

NICCEA SCIENCE: SINGLE AWARD (MODULAR)

Subject code 1310

**GCSE SCIENCE: SINGLE AWARD (MODULAR)
SYLLABUS 2001 and 2002**

**SUBJECT
CONTENT**

**The final column shows
the relevant page number
in**

**Biology for You,
Chemistry for You,
Physics for You.**

STAYING ALIVE

TOPIC	KNOWLEDGE, SKILLS & UNDERSTANDING	Learning Activities	Page
Variation	<p>Candidates should be able to:</p> <ul style="list-style-type: none"> • Use a microscope to look at slides; • Recall parts of a plant and animal cells including nucleus, cytoplasm, cell nuclear membrane, cell wall, permanent vacuole and chromosomes; • Recognise different types of cells exemplified by: nerve cells, human sex cell, plant guard cell, onion epidermis cell. <p>Candidates should know:</p> <ul style="list-style-type: none"> • What tissues, organs and organ systems are exemplified by • Tissues – muscle and xylem; • Organs – heart and leaf • Systems – breathing and reproductive (human); • Skeletal System – the role of bone structure in support, movement and protection. 	<p>Use of microscope to look at a selection of prepared slides.</p> <p>Preparing a microscope slides of onion epidermal cells.</p>	<p>10-11 8-9 12 16 12,15 15-16 75, 157- 158 140</p>
Nutrition	<p>Candidates should recall that:</p> <ul style="list-style-type: none"> • Nutrients in diet include: Proteins for growth and repair; Carbohydrates and fats for energy; Vitamins, water, minerals and fibre for health. (Vitamins: C and D only, minerals: calcium and ion only) <p>Candidates should be able to: Compare the energy content of different foods.</p> <p>Candidates should be able: To compare the relative energy content of two different meals – eg one high in energy and the other low in energy; To relate energy needs to activity, age and gender.</p>	<p>Interpretation of data, eg HEA booklet "Healthy eating..."</p> <p>Measurement of energy in peanut</p> <p>Comparison of energy in meals using data sheets from text books</p>	<p>45-47 52-53 48-49 48 49</p>
Dental Care	<p>Candidates should know:</p> <ul style="list-style-type: none"> • Types of teeth, number of each type of tooth, function of each type of tooth; • The role of bacteria and sugar in tooth decay; • How tooth decay is prevented, with special reference to the role of fluoride and enamel; • Milk teeth and permanent teeth • Structure of a tooth 	<p>Survey of incidence of dental decay in class. Data relating to fluoride in addition to drinking water and dental decay.</p>	<p>55 56 56 55 55</p>

STAYING ALIVE

TOPIC	KNOWLEDGE, SKILLS & UNDERSTANDING	Learning Activities	Page
Digestive System	Candidates should know:	Model gut.	
	<ul style="list-style-type: none"> The major parts and functions of digestive system, namely mouth, oesophagus, stomach, ileum, (liver), colon, appendix, rectum and anus; 		58-61
	<ul style="list-style-type: none"> The role of enzymes in breaking down food (specific enzymes not required); 	Investigation of changes to starch in presence of amylase.	57
	<ul style="list-style-type: none"> The importance of fibre 		53
Transport	Candidates should know:		
	<ul style="list-style-type: none"> Constituents of blood-plasma, red blood cells, white blood cells and platelets; 		97-99
	<ul style="list-style-type: none"> Role of haemoglobin, white blood cells, platelets and plasma; 		98-100
	<ul style="list-style-type: none"> Circulatory system – role of arteries, veins and capillaries; 		91, 101
	<ul style="list-style-type: none"> Heart structure and role as a pump; 		92-93
	<ul style="list-style-type: none"> The meaning of a term pulse rate; 		91
	<ul style="list-style-type: none"> Effect of exercise on heart beat; 		94
	<ul style="list-style-type: none"> Importance of exercise with special reference to dangers of blocked blood vessels causing heart attacks. 	Counting pulse beats. Effects of exercise on heart rate	95-96
Respiration	Candidates should know:	Investigation of expired air.	
	<ul style="list-style-type: none"> The word equation for respiration; 		69
	<ul style="list-style-type: none"> The difference between the air breathed in and out; 		72
	<ul style="list-style-type: none"> Respiration as the release of energy from food; 		69
	<ul style="list-style-type: none"> The structure of the breathing system to include-trachea, bronchi, alveoli, lungs and intercostals muscles; 		75-77
	<ul style="list-style-type: none"> The role of nose, ribs and diaphragm in breathing and out; 		74-76
	<ul style="list-style-type: none"> That gas exchange occurs as the alveoli; 		77
	<ul style="list-style-type: none"> The role of the blood system in gas transport. 		98, 101
Nervous System	Candidates should know:		
	<ul style="list-style-type: none"> The five senses and sense organs; 		126
	<ul style="list-style-type: none"> The structure of the nervous system (brain and spinal cord only) 	Limited to arm jerk.	119, 125
	<ul style="list-style-type: none"> A simple reflex arc; 		123
	<ul style="list-style-type: none"> The eye as a receptor – structure of the human eye, the function of the pupil, iris, lens, retina, optic nerve and cornea. 		130-131
Excretory System	<ul style="list-style-type: none"> An outline of the structure and role of the human urinary system, to include the kidney, bladder, renal artery and vein. 		111

