

SULIT



PENTAKSIRAN DIAGNOSTIK AKADEMIK SEKOLAH BERASRAMA PENUH 2019

PEPERIKSAAN PERCUBAAN SIJIL PELAJARAN MALAYSIA

BIOLOGY

4551/PP

Peraturan Pemarkahan

Kertas 1, Kertas 2 dan Kertas 3

September 2019

1. *Peraturan pemarkahan ini adalah dalam bahasa Inggeris sahaja.*
2. *Terima jawapan-jawapan calon sama ada dalam bahasa Inggeris sepenuhnya, bahasa Melayu sepenuhnya, ataupun sebahagian dalam bahasa Inggeris dan sebahagian dalam bahasa Melayu.*
3. *Sampel-sampel jawapan dalam peraturan pemarkahan ini adalah cadangan sahaja. Jawapan-jawapan lain yang relevan dan menepati kehendak soalan perlu dipertimbangkan untuk diberikan skor yang sewajarnya.*
4. *Teknik pemeriksaan kertas jawapan calon adalah mengikut format yang digunakan dalam peperiksaan SPM yang terkini.*

Peraturan pemarkahan ini mengandungi 26 halaman bercetak.

PAPER 1

No	Answer	No	Answer	No	Answer	No	Answer	No	Answer
1	C	11	B	21	B	31	C	41	C
2	A	12	B	22	C	32	C	42	B
3	D	13	A	23	A	33	B	43	D
4	C	14	C	24	B	34	C	44	B
5	B	15	C	25	D	35	B	45	C
6	A	16	A	26	C	36	C	46	A
7	C	17	D	27	B	37	C	47	B
8	B	18	B	28	C	38	D	48	C
9	D	19	B	29	D	39	C	49	C
10	C	20	D	30	A	40	A	50	B

PAPER 2

Question 1

No	Criteria	Marks	
(a) (i)	Able to state the name for food class for J and K. Answers: J - Carbohydrate K - Protein // Mineral // Vitamin // Fat // Water // Carbohydrate	1 1	2
(ii)	Able to state the main function of food J in human body. Answers: P - Source of energy (that can be used by cells) / glucose / substrate of respiration	1	1
(iii)	Able to explain the effect if infants do not drink enough K. Sample answers: F1 - insufficient of protein P1 - process of growth slow /stunted growth /body mass decrease P2 - kwasyiokor //Any symptom of kwasyiokor F2 - insufficient of calcium /phosphorus P3 - formation bones tissue slow P4 - length of bones reduces P5 - height of babies remains P6 - formation of baby tooth slow F3 - insufficient of Vitamin A P7 - infant skin become dry P8 - infant skin become scally F4 - insufficient of Vitamin B P9 - might have a pellagra (symptom) P10 - infant have a skin problem (Any 3 of Fs or/and Ps)	1 1 1 1 1 1 1 1 1 1 1 1 1 1	3

(b) (i)	Able to state name of enzyme M and molecule N. Answers: Enzyme M: Maltase Molecule N : Glucose	1 1	2
(ii)	Able to explain the chemical reaction to produce molecules N. Sample answers: P1 - Hydrolysis occurs P2 - The bond between two molecules of glucose /glycosidic bond is broken down // Maltose is broken down / hydrolysed / digested [Reject: converted] P3 - Involves the addition of water // Water (molecule) is used // Water is involved // Maltose react with water P4 - Two molecules of glucose formed [Reject: molecule N formed] (Any 3)	1 1 1 1	3
(iii)	Able to state what will happen to the rate of reaction if enzyme M is not used. Sample answers P1 - Hydrolysis /biochemical /metabolic reaction becomes slow P2 - The quantity of molecules N /glucose /product decreases (Any 1)	1 1	1
TOTAL			12

Question 2

No	Criteria	Marks	
(a)	Able to name cell divisions X and Y. Answers: X - Mitosis Y - Meiosis	1 1	2
(b) (i)	Able to explain the significance of cell division X to human. Sample answers: P1 - To increase the number of (similar) cells for growth /regeneration P2 - To replace dead /damagedcells // To repair damaged cells P3 - To maintain the number of chromosome (in daughter cell) (Any 2)	1 1 1	2
(ii)	Able to explain how division X can be applied to increase the production of plantlets in a short time. Sample answers: P1 - By using tissue culture // Clone the plant P2 - Cells divide by mitosis // Culture medium promotes mitosis P3 - to form callus /mass of undifferentiated cells P4 - Callus develops into plantlet [Reject: becomes /converts] // Culture medium promotes defferentiation /specialisation (Any 3)	1 1 1 1	3

(c)	<p>Able to explain why cell division Y is important in sexual reproduction.</p> <p>Sample answers:</p> <p>P1 - (Division Y /meiosis) produces gametes</p> <p>P2 - (Gametes produced) are haploid /half of the parent's chromosomal number</p> <p>P3 - After fertilization of (two) gametes the number of chromosome will be diploid /same as the parents.</p> <p>(Any 2)</p>	<p>1</p> <p>1</p> <p>1</p>	2
(d)	<p>Able to explain how carcinogenic substances such as food colouring may cause the number of chromosomes in the daughter cells from division Y to be different.</p> <p>Sample answers:</p> <p>P1 - (Carcinogens) can retard /disrupt the formation of spindle fiber (during prophase I)</p> <p>P2 - During anaphase 1</p> <p>P3 - The homologous chromosomes are not separated /are not pulled (to the opposite poles)</p> <p>P4 - producing gametes with extra /less one /two /three /.. chromosomes.</p> <p>(Any 3)</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p>	3
TOTAL			12

