

Integrated Science Syllabus

Grade 6

General Objectives of Grade 6 Integrated Science

1. To develop understanding and acquire knowledge of:

- mixtures, their forms and methods of separation
- importance and methods of keeping room air clean
- causes and effects of air pollution and methods of preventing it
- benefits and harms of technology to humans
- causes, symptoms, and methods of prevention of airborne and waterborne diseases
- physical properties, composition, and states of water, factors that make it unclean and methods of purifying it
- general properties and safe handling of acids, bases and salts
- importance and methods of crop irrigation and how water pressure is applied
- electric energy, how it is generated from water, what conductors, insulators, electric current, and voltage are, electric safety rules, and examples of electrical appliances
- habitats and importance of algae, fungi, mosses and ferns
- structures and functions of flower and types and agents of pollination
- structures and functions of a seed, its dispersal mechanisms and germination process
- food storage organs of plants and their importance as food
- steps followed in raising tree seedlings
- processes of harvesting and storing crops
- the role of technology in agriculture and the advantages of hybrid crops and selected seed varieties
- common characteristics and reproduction of birds and of mammals
- poultry farming, types of poultry and methods of feeding, caring and housing poultry
- livestock farming and methods of feeding, caring and housing livestock
- importance and conservation of wildlife, national parks of Ethiopia and common animals found in them
- structures, functions, defects and diseases of human eye and image formation by it and by other optical instruments
- nervous system, structures and functions of brain and spinal chord, hormones, and effects of drugs
- structures and functions of male and female reproductive organs, menstruation and fertilization and prevention of common sexually transmitted infections (STIs)
- FGM, illegal abortion, abduction, rape, and sexual harassment as harmful practices
- need for care and affection to PLWHA and the social impacts of HIV and AIDS
- shape and layers of the earth, types and importance of rocks, and causes and effects of volcanoes
- composition and layers of atmosphere, weather, climatic zones of the earth and causes and effects of global warming

2. To develop skills and abilities of:

- using simple methods of separating mixtures
- keeping room air clean
- demonstrating the three states of water

- identifying acids bases and salts
- using safety rules with acids, bases and salts
- using simple methods of purifying water
- constructing simple circuits and demonstrating series and parallel connections
- identifying algae, fungi, mosses and ferns
- identifying parts of a flower
- demonstrating the conditions for germination through experiments
- raising, transferring, and giving care to tree seedlings as they grow
- constructing simple models of modern stores
- constructing a model house for poultry
- demonstrating propagation, reflection and refraction of light
- empathy, cooperation, love, communication, and problem solving skills that help to prevent HIV
- identifying the three types of rocks
- constructing and using some weather measuring instruments
- scientific enquiry: observing, classifying, comparing, making models, communicating, measuring, asking questions, drawing conclusions, applying concepts, interpreting photos and illustrations and relating cause and effect

3. To develop the habit and attitude of:

- willingness to conform to a drug free behaviour
- willingness to conform to a responsible sexual behaviour
- appreciating the fact that old scientific ideas are rejected as new scientific findings are published
- love and respect to nature and life
- curiosity to explore new knowledge, every time, in learning science
- working in groups, cooperating with each other and respect and love for each other
- willingness to participate in community activities of protecting the environment by keeping it clean, planting trees, conservation practices

Unit 1: Air (19 periods)

Unit Outcomes: Students will be able to:

- define mixture and air and name, identify and separate mixtures using simple methods
- tell the importance and demonstrate the methods keeping room air clean
- list the causes, explain the effects and methods of prevention of air pollution
- describe the benefits of technology, how it is contributing to air pollution and how it could help to prevent it
- give examples of air borne diseases and explain their causes, symptoms and methods of prevention and discuss the effects of disposing human waste at wrong places
- demonstrate scientific enquiry skills: classifying, comparing and contrasting, asking questions, interpreting illustrations, drawing conclusions, applying concepts and relating cause and effect.

<i>Competencies</i>	<i>Contents</i>	<i>Suggested activities</i>
<p><i>Students will be able to:</i></p> <ul style="list-style-type: none"> • define mixture as two or more substances which are not chemically combined • define air as a mixture of several gases • name the two forms of mixture • identify the two forms of mixture <ul style="list-style-type: none"> • separate mixtures using simple methods 	<p>1. Air</p> <p>1.1 Air as Mixture (6 periods)</p> <ul style="list-style-type: none"> • What is mixture • Defining air as a mixture • Forms of mixture <ul style="list-style-type: none"> • Separation of mixtures – hand picking, sieving, filtration, decantation, evaporation, and magnetic separation 	<p>Remind students of the work they have already carried out on air. Air is a mixture of gases: nitrogen, oxygen, argon, carbon dioxide and traces of some noble gases. Students could name some other mixtures with which they are familiar such as:</p> <ul style="list-style-type: none"> • Rocks – a mixture of minerals • Soil – a mixture of different sized particles and plant material • Petrol – a mixture of chemicals (hydrocarbons) • Cooking oil – a mixture of vegetable oils <p>Students should understand that mixtures can be composed entirely of solids, liquids or gases, or a mixture of different states.</p> <p>Students should describe the two types of mixtures, i.e., homogenous and heterogeneous and give examples for each. They could also be given mixtures of different kinds and be asked to identify them as homogenous or heterogeneous.</p> <p>Use air as the basis of a definition of a mixture as two or more substances which are not chemically combined. Since the components of a mixture are not chemically combined they can be separated by physical means.</p> <p>Students should appreciate that the method used to separate a mixture depends on the properties of the components.</p> <p>Students could attempt the separation of different mixtures using a range of techniques including:</p> <ul style="list-style-type: none"> • A mixture of nails and screws – these are large and differ in appearance so they can be separated by hand • A mixture of iron filings and sulphur – iron is magnetic and can be removed from the mixture leaving the sulphur behind. It is wise to place the magnet in a poly(ethene) before doing this experiment as it can be difficult to remove all of the iron filings from the magnet

Competencies	Contents	Suggested activities
<ul style="list-style-type: none"> • tell the importance of clean air • demonstrate methods of keeping room air clean • list the causes of air pollution 	<p>1.2 Air Pollution (7 periods)</p> <ul style="list-style-type: none"> • Importance and methods of keeping clean air • Causes of air pollution – pollutants (Carbon dioxide, Sulphur dioxide, Nitrogen dioxide, dust particles) 	<ul style="list-style-type: none"> • A mixture of rice and flour can be separated by sieving – the flour particles are much smaller than the rice grains and will pass through the sieve while the rice will not. • A mixture of chalk particles in water can be separated by filtration – the water passes through the filter paper as the filtrate while the chalk particles are held in the filter paper and the residue. • A mixture of cooking oil and water can be separated by decanting - the cooking oil and water form two layers. The top layer, the cooking oil, can be removed by careful pouring. This is best done when the mixture is in a narrow tube such as a measuring cylinder or separating funnel. • A mixture of salt and water forms a solution which can be separated by evaporation – if the solution is left in an open dish on a window sill the water will evaporate the salt will be left behind. Evaporation is quicker if the solution is placed in a broad dish, such as an evaporating basin, which gives exposes a large surface area of the solution to the air. <p>Students could undertake separation using a combination of techniques. For example, a mixture of salt and sand can be separated by first adding water to dissolve the salt, filtering to remove the sand and finally evaporation of the filtrate to give the salt.</p> <p>The black powder found inside electric cells consists of a mixture of powdered carbon and manganese(IV) oxide, which are both insoluble, and ammonium chloride, which is soluble in water. Students could be set the task of obtaining a pure sample of ammonium chloride from the black powder removed from a spent electric cell.</p> <p>Students should be aware from their work on respiration that we are continually inhaling and exhaling air into our lungs, and that gases are exchanged between the air and the blood through the lungs. Any pollutants in the air can therefore pass into our lungs, and maybe into our blood.</p> <p>Air pollutants can be conveniently divided into particles and gases. Students could discuss different types of particles and their sources including:</p> <ul style="list-style-type: none"> • Dust – fine particles of soil • Pollen – from plants • Particulates – from the exhaust of motor vehicles <p>Point out that dust and pollen are natural products however their concentration in the air is often increased by human activity.</p>

