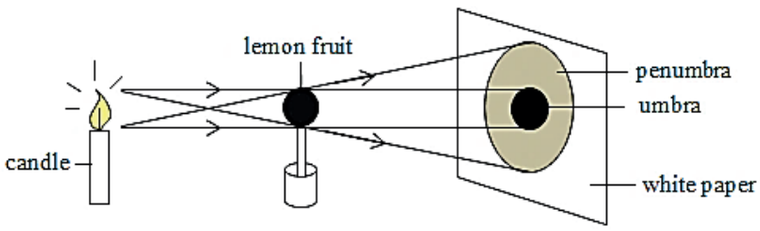
What you should do (steps to follow)

i) Fill the tin with soil.
ii) Fix the lemon fruit onto a stick and fix the free end of the stick into the tin with soil.
iii) Pin the white sheet paper to the wall at the same height of the stick holding the fruit.
iv) Move the tin with the lemon fruit near to the paper on the wall.
v) Flash light direct onto lemon fruit as you observe what is formed on the paper.
vi) Repeat the steps while using other opaque objects.

Summary

From the above activity, the lemon fruit blocks light and forms a dark region on the paper. This dark region is called a ***shadow***. A ***shadow is the region of darkness formed when an opaque object blocks light***. The size of the shadow formed depends on the size of the source of light and the distance of an object from the source of light.A shadow has ***two*** parts; the dark inner part of a shadow is called ***umbra*** while the light outer part is called ***penumbra***.

Parts of a shadow



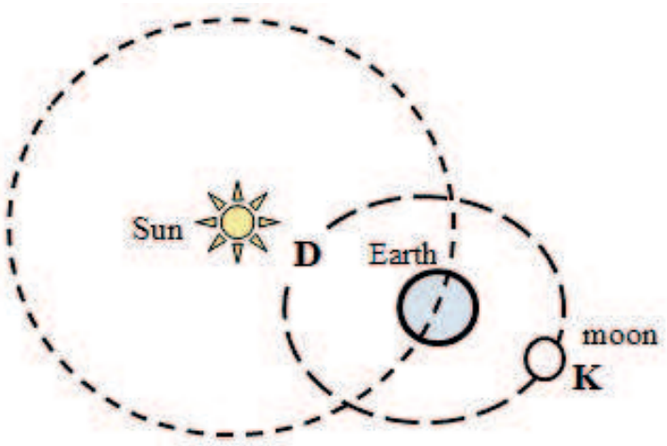
Umbra is formed by total blockage of light while penumbra is formed when light is partially blocked.

Eclipses

You have learnt that total blockage of light forms umbra while partial blockage of light forms penumbra. In nature, the earth revolves around the sun while the moon revolves around the earth. At a certain time in a year, the moon passes between the sun and the earth such that all the three bodies are in a straight line. The moon will block the sun's light and its shadow is formed on the earth. This condition is called solar eclipse or eclipse of the sun.

There are also periods in some years when the earth passes between the sun and the moon. The earth being opaque will block the sun's light and form a shadow on the moon. This is called lunar eclipse or eclipse of the moon.

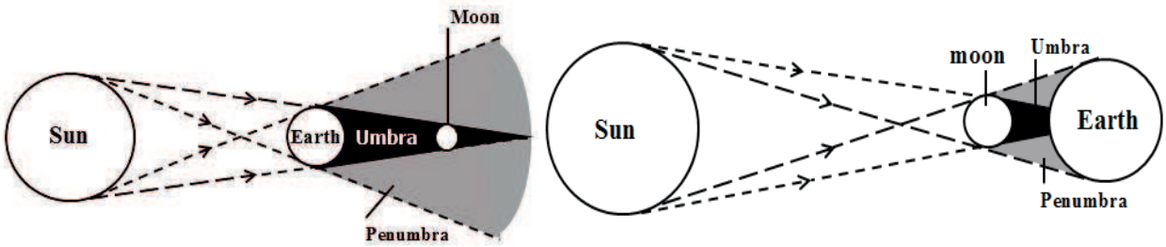
The diagram below shows how the moon and the earth revolve to form eclipses.



When the moon revolves and reaches point **D**, *a* solar eclipse is formed. When the moon revolves and reaches point **K**, *a* lunar eclipse is formed. ***An eclipse*** is the partial or total blockage of sunlight by either the moon or the earth.

Activity

1. E
2. xplain the difference between *an* eclipse *and a* shadow.
3. Below *are* types of eclipses. Which type of eclipse is marked A *and* B?



A …… ii) B ……

Lesson 3: Reflection of Light

Dear learner, welcome to this lesson about reflection of light. You are aware that the government of Uganda has closed all schools due to widespread of the Corona Virus Disease. This disease mainly spreads through saliva and mucus droplets from an infected person. You need to do the following in order to protect yourself against the virus; always wash your hands with clean water and soap, do not touch other people in the community and wear your face mask while in public.

By the end of this lesson, you should be able to;

i) define the term reflection of light.
ii) state the laws of reflection.
iii) state the importance of reflection of light in daily life.

Calculate simple problems on reflection of light

You will need the following materials

Torch, dressing mirror, black polythene bag, clear water in a clean container, exercise book, pen and pencil

Introduction

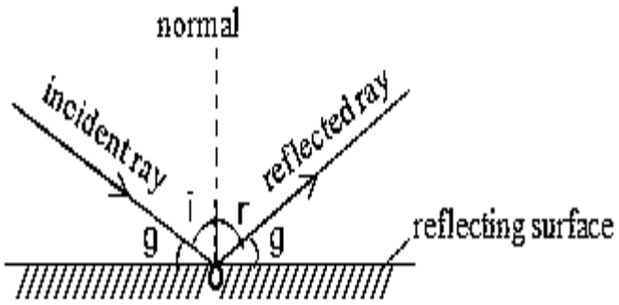
You learnt about reflection of heat and reflection of sound in P5 and P6 respectively. You have also learnt the effects of different materials on light in Lesson One of this topic. In this lesson, you are going to learn about reflection of light.