Question 3

No	Criteria	Marks
(a)	<p>Able to name muscle P and Q</p> <p>Answers:</p> <p>P - Biceps (muscle)</p> <p>Q - Triceps (muscle)</p>	<p>2</p> <p>1</p> <p>1</p>
(b)	<p>Able to explain the actions of muscles P and Q as antagonistic muscles in moving the arm.</p> <p>Answers:</p> <p>P1 - (muscle) P /biceps contract while (muscle) Q /triceps relax //vice versa</p> <p>P2 - Arm will be bend /move upwards /tendon pull radius /pulling force transfers to radius // Arm will be straightened /move downwards /tendon pull ulna /pulling force transfers to ulna</p>	<p>2</p> <p>1</p> <p>1</p>
(c)	<p>Able to state two similarities between muscles Q and R.</p> <p>Sample answers:</p> <p>P1 - Both /they are skeletal muscle tissues</p> <p>P2 - Both tissues contain <u>abundant</u> /<u>large</u> number of mitochondria</p> <p>P3 - Both are extensor (muscle) // Both contract to move body/arm/leg</p> <p>// Both cause limbs to straightened when contract</p> <p>// Both cause physical movement (to appendicular skeleton/arm/knee) when in contraction</p> <p>(Any 2)</p>	<p>2</p> <p>1</p> <p>1</p> <p>1</p>

(d)	Able to explain how fatigue and muscle pain happened. Sample answers: P1 - (Skeletal) muscle cells undergo anaerobic respiration // Insufficient /lack of /no oxygen P2 - Incomplete oxidation of glucose P3 - increase content /accumulation of lactic acid (in the muscles) (Any 2)	1 1 1	2
(e) (i)	Able to explain the problem faced by the patient. Sample answers: P1 - Osteoporosis P2 - Bone mass reduced /porous P3 - Bone easily fractured (Any 2)	1 1 1	2
(ii)	Able to explain how a boy inherited the gene that cause the muscular dystrophy. Sample answers: P1 - (Muscular dystrophy) is controlled /caused by a recessive /mutated allele /gen // Mutated gene which linked /located at X chromosome P2 - (During gamete formation) mother produced gametes /ova that carry X chromosome with recessive allele P3 - The boy inherited the X chromosome with recessive allele from mother P4 - and Y chromosome from father (Any 2)	1 1 1 1	2
TOTAL			12

Question 4

No	Criteria	Marks												
(a)	Able to name neuron S and T. Answers: S - Afferent neurone T - Efferent neurone	2 1 1												
(b)	Able to state the difference in the structure and function of neurons S and T. Sample answers: <u>Structure</u> <table border="1"> <thead> <tr> <th></th><th>Neuron S</th><th>Neuron T</th></tr> </thead> <tbody> <tr> <td>P1</td><td>Cell body located in ganglion dorsal root // Cell body at side of the cell</td><td>Cell body located in the grey matter (spinal cord) // Cell body at the end of the cell</td></tr> <tr> <td>P2</td><td>Has a long dendron</td><td>Has a short dendron</td></tr> <tr> <td>P3</td><td>Has a short axon</td><td>Has a long axon</td></tr> </tbody> </table> (Any 1)		Neuron S	Neuron T	P1	Cell body located in ganglion dorsal root // Cell body at side of the cell	Cell body located in the grey matter (spinal cord) // Cell body at the end of the cell	P2	Has a long dendron	Has a short dendron	P3	Has a short axon	Has a long axon	2 1 1 1
	Neuron S	Neuron T												
P1	Cell body located in ganglion dorsal root // Cell body at side of the cell	Cell body located in the grey matter (spinal cord) // Cell body at the end of the cell												
P2	Has a long dendron	Has a short dendron												
P3	Has a short axon	Has a long axon												

Function							
	<table><tr><th>Neuron S</th><th>Neuron T</th></tr><tr><td>P4 Carry /transmit impulses from receptor to the central nervous system /spinal cord</td><td>Carry /transmit impulses from central nervous system /spinal cord to the effector /muscle /gland</td></tr></table>	Neuron S	Neuron T	P4 Carry /transmit impulses from receptor to the central nervous system /spinal cord	Carry /transmit impulses from central nervous system /spinal cord to the effector /muscle /gland	1	
Neuron S	Neuron T						
P4 Carry /transmit impulses from receptor to the central nervous system /spinal cord	Carry /transmit impulses from central nervous system /spinal cord to the effector /muscle /gland						
(c)	<p>Able to explain the reflex action.</p> <p>Sample answers:</p> <p>P1 - (Sensory) receptor detects stimulus /pain // Triggered (nerve) impulses</p> <p>P2 - Afferent neurone transmits the impulse (from receptor) to spinal cord</p> <p>P3 - Impulse across a synapse to the interneurone /efferent neurone</p> <p>P4 - Efferent neurone transmits the impulse (from spinal cord) to effector /(biceps) muscle</p> <p>P5 - Biceps (muscle) contract // The hand is withdraw from the sharp pin (immediately)</p> <p>(Any 3)</p>	1 1 1 1 1	3				
(d) (i)	<p>Able to explain the meaning of homeostasis.</p> <p>Sample answer:</p> <p>P1 - A process of regulating /maintain the body temperature / physical factor</p> <p>P2 - in the internal environment /tissue fluid /blood</p> <p>P3 - Thus the body temperature is maintained at normal /37°C</p> <p>// Any increase of temperature will be decreased //Vice versa /back to normal</p> <p>(Any 2)</p>	1 1 1	2				
(e)	<p>Able to response of blood vessels during the regulation of body temperature.</p> <p>Sample answer:</p> <p>P1 - (At low temperature), vasoconstriction occurs // (Smooth) muscles in the arterioles (wall) contract // Lumen of arterioles constrict /smaller / reduced (Reject: Blood capillaries contract)</p> <p>P2 - Blood capillaries away from the skin surface</p> <p>// Less blood flowing near the skin surface</p> <p>P3 - Less heat is lost (by radiation /conduction)</p> <p>P4 - Body temperature increase /back to normal /remains normal / maintained at normal /37°C</p> <p>(Any 3)</p>	1 1 1 1	3				
TOTAL			12				

