

THEME: MANAGEMENT AND CONTINUITY OF LIFE

LEARNING AREA: 1. RESPIRATION

Learning Objectives	Suggested Learning Activities	Learning Outcomes	Notes	Vocabulary
<p>1.1 Analysing the human breathing mechanism.</p>	<p>Observe models or computer software to identify the structure of the human respiratory system which consists of the nasal cavity, trachea, bronchus, lungs, ribs, diaphragm and the intercostal muscles.</p> <p>Examine a model of a lung to identify the bronchus, bronchiole and alveolus.</p> <p>Build a functional model of the human respiratory system to show the relationship between the air pressure in the thoracic cavity and the process of inhalation and exhalation.</p> <p>Discuss the breathing mechanism.</p>	<p>A student is able to:</p> <ul style="list-style-type: none"> ▪ identify the structure of the human respiratory system, ▪ identify the structure of the lung, ▪ describe the process of inhalation and exhalation, ▪ relate the changes of air pressure in the thoracic cavity to inhalation and exhalation, ▪ describe the breathing mechanism. 	<p>The contraction and relaxation of the internal and external intercostal muscles are not required.</p>	<p>breathing mechanism – <i>mekanisme pernafasan</i> exhalation – <i>hembusan nafas</i> inhalation – <i>tarikan nafas</i> intercostal muscle – <i>otot interkosta</i> nasal cavity – <i>rongga nasal</i> rib – <i>tulang rusuk</i> thoracic cavity – <i>rongga toraks</i></p>

Learning Objectives	Suggested Learning Activities	Learning Outcomes	Notes	Vocabulary
<p>1.2 Understanding the transport of oxygen in the human body.</p>	<p>View a video or computer software then gather and interpret data on the following:</p> <ol style="list-style-type: none"> diffusion of oxygen from the alveoli into the blood capillaries and from the blood capillaries into the cells, transport of oxygen by the red blood cells in the form of oxyhaemoglobin. 	<p>A student is able to:</p> <ul style="list-style-type: none"> ▪ describe the diffusion of oxygen from the alveoli into the blood capillaries, ▪ describe the transport of oxygen by blood, ▪ describe the diffusion of oxygen from the blood capillaries into the cells. 		<p>diffusion – <i>peresapan</i></p>
<p>1.3 Realising the importance of a healthy respiratory system.</p>	<p>Collect and interpret data on the following:</p> <ol style="list-style-type: none"> substances that are harmful to the respiratory system, i.e. nicotine and tar (from the smoke of cigarettes), sulphur dioxide (from factories), and carbon monoxide (from the smoke of vehicles) and haze, effects of harmful substances such as toxin and carcinogen on the respiratory system, diseases of the respiratory system. 	<p>A student is able to:</p> <ul style="list-style-type: none"> ▪ list the substances which are harmful to the respiratory system, ▪ explain the effects of pollutants on the respiratory system, ▪ list the diseases that affect the respiratory system, ▪ practise good habits to improve the quality of air. 		<p>carcinogen – <i>karsinogen</i> toxin – <i>bahan beracun</i></p>

Learning Objectives	Suggested Learning Activities	Learning Outcomes	Notes	Vocabulary
	<p>Carry out an activity to show the effects of smoking on the lungs.</p> <p>Hold or visit an exhibition on the effects of smoking and diseases of the lungs.</p> <p>Brainstorm ideas on how to improve air quality and put these ideas into practice.</p>			

LEARNING AREA: 2. BLOOD CIRCULATION AND TRANSPORT

Learning Objectives	Suggested Learning Activities	Learning Outcomes	Notes	Vocabulary
<p>2.1 Understanding the transport system in humans.</p>	<p>Observe and study models, computer software or videos on the structure of the heart and types of blood vessels (i.e. artery, vein and capillary) in the blood circulatory system.</p> <p>Examine a live specimen of a heart to identify its structure.</p> <p>Discuss the following: a) functions of the heart, b) characteristics of the blood vessels and their functions.</p> <p>Carry out an activity to compare and contrast oxygenated and deoxygenated blood.</p> <p>Simulate the flow of blood in the circulatory system.</p> <p>Discuss the role of the blood circulatory system in the transport of substances.</p> <p>Invite a medical officer to give a talk on 'Taking Care of Your Heart'.</p>	<p>A student is able to:</p> <ul style="list-style-type: none"> ▪ describe the circulatory system as a system of tubes with a pump and valves that ensure one-way flow of blood, ▪ state the functions of the heart, ▪ identify the structure of the human heart, ▪ compare and contrast the structure of arteries, veins and capillaries, ▪ relate the characteristics of the blood vessels to their functions, ▪ compare and contrast oxygenated and deoxygenated blood, ▪ illustrate the path of blood flow in the circulatory system, ▪ describe the role of the blood circulatory system in the transport of substances, ▪ explain the importance of maintaining a healthy heart. 		<p>blood vessel – <i>salur darah</i> deoxygenated blood – <i>darah terdeoksigen</i> heart – <i>jantung</i> oxygenated blood – <i>darah beroksigen</i> vein – <i>vena</i> artery – <i>arteri</i></p>

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2.2 Analysing the human blood.	Invite a physician to give a talk on the following: a) the constituents of blood, i.e. plasma, red blood cells, white blood cells, platelets and their functions, b) the blood groups, i.e. A, B, AB and O, c) the compatibility between the blood group of the donor and that of the recipient, d) the importance of blood donation, e) the storage and handling of donated blood.	A student is able to: <ul style="list-style-type: none"> ▪ state the constituents of blood and their functions, ▪ state the blood groups, ▪ match the blood group of the donor to that of the recipient, ▪ justify the importance of blood donation, ▪ describe how donated blood is stored and handled. 	Universal donor and universal recipient should be included.	blood donation – <i>derma darah</i> blood group – <i>kumpulan darah</i> physician – <i>doktor</i> universal donor – <i>penderma universal</i> universal recipient – <i>penerima universal</i>