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<i>Competencies</i>	<i>Contents</i>	<i>Suggested activities</i>
<ul style="list-style-type: none"> • explain the effects of air pollution 	<ul style="list-style-type: none"> • Effects of air pollution on health 	<p>They can also discuss sources of pollutants encountered in industry such as :</p> <ul style="list-style-type: none"> • Coal dust • Asbestos • Dust particles from cement factory and other factories <p>Students could discuss different pollutant gases and their sources including:</p> <ul style="list-style-type: none"> • Sulphur dioxide • Nitrogen dioxide • Carbon monoxide • Hydrocarbons • Carbon dioxide <p>Carbon dioxide occurs naturally in the air however its concentration has increased significantly over the past century due to the increasing combustion of fossil fuels.</p> <p>Sulphur dioxide occurs naturally in the gases resulting from volcanic activity but the proportion is very small compared to the amount of this gas produced by human activity.</p> <p>Nitrogen dioxide is also gaseous pollutant resulting from car exhausts.</p> <p>Students could research the main sources of the different pollutants such as:</p> <ul style="list-style-type: none"> • Dust – mining work, construction, farming • Pollen – farming • Particulates – small particles of carbon formed by inefficient combustion of fuel in diesel engines • Sulphur dioxide – burning of coal and fuel oil in power stations and for domestic heating • Nitrogen oxides – form from atmospheric nitrogen when fuels are burnt in air in engines and boilers • Carbon monoxide – formed by the incomplete combustion of hydrocarbon fuels in motor vehicles and gas heaters and cookers • Hydrocarbons – unburnt fuel left as a result of inefficient combustion in car engines • Carbon dioxide formed by the complete combustion of fossil fuels in power stations, car engines and domestic fires and cookers <p>Students could be provided with statistics on how the concentrations of pollutants have changed over a period of time. These could be used to provide a greater appreciation of the problem of atmospheric pollution and as an exercise on data presentation.</p> <p>Students should differentiate between short term irritations caused by temporary high levels of pollutants and continued exposure over a long term leading to permanent lung damage.</p>

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<i>Competencies</i>	<i>Contents</i>	<i>Suggested activities</i>
<ul style="list-style-type: none"> • describe the benefits of technology to humans • state how technology is contributing to air pollution • explain environment friendly technology as a prevention method of air pollution 	<ul style="list-style-type: none"> • Technology and air pollution – benefits and drawbacks of technology • Environment friendly technology 	<p>Students could be given data linking high levels of air pollution with lung disease and asked to evaluate the correlation.</p> <p>Students could look research into the causes and effects of lungs conditions such as bronchitis and emphysema.</p> <p>Students could debate whether cigarette smoke is a source of air pollution. They could review data about the effects of secondary inhalation on the health of people who don't themselves smoke.</p> <p>Students could research into industrial diseases caused by air pollution such as pneumoconiosis (coal dust) and asbestosis (asbestos).</p> <p>Students could investigate the causes of smog and chemical smog. They could look at case studies such as London in the late 19th century where large scale coal burning as a domestic fuel was the source of smog and of high instances of lung disease. More recently they could look the problems of chemical smog in Los Angeles.</p> <p>Students should appreciate that as technology has developed the demand for energy has increased and the amount of air pollution (and other pollution) has also increased. Use the motor car as an example.</p> <p>Students could debate the advantages of motorized transport e.g. speed, carry large loads, comfort etc. and the disadvantages e.g. pollutants, large-scale use of non-renewable resources, safety issues etc.</p> <p>Students could also focus on the dynamics of their local community. For example, a local factory may be a source of air pollution but it may produce an important product needed by the community, and it may also employ a significant number of local people who then spend their wages within the community. Should the factory be shut down or not?</p> <p>Students should look at ways in which air pollution is reduced. These could include:</p> <ul style="list-style-type: none"> • Fuel gas desulphurization which removes sulphur dioxide gas from the waste gases produced at coal-fired power stations • Electrostatic particle eliminators that remove particles of carbon from the waste gases produced by fossil-fuelled power stations. • Catalytic converters which are fitted to the exhaust systems of cars to convert pollutant gases, such as nitrogen oxides and carbon monoxide, into harmless gases like nitrogen and carbon dioxide. • Replacing coal and oil –fired power stations with ones which burn natural gas as the latter produce less air pollution. <p>Students could discuss developments which it is hoped will reduce air pollution in the future such as:</p>

Competencies	Contents	Suggested activities
<ul style="list-style-type: none"> • mention tuberculosis and influenza as air borne diseases • mention viruses and bacteria as causes of air borne diseases • state the symptoms of tuberculosis and influenza • explain methods of prevention of tuberculosis and influenza 	<p>1.3 Air Borne Diseases (6 periods)</p> <ul style="list-style-type: none"> • Examples – tuberculosis and influenza • Causes and symptoms • Prevention of air borne disease 	<ul style="list-style-type: none"> • Electric powered vehicles – the electricity has to be generated, which causes some air pollution, but electric powered vehicles would greatly reduce the air pollution in city centres where there are high concentrations of vehicles and people. • Hydrogen-powered vehicles – hydrogen can easily be made and burns to produce water only. The use of hydrogen would reduce the demand for crude oil and reduce the amount of carbon dioxide released into the atmosphere which would address the problem of global warming. <p>Students could research what is meant by a carbon footprint and carbon neutral. They could find out what steps large companies are taking to become carbon neutral.</p> <p>Students should know that airborne diseases are the result of the transfer of viruses and bacteria, and be able name some examples of air borne diseases including tuberculosis and influenza</p> <p>Students should know that tuberculosis is caused by a bacterial infection. The commonest ways of becoming infected is by inhaling or swallowing the bacterium. The commonest form of tuberculosis is that which affects the lungs.</p> <p>Students should discuss the symptoms of tuberculosis such as coughing, shortage of breath and impaired functioning of the lungs leading to a general poor health. Students could discuss methods of preventing tuberculosis including:</p> <ul style="list-style-type: none"> • Killing infected cattle • Pasteurisation of milk • Development of effective drugs • Improved methods of detection • Use of an effective vaccine <p>Students should know that influenza is caused by a virus and leads to fever, headaches, loss of appetite and tiredness. Normal healthy people have no trouble dealing with influenza but for the very young, very old and those who are in poor health it can be fatal.</p> <p>Students should identify situations where people are in close proximity and the opportunities for the transfer of air borne disease is high, such as crowded public transport, crowded rooms and poor ventilation.</p> <p>Students could discuss the importance of vaccination as a means of eradicating a disease. Smallpox could be used as an example.</p> <p>Student could research the problems of over-use of antibiotics in cattle food leading to resistant strains of tuberculosis which are no longer adequately controlled by existing antibiotics.</p> <p>Students could research the effect of influenza brought over by European settlers on the indigenous population in South America. They could also find out about the influenza pandemics of the 20th century.</p>

Assessment

The teacher should assess each student's work continuously over the whole unit and compare it with the following description, based on the Competencies, to determine whether the student has achieved the minimum required level.

Students at minimum requirement level

A student working at the minimum requirement level will be able to: define mixture and air and name, identify and separate mixtures using simple methods; tell the importance and demonstrate the methods keeping room air clean; list the causes, explain the effects and methods of prevention of air pollution; describe the benefits of technology, how it is contributing to air pollution and how it could help to prevent it; mention tuberculosis and

influenza as air borne diseases and explain their causes, symptoms and methods of prevention

Students above minimum requirement level

Students working above the minimum requirement level should be praised and their achievements recognized. They should be encouraged to continue working hard and not become complacent.

Students below minimum requirement level

Students working below the minimum requirement level will require extra help if they are to catch up with the rest of the class. They should be given extra attention in class and additional lesson time during breaks or at the end of the day.

Unit 2: Water (31 periods)

Unit Outcomes: Students will be able to:

- describe the physical properties and demonstrate the three states of water
- describe the general properties, give examples, identify, and use safety rules with acids bases and salts
- tell the chemical composition of water and show that water is a neutral compound
- describe clean water, factors that make it unclean, simple methods of purifying it and demonstrate some of these methods
- list some common waterborne diseases, mention their causes, symptoms, transmission and prevention
- define crop irrigation, explain its importance and methods and how water pressure is applied in crop irrigation
- explain how electric energy is generated from water
- define conductors, insulators, electric current and voltage and give examples of conductors and insulators
- demonstrate series and parallel connections by constructing simple circuits
- list electric appliances at home as technological products and state electric safety rules
- demonstrate scientific enquiry skills: classifying, comparing and contrasting, measuring, asking questions and applying concepts.