Question 5

No	Criteria	Marks	
(a) (i)	<p>Able to explain the process that occur during stage U.</p> <p>Sample answers:</p> <p>P1 - (X is) spermatogonium</p> <p>P2 - (X/spermatogonium) grow /develop</p> <p>P3 - into primary spermatocyte</p> <p>(Any 2)</p>	1 1 1	2
(ii)	<p>Able to explain the effect if stage W does not occur.</p> <p>Sample answers:</p> <p>P1 - No differentiation/specialisation occurs</p> <p>P2 - No tail /head formed // Sperms are not formed</p> <p>P3 - Sperms cannot swim toward ovum (in fallopian tube) // No fertilisation occurs</p> <p>(Any 2)</p>	1 1 1	2
(b)	<p>Able to explain one similarity between a sperm and an ovum.</p> <p>Sample answers:</p> <p>P1 - (Both of them /they have) same/haploid chromosomal number</p> <p>P2 - Formed by meiosis // homologous chromosomes separated (in meiosis I)</p> <p>P3 - Parent cells are primordium /epithelial germ cells</p> <p>(Any 2)</p>	1 1 1	2
(c)	<p>Able to explain the relationship between the level of hormone oestrogen with the changes that occur at the uterus wall between day 5 to day 14.</p> <p>Able to explain how the changes is important in ensuring the continuity of life</p> <p>Sample answers:</p> <p>P1 - Follicle developed /more follicle cells // Follicle (cells) secrete oestrogen</p> <p>P2 - The higher the oestrogen level, the thicker the endometrium wall</p> <p>P3 - Uterus lining /endometrium (wall) is repaired /thickened // More blood vessels formed /highly vascularised</p> <p>P4 - (As a preparation) for implantation of embryo /any explanation</p> <p>P5 - Provides nutrient for the development of embryo/foetus</p> <p>(Any 3)</p>	1 1 1 1 1	3
(d)	<p>Able to explain why her menstrual cycle stops that month.</p> <p>Sample answers:</p> <p>P1 - The woman is pregnant // Implantation of embryo occurs // Embryo developed (Reject: zygote)</p> <p>P2 - Corpus luteum does not disintegrate /continues to develop</p> <p>P3 - (More) progesterone secreted /released</p> <p>P4 - Progesterone (increase and) maintain the thickness of endometrium // (High level of) progesteron prevent the collapse of endometrium (wall)</p> <p>(Any 3)</p>	1 1 1 1	3
TOTAL			12