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<p>2.3 Analysing the transport system in plants.</p>	<p>Observe a wilted plant and discuss how it occurred.</p> <p>Examine the epidermis of a leaf under a microscope to identify the stomata and discuss its functions.</p> <p>Carry out experiments to study the factors affecting the rate of transpiration.</p> <p>Carry out activities to study the following:</p> <p>a) transport of synthesised food substances via the phloem, b) transport of water from roots to the leaves via the xylem.</p> <p>Examine cross-sections of root, stem and leaf to identify the location of xylem and phloem.</p> <p>Discuss the roles of transpiration in the transport of water and minerals.</p>	<p>A student is able to:</p> <ul style="list-style-type: none"> ▪ describe how wilting occurs, ▪ describe what transpiration is, ▪ describe the functions of stomata, ▪ identify the factors affecting the rate of transpiration, ▪ describe how the factors affect the rate of transpiration, ▪ describe the roles of transpiration, ▪ investigate the pathway of water in a cut stem using a suitable stains, ▪ identify the locations of xylem and phloem, ▪ describe the functions of xylem and phloem. 	<p>The transport of water and minerals in transpiration should be emphasized.</p>	<p>transport – <i>pengangkutan</i> transpiration - <i>transpirasi</i></p>

LEARNING AREA: 3. EXCRETION

Learning Objectives	Suggested Learning Activities	Learning Outcomes	Notes	Vocabulary
<p>3.1 Understanding human excretion.</p>	<p>Discuss what excretion is.</p> <p>Examine models, charts or view computer software to identify the excretory organs, i.e. skin, lungs and kidneys.</p> <p>Discuss the excretory products of each excretory organ, i.e. water, carbon dioxide, minerals, salt and urea.</p> <p>Discuss the importance of excretion.</p>	<p>A student is able to:</p> <ul style="list-style-type: none"> ▪ explain what excretion is, ▪ identify the excretory organs in humans, ▪ state the excretory products of each excretory organ, ▪ explain the importance of excretion. 		<p>excretion – <i>perkumuhan</i></p>
<p>3.2 Analysing the urinary system in human.</p>	<p>Examine models, charts or view computer software of the urinary system to identify the locations of kidneys, ureters, urinary bladder and urethra.</p>	<p>A student is able to:</p> <ul style="list-style-type: none"> ▪ identify the locations of kidneys and other parts of the urinary system, ▪ describe the shape of the kidney, ▪ identify the structures of the kidney, 	<p>The structure and the function of the nephron is not required.</p>	<p>kidney – <i>ginjal</i> urinary bladder – <i>pundi kencing</i></p>

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	<p>Collect and interpret data on the functions of the kidney.</p> <p>Examine a live specimen of a kidney to:</p> <p>a) describe the shape of the kidney,</p> <p>b) identify the components of the kidney, i.e. the cortex, medulla and pelvis.</p> <p>Discuss the following:</p> <p>a) the importance of the kidneys,</p> <p>b) living with kidney failure.</p>	<ul style="list-style-type: none"> ▪ describe the functions of the kidney, ▪ explain the importance of maintaining healthy kidneys. 	<p>Describe briefly how a dialysis machine works.</p>	
<p>3.3 Analysing excretion in plants.</p>	<p>Collect and interpret data on the following:</p> <p>a) the ways plants eliminate their excretory products,</p> <p>b) the excretory products of plants, i.e. carbon dioxide, water and complex waste products.</p>	<p>A student is able to:</p> <ul style="list-style-type: none"> ▪ describe the ways plants eliminate their excretory products, ▪ identify the excretory products of plants. 		

LEARNING AREA: 4. REPRODUCTION

Learning Objectives	Suggested Learning Activities	Learning Outcomes	Notes	Vocabulary
<p>4.1 Understanding sexual and asexual reproduction.</p>	<p>Discuss the following;</p> <p>a) the importance and types of reproduction,</p> <p>b) the similarities and differences between sexual and asexual reproduction.</p> <p>Using charts, diagrams, videos or computer software to study the following:</p> <p>a) fertilisation,</p> <p>b) internal and external fertilisation,</p> <p>c) the various ways of asexual reproduction, i.e. binary fission, budding, spore formation, vegetative reproduction and regeneration.</p> <p>Discuss and classify animals and plants according to how they reproduce.</p>	<p>A student is able to:</p> <ul style="list-style-type: none"> ▪ state the importance of reproduction, ▪ state the types of reproduction, ▪ state what fertilisation is, ▪ describe internal and external fertilisation, ▪ compare and contrast sexual and asexual reproduction, ▪ classify animals and plants according to their ways of reproduction. 	<p style="text-align: center;">Reproduction</p> <pre> graph TD Reproduction --> sexual Reproduction --> asexual asexual --> binary_fission[binary fission] asexual --> budding asexual --> spore_formation[spore formation] asexual --> vegetative asexual --> regeneration </pre>	<p>asexual reproduction – <i>pembiakan aseks</i></p> <p>binary fission – <i>belahan dedua</i></p> <p>budding – <i>pertunasan</i></p> <p>external fertilisation – <i>persenyawaan luar</i></p> <p>internal fertilisation – <i>persenyawaan dalam</i></p> <p>sexual reproduction – <i>pembiakan seks</i></p> <p>spore formation – <i>pembentukan spora</i></p> <p>vegetative reproduction – <i>pembiakan vegetatif</i></p> <p>regeneration – <i>penjanaan semula</i></p>

Learning Objectives	Suggested Learning Activities	Learning Outcomes	Notes	Vocabulary
<p>4.2 Analysing the male reproductive system.</p>	<p>Identify the following parts of the male reproductive system with the help of charts, models, videos or computer software:</p> <ol style="list-style-type: none"> a) the sexual organs, i.e. testes and penis, b) the other related parts, i.e. the scrotum, urethra, sperm ducts and prostate gland. <p>Discuss the following:</p> <ol style="list-style-type: none"> a) the functions of the different parts of the male reproductive system, b) the role of sperm in reproduction, c) the physical, physiological and emotional changes in male during puberty. 	<p>A student is able to:</p> <ul style="list-style-type: none"> ▪ identify the parts of the male reproductive system, ▪ describe the functions of the different parts of the male reproductive system, ▪ state the role of sperm in reproduction, ▪ describe the changes in male during puberty. 		<p>emotional changes – <i>perubahan emosi</i> penis – <i>zakar</i> puberty – <i>baligh</i> sperm – <i>sperma</i> sperm duct – <i>duktus sperma</i></p>