<i>Competencies</i>	<i>Contents</i>	<i>Suggested activities</i>
<p><i>Students will be able to:</i></p> <ul style="list-style-type: none"> • describe the physical properties of water • demonstrate the three states of water 	<p>2. Water</p> <p>2.1 Physical properties of water (4 periods)</p> <ul style="list-style-type: none"> • Colour, odour, density, boiling point, freezing point and the three states of water • Activities to demonstrate some of the physical properties of water 	<p>Students will already be familiar with the simple properties of water; colourless and odourless.</p> <p>Students should know that the density of a substance is its mass per unit volume. It is measured in grams per cubic centimetre (g/cm^3) and kilogram per cubic metre (kg/m^3).</p> <p>Students should already be familiar with the three states of matter: solid, liquid and water. They will also know that solid water is called ice and water as a gas is called steam.</p> <p>Students should be made familiar with the terms freezing and boiling.</p> <p>Before discussing freezing and melting points students should be made familiar with the Celsius or Centigrade temperature scale, and how temperature is measured using a thermometer.</p> <p>Students could find the density of water by measuring the mass of known volume of it: $\text{density} = \text{mass}/\text{volume}$.</p> <p>Students could practice reading a thermometer by measure the temperature of water at different temperatures.</p> <p>Students could measure the freezing point of water by placing a thermometer in a funnel of crushed ice which is melting and water is passing out of the funnel.</p> <p>Students could measure the boiling point of water by placing a thermometer a little above the surface of water that is boiling in a beaker of other suitable vessel.</p> <p>Students could use blue (anhydrous) cobalt chloride paper to test for the presence of water. They should be advised that a positive test means that water is present but not that it is pure.</p>

Competencies	Contents	Suggested activities
<ul style="list-style-type: none"> • tell the chemical composition of water • indicate that compounds are either acids or bases or neutral • describe the general properties of acids, bases and salts • give examples of acids and bases • identify acids and bases using locally prepared indicators • use safety rules with acids and bases • show that water is a neutral compound 	<p>2.2 Water as a neutral compound (7 periods)</p> <ul style="list-style-type: none"> • Composition of water • Neutrality of water • Other common compounds – acids, bases and salts <ul style="list-style-type: none"> - general properties - examples of acids and bases - identification of acids and bases - safety with acids and bases 	<p>Students could use water to make solutions of some common substances such as salt (sodium chloride). The salt can be regained by leaving the solution in a shallow dish somewhere warm such as a window sill. This could be used to demonstrate a physical change.</p> <p>Students could develop data skills by using a data book or other resource to look up the densities of some other liquids, the freezing points and boiling points of some other liquids.</p> <p>Students should already be familiar with compounds and mixtures from their work in Grade 5.</p> <p>Students should know that water is a compound in which hydrogen and oxygen are chemically combined. Emphasise that this is different from a mixture of hydrogen and oxygen. Students should recognize that</p> <p>Students should be given the names of other groups of chemical compounds including:</p> <ul style="list-style-type: none"> • acids; bases; salts <p>Students should appreciate that acids are a group of chemicals which share some similar properties. They should be made familiar with the common laboratory acids:</p> <ul style="list-style-type: none"> • hydrochloric acid; nitric acid; sulphuric acid <p>They may also be given the names of other acids which are present in food including:</p> <ul style="list-style-type: none"> • citric acid – in citrus fruit like lemons and oranges • ethanoic acid – in vinegar • tartaric acid – baking powder • ascorbic acid – vitamin C in fruit and other foods <p>Students should appreciate that bases are another group of chemicals which share some similar properties. Students should be made familiar with the common laboratory bases:</p> <ul style="list-style-type: none"> • sodium hydroxide solution • calcium hydroxide solution (limewater) • ammonia solution <p>Students should appreciate that both acids and bases are potentially harmful and should be handled with care at all times.</p> <p>Students could find the meaning of the hazard signs which appear on reagent bottles of acids and bases, together with hazard signs on other chemicals.</p> <p>Before they explore the properties of acids and bases students should be made familiar with acid-base indicators. They should be familiar with common laboratory indicators including:</p> <ul style="list-style-type: none"> • litmus • phenolphthalein • methyl orange <p>Students could investigate the colours which indicators turn in acids and in bases.</p> <p>Students should use an indicator (litmus paper) to demonstrate that pure water is neither acidic nor basic but neutral.</p>

Competencies	Contents	Suggested activities
<ul style="list-style-type: none"> • describe clean water • list the factors that make water unclean • state simple methods of purification of water • demonstrate simple methods of purification of water • list some common waterborne diseases of their locality • mention the causes of ascariasis and bilharziasis 	<p>2.3 Clean Water (4 periods)</p> <ul style="list-style-type: none"> • What is clean water? • What makes water unclean? <ul style="list-style-type: none"> • Methods of purification of drinking water - decantation, filtration, boiling <p>2.4 Waterborne diseases (7 periods)</p> <ul style="list-style-type: none"> • Examples – cholera, dysentery, giardia, ascaris, bilharzias 	<p>Students could make their own indicator by extracting the colour from a vegetable, such as beetroot, or flowers. They could discuss the characteristics of a good indicator and evaluate their own indicator.</p> <p>Students should understand that, in some ways, acids and bases are chemical opposites. When acids and bases are added together a chemical reaction takes place and another group of chemicals called salts are formed.</p> <p>Students should be made familiar with the names of some common salts such as:</p> <ul style="list-style-type: none"> • sodium chloride (table salt) • copper(II) sulphate • ammonium nitrate – in fertilisers • sodium carbonate (washing soda) <p>Students should appreciate that water which is described as clean is fit to drink, but may not necessarily be pure as it may contain dissolved mineral salts.</p> <p>Students should appreciate that water may be unclean because of impurities that can be seen, such as grains of sand and organic material, and things that can't be seen, such as microorganisms.</p> <p>Students should appreciate that clear water may not be clean water as it may contain harmful microorganisms. This can be linked in to the next section on waterborne diseases.</p> <p>Students could be given some muddy water and asked to either decant it or filter it. This water is clear – but is it clean? Students could smear the water on an agar gel plate and see that colonies of microbes develop therefore the water was not clean.</p> <p>Students could research the system of filtering used in a water treatment plant where the water passes down a filter bed of gravel and sand. A filter bed can be made in a wide glass tube.</p> <p>Students should appreciate that filtering on its own is insufficient to provide clean water. Boiling is necessary to kill any harmful microbes present.</p> <p>Students could research the method of purification in a water treatment plant by passing chlorine gas through the water.</p> <p>Students could treat filtered water with chlorine tablets and then repeat the exercise with another agar gel plate to show that chlorination does kil off microbes.</p> <p>Students should be able to name some examples of water borne diseases including:</p> <ul style="list-style-type: none"> • Cholera; dysentery; giardia; ascaris; bilharzias <p>Students should be aware that ascariasis is an intestinal infection that occurs when eggs of a parasitic roundworm enter the body in infected food or water. The eggs hatch out in the body and the larvae lodge in the intestines. When the number of worms is small there are not obvious symptoms however, more serious infection results in inflammation, fever and diarrhoea. Serious problems may occur if the worm migrates to other parts of the body.</p>

Competencies	Contents	Suggested activities
<ul style="list-style-type: none"> • state the symptoms of ascariasis and bilharziasis • describe the modes of transmission and methods of prevention of ascariasis and bilharziasis • discuss disposing human waste at wrong places as a harmful practice • define crop irrigation as bringing water to crops through canals • explain the importance of crop irrigation • describe methods of crop irrigation • indicate the application of water pressure in crop irrigation 	<ul style="list-style-type: none"> • Causes, modes of transmission and symptoms • Prevention <ul style="list-style-type: none"> - use, location and proper construction of latrines - keeping water clean - avoid disposing human waste at wrong places 2.5 Water and technology (9 periods) • Crop irrigation – definition, importance and methods of crop irrigation 	<p>Students should be aware that biharziasis or schistosomiasis is a disease caused when the larvae of a parasitic flatworm enter the body through the skin. The larvae develop in the body spending time in the lungs and liver before migrating to the kidneys and bladder. Symptoms include abdominal pain, coughing, diarrhoea, fever and tiredness.</p> <p>Students could research into the instances of these diseases in Ethiopia as a whole and in the different regions to see the extent of the problem and whether it is focused in particular areas.</p> <p>Students should be aware that a person infected with ascaris or bilharzia can pass the disease on to others. Eggs from the parasitic worms leave the body in the faeces and can live in water.</p> <p>Students could discuss how drinking and bathing water might become contaminated by infected faeces.</p> <p>Students could devise a plan for the provision of clean water for a community, taking into account the need for fresh water for drinking, cooking and washing, and the need to dispose of human waste.</p> <p>Students could present their plan to the class as the basis of a discussion.</p> <p>Students should appreciate that just as animals need regular supplies of water, the same is true of plants. During the rainy season there is no problem but during the dry season plants must receive water by irrigation.</p> <p>Students could discuss some of the criteria to be considered when devising a method for irrigation. These could include:</p> <ul style="list-style-type: none"> • Reaching all plants • Not wasting water • Minimum time <p>Students could discuss some different methods of watering crops and the strengths and weaknesses of them e.g.</p> <ul style="list-style-type: none"> • Watering can – reaches all plants; economic of water; very time consuming and only possible for a very small area • Overhead spraying – reaches all plants but some areas receive more water than others; wasteful on water; need high water pressure or pump; can be left unattended. • Irrigation channels – body of water needed; plants nearest the channel need more water; economic use of water; pump may be needed; can be left unattended. <p>Students could investigate the methods of irrigation used in their own locality – and why they have been adopted.</p>