STAYING ALIVE			
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TOPIC	KNOWLEDGE, SKILLS & UNDERSTANDING	Learning Activities	Page
Drugs and Health	Candidates should know:	Health Education Authority leaflets "Change of Heart-campaign.	
	<ul style="list-style-type: none"> The contents of tobacco smoke to include: tar, carbon monoxide and nicotine; 		83
	<ul style="list-style-type: none"> The diseases connected with smoking to include: heart disease, cancers, bronchitis; 		83-84
	<ul style="list-style-type: none"> That nicotine is addictive and affects heart/brain; 		83
	<ul style="list-style-type: none"> The meaning of any dangers of "passive smoking,, 		84
	<ul style="list-style-type: none"> The meaning of the term "drug,, - beneficial and harmful; 		185
	<ul style="list-style-type: none"> Problems of addiction; 		186
	<ul style="list-style-type: none"> That alcohol is a drug which can be harmful. 		188-189
	Candidates should:		
	<ul style="list-style-type: none"> Be able to describe the effects of alcohol on road safety, drug abuse, risk of AIDS, addiction. 		188-189, 184

MAINTAINING THE SPECIES

TOPIC	KNOWLEDGE, SKILLS & UNDERSTANDING	Learning Activities	Page
Classification	Candidates should know how plants and animals are grouped, to be restricted to: <ul style="list-style-type: none"> Flowering and non-flowering plants as exemplified by mosses/ferns and one flowering plant; Animals – vertebrates and invertebrates. 	Examination of mosses, ferns and flowering plants	266-267
	Candidates should: <ul style="list-style-type: none"> Be able to assign organisms to the following groups using the specified characteristics; non flowering plants, eg mosses and ferns that produce spores; flowering plants that reproduce by seeds; invertebrates – animals without backbones; vertebrates – animals with backbones. Group vertebrates into mammals, fish, reptiles, amphibians and birds. Group invertebrates into annelids (worms), arthropods (insects), molluscs, crustacea and myriapoda. 		260-265
	Use keys to identify organisms		257
	Candidates should: Study a local habitat and the factors affecting environmental change (temperature and light)		328-329
Photo-synthesis	<ul style="list-style-type: none"> Recount that water, light energy and carbon dioxide are needed for photosynthesis, that sugars and starch are produced and that oxygen is a by-product. 	Use of a quadrat, pooter, etc.	205-207
	Candidates should: <ul style="list-style-type: none"> Be able to express photosynthesis as a simple word equation (details of leaf structure not required). 		205
Food Chains	Candidates should: <ul style="list-style-type: none"> Understand the components of food chains and webs including: Sun as a primary source of energy; 	Culture of microbes. What can microbes break down?	355-357
	<ul style="list-style-type: none"> Producers; Consumers; Decomposers; Herbivore; Carnivore; Predator/prey. 		355 355 355 355 341-342
Cycles	Candidates should: <ul style="list-style-type: none"> Understand that materials are recycled to maintain the balances in the environment, including: 	Simplified diagrams of the carbon cycle and nitrogen cycle. Relationship between photosynthesis & respiration	369
	<ul style="list-style-type: none"> Carbon cycle: photosynthesis, respiration, combustion and fossilisation. 		371

MAINTAINING THE SPECIES

TOPIC	KNOWLEDGE, SKILLS & UNDERSTANDING	Learning Activities	Page
Pollution	<p>Find out that human activity can damage the environment and affect the plants and animals living there. Including:</p> <ul style="list-style-type: none"> • Air – effects of pollution by soot and sulphur dioxide on plants • Land – deforestation; <ul style="list-style-type: none"> - household refuse: biodegradable and non-biodegradable materials; • Water – sewage; <ul style="list-style-type: none"> - effluent from water cooling processes. 	Grow cress seeds in an atmosphere of sulphur dioxide.	347 347 349
Conservation	<p>Find out that Man may contribute to improving the environment for himself, and the plants and animals which live there, including:</p> <ul style="list-style-type: none"> • Air - afterburners; • Land - reforestation; • Water - sewage disposal (detail of plant treatment not required). <p>Candidates should know the:</p> <ul style="list-style-type: none"> • Role of decomposers (bacteria and fungi) • Role of humus and chemical fertilisers. <p>Recall the key factors in the process of decay (temperature, microbes, compactness, moisture) and how this process is important in the cycling of biological materials in everyday life.</p> <p>Candidates should know:</p> <ul style="list-style-type: none"> • The main groups of microbes, restricted to fungi, bacteria and viruses; • The importance of good laboratory practice when dealing with microbes. 		347 346 316-317 369-370 219 369-370 171-173, 268-269 310