Question 6

No	Criteria	Marks																									
(a)	<p>Able to explain the function of structure Z during exhalation.</p> <p>Sample answers:</p> <p>P1 - (During exhalation), diaphragm /<u>muscle</u> Z relaxes</p> <p>P2 - (and) the diaphragm /Z curves upwards</p> <p>P3 - This reduces the space in the thoracic cavity // Volume of thoracic cavity decreases</p> <p>P4 - (causing) higher (air) pressure in the lungs /alveoli</p> <p>P5 - Air is forced out /moves out of the lungs</p> <p>(Any 4)</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	4																								
(b)	<p>Able to explain the similarities and the differences between the human respiratory system with that of an insect.</p> <p>Sample answers:</p> <p>Similarities:</p> <p>S1 - (Both /they) have large <u>surface</u> area (to volume ratio)</p> <p>S2 - (Cells lining /wall of) the respiratory (exchange) <u>surface</u> (of both) are thin /one cell thick</p> <p>S3 - The exchange of gaseous /respiratory <u>surface</u> for (both) are (constantly) moist</p> <p>S4 - (Both) involved diffusion of gases /O₂ /CO₂ (in gaseous exchange)</p> <p>(At least 2 S)</p> <p>Differences:</p> <table> <tr> <th>Human respiratory system</th> <th>Aspect</th> <th>Insects respiratory system</th> </tr> <tr> <td>Lungs</td> <td>D1 - Organs /Structure</td> <td>Tracheae</td> </tr> <tr> <td>Alveolus</td> <td>D2 - Respiratory (exchange) surface // Site of gases exchange /diffusion</td> <td>Tracheoles</td> </tr> <tr> <td>Nostril</td> <td>D3 - Respiratory opening // Air moves in /out</td> <td>Spiracle</td> </tr> <tr> <td>Numerous alveolus</td> <td>D4 - Respiratory structure to increase surface area</td> <td>Numerous tracheoles</td> </tr> <tr> <td>Richly supplied</td> <td>D5 - Network of blood capillary</td> <td>None</td> </tr> <tr> <td>Nostril→trachea →bronchi →bronchioles →alveoli</td> <td>D6 - Air passage</td> <td>Spiracle→trachea →tracheoles (→body cell)</td> </tr> <tr> <td>Diaphragm /rib cage /intercostal muscle</td> <td>D7 - Other structures that help external respiration /inhalation /exhalation</td> <td>Thorax /abdomen (muscles)</td> </tr> </table>	Human respiratory system	Aspect	Insects respiratory system	Lungs	D1 - Organs /Structure	Tracheae	Alveolus	D2 - Respiratory (exchange) surface // Site of gases exchange /diffusion	Tracheoles	Nostril	D3 - Respiratory opening // Air moves in /out	Spiracle	Numerous alveolus	D4 - Respiratory structure to increase surface area	Numerous tracheoles	Richly supplied	D5 - Network of blood capillary	None	Nostril→trachea →bronchi →bronchioles →alveoli	D6 - Air passage	Spiracle→trachea →tracheoles (→body cell)	Diaphragm /rib cage /intercostal muscle	D7 - Other structures that help external respiration /inhalation /exhalation	Thorax /abdomen (muscles)	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	10
Human respiratory system	Aspect	Insects respiratory system																									
Lungs	D1 - Organs /Structure	Tracheae																									
Alveolus	D2 - Respiratory (exchange) surface // Site of gases exchange /diffusion	Tracheoles																									
Nostril	D3 - Respiratory opening // Air moves in /out	Spiracle																									
Numerous alveolus	D4 - Respiratory structure to increase surface area	Numerous tracheoles																									
Richly supplied	D5 - Network of blood capillary	None																									
Nostril→trachea →bronchi →bronchioles →alveoli	D6 - Air passage	Spiracle→trachea →tracheoles (→body cell)																									
Diaphragm /rib cage /intercostal muscle	D7 - Other structures that help external respiration /inhalation /exhalation	Thorax /abdomen (muscles)																									

	<table> <tr> <td>Cartilage</td> <td>D8 - Strengthen the structure to prevent collapsing</td> <td>Chitin</td> </tr> <tr> <td>Blood (transport oxygen from lungs in the form of oxyhaemoglobin) to the body tissue</td> <td>D9 - Transportation of respiratory gases</td> <td>(Moisture in) tracheoles are directly contact with body tissue</td> </tr> </table>	Cartilage	D8 - Strengthen the structure to prevent collapsing	Chitin	Blood (transport oxygen from lungs in the form of oxyhaemoglobin) to the body tissue	D9 - Transportation of respiratory gases	(Moisture in) tracheoles are directly contact with body tissue	1 1	
Cartilage	D8 - Strengthen the structure to prevent collapsing	Chitin							
Blood (transport oxygen from lungs in the form of oxyhaemoglobin) to the body tissue	D9 - Transportation of respiratory gases	(Moisture in) tracheoles are directly contact with body tissue							
	(At least 2 D) (Plus 6 others of S and/or D)								
(c)	<p>Able to explain the regulatory mechanism of oxygen content in the body after a 100m run</p> <p>Sample answers:</p> <p>P1 - (After a 100m run,) oxygen content in blood is low // Oxygen has been used up for cellular respiration (to get energy)</p> <p>P2 - The peripheral chemoreceptor /aortic body /carotid body detects the low level oxygen /is stimulated</p> <p>P3 - (Nerve) impulse is triggered / and send to the respiratory control center /medulla oblongata</p> <p>P4 - Impulse then send to intercostal muscle <u>and</u> diaphragm muscle /respiratory muscles</p> <p>P5 - (alternate) contraction <u>and</u> relaxation occurs rapidly</p> <p>P6 - Breathing /ventilation rate increase //More oxygen enters the lungs</p> <p>P7 - Impulse also send to the heart /cardiac muscles</p> <p>P8 - Heart pump blood faster</p> <p>P9 - to transport oxygen from the lungs to the whole body faster /blood circulation occurs faster</p> <p>P10 - the level of oxygen increases back to normal /to replace oxygen lost /to oxidize lactic acid (in muscle)</p> <p>(Any 6)</p>	1 1							

Question 7

No	Criteria	Marks	
(a)	<p>Able to explain the type of immunity acquired by individual M.</p> <p>Sample answers:</p> <p>P1 - Type of immunity (acquire by individual M) is passive artificial immunity</p> <p>P2 - Injection of anti-serum (which contain antibody) /anti-toxin /toxoid</p> <p>P3 - after 1st injection /2nd injection, concentration of antibody increase immediately /rapidly above immunity level</p> <p>P4 - because he/she obtain antibody (from sources of antibody)</p> <p>P5 - lymphocyte (of individual M) does not produce antibody</p> <p>P6 - concentration of antibody decrease rapidly</p> <p>P7 - 2nd injection is given when the concentration of antibody /anti-toxin /toxoid expires /decreases from the 1st injection</p> <p>(Any 4)</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	4
(b)	<p>Able to predict the consequences if the mechanism of blood clotting fails to occurs.</p> <p>Sample answers:</p> <p>P1 - The individual is suffering from hemophilia /do not inherit the dominant gene /allele for normal blood clotting</p> <p>P2 - (Blood fails to clot) due to lack of clotting factor VIII</p> <p>P3 - Causes excessive loss of blood</p> <p>P4 - Cause the blood pressure to decrease</p> <p>P5 - Blood do not flow in a closed system</p> <p>P6.- The injured part /wound is not closed</p> <p>P7 - prone to entry of pathogen (into blood system)</p> <p>P8 - the injured part /wound heal slowly /cannot heal</p> <p>(Any 6)</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	6