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<i>Competencies</i>	<i>Contents</i>	<i>Suggested activities</i>
<ul style="list-style-type: none"> • explain how electric energy is generated from water • define conductors as materials that will carry an electric current. • give examples of conductors • define insulator as a material which does not allow electricity to pass through it • give examples of insulators • define electric current as the flow of electricity through a wire • define voltages as an electric force • demonstrate series and parallel connection by constructing simple circuits • list electric appliances at home as technological products • state electric safety rules 	<ul style="list-style-type: none"> • Electric energy <ul style="list-style-type: none"> - water as a source of electric energy - conductors and insulators - electric current and voltage - series and parallel circuits • Electricity at home <ul style="list-style-type: none"> - electric appliances at home - safety with electricity 	<p>Students should understand that the energy in flowing water can be used to generate electricity. This can be on a small or large scale.</p> <p>Students could visit a hydroelectric plant if there is one in the locality.</p> <p>Students could research how the energy from running water was used in the past – e.g. to drive mill wheels to grind corn.</p> <p>Students could be supplied with statistics showing what proportion of the electricity used in Ethiopia is obtained from hydroelectric plants. They could look at the contribution made by hydroelectric plants in other countries and in the world as a whole.</p> <p>Students could evaluate hydroelectric power compared to other sources of electricity.</p> <p>Students should appreciate that some materials will conduct electricity, and are called conductors, while others will not, and are called insulators.</p> <p>Students could build a simple circuit consisting of a cell, a lamp and two clips. They could place the clips at either end of a sample of material to test whether it was a conductor or an insulator.</p> <p>Students could use the results of the above experiment to make general statements about conductors and insulators.</p> <p>Students should be introduced to the terms current and voltage.</p> <p>The waterfall analogy could be used to explain the difference between current and voltage – the current as the amount of water and the voltage the height of the waterfall.</p> <p>Students could examine the labels on electrical appliances to see the currents they draw and the voltage at which they work.</p> <p>Students should appreciate the difference between series and parallel circuits.</p> <p>Students could experiment by making up simple circuits using a cell and two lamps in series and two lamps in parallel.</p> <p>Students could evaluate the two types of circuit and be asked to explain why domestic lighting is connected in parallel and not in series.</p> <p>Students should discuss and list electric appliances found in the home. They could classify these on the basis of what they do e.g. those which heat, such as a cooker, kettle, toaster and iron, and those which don't e.g. drill, food mixer.</p> <p>Students could carry out a survey of the electric appliances in their homes. This could be linked to the previous work on current and voltage.</p> <p>Students should be aware that electricity is potentially dangerous and appliances should be handled with care. They should be aware of potential hazards such as:</p> <ul style="list-style-type: none"> • Overloaded sockets • Frayed cables • Exposed wire • Handling appliances with wet hands • Having appliances near water i.e. sink and bath • Damaged plugs and sockets <p>Students could carry out a risk assessment of their own homes.</p>

Assessment

The teacher should assess each student's work continuously over the whole unit and compare it with the following description, based on the Competencies, to determine whether the student has achieved the minimum required level.

Students at minimum requirement level

A student working at the minimum requirement level will be able to: describe the physical properties and demonstrate the three states of water; describe the general properties, give examples, identify, and use safety rules with acids bases and salts; tell the chemical composition of water and show that water is a neutral compound; describe clean water, factors that make it unclean, simple methods of purifying it and demonstrate some of these methods; list some common waterborne diseases, mention their causes, symptoms, transmission and prevention; define crop irrigation, explain its importance and methods and how water pressure is applied in crop irrigation; explain how electric energy is generated from water; define

conductors, insulators, electric current and voltage and give examples of conductors and insulators; demonstrate series and parallel connections by constructing simple circuits; list electric appliances at home as technological products and state electric safety

Students above minimum requirement level

Students working above the minimum requirement level should be praised and their achievements recognized. They should be encouraged to continue working hard and not become complacent.

Students below minimum requirement level

Students working below the minimum requirement level will require extra help if they are to catch up with the rest of the class. They should be given extra attention in class and additional lesson time during breaks or at the end of the day.

Unit 3: Plants (30 periods)

Unit Outcomes: Students will be able to:

- give examples of algae, fungi, mosses and ferns, indicate their habitats, identify them and explain their importance
- identify the parts of a flower and describe their functions
- define pollination, explain its types and list its agents
- identify the parts of a seed and describe their functions, dispersal mechanism and processes of germination
- demonstrate the necessary conditions for germination through practical activities
- list the food storage organs of plants, give examples for each and explain the importance of plant foods for health
- explain the steps followed in raising tree seedlings and raise, transfer and give care to the seedlings as they grow
- describe the processes of harvesting and storing crops and compare modern and traditional methods of harvesting and storing crops
- construct simple models of modern stores
- appreciate the role of technology in agriculture, explain the advantages of hybrid crops and selected seed varieties and compare them with normal crops
- demonstrate scientific enquiry skills: observing, classifying, comparing and contrasting, making models, measuring and interpreting data.

Competencies	Contents	Suggested activities
<p><i>Students will be able to:</i></p> <ul style="list-style-type: none"> • give examples of algae, fungi, mosses and ferns in their locality • indicate the habitats of algae, fungi, mosses and ferns • identify algae, fungi, mosses and ferns • explain the significances of algae, fungi, mosses and ferns in their life 	<p>3. Plants 3.1 Algae, fungi, mosses and ferns (5 periods)</p> <ul style="list-style-type: none"> • Examples • Habitat and identification • Significance 	<p>Students should know that algae, fungi, mosses and ferns are groups of plants which do not have flowers. Show students examples of each type of plant.</p> <p>Students could search for examples of algae, fungi, mosses and ferns in their own locality. They should make notes of the nature of the habitats in which they find them.</p> <p>Students should discuss the features of the habitat in which each group of plants is found.</p> <p>Students should be given examples of algae, fungi, mosses and ferns and asked to identify them.</p> <p>Students could discuss the important features of each group which leads to their identification.</p> <p>Students should appreciate the importance of each group of plants to an environment e.g. fungi are essential for the decomposition of organic material and the recycling of nutrients.</p> <p>Students could discuss how each group of plants is used by people e.g. some types of fungi are edible.</p>

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Competencies	Contents	Suggested activities
<ul style="list-style-type: none"> • identify the parts of a flower • describe the functions of the parts of a flower • define pollination as the transfer of pollen from the male part of a flower to the female part of the same or a different flower • explain the two types of pollination • list the agents of pollination • identify the parts of a seed • describe the functions of the parts of a seed • explain seed dispersal mechanism 	<p>3.2 Reproduction in plants (5 periods)</p> <ul style="list-style-type: none"> • Flower – structure and function • Pollination and its types • Pollinating agents 3.3 Seed dispersal and germination (5 periods) • Seed structure and functions • Seed dispersal mechanism 	<p>Students should know the parts of a flower including:</p> <ul style="list-style-type: none"> • Sepals, petals, stamens and pistils <p>Students could dissect a flower, and draw and label the parts. Students could examine several local flowers and identify the parts on each of them.</p> <p>Students should appreciate the functions of the different parts of the flower:</p> <ul style="list-style-type: none"> • Petals – to attract pollinators by sight • Nectaries – to attract pollinators by smell • Anther and filaments – male part of the plant produces pollen • Style, stigma and ovaries – female part of plant; ovules produced and fertilised in the ovary • Calyx – protects flower until it opens <p>Students should know that pollination involves the transfer of pollen from the male part of a flower to the female part of the same or a different flower. The same - self-pollination and a different flower – cross pollination.</p> <p>Students should discuss how pollination might occur. What agents could transfer pollen? Focus them on the idea of wind and animals (insects and birds)</p> <p>Students should examine a soaked bean or some other large dichotomous seed. They should identify the micropyle before removing the testa. The student should draw and label a large dichotomous seed to show parts including:</p> <ul style="list-style-type: none"> • Testa; Micropyle; Cotyledons <p>Students should discuss the function of each part of the seed including:</p> <ul style="list-style-type: none"> • Testa – to protect the seed and prevent it drying out • Micropyle – to absorb water into the seed • Cotyledons – to provide a food source for the germinating seed. <p>Students could examine a monocotyledonous seed and make a comparison with the dichotomous seed already seen.</p> <p>Students should appreciate the need for seeds to be deposited at a reasonable distance from the parent plant. This is called dispersion. Students could be given a variety of seeds to examine and ask themselves how each seed may be carried from place to place. These should include examples of seeds that are:</p> <ul style="list-style-type: none"> • Carried by the wind • Carried attached to the outside of an animal