Learning Objectives	Suggested Learning Activities	Learning Outcomes	Notes	Vocabulary
<p>4.3 Analysing the female reproductive system.</p>	<p>Identify the following parts of the female reproductive system with the help of diagrams, models, videos or computer software:</p> <ol style="list-style-type: none"> the sexual organs, i.e. ovaries and uterus, the other related parts, i.e. the fallopian tube, vagina and cervix. <p>Discuss the following:</p> <ol style="list-style-type: none"> the functions of the different parts of the female reproductive system, the role of an ovum in reproduction, the physical, physiological and emotional changes in female during puberty. <p>Simulate the differences between male and female gametes in terms of size, numbers and mobility.</p>	<p>A student is able to:</p> <ul style="list-style-type: none"> ▪ identify the parts of the female reproductive system, ▪ describe the functions of the different parts of the female reproductive system, ▪ state the role of an ovum in reproduction, ▪ describe the changes in female during puberty, ▪ compare and contrast male and female gametes in terms of size, numbers and mobility. 		<p>cervix - <i>servik</i> vagina – <i>faraj</i></p>

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<p>4.4 Analysing the menstrual cycle.</p>	<p>Discuss the following:</p> <ol style="list-style-type: none"> menstruation and the menstrual cycle, the changes in the uterus wall during menstrual cycle, the relationship between the fertile phase of the menstrual cycle and fertilisation, the importance of personal hygiene during menstruation. 	<p>A student is able to:</p> <ul style="list-style-type: none"> ▪ describe the meaning of menstruation, ▪ describe the menstrual cycle, ▪ describe the changes in the uterus wall during menstrual cycle, ▪ relate the fertile phase of the menstrual cycle to fertilisation, ▪ explain the importance of personal hygiene during menstruation. 	<p>The description of the menstrual cycle should not include hormones.</p>	<p>fertile phase – <i>fasa subur</i> menstrual cycle – <i>kitar haid</i> personal hygiene – <i>kebersihan diri</i></p>
<p>4.5 Analysing fertilisation and pregnancy.</p>	<p>Discuss the following with the help of diagrams, charts, models, videos or computer software:</p> <ol style="list-style-type: none"> the location of implantation of embryo, the development of a zygote into an embryo and subsequently into a foetus until birth. 	<p>A student is able to:</p> <ul style="list-style-type: none"> ▪ describe fertilisation in human, ▪ identify the location of implantation of embryo, ▪ describe the development of a zygote into an embryo and subsequently into a foetus until birth. 	<p>The concept of fertilisation in human should include tracing the pathways of sperm and ovum until they meet and fuse.</p>	<p>fertilisation – <i>persenyawaan</i> implantation – <i>penempelan</i></p>

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4.6 Understanding the importance of pre-natal care.	Organise an exhibition or a multimedia presentation on the following: a) the importance of taking nutritious food during pregnancy, b) the effects of smoking and the taking of certain substances such as drugs and alcohol on the embryo and foetus.	A student is able to: <ul style="list-style-type: none"> ▪ relate the importance of taking nutritious food to the health of both mother and foetus during pregnancy, ▪ explain the importance of avoiding the intake of substances that are harmful to the foetus. 		deformity – <i>kecacatan</i> nutritious food – <i>makanan berkhasiat</i>

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<p>4.7 Evaluating the importance of research in human reproduction.</p>	<p>Collect and interpret data on the following:</p> <ul style="list-style-type: none"> a) the meaning of sterility, b) ways to overcome sterility, i.e. nutrition, hormone treatment, surgery and in vitro fertilisation (IVF), c) birth control, i.e. rhythm method, the use of condom, contraceptive pills, intra-uterine contraceptive device (IUCD), spermicides, vasectomy and ligation. <p>Debate on birth control and its effects on society.</p> <p>Discuss the importance of research on human reproduction.</p>	<p>A student is able to:</p> <ul style="list-style-type: none"> ▪ state the meaning of sterility, ▪ describe ways to overcome sterility, ▪ describe the methods of birth control, ▪ debate on the abuse of birth control and its effects on the community, ▪ explain the importance of research on human reproduction. 	<p>Birth control methods to be included: Natural, chemical, mechanical, hormonal and surgical.</p>	<p>ligation – <i>ligasi</i> sterility – <i>kemandulan</i> vasectomy – <i>vasektomi</i></p>

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<p>4.8 Analysing the sexual reproductive system of flowering plants.</p>	<p>Examine flowers to identify the following parts:</p> <ol style="list-style-type: none"> petal and sepal, the male part, i.e. the stamen which consists of the filament, anther and pollen grains, the female part, i.e. the pistil which consists of the stigma, style, ovary and ovules. <p>Use a microscope or hand lens to observe the following:</p> <ol style="list-style-type: none"> the cross-section and longitudinal section of an ovary to identify the ovules, pollen grains. <p>Discuss the functions of the following;</p> <ol style="list-style-type: none"> flowers in reproduction, male reproductive parts of the flower, female reproductive parts of the flower. 	<p>A student is able to:</p> <ul style="list-style-type: none"> ▪ identify the different parts of a flower, ▪ identify the male and female reproductive parts of a flower, ▪ identify the male and female gametes, ▪ describe the functions of the male and female reproductive parts of a flower in sexual reproduction. 		<p>petal – <i>ranggi</i> pollen grain – <i>butir debunga</i></p>