MAINTAINING THE SPECIES

TOPIC	KNOWLEDGE, SKILLS & UNDERSTANDING	Learning Activities	Page
Reproduction			
Plants	<p>Candidates should:</p> <p>Learn about the structure and functions of the component parts of the flower, including:</p> <ul style="list-style-type: none"> • Name the parts – sepals, petals, nectarines, stamens, (anthers and filaments) and carpels (stigma, style, ovary), receptacle; • Self and cross-pollination; • Insects and wind as agents of pollination; • Fruit and seed dispersal – wind, animals, water and explosive mechanisms; • Seed structure (radicle, plumule, cotyledon, testa, endosperm); • Seed germination (a hypogeal seed); • Investigate the conditions which affect germination (temperature, adequate water, oxygen supply). 	Dissect a flowering plant.	<p>235-236</p> <p>238</p> <p>238</p> <p>240-241</p> <p>241</p> <p>242</p> <p>242</p>
Animals	<p>Be introduced to the structure and function of the component parts of the reproductive systems in humans, including:</p> <ul style="list-style-type: none"> • Naming the parts of the males system – testes, scrotum, sperm ducts, prostate gland, urethra and penis. • Naming the parts of the female system – ovaries, oviducts, uterus, cervix, vagina and vulva; • Intercourse (including the structure of sperm andora); • Fertilisation in the oviducts; • Development by cell division, into a ball of cells which implants in the uterus lining; • Birth limited to contraction of the uterus and dilation of the cervix. <p>Find out about the requirements to maintain healthy bodies and healthy babies during pregnancy, including diet, Rubella, smoking, alcohol, and drugs;</p>	Germinate cress seedlings in different conditions.	<p>159</p> <p>158</p> <p>159</p> <p>159</p> <p>160</p> <p>161</p> <p>161</p>
Childhood	<p>Candidates should know:</p> <ul style="list-style-type: none"> • The developing child needs food and oxygen supplied by mother's blood before birth (the role of the placenta) and the umbilical cord; • After birth a balanced diet and parental care are required. 		<p>160-161</p> <p>44</p>

MAINTAINING THE SPECIES

TOPIC	KNOWLEDGE, SKILLS & UNDERSTANDING	Learning Activities	Page
Puberty	Report on the physical and emotional changes that take place during adolescence and explain the need to have a moral and responsible attitude to sexual behaviour (prevention of sexually transmitted diseases and contraception)		166 164-165
	Puberty		166
	Candidates should know the:		
	<ul style="list-style-type: none"> • Physical changes in boys and girls at puberty to include: Girls – height increase, breasts grow, pubic hair, periods, ovulation 		166
	<ul style="list-style-type: none"> • Boys - height increase, voice deepens, penis and testes enlargement, sperm production, pubic hair and facial hair growth; • Hormone changes leading to emotional changes. 		166 166
Variation	Measure variations in living organisms.		254
	Variations to include height, eye colour, ear lobes, tongue rolling, continuous and discontinuous variation.	Measurement of differences, eg ear lobes, tongue rolling, height.	254-255
	Relate that information in the form of genes is passed on from one generation to the next.		272
	Candidates should be able to describe:		
	<ul style="list-style-type: none"> • Chromosomes; • Gene as a section of a chromosome; • Genes controlling characteristics 		272 273 280
	Describe an example of variation in living organisms which have both genetic and environmental causes (limited to height in humans).		255

MATERIALS			
TOPIC	KNOWLEDGE, SKILLS & UNDERSTANDING	Learning Activities	Page
Hazard Symbols and their uses	<p>Candidates should know the normal symbols for flammable, corrosive, toxic, radioactive, explosive.</p> <p>Candidates should:</p> <ul style="list-style-type: none"> • Be able to classify materials as natural or synthetic. 	Sort an exhibition of materials into 2 groups, (natural and synthetic).	44
Properties and uses	<p>Candidates should be able to:</p> <p>Make comparisons between materials on the basis of investigation and measurement of simple properties for example, strength, hardness, flexibility, thermal conductivity and electrical conductivity.</p> <p>Candidates should know:</p> <ul style="list-style-type: none"> • Some common uses of materials and why they are used; • PVC in clothing because it is soft and flexible and durability; • Diamond in cutting tools because of its hardness; • Copper for making electrical cable because it conducts electricity; • Aluminium in aircraft manufacture because of its strength and density. 	<p>Test the strength of fibres. Use a scratch test on materials. Test the flexibility of materials.</p> <p>Test the thermal conductivity & electrical conductivity of materials.</p>	171 274 59 107, 184
Environment	<p>Candidates should know the effects of glowing and lighted splint and lime water on gases, hydrogen, oxygen and carbon dioxide.</p> <ul style="list-style-type: none"> • Candidates should be able to recall that hydrogen is used in rocket fuel, oxygen in respiration and carbon dioxide in fire extinguishers. <p>Give examples of some waste materials which can be recycled and suggest some reasons why this is desirable.</p> <p>Candidates should know:</p> <ul style="list-style-type: none"> • That glass, paper and aluminium cans are easily recycled; • How certain materials are recycled. <p>Explain the economic importance of re-cycling.</p> <p>Candidates should understand:</p> <ul style="list-style-type: none"> • That a large amount of the waste that is put into rubbish tips can be re-cycled or used as fuel; • That glass, paper and metals can be re-cycled easily and that re-cycling keeps costs down and saves using raw materials; • The positive and negative effects of the exploitation of raw materials, for example, limestone extraction on the local community; 	<p>Tests to identify hydrogen, oxygen and carbon dioxide.</p> <p>Details of recycling plant.</p> <p>Navan fort.</p>	81, 208, 212, 316, 134, 318 125, 186, 196 109, 172 131, 132' 109 109 172 131, 132, 109 107, 127