When light rays fall on an object;

i) they may pass through that material or get blocked.
ii) they may bend as they pass through that material.
iii) they may be absorbed or bounced back.

The bouncing back of light rays is called ***reflection***. Reflection of light usually takes place when light rays fall on shiny objects or surface. A ray of light which hits the shiny surface is called ***incident ray*** and when it bounces off, it is called ***reflected ray***. There is also an imaginary line in the centre of the reflecting surface at an angle of 90^0 called the ***normal.***

Diagram showing how light can be reflected



Key

i is called angle of incidence. It is the angle between incident ray and the normal.

r is angle of reflection. It is the angle between the reflected ray and the normal.

g is the glancing angle. This is the angle between the incident or reflected ray and the reflecting surface.

o is the point of incidence.

Note that the incident ray and the reflected ray are on the opposite sides of the normal.

Laws of reflection of light

i) The angle of incidence is equal to the angle of the reflection (.

ii) The incident ray, the reflected ray and the normal ray at the point of incidence, all lie in the same plane. Point **o** at the centre of the reflecting surface shows the point of incidence.

Note: The point of incidence is the point where the incident ray touches the reflecting surface.

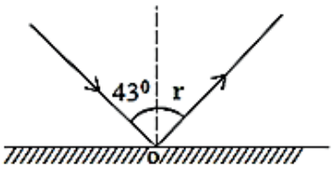
Calculating simple problems on reflection of light

We can find one angle when the other is given using the first law of reflection of light. If the angle of incidence is 30^0, the angle of reflection is also 30^0 since they are equal. Remember the angle of incidence or angle of reflection and the glancing angle add up to 90 degrees.

Worked Examples

Find the size of angle ***r, I*** and ***g*** in the diagrams below.

(a)



Solution

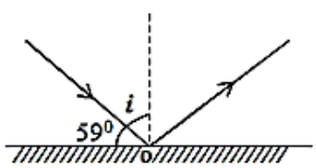
(a)

$\angle i = 43^0$

Since $\angle i = \angle r$

Therefore $\angle r = 43^0$

(b)



Solution

(b)

$\angle i = 59^0$

$\angle g + i = 90^0$

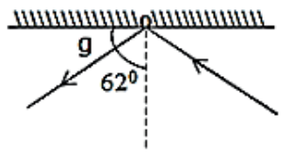
$59^0 + i = 90^0$

$59^0 - 59^0 + i = 90^0 - 59^0$

$i = 90^0 - 59^0$

Therefore $\angle i = 31^0$

(c)



Solution

(c)

$\angle r = 62^0$

$\angle r + g = 90^0$

$62^0 + g = 90^0$

$62^0 - 62^0 + g = 90^0 - 62^0$

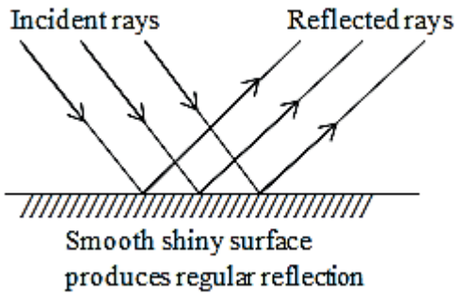
$g = 90^0 - 62^0$

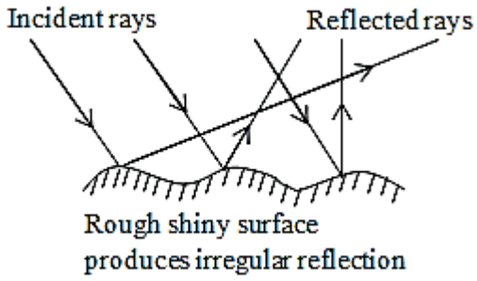
Therefore $\angle g = 28^0$

Types of reflection (regular and irregular reflection)

Regular reflection occurs on smooth shiny surfaces such as plane mirror and clear water. Light rays are reflected at the same angle and in parallel form.

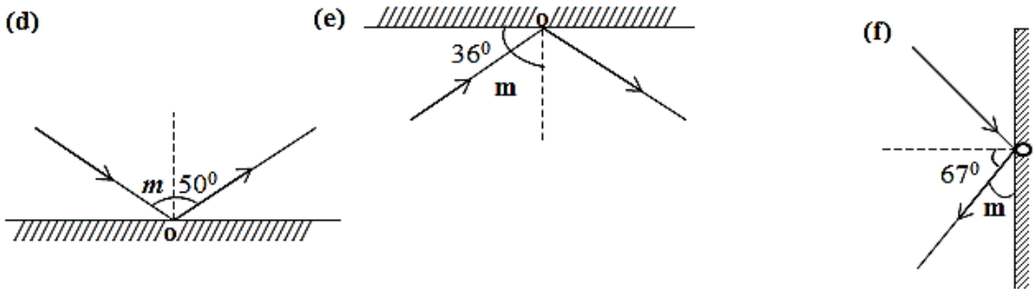
Irregular reflection occurs on rough shiny surfaces like cracked mirror and muddy water. Light rays are scattered and reflected at different angles. This is why irregular reflection is also called ***diffuse reflection***.





Activity

1. Define the term reflection of light.
2. State **one** law of reflection.
3. In each of the diagrams **d**, **e** and **f**, find the value of **m** in degrees.



Lesson 5: Characteristics of Images Formed by Plane Mirrors

Dear learner; you are welcome into this lesson. We would like to remind you that COVID-19 is still spreading in our communities. In order to avoid getting this deadly disease, do not get too close to people who are sneezing and coughing, always wear your face mask when in public and wash your hands with soap and water.

By the end of this lesson, you should be able to;

i) state uses of plane mirrors.
ii) describe characteristics of images formed by plane mirrors.

Activity

In this activity, you will find out the characteristics of images formed by plane mirrors. Ask at least one of the family members or friends to help you in some steps.