Learning Objectives	Suggested Learning Activities	Learning Outcomes	Notes	Vocabulary
<p>4.9 Analysing pollination.</p>	<p>Discuss the following with the help of models, charts, videos or computer software:</p> <ol style="list-style-type: none"> pollination, types of pollination, similarities and differences of self-pollination and cross-pollination, advantages of cross-pollination, uses of cross-pollination in agriculture. <p>Carry out an activity to study the various types of flowers to identify their pollinating agents.</p>	<p>A student is able to:</p> <ul style="list-style-type: none"> ▪ describe what pollination is, ▪ relate the characteristics of flowers to their agents of pollination, ▪ state the types of pollination, ▪ compare and contrast self-pollination and cross-pollination, ▪ explain the advantages of cross-pollination, ▪ explain with examples the uses of cross-pollination in agriculture. 		<p>agriculture – <i>pertanian</i> cross-pollination – <i>pendebungaan kacuk</i> self-pollination – <i>pendebungaan sendiri</i></p>
<p>4.10 Understanding the development of fruits and seeds in plants.</p>	<p>Use a microscope to observe the development of pollen tubes in different percentage of sucrose solution (5% - 10%).</p>	<p>A student is able to:</p> <ul style="list-style-type: none"> ▪ identify the location where fertilisation occurs in flower, ▪ describe fertilisation in plants, ▪ describe the formation of fruits and seeds. 		<p>germination – <i>percambahan</i> sucrose solution – <i>larutan sukrosa</i></p>

Learning Objectives	Suggested Learning Activities	Learning Outcomes	Notes	Vocabulary
	<p>Draw annotated diagrams of the following:</p> <ul style="list-style-type: none"> a) the fertilisation process in plants, b) the formation of fruits and seeds. <p>Discuss the following:</p> <ul style="list-style-type: none"> a) the location where fertilisation occurs in flower, b) fertilisation in plants, c) formation of fruits and seeds. 			

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<p>4.11 Synthesising the concept of germination of seeds.</p>	<p>Dissect a seed longitudinally and identify its structure using hand lens or microscope.</p> <p>Collect and interpret data on the following:</p> <p>a) functions of the different parts of a seed, i.e. the embryo (radicle, plumule and cotyledons) and testa, protected by the pericarp (fruit wall),</p> <p>b) physical changes of seedlings in terms of the development of radicle, plumule and cotyledon.</p> <p>Carry out small group discussions to:</p> <p>a) identify the variables related to the germination of seeds,</p> <p>b) formulate hypotheses about the conditions required for the germination of seeds.</p> <p>Design and carry out experiments to determine the conditions required for the germination of seeds.</p>	<p>A student is able to:</p> <ul style="list-style-type: none"> ▪ identify the structure of a seed, ▪ explain the functions of the different parts of a seed, ▪ describe the physical changes of seedlings during germination, ▪ make hypotheses on the conditions required for the germination of seeds, ▪ design an experiment to study the conditions required for the germination of seeds, ▪ carry out the experiment to study the conditions required for the germination of seeds, ▪ draw conclusions on the conditions required for germination of seeds. 		<p>cotyledon – <i>kotiledon</i> plumule – <i>plumul</i> radicle – <i>radikel</i> seedling – <i>anak benih</i> germination - <i>percambahan</i></p>

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<p>4.12 Application of vegetative reproduction in flowering plants.</p>	<p>Carry out a study of the vegetative reproduction of various plants in a nursery to identify the types of vegetative reproduction.</p> <p>Discuss what vegetative reproduction is.</p> <p>Discuss the application of research carried out in vegetative reproduction in agriculture.</p>	<p>A student is able to:</p> <ul style="list-style-type: none"> ▪ explain with examples the meaning of vegetative reproduction, ▪ state the parts of the plants that can reproduce vegetatively, ▪ classify flowering plants according to the parts that can reproduce vegetatively, ▪ describe the application of research carried out on vegetative reproduction in agriculture. 	<p>Biotechnology can be introduced.</p> <p>Example of vegetative reproduction is plant tissue culture.</p> <p>Details of plant tissue culture are not required.</p>	

LEARNING AREA: 5. GROWTH

Learning Objectives	Suggested Learning Activities	Learning Outcomes	Notes	Vocabulary
<p>5.1 Analysing the pattern of human growth.</p>	<p>Discuss the following:</p> <ul style="list-style-type: none"> a) characteristics used to measure growth rate such as height and weight, b) meaning of growth, c) growth pattern in male and female, d) effects of nutrition on the development of physical and mental well-being of children. <p>Carry out activities to interpret the growth curve for male and female from infancy to adulthood.</p>	<p>A student is able to:</p> <ul style="list-style-type: none"> ▪ describe what growth is, ▪ identify the characteristics used to measure growth rate, ▪ analyse the growth curve for male and female, ▪ compare and contrast the growth rate in male and female, ▪ describe the effects of nutrition on the growth in children. 		<p>growth - <i>pertumbuhan</i></p>

THEME: MATTER IN NATURE

LEARNING AREA: 1. LAND AND ITS RESOURCES

Learning Objectives	Suggested Learning Activities	Learning Outcomes	Notes	Vocabulary
<p>1.1 Analysing the various minerals found in the Earth's crust.</p>	<p>Discuss what a mineral is.</p> <p>Collect and interpret data on the various types of minerals that exist in the Earth's crust:</p> <p>a) natural elements, i.e. gold and silver,</p> <p>b) natural compounds, i.e. oxides, carbonates, sulphides and silicates.</p> <p>Discuss and identify the elements in a few natural compounds.</p> <p>Carry out activities to study the following:</p> <p>a) hardness of minerals,</p> <p>b) solubility of minerals in water,</p> <p>c) the effect of heat on some metal carbonates, oxides and sulphides.</p>	<p>A student is able to:</p> <ul style="list-style-type: none"> ▪ describe what a mineral is, ▪ explain through examples that minerals exist in the form of natural elements or natural compounds, ▪ identify the elements in natural compounds, ▪ describe the properties of minerals, ▪ write equations in words to show the effect of heat on the minerals. 		<p>compound – <i>sebatian</i> earth crust – <i>kerak bumi</i> element – <i>unsur</i> gold – <i>emas</i> hardness – <i>kekerasan</i> silver (argentum) – <i>perak</i></p>