(c)	<p>Able to compare the blood circulatory system and the lymphatic system of human.</p> <p>Sample answers:</p> <p>Similarities:</p> <p>S1 - (Both) systems involve in the transportation of substance /glucose /amino acid /any example /are transport systems (in the body)</p> <p>S2 - (Both systems) have vessels</p> <p>S3 - (Both systems) have fluid as a medium of transport</p> <p>S4 - (Both systems) involve in body defence process</p> <p>S5 - Vein and lymphatic vessel have valves</p> <p>S6 - (Both) contain leucocytes</p> <p>Differences:</p> <table><tr><td></td><td>Blood circulatory system</td><td>Lymphatic system</td></tr><tr><td>D1 -</td><td>Has pumping organ /heart</td><td>Has no pumping organ</td></tr><tr><td>D2 -</td><td>Has 3 type of blood vessel /has artery, vein and blood capillary</td><td>Has 2 type of vessel /has lymphatic vessel and capillary</td></tr><tr><td>D3 -</td><td>Artery has no valve</td><td>Lymphatic vessel has valve</td></tr><tr><td>D4 -</td><td>Has no lymph nodes</td><td>Has lymph nodes (along lymphatic vessel)</td></tr><tr><td>D5 -</td><td>Has low lymphocytes</td><td>Has higher lymphocytes</td></tr><tr><td>D6 -</td><td>Has erythrocyte /platelet /plasma protein</td><td>Has no erythrocyte /platelet /plasma protein</td></tr><tr><td>D7 -</td><td>Blood is circulated in closed vessel</td><td>Lymph flow from lymph capillary to subclavian vein</td></tr><tr><td>D8 -</td><td>Medium of transport /blood is red in color /contain hemoglobin</td><td>Medium of transport /lumph is yellowish /colorless /has no hemoglobin</td></tr></table> <p>(Any 10)</p>		Blood circulatory system	Lymphatic system	D1 -	Has pumping organ /heart	Has no pumping organ	D2 -	Has 3 type of blood vessel /has artery, vein and blood capillary	Has 2 type of vessel /has lymphatic vessel and capillary	D3 -	Artery has no valve	Lymphatic vessel has valve	D4 -	Has no lymph nodes	Has lymph nodes (along lymphatic vessel)	D5 -	Has low lymphocytes	Has higher lymphocytes	D6 -	Has erythrocyte /platelet /plasma protein	Has no erythrocyte /platelet /plasma protein	D7 -	Blood is circulated in closed vessel	Lymph flow from lymph capillary to subclavian vein	D8 -	Medium of transport /blood is red in color /contain hemoglobin	Medium of transport /lumph is yellowish /colorless /has no hemoglobin	10
	Blood circulatory system	Lymphatic system																											
D1 -	Has pumping organ /heart	Has no pumping organ																											
D2 -	Has 3 type of blood vessel /has artery, vein and blood capillary	Has 2 type of vessel /has lymphatic vessel and capillary																											
D3 -	Artery has no valve	Lymphatic vessel has valve																											
D4 -	Has no lymph nodes	Has lymph nodes (along lymphatic vessel)																											
D5 -	Has low lymphocytes	Has higher lymphocytes																											
D6 -	Has erythrocyte /platelet /plasma protein	Has no erythrocyte /platelet /plasma protein																											
D7 -	Blood is circulated in closed vessel	Lymph flow from lymph capillary to subclavian vein																											
D8 -	Medium of transport /blood is red in color /contain hemoglobin	Medium of transport /lumph is yellowish /colorless /has no hemoglobin																											
TOTAL																													
		20																											

Question 8

No	Criteria	Marks	
(a)	<p>Able to describe how the methods used in the project works</p> <p>Sample answers:</p> <p>F - Plant is planted in a greenhouse</p> <p>P1 - to overcome the extreme changes of weather</p> <p>P2 - Able to control the factors affecting the photosynthesis rate // To ensure all the factors affecting the photosynthesis rate are enough /at optimum level</p> <p>P3 - (The greenhouse) consists of glass /allow light penetration /heat is trapped</p> <p>P4 - In winter /autumn /fall, the light intensity /temperature is low</p> <p>P5 - The rate of photosynthesis lowest</p> <p>P6 - Light intensity is controlled by artificial light /bulb</p> <p>P7 - (Electric) heater is used to optimized /suitable temperature</p> <p>P8 - In summer, the excessive intensity of light is control by external shading roof</p> <p>P9 - Also have air ventilator /air hole /shuttle fan</p> <p>P10 - to cool the temperature // to keep the heat down</p> <p>P11 - paraffin wax /heater is used to release carbon dioxide</p> <p>P12 - carbon dioxide pump are used to increase the rate of photosynthesis</p> <p>P13 - Has an automatic water sprinkler system</p> <p>P14 - to supply water continuously</p> <p>P15 - Has an air humidifier system</p> <p>P16 - to prevent dryness /loss of water from plants</p> <p>(Any 10)</p>	10	
(b)	<p>Able to justify the daily menu that pregnant women practiced.</p> <p>Sample answers:</p> <p>F1 - Suitable menu /balanced diet</p> <p>P1 - Rice /bread /chapatti /carbonated drink contains carbohydrate /sugar</p> <p>P2 - which provides energy</p> <p>P3 - Chicken /eggs /meat contain protein</p> <p>P4 - which is needed for growth /forming new cell for foetus /other functions</p> <p>P5 - Chicken soup provides vitamins /minerals</p> <p>P6 - source of iron for haemoglobin formation in foetus /mother // Other examples of the need for minerals</p> <p>P7 - Vitamin C to prevent scurvy /healthy skin // Other examples of the need for vitamins</p> <p>P8 - Fruit juice /custard /salad provided fibres</p> <p>P9 - to avoid constipation</p> <p>P10 - Fried chicken /meat curry contain fat /lipid /cholesterol</p> <p>P11 - for the formation of plasma membrane /new cells /as heat insulator</p>	10	