You will need the following materials

Plane mirrors (dressing mirror), pen, pencil and exercise book, ruler

What you should do (steps to follow)

i) ask a sibling to hold the plane mirror upright on a table or a flat surface.
ii) Use the pen to write the word plane in capital letters on a piece of paper.
iii) Hold the piece of paper upright with the word facing the mirror. The paper should be 15 cm away from the mirror.
iv) Observe how each letter of the word appears in the mirror.
v) Ask your friend to raise the mirror to the level of your face, touch on your left ear and observe inside the mirror.
vi) Now hold the mirror and follow the steps again for your friend to see what happens.

Summary

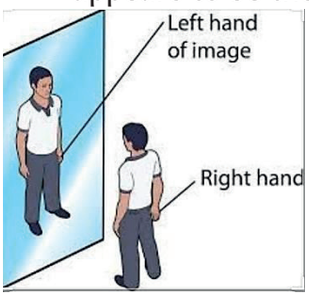
A mirror is a piece of glass which reflects light. Due to reflection, mirrors form images of objects in front of them. An image is the light picture of a real object on film or screen.

There are two types of images;

i) **Real images;** images which are formed (that can be cast) on the screen.
ii) **Virtual images** are not formed on the screen or the film. Virtual images are cast by ***plane mirrors*** *and* ***lenses***.

Characteristics of images formed by plane mirrors

i) The images are upright /erect.
ii) The image distance is equal to the object distance from the mirror.
iii) The image has the same size as the object.
iv) Images are laterally inverted. This means that the right side of the object appears to be the left of the image in the mirror.



v) The image is virtual (not formed on the screen).

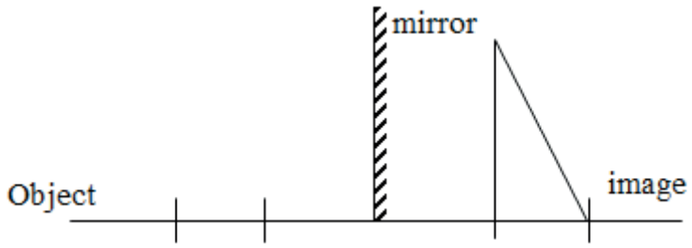
Uses of plane mirrors

i) They are used as dressing mirrors.
ii) They are used by dentists to see damaged parts of the teeth.
iii) They are used in salons when working on hair.

iv) They are used in periscopes.

Activity

1. Name the type of reflection produced by plane mirrors.
2. Describe any three characteristics of images formed by a plane mirror.
3. List any two uses of plane mirrors to people.
4. In the diagram below, draw the object which forms the image.



Lesson 6: Refraction of Light

Dear learner; you are welcome into this lesson. We would like to remind you that COVID-19 is still spreading in our communities. In order to avoid getting this deadly disease, do not get too close to people who are sneezing and coughing, always wear your face mask when in public, and wash your hands with soap and water.

By the end of this lesson, you should be able to;

i) give the difference between reflection and refraction.
ii) state the law/principle of refraction.
iii) explain the effects of refraction of light.

You will need the following materials

Glass cup with clean water, basin, coin, pencil, pen, exercise book,

What you should do

i) Pour clean water in the glass cup and place it under an open source of light.
ii) Allow the water to settle and gently dip the pencil or the wooden rod in it.
iii) Call one other person to help you hold the pencil as you observe it from one side through the glass. How does the pencil appear when dipped into glass containing water?
iv) Also fill the basin/bowel with clean water and place the coin in it.
v) Stand and observe the coin. What have you observed?

You will notice that the pencil appears to be broken or bending in the water. This is due to refraction of light. Air which surrounds the glass cup is less dense than water.

When light moves from a less dense medium to a denser medium (e.g. from air to water), its speed reduces and when light moves from a denser medium to less dense medium (i.e. from water to air, its speed increases.

These changes in speed of light cause the light rays to bend. The bending of

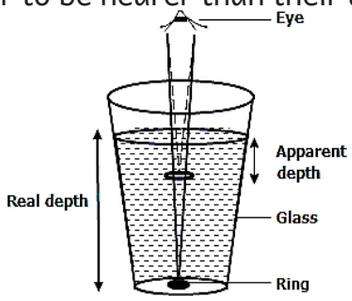
light rays as they move from one transparent medium to another is called **refraction.**

Principle / law of refraction: The incident ray, the refracted ray and the normal all lie in the same plane.

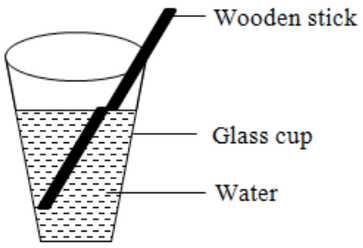
Effects of refraction of light

i) Refraction produces colours e.g. a rainbow occurs when white light from the sun is refracted through rain drops and split into seven colours. The band of seven different light colours is called spectrum.

ii) Refraction causes real and apparent depths i.e. objects placed in a basin containing water appear to be nearer than their actual depth.



iii) Refraction makes objects dipped in water to appear bent or broken.



Activity

1. Define the term refraction of light.
2. State the law of refraction.
3. Briefly explain how a rainbow is formed.
4. Give a reason why a pencil dipped in a glass of water appears broken.

Lesson 7: Effects of Lenses on Beams of Light

Dear learner; you are welcome into this lesson. We would like to remind you that COVID-19 is still spreading in our communities. In order to avoid getting this deadly disease, do not get too close to people who are sneezing and coughing, always wear your face mask when in public and wash your hands with soap and clean water regularly.

By the end of this lesson, you should be able to;

i) draw and identify types of lenses.
ii) describe the effects of lenses on beams of light.

iii) explain how a lens camera works.

You will need the following materials

A pen and a pencil, an exercise book, clay

Introduction

You learnt about beams of light and different types of objects earlier in this topic. You also learnt that when the speed of light changes, the light rays bend or get refracted. A lens is transparent glass material with smooth, curved surfaces that refract light passing through it.

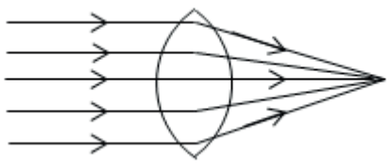
Types of lenses

There are two types of lenses; ***convex lenses*** and ***concave lenses.***

A convex lens is thicker at the centre and thin at the edges. When light passes through a convex lens, its speed reduces and the light rays bend to form convergent beam. This is why a convex lens is also called a converging lens.