MATERIALS					
TOPIC	KNOWLEDGE, SKILLS & UNDERSTANDING	Learning Activities	Page		
Classification	<ul style="list-style-type: none"> The effects of hard water on soap; The differences between temporary and permanent hardness; Cave formation, stalagmites and stalactites; Disadvantages and advantages associated with hard water Water softening by boiling and addition of washing soda (sodium carbonate). 	Removing temporary hardness by boiling and permanent hardness by adding washing soda. Effects limited to scum on bath sides and blockage of pipes. Causes limited to calcium compounds in water	302, 304, 304, 303, 302', 304-305		
	Candidates should recall:				
	<ul style="list-style-type: none"> That materials exist in three states – either solid, liquid or gas; The properties of solids, liquids and gases; <ul style="list-style-type: none"> solids: fixed shape, fixed volume, difficult to compress liquids: no fixed shape, no fixed volume, difficult to compress gases: no fixed shape, no fixed volume, easily compressed 			6	
	<ul style="list-style-type: none"> That some materials such as sand and shaving foam are hard to classify. 				6
	Candidates should know:				
	<ul style="list-style-type: none"> That materials can be classified as elements, compounds or mixtures; 		Compare the properties of iron with the properties of sulphur. Separate an iron/sulphur mixture.		16,17,18
	<ul style="list-style-type: none"> The meaning of the terms elements, compounds and mixture; 				16, 17, 18
	<ul style="list-style-type: none"> That the element iron has different properties from the element sulphur (properties to include, appearance, effect of a magnet, reaction with acid, whether it floats or sinks in water); That we can use some of these properties to separate a mixture of iron and sulphur. 				17
	Candidates should understand:				
	<ul style="list-style-type: none"> That compounds can be made by chemically reacting elements together for example heating a mixture of iron and sulphur produces iron sulphide and the burning of magnesium in air to form magnesium oxide. 		Make iron sulphide from iron filings and sulphur, burn magnesium metal.		17, 46
Kinetic theory	Candidates should know the meaning of:				
	<ul style="list-style-type: none"> Melting, freezing, boiling, condensing. Describe the role of filtration and chlorination in water treatment.	Investigate changes of state (water only) and the water cycle.		10, 11, 296	
	Recognise that it is helpful to imagine that everything is made up of very small particles.			300-301, 8	

MATERIALS

TOPIC	KNOWLEDGE, SKILLS & UNDERSTANDING	Learning Activities	Page
	<p>Candidates should be able:</p> <ul style="list-style-type: none"> • To use particle theory to explain: <ul style="list-style-type: none"> - the differences between solid, liquid and gas; - changes of state; - solubility of solids in liquids. 	<p>Use kinetic theory model kit to explain the differences between solids, liquids and gases and change of state. Use computer simulation to demonstrate same (eg "Moving Molecules,,). Dissolve coloured solids in water. Dilution experiments</p>	7, 10, 11, 267
	<p>Candidates should recall:</p> <ul style="list-style-type: none"> • That the properties of a mixture are the same as its ingredients; • That the properties of a compounds are different from the elements from which it was made. 	<p>Compare the properties of iron sulphide to those of iron and sulphur. Compare the properties of sodium metal, chlorine gas and sodium chloride.</p>	18, 22
	<p>Candidates should know:</p> <ul style="list-style-type: none"> • The word equations: <ul style="list-style-type: none"> - iron + sulphur gives iron sulphide: - magnesium + oxygen gives magnesium oxide. 		17 46
Solubility	<p>Understand the terms solvent, solute, solution and saturated solution. Recognise the factors affecting solution, ie heat, surface area and stirring. Know that some gases dissolve in water, limited to oxygen and carbon dioxide and the effect of temperature on solubility of gases in water.</p>		20, 149, 314
Separating mixtures	<p>Candidates should recognise</p> <ul style="list-style-type: none"> • That making pure materials is very important in many industries such as the food, cosmetic, drug and paint industries, so separation of mixtures is used widely; • That the method of separation depends on the properties of the mixture. <p>Candidates should be able:</p> <ul style="list-style-type: none"> • To describe the separation techniques: <ul style="list-style-type: none"> - dissolving; - filtering; - evaporating; - distilling; - fractional distillation; - magnetic attraction; - chromatography; - use of a separating funnel. 	<p>Prepare pure salt from rock salt.</p> <p>Separate pure water from muddy or salty water. Separate coloured inks.</p> <p>Separation of oil from water</p>	119 17, 18, 19, 20, 27, 144