Competencies	Contents	Suggested activities
<ul style="list-style-type: none"> • list the food storage organs of plants • give examples of foods for each storage organ • explain the importance of plant foods for health • explain the steps followed in raising tree seedlings • raise tree seedlings in pots or on seedbeds • transfer the seedlings to where they will grow 	<p>3.4 Plants as food for humans (3 periods)</p> <ul style="list-style-type: none"> • Food storage organs and examples • Importance for health <p>3.5 Raising tree seedlings (5 periods)</p> <ul style="list-style-type: none"> • Steps in raising tree seedlings Transferring and growing tree seedlings 	<ul style="list-style-type: none"> • Sprinkle small seeds onto damp cotton wool in Petrie dishes. Seal the dishes so the damp cotton wool does not dry out. Place the dishes somewhere warm but cover one with a box or cloth so no light can get in. Examine daily for signs of germination. At the end of this practical work there should be a plenary session in which students discuss their observations and, from these, to deduce the conditions which are essential for germination. Students should be shown some of the fruits and vegetables that are commonly eaten in their locality. They should appreciate that some plants produce much more food than they require and that the surplus may be stored in the leaves, stem, roots and fruits to assist the dispersal process. This excess provides food for many animals including humans. Students should select one of each of the following in their locality: <ul style="list-style-type: none"> • A plant eaten for its swollen root • A plant eaten for its leaves • A plant eaten for its stem • A plant that produces edible fruits They should research, either from books or local farmers, to find out one animal that attacks the food store in the plant. They should find a different pest for each plant. Students should appreciate that plants are an important source of nutrients including: <ul style="list-style-type: none"> • Carbohydrates; fats; Protein; Vitamins; Minerals And also supply the body with water and fibre. Students should research some good sources of the various nutrients from local plants e.g. <ul style="list-style-type: none"> • Carbohydrates – root vegetables • Fats/oils – nuts • Protein – lentils • Vitamin C – oranges • Iron – green leaf vegetables Students could research about deficiency diseases associated with the main nutrients. Students should be familiar with the stages of growing trees to eventually be planted on the land. They should be able to discuss different aspects of the different stages. Planting seeds : <ul style="list-style-type: none"> • Prepare seed bed or pot of soil • Provide conditions suitable for growth • Protect against pests such as caterpillars which will target the young soft growth • Provide water and nutrients

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Competencies	Contents	Suggested activities
<ul style="list-style-type: none"> • give care to the seedlings as they grow • describe the processes of harvesting and storing crops • compare modern and traditional methods of harvesting • compare modern and traditional methods of storing crops • construct simple models of modern stores 	<p>3.6 Harvesting and storing crops (5 periods)</p> <ul style="list-style-type: none"> • Traditional and modern ways of harvesting crops • Traditional and modern ways of storing crops • Making models of modern stores 	<p>Transplanting seedlings in final position:</p> <ul style="list-style-type: none"> • Dig a hole big enough for the root ball • Transplant and firm into the ground • Tie the seedling to a stake until is well established enough to support itself • Protect the seedlings from grazing animals • Continue to water the seedling in dry spells until its root system is sufficiently well established. <p>Students could research those areas of Ethiopia that were forested in 1900 and those which are forested now. Students could find out the names of indigenous trees and what is being done across the country to re-establish forests of them.</p> <p>Students should discuss some different ways of harvesting crops, in particular in their area, and discuss whether each is considered as a traditional method or a modern method. Students could identify some aspects of traditional harvesting such as:</p> <ul style="list-style-type: none"> • Less wastage • Less bruising • Labour intensive • Takes longer • Smaller areas farmed • Physically more demanding <p>With some aspects of modern harvesting such as:</p> <ul style="list-style-type: none"> • Quicker • Less people needed • Larger area can be farmed • Physically less demanding • Equipment is expensive to buy and requires maintenance <p>Students should discuss some different ways of storing crops, in particular in their area, and discuss the advantages and disadvantages of each in the same way as they did for harvesting. Possible considerations could include:</p> <ul style="list-style-type: none"> • Keeping the crop good to eat • Preventing pest damage • Cost of storage • Maximum time crop can be stored <p>Students should make a model of a modern storage facility using card and other readily available materials. Students could demonstrate how their storage facility works and what crops could be stored safely in it.</p>

Competencies	Contents	Suggested activities
<ul style="list-style-type: none"> • appreciate the role of technology in agriculture • explain the advantages of hybrid crops and selected seed varieties • compare hybrid crops with normal crops using sample specimens • compare selected seed varieties with normal seeds using sample specimens 	<p>3.7 Technology and Agriculture (2 periods)</p> <ul style="list-style-type: none"> • Hybrid crops • Selected seed varieties 	<p>Students should appreciate the importance of farmers in providing the country with food. They should understand that farmers are always prepared to try improved types of crops.</p> <p>Students should discuss those factors that would make a crop attractive to farmers. These could include:</p> <ul style="list-style-type: none"> • High germination rate • Strong growth on poor soil • Drought resistance • Pest resistance • Quick growth • Large crop • Crop earns a good price • Easy to harvest <p>Students should appreciate that modern hybrid seeds provide farmers with plants which have some of the above qualities.</p> <p>Students should research either in books or by talking to local farmers, to find out what hybrid crops are being grown in Ethiopia, and particularly in their area, and what advantages they have over crops grown from normal seeds.</p> <p>Students should sew normal and hybrid seeds of a particular crop as a long term experiment. They should treat both sets of plants in an identical way, as far as possible, and keep a note of their observations up until the plants provide a crop.</p>

Assessment

The teacher should assess each student's work continuously over the whole unit and compare it with the following description, based on the Competencies, to determine whether the student has achieved the minimum required level.

Students at minimum requirement level

A student working at the minimum requirement level will be able to: give examples of algae, fungi, mosses and ferns, indicate their habitats, identify them and explain their importance; identify the parts of a flower and describe their functions; define pollination, explain its types and list its agents; identify the parts of a seed and describe their functions, dispersal mechanism and processes of germination; demonstrate the necessary conditions for germination through practical activities; list the food storage organs of plants, give examples for each and explain the importance of plant foods for health; explain the steps followed in raising tree seedlings and raise, transfer and give care to the seedlings as they

grow; describe the processes of harvesting and storing crops and compare modern and traditional methods of harvesting and storing crops; construct simple models of modern stores; appreciate the role of technology in agriculture, explain the advantages of hybrid crops and selected seed varieties and compare them with normal crops

Students above minimum requirement level

Students working above the minimum requirement level should be praised and their achievements recognized. They should be encouraged to continue working hard and not become complacent.

Students below minimum requirement level

Students working below the minimum requirement level will require extra help if they are to catch up with the rest of the class. They should be given extra attention in class and additional lesson time during breaks or at the end of the day.

Unit 4: Animals (17 periods)

Unit Outcomes: Students will be able to:

- explain the common characteristics of birds, give examples for them and tell how they reproduce
- name the types of poultry, describe the importance of poultry farming and methods of feeding, caring for and housing poultry
- construct a model house for poultry
- explain the common characteristics of mammals, give examples for them and tell how mammals reproduce
- describe the importance of livestock farming and explain the methods of feeding, caring for and housing livestock [for pastoral regions only]
- explain the importance of wildlife and describe the methods of conservation of wildlife
- list the national parks of Ethiopia, explain their importance and name the common animals found in them
- demonstrate scientific enquiry skills: observing, comparing and contrasting, making models, measuring, communicating, asking questions and applying concepts.

<i>Competencies</i>	<i>Contents</i>	<i>Suggested activities</i>
<p><i>Students will be able to:</i></p> <ul style="list-style-type: none"> • explain the common characteristics of birds • give examples of birds <ul style="list-style-type: none"> • tell how birds reproduce by internal fertilization 	<p>4. Animals</p> <p>4.1 Birds (6 periods)</p> <ul style="list-style-type: none"> • Common characteristics • Examples <ul style="list-style-type: none"> • Type of fertilization 	<p>Students should already be familiar with the external shape of a bird from their everyday experience. They should also know that it is a vertebrate.</p> <p>Students could examine a bird and draw its external structure including: the eye, beak, wings, tail and feet.</p> <p>Students could discuss the birds commonly seen in their locality and compile a list giving key features which could be used to identify a bird.</p> <p>Students could look at the shape of the beaks of different birds and relate them to the bird eats.</p> <p>Students could look at the shape of the feet of different birds and how they are adapted to bird's habitat and way of life.</p> <p>Students could discuss why it is that although there are no obvious external sex organs fertilisation takes place internally. The male bird mounts the female and sperm passes into the female's body.</p> <p>Students should know that the eggs are fertilised internally in the female. Once the eggs are laid, the female, and sometimes the male, sits on them to keep them warm. Once hatched the parent birds provide food for the chick until they are able to fly and feed themselves.</p> <p>Students could relate the high level of parental care to the relatively small number of eggs laid by birds. This could be compared to the large number of eggs laid by fish and amphibians, where there is little or no parental care.</p>