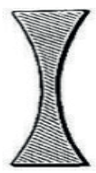
Convex lens



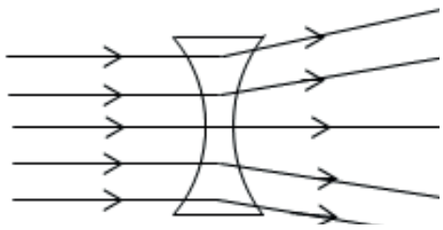
Light passing through convex lens

A concave lens is thin at the centre and thicker at the edges. When light meets a c

cave lens, the light rays bend to form divergent beam and this is why a concave lens can also be called a diverging lens.



Concave lens



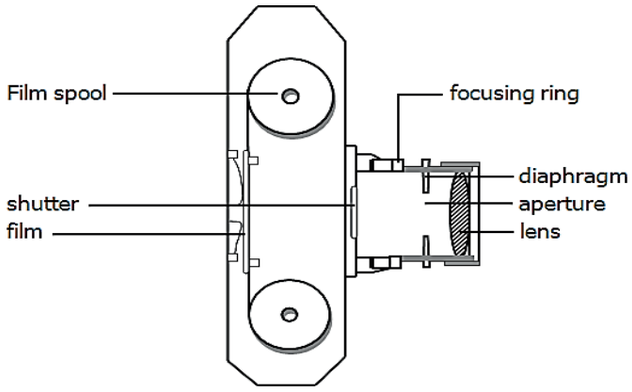
Light passing through concave lens

Uses of lenses

i) Lenses are used in telescopes, cameras, microscopes and film projectors.

ii) They are used in spectacles to correct eye defects and also in magnifying glasses.

The lens camera



How the lens camera works

- Light enters the camera through the ***aperture***; the ***lens*** refracts and focuses the light rays on the ***film*** where images are formed.
- The ***diaphragm*** controls the amount of light entering the camera. The ***focusing ring*** is used to increase or reduce the distance between the lens and the film.
- When the camera is not in use, the shutter closes to keep out light.
- Images formed by the lens camera are real, upside down (inverted) and smaller than the object (diminished).

Activity

1. Mention any **one** types of lens.
2. Name **two** instruments that use lenses.
3. State any t**wo** characteristics of images formed by a lens camera.
4. Use a pencil to draw a convex lens and a concave lens in your note books the spaces below.

Project work

Use the available local materials like clay soil, old boxes and plastics to make a model of;

i) Concave lens and convex lens

ii) A Photographic camera (camera)

Lesson 8: The Working of the Human Eye

Dear learner; you are welcome into this lesson. Corona Virus Disease is real and it exists in different parts of Uganda. You should take care of yourself because this disease is still spreading and new cases are still being reported every day from different

communities. To avoid this deadly disease, always wash your hands with clean water and soap, maintain social distancing of 2 metres from other people and stay at home.

By the end of this lesson, you should be able to;

i) draw and name parts of the human eye.
ii) explain how the human eye works.
iii) describe images formed by the human eye.
iv) compare the human eye with the lens camera.

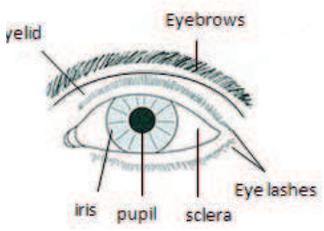
You will need the following materials

A pen, pencil, an exercise book, plane mirror

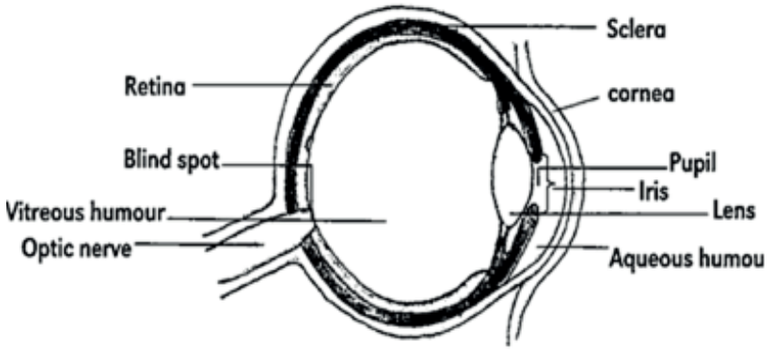
Introduction

Did you know that the human eye is the part of our body which works in the same way as a photographic camera? The human eye is the sense organ for sight. It is an optical organ because it uses light to function. Mirrors, microscopes, telescopes, binoculars, lens cameras and periscopes are examples of optical instruments because they use light to function. The complete shape of the eye is called eyeball and it is protected by the eye socket or orbit in the skull.

The structure of the human eye



Front view of the eye



cross section of the eye

How the does the eye work?

Light rays from an object enter the eye through the pupil. The cornea refracts the light rays onto the lens. The lens focuses the light rays onto the retina where images are formed upside down.

The optic nerves connected to the retina send this information to the brain as light (vision) impulses. The brain interprets these impulses to produce a correct image of the object (what we see). Images formed in the eye are inverted, real and diminished.

The ***iris*** controls the amount of light entering the eye by changing the size of the pupil. ***Aqueous humour*** and ***vitreous humour*** are fluids which maintain the shape of the eyeball and also refract light.

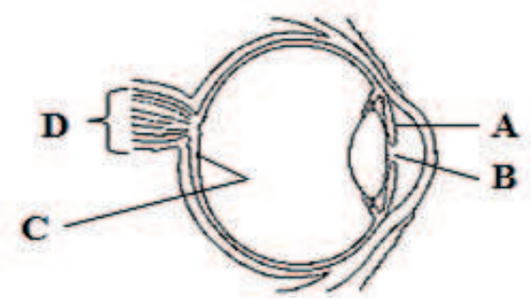
Eyelids close to keep out light when not needed in the eye while the ***eyelashes*** trap dust particles from entering the eye.