CHEMICAL REACTIONS

TOPIC	KNOWLEDGE, SKILLS & UNDERSTANDING	Learning Activities	Page
Rusting	<p>Candidates should know:</p> <ul style="list-style-type: none"> • that both air and water are needed for rusting; • that rusting can be slowed down or prevented by: <ul style="list-style-type: none"> - greasing or oiling; - painting; - tin plating; - zinc plating; - chromium plating. 	Test tube reactions to investigate rusting of iron nails showing that air and water are needed for rusting. Test tube reactions to show how the rusting of iron nails can be slowed down or stopped.	92, 93, 95
Acids, alkalis and neutralisation	<p>Candidates should be able:</p> <ul style="list-style-type: none"> • To use indicators to classify solutions as acidic, alkaline or neutral. 	Use indicators to classify a range of solutions as acids, alkaline or neutral.	143
	<p>Candidates should:</p> <ul style="list-style-type: none"> • Understand the pH scale. 	Use universal indicator to measure the pH of a range of solutions.	143
	<p>Candidates should know:</p> <ul style="list-style-type: none"> • That when hydrochloric acid reacts with sodium hydroxide, common salt is formed; • That universal indicator can be used to monitor the neutralisation process; • Some everyday applications of neutralisation, for example treating: <ul style="list-style-type: none"> - wasp stings; - indigestion; - acid soil with lime. 	Make sodium chloride.	143, 144, 143
	<p>Candidates should know:</p> <ul style="list-style-type: none"> • that acid rain comes from the burning of fossil fuels; • How acid rain affects common materials such as limestone, marble, brick, copper, steel and aluminium; 	Investigate the effects of sulphur dioxide solution on common building materials.	188
	<ul style="list-style-type: none"> • How acid rain affects fish and plants. 		188

CHEMICAL REACTIONS

TOPIC	KNOWLEDGE, SKILLS & UNDERSTANDING	Learning Activities	Page
Chemical reactions	Candidates should know: <ul style="list-style-type: none"> How lime is made from limestone by thermal decomposition; That limestone, sand, sodium carbonate (soda ash) and cullet are used to make glass; The meaning of oxidation and reduction (limited to the gaining or loss of) oxygen. The word equations: <p>Magnesium + oxygen → magnesium oxide, Copper oxide + hydrogen → copper + water.</p> 	Make lime from limestone. Make magnesium oxide from magnesium ribbon. Reduce copper oxide with hydrogen.	129 132 90 46
Periodic table	Candidates should know that the periodic table groups together elements with similar properties. Candidates should know: <ul style="list-style-type: none"> That elements can be classified as metals, non-metals and semi-metals; That elements are arranged in vertical columns called groups; Names of Group 1 and Group II elements; That elements in the same group have similar chemical properties (group 1 only); Rows across the periodic table are called periods. 	Colour in areas of metals, non-metals and semi-metals in the periodic table. Compare the properties of a typical metal and a non-metal, for example sodium and sulphur. Teacher demonstrations of the properties of sodium and potassium. "Chemistry in Action", video.	43 44 43 50, 54 51 43
Electronic structure & chemical formulae	Candidates should know: <ul style="list-style-type: none"> That atoms consist of protons, neutrons and electrons and their relative charges and masses; The electronic structure of sodium, potassium, fluorine, chlorine, magnesium and oxygen; That when atoms lose or gain electrons, they become charged and are then called ions; Formulation of sodium chloride and magnesium oxide by ionic bonding. Candidates should know: <ul style="list-style-type: none"> The symbols for iron, sulphur, hydrogen, oxygen, magnesium, sodium and chlorine; The formulae of iron sulphide, water, magnesium oxide and sodium chloride. 		28, 29 30, 71, 262- 264 14, 43