Competencies	Contents	Suggested activities
<ul style="list-style-type: none"> • name the types of poultry • describe the importance of poultry farming • explain the methods of feeding, caring for and housing poultry • construct a model house for poultry • explain the common characteristics of mammals • give examples of mammals • tell how mammals reproduce by internal fertilization • describe the importance of livestock farming • explain the methods of feeding, caring for and housing livestock 	<ul style="list-style-type: none"> • Poultry Production <ul style="list-style-type: none"> - Types of poultry - Importance - Methods (feeding, care, protection, housing) - Visit to a poultry farm 4.2 Mammals (6 periods) <ul style="list-style-type: none"> • Common characteristics • Examples • Types of fertilization • Rearing domestic animals like goats, sheep, and camels [for pastoral regions only] <ul style="list-style-type: none"> - Importance - Methods (feeding, care, protection, housing) - Visit to a nearby 	<p>Students should appreciate the importance of poultry as a source of both eggs and meat. Students should discuss the types of poultry commonly key and name some popular varieties. Students could discuss the advantages and disadvantages of different varieties of poultry kept for egg laying and for meat.</p> <p>Students should appreciate the need to house poultry in an appropriate way and be able to identify important features of a poultry house including:</p> <ul style="list-style-type: none"> • Protection from the weather • Protection from predators • Adequate supplies of food • Adequate supplies of water • Sufficient ventilation • Removal of waste • Measures to deter pests such as rats • Health measures such as inoculation against disease <p>Students could make a model poultry house using cardboard and other available materials. Students should visit a poultry house if there is one in the area.</p> <p>Students should already be familiar with the external shape of a number of different mammals from their everyday experience. They should also know that all mammals are vertebrates.</p> <p>Students should be able to name a number of common mammals.</p> <p>Students could discuss the mammals commonly seen in their locality and compile a list giving key features which could be used to identify a mammal.</p> <p>Students could examine one or more mammals and draw its external structures.</p> <p>Students should be aware of the external sex organ of the male and that fertilisation takes place internally. The fertilised egg develops in the female and is born live.</p> <p>Students could relate the high level of parental care provided by mammalian parents to the small number of offspring produced. This could be linked back the work on birds or to Grade 5 to the work on fish, amphibians and reptiles.</p> <p>Students should be able to name domestic animals which are reared for various reasons. These should include:</p> <ul style="list-style-type: none"> • Goats • Sheep • Camels <p>Students could discuss how these animals are allowed to graze when food is plentiful but need to be given additional food when it is not.</p> <p>Students could discuss the problems created by overgrazing of livestock.</p> <p>Students should discuss different aspects of keeping livestock including:</p>

Competencies	Contents	Suggested activities
<ul style="list-style-type: none"> • explain the importance of wildlife • describe the methods of conservation of wildlife • list the national parks of Ethiopia • explain the importance of national parks • name the common animals found in the national parks of Ethiopia 	<p>livestock farm</p> <p>4.3 Wild Life (5 periods)</p> <ul style="list-style-type: none"> • Importance • Conservation • National parks of Ethiopia – their importance and common wild animals in them 	<ul style="list-style-type: none"> • Providing shelter when necessary • Protection from predators • Health issues <p>Students should visit a livestock farm in the locality if possible.</p> <p>Students should appreciate the importance of conserving wildlife. They should discuss a range of reasons including:</p> <ul style="list-style-type: none"> • National identity • Biodiversity • Acquisition of knowledge • Tourism • Aesthetic pleasure <p>Students should discuss the different means by which wild life can be conserved in Ethiopia. These could include:</p> <ul style="list-style-type: none"> • Limitations on hunting • Preservation of land from farming • Sharing of water with wild life • Preservation of a variety of habitats • Public awareness <p>Students could discuss ways in which the public could be made more aware of the wild life in Ethiopia.</p> <p>Students should name and write a list of the national parks in Ethiopia. This should include:</p> <ul style="list-style-type: none"> • Abijatta-Shalla; Awash; Bale Mountain; Gambela; Mago; Nechisar Omo; Semien; Yangudi Rassa <p>Students should discuss the importance of national parks including:</p> <ul style="list-style-type: none"> • Havens for wild life • Communities of plants and animals that can be used to re-colonize other areas • Areas of original woodland • Areas of unspoilt land • Areas of natural beauty

<i>Competencies</i>	<i>Contents</i>	<i>Suggested activities</i>
		<p>Students should name and write a list of common animals found in the national parks. Students could discuss ways in which the national parks should be managed in order to:</p> <ul style="list-style-type: none"> • Provide a quite refuge for animals • Conserve species of plants • Allow access for people • Provide opportunities for education <p>Students could discuss the problems which living in a national park creates for indigenous tribes.</p>

Assessment

The teacher should assess each student’s work continuously over the whole unit and compare it with the following description, based on the Competencies, to determine whether the student has achieved the minimum required level.

Students at minimum requirement level

A student working at the minimum requirement level will be able to: explain the common characteristics of birds, give examples for them and tell how they reproduce; name the types of poultry, describe the importance of poultry farming and methods of feeding, caring for and housing poultry; construct a model house for poultry; explain the common characteristics of mammals, give examples for them and tell how mammals reproduce; describe the importance of livestock farming and explain the methods of feeding, caring for and housing livestock [for pastoral regions only]; explain

the importance of wildlife and describe the methods of conservation of wildlife; list the national parks of Ethiopia, explain their importance and name the common animals found in them

Students above minimum requirement level

Students working above the minimum requirement level should be praised and their achievements recognized. They should be encouraged to continue working hard and not become complacent.

Students below minimum requirement level

Students working below the minimum requirement level will require extra help if they are to catch up with the rest of the class. They should be given extra attention in class and additional lesson time during breaks or at the end of the day.

Unit 5: Our body (26 periods)

Unit Outcomes: Students will be able to:

- identify the structures of the human eye, tell their functions, mention eye defects and diseases and their correction and prevention methods
- demonstrate propagation, reflection and refraction of light
- explain how eye and other lenses produce image and name other optical instruments
- define the nervous system and tell its importance
- identify the brain and the spinal chord on a chart, tell their functions and show their main parts
- define hormones and explain the functions of adrenaline and insulin
- name some common drugs, explain their effects and express willingness to conform to a drug free behaviour
- identify the structures of male and female reproductive organs
- define menstruation and explain the care that should be taken before and during menstruation
- define fertilization, explain how it takes place, the consequences of unwanted pregnancy and the benefits of family planning
- list common sexually transmitted diseases and describe their prevention methods
- discuss female genital mutilation, illegal abortion, abduction, rape and sexual harassment as harmful practices that should be stopped
- explain the care and affection that should be given to people living with HIV and AIDS and describe the social impacts of HIV and AIDS
- demonstrate empathy, cooperation, love, interpersonal communication, and problem solving as life skills that help them to prevent HIV
- Demonstrate scientific enquiry skills: observing, classifying, communicating, measuring, asking questions, relating cause and effect and making judgment.

<i>Competencies</i>	<i>Contents</i>	<i>Suggested activities</i>
<p><i>Students will be able to:</i></p> <ul style="list-style-type: none"> • identify the structures of the human eye on a model or a chart • tell the functions of the structures of the human eye • indicate light as a form of energy • demonstrate propagation, reflection and refraction of light • explain how eye and other lenses produce image 	<p>5. Our body</p> <p>5.1 The human eye (7 periods)</p> <ul style="list-style-type: none"> • The structure and function of human eye • How do we see things? – • propagation, reflection, refraction 	<p>The student should be made familiar with the structure of the human eye. Students could observe the outside structure of the eye either with a mirror or by working with a partner. Students could examine the eye of a recently slaughtered mammal such as a sheep or goat.</p> <p>Students should understand the function of each part of the eye including:</p> <ul style="list-style-type: none"> • Cornea, Iris, Lens, Retina, and Optic nerve <p>Students could observe how the size of the pupil changes moving between bright light and shade. Students should understand some of the terminology used in connection with light including:</p> <ul style="list-style-type: none"> • Propagation; Reflection; Refraction <p>Students could investigate the rectilinear propagation of light by passing light through a series of cards with holes at the centre to show that light only travels in straight lines. Students could investigate the reflection of light using a mirror and ray box. Students could investigate the refraction of light using a glass block and ray box. A pencil (rod) immersed obliquely in a glass of water could also be used.</p>