Differences between the eye and the lens camera

No.	Human eye	Lens camera
	Iris controls amount of light entering the eye	Diaphragm controls amount of light entering the camera
	Eyelids block light when not needed	Shutter blocks light when not needed
	Pupil allows light into the eye	Aperture allows light into the camera
	Lens focuses light on the retina	Lens focuses light on the film
	Images are formed on the retina	Images are formed on the film

Activity

1. Give any **two** examples of optical instruments.
2. The diagram below is of a human eye. Use it to answer questions that follow:



i) Identify the parts labelled **A** and **B**.
ii) Give the function of part **C** and **D**.

Lesson 9: Eye Defects/Disorders and Diseases

Dear learner; you are welcome into this lesson. We would like to remind you that COVID-19 is still spreading in our communities. In order to avoid getting this deadly disease, do not get too close to people who are sneezing and coughing, always wear your face mask when in public and wash your hands with soap and clean water regularly.

By the end of this lesson, you should be able to;

i) identify and describe different defects of the human eye.
ii) describe ways of correcting the different eye defects.
iii) describe the common diseases of the human eye.
iv) practice correct ways of caring for the human eye.

You will need the following materials

A pen, pencil, exercise book, water, soap, face towel, eye glasses (spectacles)

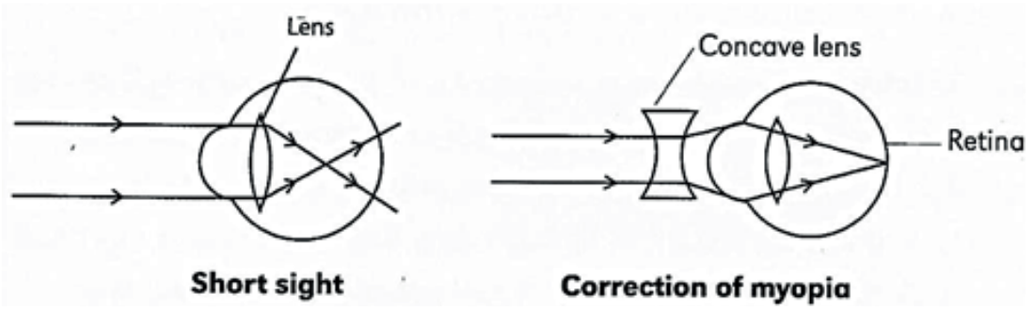
Introduction

In the previous lesson, you learnt about the parts of the human eye and how your eyes work. There are certain conditions that may prevent your eyes from functioning properly. This may affect only a certain part of the eye or even sometimes the whole eye. These conditions are called eye defects or disorders. Below are the common eye defects.

Short sightedness (myopia)

A person suffering from short sightedness cannot see objects which are far away from him/her very well. This eye defect is caused by too large eyeball and too thick eye lens. In short sightedness, the light rays from far objects are focused in front of the retina. The images are also formed in front of the retina.

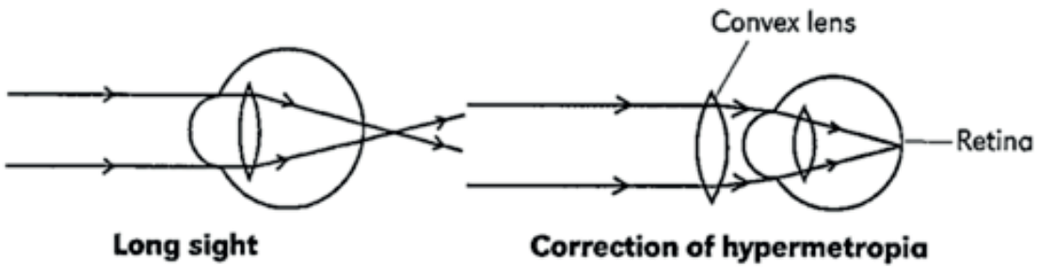
Short sightedness is corrected by wearing spectacles with concave lens. Concave lenses diverge light rays to focus images on the retina.



Long sightedness (Hypermetropia)

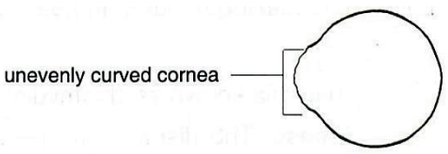
A person with Hypermetropia sees objects that are far but cannot see nearby objects clearly. This is caused by too small eyeball, too thin eye lens and loss of flexibility by the eye lens. In long sightedness, the light rays from nearby objects are focused behind the retina. The images are also formed behind the retina.

- Long sightedness is corrected by wearing spectacles with convex lenses. Convex lenses converge light rays to focus images on the retina.



Astigmatism

This is the inability to see objects both vertically and horizontally clearly at the same time. It is caused by having irregular cornea (cornea that is not evenly curved). This unevenly curved cornea causes the images formed on the retina to be unclear (blurred). Astigmatism is corrected by wearing spectacles with special cylindrical lenses.



Diseases of the human eye

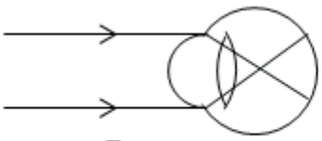
Eye disease and cause	How it spreads	Signs and symptoms	Prevention, control and treatment
Trachoma *Caused by chlamydia bacteria*	• Through body contact with infected people • By houseflies • Through sharing handkerchiefs and face towels with infected people	• Red eyes • Swollen eyelids • Watery discharge from the eyes	• Avoid sharing handkerchiefs and face towels • Washing the face with clean water and soap • Treat infected people using antibiotics
Conjunctivitis *Caused by bacteria or virus*	• Through shaking hands with infected people • Sharing face towels and handkerchiefs	• Eye turns pink • Watery discharge from the eyes • Itching of the eyes	• Avoid shaking hands with infected people • Isolating the infected people • Avoid sharing face towels and handkerchiefs
River blindness *Caused by protozoa called onchocerca volvulus*	• Through bites of black fly or Jinja fly	• Swelling of the skin near the eyes • Itching of the eye	• Spray breeding places for black flies using insecticides • Early treatment of infected people
• Night blindness *Caused by lack of foods rich in Vitamin A*	• It is non-communicable since it does not spread from one person to another	• Poor night vision	• Feeding on foods rich in vitamin A e.g. carrots, pawpaw, onions, liver

Care for the human eye

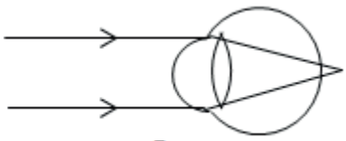
i) Washing the face with clean warm water and soap.
ii) Going for regular medical eye check-up
iii) Not touching or rubbing your eyes with dirty hands.
iv) Feeding on a balanced diet.
v) Avoid reading under dim light or too bright light. This habit strains the eye and leads to damage of the retina.
vi) Avoid playing rough games or playing with sharp objects.