ENERGY AND SPACE

TOPIC	KNOWLEDGE, SKILLS & UNDERSTANDING	Learning Activities	Page
Transfer and Conservation	<p>Candidates should:</p> <ul style="list-style-type: none"> know that there is a variety of energy resources, to include, oil, gas, coal, nuclear, biomass, wind, wave and solar; 		11-13
	<ul style="list-style-type: none"> learn that energy sources, for example, fossil fuels, are ultimately dependent on the sun's energy; 		111
	<ul style="list-style-type: none"> know the differences between renewable energy resources, for example, wind, wave, tidal, solar and biomass and non-renewable resources for example, fossil fuels and nuclear fuel (uranium); 		11-13, 113-115, 359
	<ul style="list-style-type: none"> know that global resources are limited and understand why energy should be used efficiently. 	Make solar heater out of black plastic tubing.	11
	<p>Candidates should know that:</p> <ul style="list-style-type: none"> Energy can be stored in a spring (potential); 	Investigate the energy transfers in a cotton reel tractor and a torch.	108, 116
	<ul style="list-style-type: none"> The energy in the spring can turn a dynamo (kinetic); 		111
	<ul style="list-style-type: none"> The dynamo makes electrical energy; 		110
	<ul style="list-style-type: none"> Energy can be stored in an elastic band and in batteries; 		110
	<ul style="list-style-type: none"> That this stored energy can be converted to other forms. 		110
	<p>Candidates should understand:</p> <ul style="list-style-type: none"> That a weight in a high position has stored energy (potential); 	Lifting a weight using a motor.	109, 116
<ul style="list-style-type: none"> That a falling weight can transfer its energy to a dynamo (kinetic); 		110	
<ul style="list-style-type: none"> The principle of conservation of energy. 		108	
<p>Candidates should understand that:</p> <ul style="list-style-type: none"> When energy is transferred some is useful and some is wasted; 		112	
<ul style="list-style-type: none"> When energy is transferred by a car engine most of it is wasted. 		122	
<p>Candidates should be able to describe:</p> <ul style="list-style-type: none"> Energy changes in a range of domestic devices: television, electric and gas cooker, tumble dryer. 		9	

ENERGY AND SPACE

TOPIC	KNOWLEDGE, SKILLS & UNDERSTANDING	Learning Activities	Page
Heat energy transfer	<p>Candidates should understand:</p> <ul style="list-style-type: none"> • That a conductor is a material which lets energy flow through it easily; • That a bad conductor is called an insulator • Why good conductors often feel cold; • That conduction takes place in solids; • That energy is transferred from atom to atom; • The uses of some conductors and insulators namely: - metal cooking pots with wooden handles <ul style="list-style-type: none"> - rubber on handlebars - ski jackets - spade handle; - bird's feathers; • that energy is passed through a gas or liquid by convection currents; • That a heated liquid or gas expands and rises with a cooler (heavier) liquid or gas falls; • That infra-red radiation transfers energy from one place to another; • That objects absorb and emit energy all the time; • That the amount of infra-red radiation absorbed or emitted by an object depends on its temperature and the colour of its surface; • Some applications namely: <ul style="list-style-type: none"> - refrigerator cooling fins; - shiny teapots; - white houses in hot countries; - motorcycle engine; - fireman's suit; - astronaut's suit. 	<p>Comparing a plastic bowl, metal saucepan, carpet tile, quarry tile.</p> <p>Comparing a plastic spoon & metal spoon in hot water. Compare the rate of conduction through copper, iron, aluminium, brass and glass rods.</p> <p>Demonstrate using hot air balloon and potassium permanganate crystal in water. Rate of water cooling in a black can & shiny can.</p>	<p>42-45</p> <p>42-45</p> <p>42-45</p> <p>42-45</p> <p>46-47</p> <p>46-47</p> <p>48-53</p> <p>48-53</p> <p>48-53</p>
Saving heat energy	<p>Candidates should:</p> <ul style="list-style-type: none"> • understand that the best insulators are materials which trap pockets of air; • know that keeping a house warm is expensive; • explain that the cost can be reduced by insulation with specific reference to: <ul style="list-style-type: none"> - hot-tank jacket; - draught proofing; - roof insulation; - room thermostat; - double glazing; • be aware that some insulations methods pay for themselves quickly; • know that double-glazing takes a long time to repay itself; • understand how thermostats help to save energy. 	<p>Compare the cooling rate of beakers of hot water covered in wallpaper, polystyrene and wool.</p>	<p>44, 51</p> <p>45</p> <p>44-45</p> <p>45</p> <p>10</p>

ENERGY AND SPACE

TOPIC	KNOWLEDGE, SKILLS & UNDERSTANDING	Learning Activities	Page
Sound	<p>Candidates should:</p> <ul style="list-style-type: none"> • know that sounds are produced by vibrations; • know that sound can travel through different materials at different speeds but cannot travel through a vacuum; • know that the loudness of a sound is related to the amplitude of the variation causing the sound; • know that the pitch of a sound is related to the frequency of the vibration causing the sound • Understand wavelength 	Use CRO	<p>228, 174 231</p> <p>234</p> <p>229, 175 232</p> <p>232</p> <p>238</p> <p>230- 231, 240- 241</p>
Earth in Space	<p>Candidates should know:</p> <ul style="list-style-type: none"> • What a planet is; • That the Earth is a planet; • What a moon is; • What a star is; • State what a solar system is; • The nine planets that orbit the Sun. <p>Candidates should understand:</p> <ul style="list-style-type: none"> • A table of the relative sizes of these planets; • A table of the average distances of these planets from the Sun; • That the solar system forms part of a galaxy which is part of a larger system called the Universe; • That our galaxy is called the Milky Way; • Know that the Sun, Moon and Earth are spherical bodies. <p>Specific evidence, relating to the Earth:</p> <ul style="list-style-type: none"> • Ship over horizon; • Shadow of Earth on the moon; • Photographs of Earth from space. 		<p>160- 161 159 163 160- 161</p> <p>161 161</p> <p>167</p> <p>165</p>