Competencies	Contents	Suggested activities
<ul style="list-style-type: none"> • name other optical instruments • mention eye defects and their correction methods • mention eye diseases and their prevention methods • define the nervous system as a system that consists the brain, spinal cord and nerves • tell the importance of the nervous system • identify the brain and the spinal chord on a chart • tell the functions of the brain and the spinal chord • show the main parts of the brain and the spinal chord 	<ul style="list-style-type: none"> • Lenses and other optical instruments • Our eye and health <ul style="list-style-type: none"> - Eye diseases and defects - Taking care of our eye 5.2 The human nervous system and hormones (7 periods) • What is nervous system? • The role of nervous system in body coordination • Brain and spinal cord 	<p>Students should be made familiar with some common optical instruments. These could include:</p> <ul style="list-style-type: none"> • A hand lens; A simple camera; A microscope; A telescope <p>Students should understand the operation of each of these instruments.</p> <p>Students could compare the operation of the eye with that of a simple camera.</p> <p>Students should investigate the properties of a converging lens in focusing rays of light. They should look at the properties of fat and thin converging lenses and appreciate that the focal lengths are different. This could be linked to accommodation in the eye.</p> <p>Students should understand the difference between eye defects and eye diseases.</p> <p>Students should be familiar with the characteristics of short sight and long sight.</p> <p>Students could research about other eye defects such as astigmatism.</p> <p>Students should be familiar with common eye diseases including:</p> <ul style="list-style-type: none"> • Conjunctivitis; Glaucoma; Cataracts <p>Students should discuss the causes of these diseases and how they are cured.</p> <p>Students could research the work carried out by voluntary groups improve peoples' sight.</p> <p>Students should be aware of the importance of their eyes.</p> <p>Students should discuss aspects of eye care including:</p> <ul style="list-style-type: none"> • Eye drops to treat soreness or itchiness • Eye ointment to treat minor diseases like conjunctivitis • Eye protection when doing potentially dangerous things like practical work in science <p>Students should be aware that the nervous system consists of the brain, the spinal cord and various nerves.</p> <p>Students could identify and name the nerves that run to different parts of the body from a drawing of the nervous system.</p> <p>Students should appreciate that the nervous system is controlled by the brain and controls many of the activities of the body.</p> <p>Students could discuss different activities that occur in the body and what the consequences would be if each of these activities was disrupted in some way.</p> <p>Students should examine a diagram of the brain and identify the main parts.</p> <p>Students could research the function of each part of the brain.</p> <p>Students should appreciate that the brain is at the centre of the nervous system and has a function similar to the central processor in a computer. Information passes to the brain from sensor organs, is processed, and information is sent to motor organs.</p> <p>Students should examine a cross section through the spinal cord and identify the main parts.</p>

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Competencies	Contents	Suggested activities
<ul style="list-style-type: none"> • define hormones as chemical messengers • explain the functions of the hormones adrenaline and insulin • name some common drugs abused in their locality including alcohol, chat, tobacco and hashish • explain the effects of drug abuse on individuals and their families • express willingness to conform to a drug free behaviour 	<ul style="list-style-type: none"> • Hormones and their functions (adrenaline and insulin) • Effects of drug abuse – alcohol, chat, tobacco, hashish 	<p>Students should appreciate that in reflex reactions, the body reacts via the spinal cord before information reaches the brain.</p> <p>Students could discuss the importance of reflex reactions.</p> <p>Students could investigate reflex reactions such as the narrowing of the pupils in bright light or the jerking of the knee.</p> <p>Students should understand that the nervous system provides a means of sending messages around the body rapidly as nerve impulses. Hormones are chemicals which also carry messages around the body, but more slowly through the blood stream.</p> <p>Students should be aware of the action of adrenaline and that adrenalin is commonly called the ‘fight or flight’ hormone since it is released into the blood stream at times when a person may be in danger or under stress.</p> <p>Students could discuss how the action of adrenalin helps a person in such a situation. For example:</p> <ul style="list-style-type: none"> • Increased heart rate pumps blood around the body more quickly • Increases breathing rate provides more oxygen <p>Students should be aware of the action of insulin and discuss when insulin levels are likely to be high in the body – i.e. after a meal when the body is well fed.</p> <p>Students could research the condition diabetes and link this to a shortage of insulin in the body.</p> <p>Students should be aware that a drug is a chemical which alters the behaviour of the body. They should be aware that drugs are not all harmful substances. Many are used to good effect in the treatment of illness.</p> <p>Students should appreciate that drug abuse involves taking drugs which have nothing to do with improving the health. Drugs commonly used include:</p> <ul style="list-style-type: none"> • Alcohol; Tobacco; Chat; Hashish <p>Students should know the effects that these drugs have on the body both in the short term on behaviour, and the long term, in terms of permanent damage to organs and tissues.</p> <p>Students should discuss the damage which drug abuse has on family life. This could include</p> <ul style="list-style-type: none"> • Laziness; Illness; Loss of money due to absence from work • Mood swings; Arguments <p>Students could discuss the reasons why people turn to drug abuse such as:</p> <ul style="list-style-type: none"> • Curiosity; Peer group pressure; Boredom; Escapism; Social behaviour <p>Students should discuss what can be done to stop drug abuse. This could include:</p> <ul style="list-style-type: none"> • Reducing the availability of drugs • Educating people about the damage they are doing to their bodies • Prohibiting some drugs by law <p>Students could visit a local health centre to investigate how big a problem drug abuse is in their area. They could find out which drugs are most often used.</p>

Integrated Science: Grade 6

Competencies	Contents	Suggested activities
<ul style="list-style-type: none"> • identify the main structures of male and female reproductive organs on charts • define menstruation as a monthly loss of blood from the uterus wall • explain the care that should be taken before and during menstruation • define fertilization as coming together of a sperm and an ovum to form a zygote • explain how fertilization takes place in the female body • explain the consequences of unwanted pregnancy and the benefits of family planning 	<p>5.3 The human reproductive system (7 periods)</p> <ul style="list-style-type: none"> • The male reproductive system • the female reproductive system • Menstruation • Fertilization • Unwanted pregnancy and family planning 	<p>Students should be able to identify the parts of the male and female reproductive system from a diagram. They should be able to identify the source of sperm and describe their movement.</p> <p>Students should be aware that when a girl reaches puberty, her body starts to release ova on a regular monthly basis and she becomes able to reproduce. Students should appreciate what happens during a menstrual cycle including:</p> <ul style="list-style-type: none"> • The thickening of the uterus wall • The release of an ovum • The breaking down of the uterus wall • The small loss of blood commonly called a period <p>Student should learn that menstruation is a normal and natural process that should not worry girls and the preparation and care that girls should take for this phenomenon.</p> <p>Students should appreciate that during a certain period within the menstrual cycle a woman is fertile and is she receives sperm from a man:</p> <ul style="list-style-type: none"> • the ovum will become fertilised • instead of the uterus wall breaking down, the fertilized ovum will become embedded in the uterus and develop into a baby • since the uterus wall does not break down there is no show of blood or period <p>Students could research how the menstrual cycle is controlled by hormones in the woman's body. This could link back to earlier work done on hormones.</p> <p>Students should appreciate that a woman becoming pregnant and giving birth to a child is a great even however there are circumstances where pregnancy may be unwanted. Students could discuss some circumstances where pregnancy is undesirable such as:</p> <ul style="list-style-type: none"> • a young unmarried girl • a woman who is ill and weak • a woman from a family who already has many children and is in financial difficulties <p>Students should discuss the consequences of unwanted pregnancy.</p> <p>Students could discuss the need for family planning and methods of preventing pregnancy.</p> <p>Students could visit a local family planning clinic to see the work they do at first hand.</p>

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<ul style="list-style-type: none"> • list gonorrhoea, syphilis and chancroid as common sexually transmitted diseases • describe the prevention methods of common sexually transmitted diseases • discuss female genital mutilation, illegal abortion, abduction, rape and sexual harassment as harmful practices that should be stopped • explain the care that should be given to people living with HIV and AIDS 	<ul style="list-style-type: none"> • Common sexually transmitted diseases – gonorrhoea, syphilis, and chancroid • Harmful practices – female genital mutilation, illegal abortion, abduction, rape, sexual harassment 5.4 HIV and AIDS (5 periods) • Care and affection to people living with HIV and AIDS 	<p>Students should be aware that certain diseases can be transmitted by sexual contact including:</p> <ul style="list-style-type: none"> • gonorrhoea; syphilis; chancroid <p>Students should have some knowledge of the nature of these diseases: Gonorrhoea</p> <ul style="list-style-type: none"> • bacterial infection • in men pain whilst urinating, discharge of pus from the urethra • in women difficulty urinating, vaginal discharge, bleeding after intercourse • treated with antibiotics <p>Syphilis</p> <ul style="list-style-type: none"> • bacterial infection • skin lesions on the genitalia and elsewhere • develops into a rash on different parts of the body • treated with antibiotics • if not treated can lead to damage of the heart, brain, eyes and bones <p>Chancroid</p> <ul style="list-style-type: none"> • bacterial infection • lumps that develop into painful ulcers on the genitals • treated with antibiotics <p>Students should be aware of traditional practices which are harmful including:</p> <ul style="list-style-type: none"> • female genital mutilation • illegal abortion • abduction • rape • sexual harassment <p>Students should discuss different aspects of these practices including:</p> <ul style="list-style-type: none"> • why they are unacceptable • what can be done about them <p>Students should appreciate that people who suffer with HIV and AIDS have particular problems and may require special care and discuss the social problems generated by HIV and AIDS.</p> <p>Students should discuss the benefits to both them and the victims of these conditions, of showing understanding and affection and debate on how best to help and support victims of these conditions.</p>

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<i>Competencies</i>	<i>Contents</i>	<i>Suggested activities</i>
<ul style="list-style-type: none"> • explain the benefits of showing affection to people living with HIV and AIDS • describe the social impacts of HIV and AIDS • demonstrate empathy, cooperation, love, interpersonal communication, and problem solving as life skills that help them to prevent HIV 	<ul style="list-style-type: none"> • Social impacts of HIV and AIDS • Life skills that help to prevent HIV and AIDS 	<p>Students could visit a local HIV / AIDS help centre.</p> <p>Students should be made to practice certain life skills (empathy, cooperation, love, interpersonal communication, and problem solving) through role plays, debates and case studies.</p>

Assessment

The teacher should assess each student's work continuously over the whole unit and compare it with the following description, based on the Competencies, to determine whether the student has achieved the minimum required level.