Activity

1. State the cause of night blindness.
2. Give any **one** way through which the spread of trachoma can be controlled among people.
3. The diagrams **P** and **Q** are of eye defects. Use them to answer the questions that follow.



P



Q

   i) Identify eye defect **P**.
   ii) Give any **one** cause of eye defect **Q**.
   iii) Which type of lens is used to correct eye defect **P**.
4. Write any **two** ways of caring for the human eye.

THEME: ENVIRONMENT

Topic 7: Interdependence of Things in the Environment

Lesson 1: How Components of the Environment Benefit from Each Other

Dear learner; you are welcome into this lesson. I would like to remind you that COVID-19 is still spreading in our communities. In order to avoid getting this deadly disease, do not get too close to people who are sneezing and coughing, always wear your face mask when in public and wash your hands with soap and clean water regularly.

By the end of this lesson, you should be able to;

i) define the term interdependence.
ii) identify the living and non-living components of the environment.
iii) describe how components of the environment benefit from each other.

You will need the following materials

Pen, pencil, ruler, exercise book, plants, animals, water, soil

As a human being, you need other people to stay with, water for drinking and bathing, food from plants and animals to eat and keep healthy, air to breathe in so that your body gets oxygen. All plants and animals too need water, air and food. This means that things in the environment benefit from each other. The way in which things benefit from each other is called **interdependence.**

The table below shows how components of the environment help one another

Components	Ways in which they depend on each other
How animals benefit from plants	a) Animals get food from plants b) Trees are habitats to some animals c) Trees give shade to animals
How animals benefit from other animals	a) Some animals eat other animals as food b) Young animals get care from their parents c) Some animals provide security to others
How plants benefit from animals	a) Plants get manure from animal dung, urine and poultry droppings b) Plants get carbon dioxide from animals and use it to make food c) Some insects and birds pollinate flowers on plants
How plants benefit from other plants	a) Big trees provide shade to young plants b) Plants with weak stems climb others for support c) Big plants protect others from strong wind and heavy rain drops
How animals and plants benefit from soil	a) Some animals live in the soil, *e.g. earthworms, millipedes* b) Plants get water and mineral salts from soil
How animals and plants benefit from water	a) Animals drink water b) Water is a habitat for some animals c) Plants use water as a raw material for photosynthesis

Caring for animals

Animals can be cared for in the following ways

i) Giving enough feeds and water to animals
ii) Treating sick animals
iii) Vaccinating and deworming them
iv) Building houses for domestic animals
v) Enforcing strict laws against poaching wild animals
vi) Protecting habitats of wild animals

Activity

1. Define the term interdependence.
2. State any two benefits of plants to animals.
3. Describe any two ways in which some animals depend on other animals.
4. List any two ways through which we can care for wild animals.

Lesson 2: The Importance of Agro Forestry

Hello dear candidates, welcome into this lesson about the importance of agro forestry. We would like to remind you that COVID-19 is still spreading in our communities. In order to avoid getting this deadly disease, do not get too close to people who are sneezing and coughing, always wear your face mask when in public and wash your hands with clean water and soap regularly.

By the end of this lesson, you should be able to;

i) explain the term agro forestry.
ii) discuss the importance of agro forestry.
iii) describe proper methods of harvesting trees in agro forestry.

You will need the following materials

Pen, notebook, pencil, ruler

Introduction

Have you ever visited a farm? Could you please list the different activities carried out on that farm? What crops are grown on that farm? Are there some animals kept on that farm? If yes, please name them.

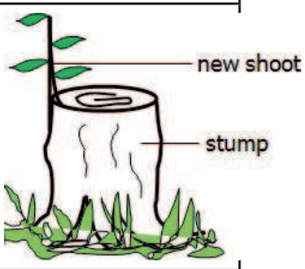
You must have seen that some farmers grow trees with other crops and even keep animals. Such a practice is called agro forestry. In agro forestry, the crops, trees and animals benefit from each other.

Agroforestry is the practice of growing trees alongside other crops on the same piece of land. Agro forestry can also be defined as the practice of growing trees alongside other crops and rearing of animals on the same farm.

Importance of agroforestry

i) The animals, crops and some trees provide food to the farmer.
ii) Trees provide shade to animals and the crops.
iii) Animal dung and urine rot to form manure for trees and crops.
iv) Crops can also be prepared and used as feeds for animals.
v) Trees in agro forestry help in rain formation by carrying out transpiration.
vi) The farmer gets wood fuel from trees. This can be in form of firewood and charcoal.

Methods of harvesting trees in agroforestry

Method	How it is done	Illustration
Coppicing	Cutting of a tree at stump level above the ground. This encourages new shoots to grow from the stump.	
Pollarding	This is the cutting off of the top part of a tree leaving some side branches to grow. This encourages thicker growth of side branches.	
Lopping	Cutting off the side branches of a tree leaving the top part to grow	

Activity

1. Define the term agroforestry.
2. Give any two ways in which crops benefit from trees when they are grown together.
3. Name the method of harvesting trees for timber.

Lesson 3: Starting and Managing a School / Home Woodlot

Dear learner; you are welcome to this lesson. We would like to remind you that Corona Virus Disease is still spreading in our communities. In order to avoid getting this deadly disease, do not get too close to people who are sneezing and coughing, always wear your mask when in public, wash your hands with clean water and soap and keep a social distance of about 2 metres from other people.