ENERGY AND SPACE				
TOPIC	KNOWLEDGE, SKILLS & UNDERSTANDING	Learning Activities	Page	
Gravity	Candidates should know that: <ul style="list-style-type: none"> The Earth moves around the Sun; It takes 365¼ days for the Earth to move round the Sun. 		158 158	
	Candidates should: <ul style="list-style-type: none"> Understand that only half of the Earth can be in daylight at any one time; Day and night can be explained in terms of the rotation of the Earth on its axis; Learn that changes in day length, seasonal changes and changes in the elevation of the sun can be explained in terms of the tilt of the Earth's axis. 		158 158 158	
	Candidates should understand that: <ul style="list-style-type: none"> Gravity is the force of attraction between all pieces of matter; Larger planets have a stronger pull of gravity than smaller planets; The force of gravity gets smaller as you move away from the Earth. 		162 162 162	
	Weight	Candidates should: <ul style="list-style-type: none"> Understand that your weight is the pull of the Earth's gravity; Distinguish between mass and weight. 		73 75
		Candidates should know that: <ul style="list-style-type: none"> A mass is measured in kilograms; Weight is measured in newtons; The Earth pulls down 1 kilogram with a force of about 10 newtons. 		75 75 75
		Candidates should be able to: <ul style="list-style-type: none"> Measure their mass in kilograms; Calculate their weight from a given equation. 		75 75
Candidates should: <ul style="list-style-type: none"> Know that gravitational force acts towards the centre of every astronomical body; Understand that different planets have different gravitational pulls; Know that their mass would stay the same on different planets; Be able to calculate their weight on different planets if given the gravitational pull 			162 76	
Space exploration		Candidates should know about: <ul style="list-style-type: none"> The extent of the human exploration of space; Apollo space programme (limited to moon landing) Space shuttle and Skylab. 		167
		CDROM Space Exploration		

LIGHT, FORCES AND ENERGY

TOPIC	KNOWLEDGE, SKILLS & UNDERSTANDING	Learning Activities	Page
	<p>Candidates should know that:</p> <ul style="list-style-type: none"> we see things when light from them enters our eyes; some objects make light and others reflect it; burning, some chemical reactions and electricity produce light. 		179
	<p>Candidates should know:</p> <ul style="list-style-type: none"> that a shadow is a dark area without light; how shadows are made; that the formation of shadows proves that light travels in straight lines. 		179
	<p>Candidates should know that:</p> <ul style="list-style-type: none"> lenses refract (bend) light; there are two kinds of lens – concave and convex; images can be formed using a convex lens; affect of lenses on two parallel rays; the human eye and camera contain a convex lens; 		180
			180
	<ul style="list-style-type: none"> prisms bend light and split it into colours; the band of colours is called a spectrum (dispersal) a rainbow is made when raindrops act as little prisms; white objects reflect all the colours of light; red coloured objects reflect red light and absorb the rest; black coloured objects do not reflect any light; the colour of an object depends on the colour of light falling on it (specific examples not required). 		180
	<p>Candidates should know that:</p> <ul style="list-style-type: none"> the spectrum of light we can see is a small part of a larger spectrum; the larger spectrum is called the electromagnetic spectrum. 		202
			202
			203
			202
			208, 206
			216-7
			216
			216
			217
			222
			222
			222-3
	<p>Candidates should be able to:</p> <ul style="list-style-type: none"> give examples of some types of electromagnetic radiation which are important in everyday life and describe some of their applications. 		217-9
	<p>Examples should include gamma rays, X-rays, infra-red and microwaves.</p> <ul style="list-style-type: none"> recognise that when electromagnetic waves travel from one point to another they transfer energy. 		218-9
			218-221, 226-7, 318, 356
			219

LIGHT, FORCES AND ENERGY

TOPIC	KNOWLEDGE, SKILLS & UNDERSTANDING	Learning Activities	Page
Forces linear	Candidates should:		
	<ul style="list-style-type: none"> • know that forces can: <ul style="list-style-type: none"> - change the shape of things; - start objects moving; - cause them to stop; - change the direction of motion; • Learn that the movement of an object depends on the size and direction of the forces exerted on it. 	Pulling a block using a newtonmeter.	73
	Candidates should understand:		
	<ul style="list-style-type: none"> • That the forces of escaping from an air balloon makes the balloon move in the opposite direction; and relate to rockets. 		96
	Candidates should be able to:		
	<ul style="list-style-type: none"> • Calculate average speed using given formula; • Explain that when an object is not moving relative to its environment or moving at steady speed without change of direction there are balanced forces acting upon it for example a car standing at rest on the surface of the Earth, a person on an escalator; • Describe the effects of friction on moving objects. 		130 77
	<ul style="list-style-type: none"> • Candidates should understand that: • Friction resists motion; • Friction can be useful, eg bicycle brakes, parachutes, walking; • Friction can be a nuisance, eg wears out machinery, wastes energy, wears out shoes, tyres, carpet. 	Dropping ball bearings through liquids of different viscosity.	92-93 92 93
	Candidates should know that:		
	<ul style="list-style-type: none"> • Stopping time depends on: <ul style="list-style-type: none"> - speed of a car; - thinking distance of driver; - braking distance; • there is a large friction force between the tyres of a car and the road; • oil, water and ice reduce the friction force. 		98 98 98