Learning Objectives	Suggested Learning Activities	Learning Outcomes	Notes	Vocabulary
<p>1.2 Understanding the reactions between metals and non-metals.</p>	<p>Brainstorm and discuss the following: a) examples of metals, b) examples of non-metals.</p> <p>Carry out activities to study the reactions of some metals, i.e magnesium, aluminium, zinc and iron with the following non-metals: a) oxygen, b) sulphur.</p>	<p>A student is able to:</p> <ul style="list-style-type: none"> ▪ state examples of metals and non-metals, ▪ describe the reactions between metals and non-metals, ▪ write equations in words for the reaction between metals and non-metals, ▪ state that metals react with non-metals at different rate. 	<p>The reactivity series need not be introduced.</p>	<p>non-metal – <i>bukan logam</i> metal – <i>logam</i></p>
<p>1.3 Understanding silicon compounds.</p>	<p>Collect and interpret data on silicon compounds that exist in the form of silica and silicate.</p> <p>Carry out activities to study the properties of silica and silicate as follows: a) solubility in water, b) reaction with hydrochloric acid, c) effects of heat.</p> <p>Visit factories to learn about the process of making glass, ceramic, electronic chips and fibre optics.</p> <p>Discuss the uses of silicon compounds in our daily life.</p>	<p>A student is able to:</p> <ul style="list-style-type: none"> ▪ state the different forms of silicon compounds, ▪ state examples of silica, ▪ state examples of silicate, ▪ relate the properties of silicon compounds to their stability, ▪ explain through examples the uses of silicon compounds in our daily life. 		<p>silicon compound – <i>sebatian silikon</i></p>

Learning Objectives	Suggested Learning Activities	Learning Outcomes	Notes	Vocabulary
1.4 Analysing calcium compounds.	<p>Collect and interpret data on calcium carbonate.</p> <p>Carry out activities to study the following:</p> <p>a) the properties of calcium carbonate in terms of its reaction with acid, solubility in water and the effects of heat,</p> <p>b) the formation of calcium oxide (quicklime) and calcium hydroxide (slaked lime).</p> <p>Discuss the following:</p> <p>a) uses of calcium compounds, i.e. calcium carbonate, calcium oxide and calcium hydroxide,</p> <p>b) properties of calcium compounds with reference to their uses.</p>	<p>A student is able to:</p> <ul style="list-style-type: none"> ▪ state the elements in calcium carbonate, ▪ identify the various forms of calcium carbonate, ▪ describe the properties of calcium carbonate, ▪ write equations in words for the reactions of calcium carbonate, ▪ describe the formation of calcium oxide and calcium hydroxide, ▪ relate the properties of calcium compounds to their uses. 		<p>calcium carbonate – <i>kalsium karbonat</i> slaked lime - <i>kapur mati</i> quicklime – <i>kapur tohor</i> solubility – <i>kelarutan</i></p>

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<p>1.5 Analysing natural fuel resources and their importance.</p>	<p>Access websites or visit PETROSAINS, National Science Centre or an oil refinery to collect information on the formation of natural fuel resources found in Malaysia.</p> <p>Carry out an activity to study fractional distillation of petroleum.</p> <p>Discuss the following:</p> <ol style="list-style-type: none"> characteristics and uses of the various fractions of petroleum, contributions of petroleum and natural gas industry to the economic development of our country, efficient ways of using petroleum and other natural fuel resources. 	<p>A student is able to:</p> <ul style="list-style-type: none"> ▪ list the natural fuel resources, ▪ explain the formation of natural fuel resources, ▪ describe the fractional distillation of petroleum, ▪ describe the characteristics of the various fractions from the fractional distillation of petroleum, ▪ describe the uses of the various fractions of petroleum, ▪ explain the contributions of petroleum and natural gas industry to the economic development of our country, ▪ generate ideas on how to use natural fuel resources efficiently. 		<p>fraction – <i>pecahan</i> fractional distillation – <i>penyulingan berperingkat</i> natural fuel resource – <i>sumber bahan api semula jadi</i> petroleum – <i>minyak mentah</i></p>

THEME: ENERGY IN LIFE

LEARNING AREA: 1. ELECTRICITY

Learning Objectives	Suggested Learning Activities	Learning Outcomes	Notes	Vocabulary
<p>1.1 Understanding electrostatics.</p>	<p>Carry out the following activities:</p> <ol style="list-style-type: none"> producing static electrical charges in materials through friction, detecting static electrical charges using an electroscope, observing what happens when two objects with the same or opposite charges are brought near to each other and making conclusions about static electrical charges. <p>Discuss the following:</p> <ol style="list-style-type: none"> what electrostatics is, types of static electrical charges, properties of static electrical charges, examples of material that are easily charged, i.e. acetate and polythene, everyday phenomena related to static electrical charges, e.g. lightning, safety measures to be taken when dealing with electrical charges, e.g. the use of lightning conductor. 	<p>A student is able to:</p> <ul style="list-style-type: none"> ▪ describe what electrostatics is, ▪ state the types of static electrical charges, ▪ state the properties of static electrical charges, ▪ describe how static electrical charges can be produced in some materials, ▪ describe ways to detect static electrical charges, ▪ explain everyday phenomena caused by static electrical charges, ▪ state the safety measures to be taken when dealing with static electricity. 		<p>polythene – <i>politena</i> charge - <i>cas</i></p>

Learning Objectives	Suggested Learning Activities	Learning Outcomes	Notes	Vocabulary
<p>1.2 Understanding electricity.</p>	<p>Collect and interpret data on the sources of electrical energy used in everyday life.</p> <p>Carry out an activity to observe the flow of electric current using a Van de Graff generator and a galvanometer.</p> <p>Discuss the following:</p> <ol style="list-style-type: none"> electricity, current, voltage, resistance, directions of current and electron flow in an electric circuit. 	<p>A student is able to:</p> <ul style="list-style-type: none"> ▪ give examples of sources of electrical energy used in everyday life, ▪ state what electricity is, ▪ state what voltage is, ▪ state what resistance is, ▪ describe the directions of current and electron flow in an electric circuit. 		<p>current – <i>arus</i> resistance – <i>rintangan</i> voltage – <i>voltan</i></p>
<p>1.3 Applying the understanding of measuring electricity.</p>	<p>Collect information and carry out a multimedia presentation on the discovery of the unit for:</p> <ol style="list-style-type: none"> current, i.e. ampere, voltage, i.e. volt, resistance, i.e. ohm. <p>Examine the instruments and discuss its use for measuring:</p> <ol style="list-style-type: none"> current, voltage. <p>Assemble an electric circuit and measure its current and voltage.</p>	<p>A student is able to:</p> <ul style="list-style-type: none"> ▪ identify the instrument for measuring current, ▪ identify the instrument for measuring voltage, ▪ state the unit for current, ▪ state the unit for voltage, ▪ state the unit for resistance, ▪ measure current in an electric circuit, ▪ measure voltage in an electric circuit. 		