By the end of this lesson, you should be able to;

i) start and manage your own woodlot project.
ii) describe different ways of caring for trees in a woodlot.
iii) practice record keeping.

You will need the following materials

A pen, pencil, exercise book, watering can, seeds or seedlings of trees of your choice, hoe, trowel

Introduction

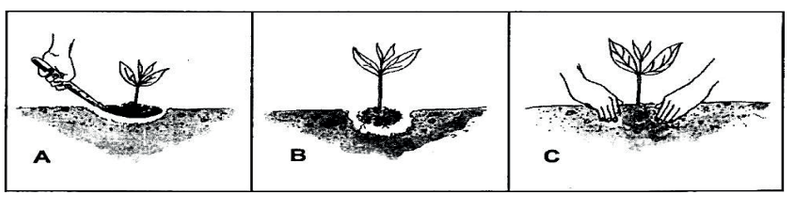
You have already learnt about different activities carried out when growing crops in P4 and P5. You also learnt different ways of caring for crops. An area of land used for growing trees is called ***woodlot***. In this lesson, you will start and manage your own woodlot project.

Project: My home woodlot project

Make sure you record the date for every activity below. You can prepare a table using the example shown below for recording the activities.

Date	Activity	Comment
15/July/2020	Buying or collecting the seeds	Activity done

i) From your environment, collect the seeds of trees you would like to plant. These could be seeds of mangoes, oranges, jackfruit, eucalyptus, avocado, paw paws etc.
ii) Identify a small piece of land where to plant the trees, plough or dig through it.
iii) Make a nursery bed for planting the seeds, you can ask your parent or an elder to guide you how to make a good nursery bed.
iv) Make sure you put shade on the nursery bed and water the nursery bed regularly.
v) When the seedlings are ready, select the healthier ones and transplant them. Your parent/guardian may still guide you on how transplanting is done. See the diagram below for more guidance



Record keeping

You learnt about record keeping in P4 and P5 under keeping animals and growing crops.

Prepare a simple record about the activities in your home woodlot project; include information about preparing the land, setting a nursery bed, planting, watering, spraying, transplanting, applying manure, weeding, mulching the garden and pruning.

In your notebook, state the;

1. Type of trees you have chosen to grow.
2. The purpose of the trees you are growing.
3. The different activities you have carried out when growing the trees.

Note: Remember the woodlot project may take more than one year but not one day or just weeks. Continue managing it until the trees are fully grown.

Activity

1. Define the term woodlot.
2. Give the importance of trees in a woodlot to people.
3. State any **two** ways through which you can care for trees in a woodlot.
4. Explain **three** reasons why it is important for farmers to keep records.

THEME 8: THE COMMUNITY, POPULATION AND FAMILY LIFE

Topic 8: Population and Health

Dear learner; you are welcome to our first lesson about population and health. You are aware that all schools are closed and you are now learning from home because of COVID-19. This disease is already within our communities and we therefore need to protect ourselves from it. We can do this by staying in our homes, washing hands with clean water and soap regularly for 20 seconds each time you do this, keeping a distance of 2 metres from other people and not touching the soft parts on the face (the nose, mouth and eyes).

Lesson 1: Causes of Common Sicknesses in a Home and the Community

By the end of this lesson, you should be able to;

i) identify common sicknesses in a home and the community.
ii) describe the causes of common sicknesses in a home and the community.
iii) explain the different ways of preventing common sicknesses in a home and the community.

You will need the following materials

Pen, pencil, notebook, your medical report book, a child health card

Introduction

In P4, you learnt about intestinal communicable diseases and food deficiency diseases. You also learnt about childhood immunisable diseases in P5 as well as Sexually Transmitted Diseases (STDs) in P6. In this lesson, you are going to learn about causes of these diseases and the ways through which you can prevent or avoid them.

Use the information you learnt in other classes to complete the table below. You may also discuss it your learning groups or ask your friends at home who are in other classes ahead of you.

Conditions that lead to common sicknesses	List the examples	Ways of preventing / controlling
Poor feeding (deficiency diseases)	Kwashiorkor	• Feeding on balanced diet • Having meals regularly
Smoking, alcohol and drug abuse (self-inflicted diseases)	Lung cancer	
Drinking contaminated water (Water borne diseases)	Dysentery	
Poor sanitation and food hygiene	....	
Having unprotected sexual intercourse with infected people (Sexually Transmitted Diseases)	AIDS ..... Candidiasis ..... Syphilis	

Lesson 2: Dangers of Anti-Social Behaviour and Sexual Deviations

Dear learner; you are welcome to this lesson. You are aware that all schools are closed and you are now learning from home because of COVID-19. This disease is already within our communities and we therefore need to protect ourselves from it. We can do this by staying in our homes, washing hands with clean water and soap regularly for 20 seconds each time you do this, keeping a distance of 2 metres from other people and not touching the soft parts on the face (the nose, mouth and eyes).

By the end of this lesson, you should be able to;

i) define the term anti-social behaviour and sexual deviations.
ii) explain the dangers or effects of anti-social behaviour and sexual deviations.
iii) describe ways of avoiding anti-social behaviour and sexual deviations.

You will need the following materials

Ruler, pen, pencil, exercise book or notebook

Introduction

You are living with different people in your area, clan or community. Some of them have good behaviour while others have behaviour which is not accepted by other members in the community. Behaviour which is not acceptable to the members of the community is called anti-social behaviour. Such behaviour in most cases is punishable by the law.

Below are some examples of anti-social behaviour, and their meaning.

Anti-social behaviour	Meaning (description)
Truancy	Act of refusing to attend school without permission
Disobedience to authority	Refusing to abide by laws of a given society
Stealing /theft	Taking away someone's property in their absence
Robbery	Taking away someone's property by use of force
Arson	Burning houses or property belonging to other people
Murder	Killing other people

Name other examples of anti-social behaviour in your community.