LIGHT, FORCES AND ENERGY

TOPIC	KNOWLEDGE, SKILLS & UNDERSTANDING	Learning Activities	Page
Turning	Candidates should understand		
	<ul style="list-style-type: none"> that a force which acts some distance from the pivot is a turning force, spade, crowbar, wheelbarrow; the term "moment of a force", scissors, spanners and a bottle opener are used to make our work easier. 		100 100 123
	Candidates should be able to:		
	<ul style="list-style-type: none"> balance a lever pivoted at the centre using two unequal forces; calculate the moment of a force (using a given formula). 		100 100
Pressure	Candidates should:		
	<ul style="list-style-type: none"> know that pressure is measured in Pascals; know and use the equation pressure = force/area; relate pressure to everyday effects, stiletto heels, snow shoes, tractor tyres, tank tracks, skis, drawing pins. 		85 85 85
Electricity and Magnetism	Candidates should know:		
	<ul style="list-style-type: none"> that electrical circuits must be complete; what electrical conductors and insulators are; that copper, iron, steel, brass, aluminium and carbon (graphite) are conductors; that plastic, rubber and wood are insulators. 		254 255 255 255
	Candidates should be able to:		
	<ul style="list-style-type: none"> set up simple series circuits containing a battery, switch, bulb or buzzer; record the above circuits diagrammatically using the appropriate circuit symbols. 		254-257 254-257
	Candidates should be able to:		
	<ul style="list-style-type: none"> use a voltmeter to measure the voltage of a battery; voltage is measured in volts; join two batteries in series and measure the voltage; set up a simple series circuit containing two batteries and a bulb; measure the voltage across the bulb using a voltmeter; set up a simple parallel circuit containing two batteries and two similar bulbs; measure the size of current in different parts of a series circuit; measure the size of current in different parts of a parallel circuit. 		258 258 258 258 258 256-257 256-7

LIGHT, FORCES AND ENERGY

TOPIC	KNOWLEDGE, SKILLS & UNDERSTANDING	Learning Activities	Page
Magnetism	Candidates should know: <ul style="list-style-type: none"> • the voltmeter is connected in parallel across the bulb; • electric current is measured in amperes (amps); • electric current is measured with an ammeter; • the ammeter is connected in series with the circuit. 		258 256 256 256
	Candidates should recall that: <ul style="list-style-type: none"> • when electricity flows there is a heating effect; • the heating effect is used kettles and fires. 	Use low voltage power supply and 12v 5 w car bulb to investigate how electricity flowing in a bulb affects how hot it is.	270
	Candidates should know that: <ul style="list-style-type: none"> • the electricity meter records the electricity used; • the consumer unit distributes the electricity to several circuits; • lights and power sockets are on different circuits; • a light can be operated by a single switch or a two-way switch; • two-way switches are used at the top and bottom of a staircase; • fuses and earth wire protect the user. 		273 274 274 271
	Candidates should: <ul style="list-style-type: none"> • know that units of an electric meter are kilowatt hours (kWh); • Be able to calculate the cost of electricity used, given the price of a unit and the number of units used. 	Domestic electric bills.	271 275 273
	Candidates should: <ul style="list-style-type: none"> • Find out about the properties of magnets including attraction and repulsion; • Find out about the magnetic field pattern produced by a bar magnet. 	Draw magnetic fields.	273 284 287
	Candidates should know that: <ul style="list-style-type: none"> • When electricity flows it produces a magnetic effect; • This effect can be used to make electromagnets; • Electromagnets are useful because they can easily be turned on and off; • Electromagnets are used in lifting magnets and electric motors; • Recall that the strength of an electromagnet is affected by; <ul style="list-style-type: none"> (i) number of coils, (ii) the current, (iii) the material used in the core. 		285, 292-3 293 294
	Candidates should know that: <ul style="list-style-type: none"> • This effect can be used to make electromagnets; • Electromagnets are useful because they can easily be turned on and off; • Electromagnets are used in lifting magnets and electric motors; • Recall that the strength of an electromagnet is affected by; <ul style="list-style-type: none"> (i) number of coils, (ii) the current, (iii) the material used in the core. 		294, 296-7 293
	END OF SUBJECT CONTENT		