Learning Objectives	Suggested Learning Activities	Learning Outcomes	Notes	Vocabulary
1.4 Synthesising the relationship between current, voltage and resistance.	Design and carry out an experiment to study the following: a) effects of the change in resistance on current, b) effects of the change in voltage on current, Discuss the following: a) relationship between voltage, current and resistance, b) Ohm's Law.	A student is able to: <ul style="list-style-type: none"> ▪ design an experiment to study the relationship between resistance and current, ▪ carry out the experiment to study the relationship between resistance and current, ▪ describe the effects of the change in resistance on current, ▪ design an experiment to study the relationship between voltage and current, ▪ carry out the experiment to study the relationship between voltage and current, ▪ describe the effect of the change in voltage on current, ▪ state Ohm's Law. 	Interpretation of graphs should be emphasised.	

Learning Objectives	Suggested Learning Activities	Learning Outcomes	Notes	Vocabulary
<p>1.5 Synthesising the concept of parallel and series circuit.</p>	<p>Match the components found in an electric circuit to their symbols.</p> <p>Draw the following circuit diagrams and assemble the circuits:</p> <p>a) a complete circuit, b) a series circuit, c) a parallel circuit.</p> <p>Discuss the similarities and differences between a series circuit and a parallel circuit with the help of illustrations.</p>	<p>A student is able to:</p> <ul style="list-style-type: none"> ▪ identify the components of an electric circuit and their symbols, ▪ draw a diagram of a complete circuit, ▪ build a complete electric circuit, ▪ build a series circuit, ▪ build a parallel circuit, ▪ compare and contrast the arrangement of components in a series circuit and a parallel circuit. 		<p>complete circuit – <i>litar lengkap</i> parallel circuit – <i>litar selari</i> series circuit – <i>litar bersiri</i></p>
<p>1.6 Analysing current, voltage and resistance in a series circuit.</p>	<p>Carry out activities to study current, voltage and resistance in a series circuit.</p> <p>Discuss the advantage and disadvantage of a series circuit.</p>	<p>A student is able to:</p> <ul style="list-style-type: none"> ▪ describe the current flowing through the components in a series circuit, ▪ describe the voltages across the components in a series circuit, ▪ describe the resistance in a series circuit, ▪ explain the advantage and the disadvantage of a series circuit. 	<p>Simple calculations can be introduced.</p>	

Learning Objectives	Suggested Learning Activities	Learning Outcomes	Notes	Vocabulary
1.7 Analysing current, voltage and resistance in a parallel circuit.	Carry out activities to study the current, voltage and resistance in a parallel circuit. Discuss the following: a) advantage and disadvantage of a parallel circuit, b) similarities and differences between series and parallel circuits in terms of current, voltage and resistance.	A student is able to: <ul style="list-style-type: none"> ▪ describe the current flowing through the components in a parallel circuit, ▪ describe the voltage across the components in a parallel circuit, ▪ describe the resistance in a parallel circuit, ▪ explain the advantage and the disadvantage of a parallel circuit, ▪ compare and contrast a series circuit and a parallel circuit in terms of current, voltage and resistance. 	Simple calculations can be introduced. The differences between a series circuit and a parallel circuit should be demonstrated using meters and brightness of bulbs.	

Learning Objectives	Suggested Learning Activities	Learning Outcomes	Notes	Vocabulary
<p>1.8 Understanding magnetism.</p>	<p>Carry out the following activities:</p> <p>a) use iron fillings to study the magnetic field of a bar magnet,</p> <p>b) use compass to plot the directions of the magnetic field.</p> <p>Discuss the following:</p> <p>a) magnetic field,</p> <p>b) relationship between magnetic field lines and strength of magnetic field.</p> <p>Study and discuss the use of a magnet in a compass.</p>	<p>A student is able to:</p> <ul style="list-style-type: none"> ▪ describe what a magnetic field is, ▪ draw the magnetic field of a bar magnet, ▪ draw the directions of the magnetic field, ▪ relate magnetic field lines and strength to magnetic field, ▪ explain the use of a magnet in a compass. 		<p>magnetic field – <i>medan magnet</i> magnetism – <i>kemagnetan</i></p>
<p>1.9 Understanding electro-magnetism.</p>	<p>Carry out an activity to study the magnetic field produced by a straight wire carrying electric current.</p> <p>Discuss the meaning of</p> <p>a) electromagnetism,</p> <p>b) electromagnet.</p>	<p>A student is able to:</p> <ul style="list-style-type: none"> ▪ relate the current flow through a conductor to magnetism, ▪ describe what an electromagnet is. 		<p>electromagnetism – <i>keelektromagnetan</i></p>

LEARNING AREA: 2. GENERATION OF ELECTRICITY

Learning Objectives	Suggested Learning Activities	Learning Outcomes	Notes	Vocabulary
<p>2.1 Understanding the generation of electrical energy.</p>	<p>Explore websites or visit a power station to collect and interpret data on the following:</p> <ul style="list-style-type: none"> a) various types of generators, i.e. thermal, hydroelectric, diesel, nuclear and gas turbine, b) generation of electrical energy in various types of power stations, c) alternative sources of energy, e.g. solar energy and biomass. <p>Discuss the similarities and differences in the generation of electrical energy in various types of power stations.</p> <p>Carry out an activity on the utilisation of solar energy using devices such as solar box or solar cell (photovoltaic cell).</p>	<p>A student is able to:</p> <ul style="list-style-type: none"> ▪ list the various types of generators, ▪ describe the generation of electrical energy in various types of power stations, ▪ compare and contrast the generation of electrical energy in various types of power stations, ▪ give examples of alternative sources of energy. 		<p>biomass – <i>biojisim</i> photovoltaic – <i>fotovolta</i></p>