Sexual deviations

A sexual deviation is any sexual relationship or practice which is not accepted in a society. The following are forms of sexual deviations.

i) ***Bestiality*** is sexual relationship with other animals other than human beings.
ii) ***Homosexuality*** is sexual relationship between persons of the same sex. e.g. man and a man.
iii) ***Masturbation*** is stimulating one's sexual organs to fulfil sexual desire within oneself.
iv) ***Incest*** is sexual intercourse between close relatives.

Effects of anti-social behaviour and sexual deviations

i) They may lead to death.
ii) May lead to body pain or injuries.
iii) Leads to school dropout.
iv) Sexual deviations may lead to spread of STDs.
v) Some forms of sexual deviation can result into complications in reproduction.
vi) Embarrassment and being a social misfit.

Ways of avoiding anti-social behaviour and sexual deviations

i) Avoid bad peer groups.
ii) Educating children about body changes.

iii) Through guidance and counselling.

iv) Joining good social and health clubs.

v) Punishing wrong doers.

Activity

1. Define the following terms:
   i) Anti-social behaviour
   ii) Sexual deviations
2. Mention any two causes of anti-social behaviour.
3. State two effects of anti-social behaviour.
4. Give two ways through which you can avoid sexual deviations.

Lesson 3: Activities to Address Health Concerns

Dear learner; you are welcome to this. You are aware that all schools are closed and you are now learning from home because of COVID-19). This disease is already within our communities and we therefore need to protect ourselves from it. We can do this by staying in our homes, washing hands with clean water and soap regularly for 20 seconds each time you do this, keeping a distance of 2 metres from other people and not touching the soft parts on the face (the nose, mouth and eyes).

By the end of this lesson, you should be able to;

i) identify some of the health concerns of the community

ii) describe some of the activities to address health concerns

iii) carry out a simple survey (demography) on housing information

You will need the following materials

Pen, exercise book, ruler, data collected from homes

Introduction

As people stay in the community, there are common issues which affect their health. This can be outbreak of diseases, poor sanitation, lack of clean water in the community and food shortage. These issues which affect the health of people in the community are called health concerns.

Below are some of the activities carried out to address these issues

i) **Health surveys:** A health survey is a process of finding out the health status of people in society. The information collected enables the leaders to identify the

problems of people and plan for solutions.

ii) **Health Education:** Educating the community on matters concerning health. This can be through radios, newspapers, TV stations, etc. Issues addressed during health education may include, proper sanitation, importance of immunization and good feeding.

iii) **Health parades:** A health parade is an assembly organised to check on the health and hygiene of school children. Children's teeth, hair, uniforms and fingernails are checked by teachers or health prefects.

Other activities include immunization, feeding on balanced diet, observing proper personal hygiene, promoting family hygiene, among others.

Demography

Demography is the study of the changing population characteristics in a given area. It involves studying the changing numbers of birth, death and diseases in a community. This study provides information about overall health of people and helps the government to plan for services needed by people.

Look at the families in your area and find out whether each family has a latrine or toilet, rubbish pit, plate stand, kitchen and bathrooms.

Activity

Record your findings. Use some letters to name the families as shown in the table below

	Family Identity (home name)					
Item checked	A	B	C	D	E	F
Latrine/toilet						
Bathrooms						
Rubbish pit						
Kitchen						
Plate stand (rack)						
Clean compound						
Clean water source						

Key

Remember to put the signs below for every home visited

✓For item found

x For item not found

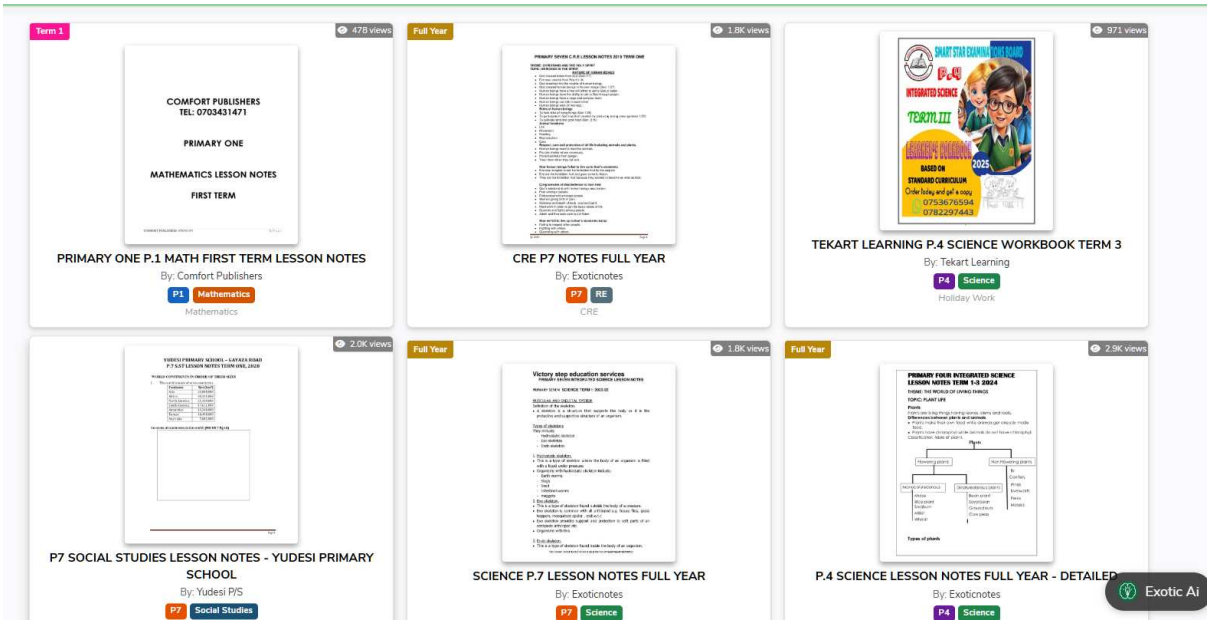
1. Find out the health problems which are likely to affect families which do not have the above items.
2. Please share your finding with your parent and your teacher of science when the government re-opens the schools.



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