P12 - Carbonated drink /tea provides water	1	
P13 - To prevent dehydration	1	
P14 - Tea contains caffeine	1	
P15 - to stimulate nerve action	1	
OR		
F2 - Unsuitable menu /not balanced diet	1	
P1 - Rice /bread /chapatti /carbonated drink contains carbohydrate /sugar	1	
P2 - <u>Excessive</u> carbohydrate will cause obesity /diabetic	1	
P3 - Chicken /eggs /meat contain protein	1	
P4 - <u>Excessive</u> protein /amino acid will cause gout /kidney failure /increase in uric acid	1	
P5 - <u>Less</u> fibre	1	
P6 - leads to constipation	1	
P7 - Fried chicken /meat curry contain fat /lipid /cholesterol	1	
P8 - <u>Too much</u> lipid /fat /cholesterol causes cardiovascular problem /heart attack / any suitable example	1	
P9 - Carbonated drink /fruit custard contains excess sugar /colouring /acid	1	
P10 - lead to diabetes /cancer /gastritis /tooth caries	1	
P11 - Tea contains caffeine	1	
P12 - <u>excessive</u> intake of tea increase caffeine / drugs	1	
P13 - effect the growth of foetus	1	
P14 - <u>Not</u> enough water	1	
P15 - cause dehydration	1	
(Any 10)		
TOTAL		20

Question 9

No	Criteria	Marks	
(a) (i)	<p>Able to state the good effects.</p> <p>Sample answers:</p> <p>P1 - <u>Enough</u> food supply /milk</p> <p>P2 - <u>Better</u> health /quality of life</p> <p>P3 - <u>Increase</u> crop production</p> <p>P4 - Provide job opportunities // <u>Increase</u> income of the country</p> <p>(Any 3)</p>	1 1 1 1	3
(ii)	<p>Able to discuss the effects of mismanagement of the ecosystem.</p> <p>Sample answers:</p> <p>P1 - Deforestation // Cutting down trees at <u>large scale /excessive</u></p> <p>P2 - Less /no grip on soil // Soil becomes loose</p> <p>P3 - Lead to soil erosion /landslide /flash flood /mud flood</p> <p>P4 - Less trees to absorb carbon dioxide // Less carbon sink /photosynthesis // More carbon dioxide in the atmosphere</p> <p>P5 - Cause increase in temperature /greenhouse effect /global warming /climatic change</p> <p>P6 - Destruction of natural habitat</p> <p>P7 - Extinction of flora /fauna // Destruction of food chain /web</p> <p>P8 - Animal farming pollute the river with animal faeces</p> <p>P9 - Cause eutrophication /alga bloom // Lead to water pollution</p> <p>P10 - leads to death of aquatic organisms</p> <p>P11 - Excessive use of pesticides /herbicides</p> <p>P12 - Leads to air pollution</p> <p>P13 - Leads to water pollution (once)</p> <p>P14 - Destruction of food chain /web (once)</p> <p>P15 - leads to death of aquatic organisms (once)</p> <p>(Any 7)</p> <p>(P13, P14 and P15 - if not mentioned in P6 /P9 /P10)</p>	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	7

(b) (i)	<p>Able to explain the importance of proper management of development activities and the ecosystem.</p> <p>Sample answers:</p> <p>P1 - To balance the demands /needs for resources with the need to conserve the resources</p> <p>P2 - A nation needs to have continuous development /improvement in the lives of its people /such as health /education /living conditions</p> <p>P3 - (Build parks in the cities) to encourage society to lead healthy lifestyle /less stress</p> <p>P4 - The resources can be replenished /renewed for future generations</p> <p>P5 - (Electric train) reduces air pollution /reduce number of cars in town /roads</p> <p>P6 - Reduce bad impact to the environment /human /animal health /any explanation</p> <p>P7 - (Forest reserve) maintain economic potential /recreational spot /tourism attraction</p> <p>P8 - To preserve /conserve /rehab forest // Protect the environment /forest</p> <p>P9 - Maintain natural habitats</p> <p>P10 - resources of medicinal plants /logs /rattan /food chains/webs</p> <p>(Any 5)</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>(Any 5)</p>	5
(ii)	<p>Able to explain measures taken in the management of development activities and the ecosystem to ensure a balance of nature is maintained.</p> <p>Sample answers:</p> <p>P1 - The government implemented laws to protect the environment</p> <p>P2 - The use of (green /environmental friendly) technology</p> <p>P3 - (Example of the use of technology): Use of catalytic converters in cars exhaust /chimney / incinerator // Use of hybrid cars /unleaded petrol /electric train</p> <p>P4 - release clean emission /no/less pollutants</p> <p>P5 - Educating the public /campaign eg: No Plastic Day</p> <p>P6 - Practice 3R: Reduce, reuse and recycle</p> <p>P7 - Use biological control /organic fertilizer /hydroponics</p> <p>P8 - less uses of chemicals such as insecticides</p> <p>P9 - which may be harmful to human/animal will be avoided</p> <p>P10 - Use of renewable energy /solar /wind /water current</p> <p>P11 - Efficient use of energy //Car pooling //Energy efficient buildings</p> <p>(Any 5)</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>(Any 5)</p>	5
TOTAL			20