Learning Objectives	Suggested Learning Activities	Learning Outcomes	Notes	Vocabulary
<p>2.2 Understanding transformer.</p>	<p>Build a simple transformer and study its physical structure.</p> <p>Carry out an activity to show the function of the simple transformer.</p> <p>Collect and interpret data on the working principle of a step-up transformer and a step-down transformer.</p> <p>Discuss step-up and step-down transformers in terms of: a) similarities and differences, b) their uses in the transmission and distribution of electricity.</p>	<p>A student is able to:</p> <ul style="list-style-type: none"> ▪ identify the different parts of a transformer, ▪ describe how a transformer works, ▪ compare and contrast a step-up transformer and a step-down transformer, ▪ describe the roles of transformer in the transmission and distribution of electricity. 		<p>step-down transformer – <i>transformer injak turun</i> step-up transformer – <i>transformer injak naik</i> distribution - <i>pengagihan</i> transmission - <i>penghantaran</i></p>
<p>2.3 Analysing the electricity transmission and distribution system.</p>	<p>Observe a model or a chart and discuss the electrical transmission and distribution system which includes the National Grid Network, transformer stations, switch zone, main sub-station and its branches.</p> <p>Collect and interpret data on the National Grid Network in Malaysia.</p>	<p>A student is able to:</p> <ul style="list-style-type: none"> ▪ arrange in order the components in the electricity transmission and distribution system, ▪ describe the functions of the components in the electricity transmission and distribution system, ▪ describe how electricity is transmitted and distributed from power stations to consumers. 		<p>national grid network – <i>rangkaian grid nasional</i> switch zone – <i>lapangan suis</i></p>

Learning Objectives	Suggested Learning Activities	Learning Outcomes	Notes	Vocabulary
<p>2.4 Understanding the electrical supply and wiring system at home.</p>	<p>Collect and interpret data on electrical energy supply at home.</p> <p>Study and discuss the following:</p> <p>a) electrical wiring system at home including fuse box, mains switch, circuit breaker, live wire, neutral wire, earth wire and electric meter,</p> <p>b) international colour code.</p> <p>Carry out an activity to:</p> <p>a) study the structure and design of a 3-pin plug,</p> <p>b) complete the wiring of a 3-pin plug.</p>	<p>A student is able to:</p> <ul style="list-style-type: none"> ▪ state the value of the main voltage, ▪ state the types of current, ▪ identify the type of electric current supplied to homes, ▪ state the types of electrical wiring, ▪ identify the parts in an electrical wiring system, ▪ describe the functions of the parts of an electrical wiring system, ▪ describe the wiring in a 3-pin plug. 	<p>Types of wiring include single-phase and three-phase wiring.</p> <p>Explain briefly when three-phase wiring is required.</p>	<p>circuit breaker – <i>pemutus litar</i> earth wire – <i>dawai bumi</i> mains switch – <i>suis sesalur</i></p>

Learning Objectives	Suggested Learning Activities	Learning Outcomes	Notes	Vocabulary
<p>2.5 Analysing the cost of electrical energy usage.</p>	<p>Examine various home appliances to collect and interpret data on the power, voltage and current ratings.</p> <p>Calculate the amount of current flowing through home electrical appliances.</p> <p>Discuss the relationship between electrical energy usage, power and time.</p> <p>Carry out a home electrical energy usage audit to determine the cost of electrical energy use per month.</p>	<p>A student is able to:</p> <ul style="list-style-type: none"> ▪ state the power and voltage rating of home electrical appliances, ▪ calculate the amount of current flowing through an electrical appliance, ▪ recall the relationship between electrical energy usage, power and time, ▪ solve problem by calculating the cost of electricity used. 	<p>Introduce the following formulae:</p> <p>Power = Voltage x Current $P = V \times I$</p> <p>Energy (kWh) = Power (kW) x Time (h)</p>	<p>appliance – <i>peralatan</i> power – <i>kuasa</i></p>
<p>2.6 Understanding the functions of fuse and earth wire.</p>	<p>Discuss the following:</p> <ol style="list-style-type: none"> a) types of fuses, b) ratings of fuses, c) function of fuse in electrical wiring system, d) the role of earth wire in electrical wiring system. <p>Carry out an activity to study the occurrence of a short circuit.</p> <p>Carry out activities to determine the suitable ratings of fuses for different electrical appliances.</p>	<p>A student is able to:</p> <ul style="list-style-type: none"> ▪ identify the types of fuses, ▪ state the ratings of fuses, ▪ describe the function of fuse in electrical wiring system, ▪ determine the suitable rating of a fuse for an electrical appliance, ▪ describe the role of earth wire in electrical wiring system. 		<p>short circuit – <i>litar pintas</i></p>

Learning Objectives	Suggested Learning Activities	Learning Outcomes	Notes	Vocabulary
<p>2.7 Evaluating the importance of safety precautions in the use of electricity.</p>	<p>Collect and interpret data on the following:</p> <ul style="list-style-type: none"> a) causes of electrical accidents, b) steps to be taken if electrical accidents occur, c) safety features at home to prevent electrical accidents. <p>Discuss the need to take safety precautions when using electricity.</p>	<p>A student is able to:</p> <ul style="list-style-type: none"> ▪ state the safety measures to be taken when using electricity, ▪ describe the steps to be taken when accidents involving electricity occur, ▪ justify the need for having safety precautions and safety features at home to prevent electrical accidents. 	<p>Mention the following safety features:</p> <ul style="list-style-type: none"> i. Miniature Circuit Breaker (MCB), ii. Earth Leakage Circuit Breaker (ELCB). 	<p>safety precautions – <i>langkah-langkah keselamatan</i></p>