Students at minimum requirement level

A student working at the minimum requirement level will be able to: identify the structures of the human eye, tell their functions, mention eye defects and diseases and their correction and prevention methods; demonstrate propagation, reflection and refraction of light; explain how eye and other lenses produce image and name other optical instruments; define the nervous system and tell its importance; identify the brain and the spinal chord on a chart, tell their functions and show their main parts; define hormones and explain the functions of adrenaline and insulin; name some common drugs, explain their effects and express willingness to conform to a drug free behaviour; identify the structures of male and female reproductive organs; define menstruation and explain the care that should be taken before and during menstruation; define fertilization, explain how it takes place, the consequences of unwanted pregnancy and the benefits of family planning;

list common sexually transmitted diseases and describe their prevention methods; discuss female genital mutilation, illegal abortion, abduction, rape and sexual harassment as harmful practices that should be stopped; explain the care and affection that should be given to people living with HIV and AIDS and describe the social impacts of HIV and AIDS; demonstrate empathy, cooperation, love, interpersonal communication, and problem solving as life skills that help them to prevent HIV

Students above minimum requirement level

Students working above the minimum requirement level should be praised and their achievements recognized. They should be encouraged to continue working hard and not become complacent.

Students below minimum requirement level

Students working below the minimum requirement level will require extra help if they are to catch up with the rest of the class. They should be given extra attention in class and additional lesson time during breaks or at the end of the day.

Unit 6: Earth (13 periods)

Unit Outcomes: Students will be able to:

- demonstrate the shape of the earth and describe its three layers
- name the three types of rocks, tell their importance, give examples for each and identify the three types of rocks
- explain the causes and effects of earthquakes and volcanoes
- describe the composition of the atmosphere name its layers and compare them
- define weather and construct and use some weather measuring instruments
- name the climatic zones of the earth and show how they affect the distribution of living organisms with examples
- define global warming and explain the causes and effects of global warming
- demonstrate scientific enquiry skills: observing, inferring, predicting, comparing and contrasting, communicating, measuring, asking questions, interpreting data, drawing conclusions, interpreting photos and illustrations and relating cause and effect.

<i>Competencies</i>	<i>Contents</i>	<i>Suggested activities</i>
<p><i>Students will be able to:</i></p> <ul style="list-style-type: none"> • demonstrate the shape of the earth • describe the three layers of the earth • name the three types of rocks • tell the importance of the three types of rocks • give examples of the three types of rocks • identify the three types of rocks • explain the causes and effects of earthquakes and volcanoes 	<p>6. Earth 6.1 Structure of the Earth <i>(4 periods)</i></p> <ul style="list-style-type: none"> • Shape • Layers – rocks in the outer layers • Types of rocks • Earthquakes and volcanoes 	<p>Students should be aware that the Earth is spherical and consists of layers including:</p> <ul style="list-style-type: none"> • The crust; The mantle ; The core <p>Students could label a diagram of a section through the earth showing the different layers. Students could research to find out of what the three layers are composed.</p> <p>Students should appreciate that there are three types of rocks and gives examples of each:</p> <ul style="list-style-type: none"> • Sedimentary e.g. sandstone, limestone • Igneous e.g. basalt, granite • Metamorphic e.g. slate, mudstone <p>Students could find out what rocks are found in their locality. Students should research the uses of these rocks. They could prepare a presentation for the rest of the class. These could include:</p> <ul style="list-style-type: none"> • Building – sandstone, limestone, granite, slate • Raw materials for industry – limestone <p>Students could find out how rocks are used in their locality.</p> <p>Students should appreciate that the crust is composed of massive plates. It is the movement of these plates which is responsible for earthquakes and volcanoes.</p> <p>Students could look at the distribution of earthquake and volcano zones on a diagram or map and show where the earthquakes and volcanoes are most prevalent.</p> <p>Students could research the proximity and frequency of earthquakes in East Africa and the location of volcanoes in East Africa.</p> <p>Students should be aware that the earth is surrounded by a layer of air called the atmosphere.</p>

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Competencies	Contents	Suggested activities
<ul style="list-style-type: none"> • describe the composition of the atmosphere • name the layers of the atmosphere in the order of their existence • compare the layers of the atmosphere • define weather as the prevailing physical conditions of temperature, rainfall and wind. • construct some weather measuring instruments • use some weather measuring instruments • name the climatic zones of the earth • show how the climatic zones affect the distribution of living organisms with examples 	<p>6.2 Atmosphere and weather (5 periods)</p> <ul style="list-style-type: none"> • Composition • Layers • Weather and weather measuring instruments <p>6.3 Earth's Climate (4 periods)</p> <ul style="list-style-type: none"> • Climatic zones and distribution of living organisms <ul style="list-style-type: none"> - Tropical - Temperate - Polar 	<p>Students should be aware of the composition of air from Grade 5 but this could be revised and an introduction to the atmosphere.</p> <p>Students should be able to name the different layers of the atmosphere including:</p> <ul style="list-style-type: none"> • Exosphere; Ionosphere; Thermosphere; Mesosphere; Stratosphere; Troposphere <p>Students should be aware of the some of the features of each layer.</p> <p>Students should be able to define weather in terms of temperature, rainfall and wind. Students should be aware of instruments used to measure weather including:</p> <ul style="list-style-type: none"> • Maximum and minimum thermometer – maximum and minimum temperature • Barometer – atmospheric pressure • Anemometer – wind speed • Wind sock – strength and direction of wind • Weather vane – direction of wind • Rain gauge – amount of rainfall <p>They should be shown these devices and some explanation should be given about how they work.</p> <p>Students should construct weather measuring instruments. The following can most easily be constructed from commonly available items:</p> <ul style="list-style-type: none"> • Anemometer; Wind sock; Weather vane; Rain gauge <p>Students should use the instruments they have made, and other instruments to measure and record the weather over a period of time.</p> <p>Students could obtain information about the weather from television, radio, newspapers and other local publications.</p> <p>Students could research local folk lore about predicting the weather based on such things as the colour of the sky at night or in the morning, and the behaviour of plants and animals.</p> <p>Students should be able to mark the major climatic zones on a map of the earth including:</p> <ul style="list-style-type: none"> • Tropical; Temperate; Polar <p>Students should appreciate that the different climate zones provide different conditions. This results in different living organisms living in each zone.</p> <p>Students should have some appreciation of the type of organisms found in each climatic zone.</p> <p>Students could research some of the adaptations shown by organisms in different zones.</p>

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<i>Competencies</i>	<i>Contents</i>	<i>Suggested activities</i>
<ul style="list-style-type: none"> • define global warming as the increase in temperature of the atmosphere of the earth • explain the causes and effects of global warming 	<ul style="list-style-type: none"> • Global Warming <ul style="list-style-type: none"> - What is global warming - Causes and effects of global warming 	<p>Students should appreciate that the average temperature of the atmosphere at ground level has increased by a small but significant amount.</p> <p>Students could research the causes of global warming from libraries.</p> <p>Students should appreciate some of the effects of global warming including:</p> <ul style="list-style-type: none"> • Melting polar ice caps • Changes in sea levels • Changes in weather patterns • Unusually warm winters and cool summers • Extreme weather conditions in some locations <p>Students could research how global warming is affecting aspects of Ethiopian life such as the crops planted by farmers and the yields of them.</p>

Assessment

The teacher should assess each student’s work continuously over the whole unit and compare it with the following description, based on the Competencies, to determine whether the student has achieved the minimum required level.

Students at minimum requirement level

A student working at the minimum requirement level will be able to: demonstrate the shape of the earth and describe its three layers; name the three types of rocks, tell their importance, give examples for each and identify the three types of rocks; explain the causes and effects of earthquakes and volcanoes; describe the composition of the atmosphere name its layers and compare them; define weather and construct and use some weather measuring instruments; name the climatic zones of the earth and show how they affect the distribution of living organisms with

examples; define global warming and explain the causes and effects of global warming

Students above minimum requirement level

Students working above the minimum requirement level should be praised and their achievements recognized. They should be encouraged to continue working hard and not become complacent.

Students below minimum requirement level

Students working below the minimum requirement level will require extra help if they are to catch up with the rest of the class. They should be given extra attention in class and additional lesson time during breaks or at the end of the day.