PAPER 3

Question 1

1 (a) [KB0603 - Measuring Using Number]

1 (a) [KB0005 - Measuring Using Number]

Score	Criteria																		
3	<p>Able to record 10-12 leafs length.</p> <p>Answers:</p> <table><tr><th colspan="2">Rose plant 1 (cm)</th><th colspan="2">Rose plant 1 (cm)</th><th colspan="2">Rose plant 3 (cm)</th></tr><tr><td>3.7 ± 0.1</td><td>3.4 ± 0.1</td><td>4.6 ± 0.1</td><td>4.6 ± 0.1</td><td>5.5 ± 0.1</td><td>5.7 ± 0.1</td></tr><tr><td>2.7 ± 0.1</td><td>3.6 ± 0.1</td><td>4.5 ± 0.1</td><td>4.7 ± 0.1</td><td>4.4 ± 0.1</td><td>6.3 ± 0.1</td></tr></table> <p>[Note: Please check these measurements by using the ruler provided in the question paper]</p>	Rose plant 1 (cm)		Rose plant 1 (cm)		Rose plant 3 (cm)		3.7 ± 0.1	3.4 ± 0.1	4.6 ± 0.1	4.6 ± 0.1	5.5 ± 0.1	5.7 ± 0.1	2.7 ± 0.1	3.6 ± 0.1	4.5 ± 0.1	4.7 ± 0.1	4.4 ± 0.1	6.3 ± 0.1
Rose plant 1 (cm)		Rose plant 1 (cm)		Rose plant 3 (cm)															
3.7 ± 0.1	3.4 ± 0.1	4.6 ± 0.1	4.6 ± 0.1	5.5 ± 0.1	5.7 ± 0.1														
2.7 ± 0.1	3.6 ± 0.1	4.5 ± 0.1	4.7 ± 0.1	4.4 ± 0.1	6.3 ± 0.1														
2	Able to state any 6-9 correctly																		
1	Able to state any 3-5 correctly																		

1 (b) (i) [KB0601 - Observation]

Score	Criteria
3	<p>Able to state any two observations correctly according to the criteria:</p> <p>C1 - Rose plant // Location</p> <p>C2 - Leaf length with unit [Note: All 4 leaves per plant/location] [Inaccurate: Average]</p> <p>Sample answers:</p> <p><u>Horizontal</u></p> <ol style="list-style-type: none"> Rose plant 1 / in the school hall, the length of leaf are 3.7, 3.4, 2.7 and 3.6cm. Rose plant 2 / in the plant nursery, the length of leaf are 4.5, 4.6, 4.4 and 4.7cm. Rose plant 3 / in the science garden, the length of leaf are 5.5, 5.7, 4.4 and 6.3cm.
2	<p>Able to state one observation correctly and one incomplete observation.</p> <p>OR</p> <p>Able to state any two incomplete observations (Any 2 criteria)</p> <p>Sample answers for incomplete observations:</p> <p><u>Horizontal</u></p> <ol style="list-style-type: none"> Rose plant 1, the leaf length is 3.7cm. Rose plant 1, the average leaf length is 3.3 / 3.33 / 3.325cm. <p><u>Vertical</u></p> <ol style="list-style-type: none"> Rose plant 1 / in the school hall, has the shortest leaf / leaf length, (that is 2.7cm). Rose plant 3 / in the science garden, has the longest leaf / leaf length, (that is 6.3cm). Rose plant 1 / in the school hall, the leaves are /the overall leaf length is the shortest. Rose plant 2 has longer leaves than plant 1 and shorter than plant 3.

1	<p>Able to state any one idea of observation (Any 1 criterion)</p> <p>Sample answers:</p> <ol style="list-style-type: none"> 1. The leaf length is a continuous variation /with intermediate length /differences are not obvious /not in distinct categories /affected by environmental factors /gives a normal curve/distribution. 2. The shortest leaf / leaf length, that is 2.7cm. 3. The longest leaf / leaf length, that is 6.3cm. 4. The leaves are different in length.
---	--

1 (b) (ii) [KB0604 - Making inferences]