Learning Objectives	Suggested Learning Activities	Learning Outcomes	Notes	Vocabulary
<p>2.8 Evaluating the importance of conserving electricity.</p>	<p>Collect and interpret data about activities that cause electricity wastage.</p> <p>Discuss the ways to conserve electricity.</p> <p>Carry out a project on energy efficiency.</p> <p>Discuss and justify the needs for conserving electricity.</p> <p>Brainstorm the problems faced by the country if there is a shortage of electricity.</p>	<p>A student is able to:</p> <ul style="list-style-type: none"> ▪ identify the activities that cause electricity wastage, ▪ describe ways to conserve electricity, ▪ justify the needs for conserving electricity, ▪ predict problems our country would face if there is a shortage of electricity. 	<p>Introduce energy labelling of appliances to improve energy efficiency.</p>	<p>wastage – <i>pembaziran</i> energy efficiency – <i>kecekapan tenaga</i></p>

THEME: ASTRONOMY AND SPACE EXPLORATION

LEARNING AREA: 1. STARS AND GALAXIES

Learning Objectives	Suggested Learning Activities	Learning Outcomes	Notes	Vocabulary
<p>1.1 Analysing the Sun.</p>	<p>Collect and interpret data on the following:</p> <ul style="list-style-type: none"> a) characteristics of the Sun, i.e. size, mass, density relative to the Earth and surface temperature, b) structures of the Sun, i.e. the corona, chromosphere and photosphere, c) phenomena occurring at the surface of the Sun, i.e. prominences, flares and sunspots, d) effects of the phenomena on the surface of the Sun on the Earth, e) generation of energy by the Sun. 	<p>A student is able to:</p> <ul style="list-style-type: none"> ▪ describe the characteristics of the Sun, ▪ identify the structures of the Sun, ▪ identify the phenomena occurring on the surface of the Sun, ▪ explain the effects of the phenomena on the surface of the Sun on the Earth, ▪ state how energy is generated by the Sun. 	<p>Aurorae, frequently associated with flares should be introduced.</p>	<p>aurorae – <i>aurora</i> chromosphere – <i>kromosfera</i> corona – <i>korona</i> density – <i>ketumpatan</i> flare – <i>nyala</i> photosphere – <i>fotosfera</i> prominence – <i>prominen</i> sunspot – <i>tompok matahari</i></p>

Learning Objectives	Suggested Learning Activities	Learning Outcomes	Notes	Vocabulary
<p>1.2 Understanding the stars and the galaxies in the Universe.</p>	<p>Discuss the following: a) the definition of star, b) the Sun as a star.</p> <p>Visit the National Planetarium or National Science Centre to collect and interpret data on the following: a) bright stars such as the Sirius and Rigel, b) the Sun as a star, c) various types of stars based on temperature, size and brightness, d) formation of stars, e) death of stars leaving behind the white dwarf, neutron star and the black hole, f) types of galaxies, i.e. elliptical, spiral and irregular, g) the Milky Way, h) the Universe.</p> <p>Take part in star gazing activities.</p> <p>View computer software or videos to gather information about the topics in this learning area.</p>	<p>A student is able to:</p> <ul style="list-style-type: none"> ▪ define what a star is, ▪ identify the Sun as a star, ▪ identify the bright stars in the sky, ▪ compare and contrast the stars based on certain characteristics, ▪ describe the formation of stars, ▪ describe the death of stars, ▪ state the types of galaxies, ▪ describe the Milky Way, ▪ describe the Universe, ▪ state the position of the Solar System in the Universe. 		<p>black hole – <i>lohong hitam</i> brightness – <i>kecerahan</i> star – <i>bintang</i> elliptical – <i>bujur</i> irregular – <i>tak teratur</i> light year – <i>tahun cahaya</i> Milky Way – <i>Bima Sakti</i> solar system – <i>sistem suria</i> spiral – <i>lingkaran</i> universe – <i>alam semesta</i> white dwarf – <i>kerdil putih</i></p>

Learning Objectives	Suggested Learning Activities	Learning Outcomes	Notes	Vocabulary
<p>1.3 Thankful for the existence of the Universe as a gift from God.</p>	<p>Write a poem or haiku about the uniqueness, orderliness, beauty and harmony of the Universe as a sign of the glory of God.</p> <p>Discuss the following:</p> <ul style="list-style-type: none"> a) the expanse of the Universe, b) all that exists in the Universe is not permanent, c) the importance of the Sun and the Moon to life on Earth. 	<p>A student is able to:</p> <ul style="list-style-type: none"> ▪ appreciate the uniqueness, orderliness, beauty and harmony in the Universe as a sign of the glory of God, ▪ describe the expanse of the Universe compared to Earth, ▪ state that all that exists in the Universe is not permanent, ▪ explain the importance of the Sun and the Moon to life on Earth. 	<p>Haiku is a Japanese poem that comprise of three lines. The first and third is made up of five syllables while the second line is made up of seven syllables. The theme and message of the poem is often associated with nature.</p> <p><u>For example:</u></p> <p><i>Up the sky I stare, I look up and wish I'm there, Beautiful and rare.</i></p> <p>This learning objective (1.3) should be integrated with the other learning objectives when relevant.</p>	

LEARNING AREA: 2. SPACE EXPLORATION

Learning Objectives	Suggested Learning Activities	Learning Outcomes	Notes	Vocabulary
<p>2.1 Understanding developments in the field of astronomy and space exploration.</p>	<p>Surf the Internet, visit the Planetarium or the National Science Centre to collect and interpret data on the following:</p> <ul style="list-style-type: none"> a) developments in the field of astronomy, b) applications of technology related to space exploration and astronomy, e.g. remote sensing, c) developments in space exploration, e.g. launching of rockets, satellites, probes as well as man's landing on the Moon. <p>Debate on the need to continue space exploration.</p> <p>Carry out a multimedia presentation on the developments in the field of astronomy and space exploration.</p>	<p>A student is able to:</p> <ul style="list-style-type: none"> ▪ describe the developments in the field of astronomy, ▪ describe the developments in space exploration, ▪ explain with examples the applications of technology related to space exploration and astronomy, ▪ justify the need to continue space exploration. 	<p>Include the applications of remote sensing, e.g. in geology, agriculture, forestry, disaster management, national security management, etc.</p> <p>Malaysian Centre for Remote Sensing (MACRES) is responsible for the remote sensing projects in the country.</p>	<p>exploration – <i>penerokaan</i> space – <i>angkasa lepas</i></p>

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