Score	Criteria
3	<p>Able to make one logical inference for each observation based on the any two criteria of C1 and C2:</p> <p>C1 - Ligth // nutrients/minerals // water // type/fertility of soil, enough/high/more/most</p> <p>C2 - (Rate of) growth /grow, high/more/the most.</p> <p>OR</p> <p>(If in the observation, mentioned the leaf length of all four leaves per plant)</p> <p>[Note: Only accepted for one observation only]</p> <p>C1 - The leaf length is a continuous variation</p> <p>C2 - with intermediate length // differences are not obvious // not in distinct categories // affected by environmental factors</p> <p>Sample answers:</p> <p><u>Horizontal / Vertical</u></p> <ol style="list-style-type: none"> 1. (Rose plant 1,) receives enough/more/most light /nutrients /water, so high/higher/highest rate of growth /grows more/the most. 2. (Rose plant 2 /3,) receives not enough/less light /nutrients /water, so low/lower rate of growth /grows less/the least.
2	<p>Able to state one inference for any observation correctly and one incomplete inference.</p> <p>OR</p> <p>Able to state any two incomplete inference for the observation (Any 2 criteria)</p> <p>Sample answers for incomplete inference:</p> <p><u>Horizontal / Vertical</u></p> <ol style="list-style-type: none"> 1. (Rose plant 1,) receives enough/more/most light /nutrients /water. 2. (Rose plant 1,) has high/higher/highest rate of growth /grows more/the most. 3. Light /nutrients /water affects the rate of growth of rose plant. <p>OR</p> <p>(If in the observation, did not mention the leaf length of all four leaves per plant)</p> <p>[Note: Only accepted for one observation only]</p> <p>C1 - The leaf length is a continuous variation</p> <p>C2 - with intermediate length // differences are not obvious // not in distinct categories // affected by environmental factors</p>

1	<p>Able to make an idea of inference with one criterion.</p> <p>Sample answers:</p> <ol style="list-style-type: none"> 1. Light affects growth. 2. Growth are different 3. Plants receive different light intensity /nutrients. 4. Different rate of cell division.
---	--

For 1(b)(i) Observation and (ii) Inference:

Score	Accurate	Inaccurate	Idea	Wrong
3	2			
2	1	1		
		2		
1	1		1	
	1			1
		1	1	
			2	
0		1		1
			1	1
				2

1 (c) [KB061001 - Controlling Variables]

Score	Criteria								
3	<p>Able to state all (6) the variables and the method to handle the variables correctly.</p> <p>Sample answers:</p> <table border="1"> <thead> <tr> <th>Variables</th><th>Method to handle the variables</th></tr> </thead> <tbody> <tr> <td> <p>Manipulated variable:</p> <p>Location // <u>Light intensity</u> // <u>Amount</u> of nutrients/minerals/water // <u>Type/fertility</u> of soil (of the location)</p> <p>OR</p> <p>Characteristic (of rose plant)</p> </td><td> <p>Three pots of rose plant / <i>Rosa</i> sp. are chosen/taken from three locations / the school hall, the plant nursery and the science garden.</p> <p>OR</p> <p>Use/observe/measure/record the leaf length</p> </td></tr> <tr> <td> <p>Responding variable:</p> <p>Length of leaf [Inaccurate: Size of leaf]</p> <p>OR</p> <p>Type of variation</p> </td><td> <p>(Measure and) <u>record</u> (the leaf length) by using a ruler</p> <p>OR</p> <p>(Determine by / based on;) The characteristic /leaf length is affected by the environment /environmental factors // The difference in the leaf length is not obvious /not in distinct categories</p> </td></tr> <tr> <td> <p>Controlled variable:</p> <p>Type /species of plant // Plant age // Plant height</p> </td><td> <p>Use rose plant / <i>Rosa</i> sp. // All are the same // All are the same</p> </td></tr> </tbody> </table>	Variables	Method to handle the variables	<p>Manipulated variable:</p> <p>Location // <u>Light intensity</u> // <u>Amount</u> of nutrients/minerals/water // <u>Type/fertility</u> of soil (of the location)</p> <p>OR</p> <p>Characteristic (of rose plant)</p>	<p>Three pots of rose plant / <i>Rosa</i> sp. are chosen/taken from three locations / the school hall, the plant nursery and the science garden.</p> <p>OR</p> <p>Use/observe/measure/record the leaf length</p>	<p>Responding variable:</p> <p>Length of leaf [Inaccurate: Size of leaf]</p> <p>OR</p> <p>Type of variation</p>	<p>(Measure and) <u>record</u> (the leaf length) by using a ruler</p> <p>OR</p> <p>(Determine by / based on;) The characteristic /leaf length is affected by the environment /environmental factors // The difference in the leaf length is not obvious /not in distinct categories</p>	<p>Controlled variable:</p> <p>Type /species of plant // Plant age // Plant height</p>	<p>Use rose plant / <i>Rosa</i> sp. // All are the same // All are the same</p>
Variables	Method to handle the variables								
<p>Manipulated variable:</p> <p>Location // <u>Light intensity</u> // <u>Amount</u> of nutrients/minerals/water // <u>Type/fertility</u> of soil (of the location)</p> <p>OR</p> <p>Characteristic (of rose plant)</p>	<p>Three pots of rose plant / <i>Rosa</i> sp. are chosen/taken from three locations / the school hall, the plant nursery and the science garden.</p> <p>OR</p> <p>Use/observe/measure/record the leaf length</p>								
<p>Responding variable:</p> <p>Length of leaf [Inaccurate: Size of leaf]</p> <p>OR</p> <p>Type of variation</p>	<p>(Measure and) <u>record</u> (the leaf length) by using a ruler</p> <p>OR</p> <p>(Determine by / based on;) The characteristic /leaf length is affected by the environment /environmental factors // The difference in the leaf length is not obvious /not in distinct categories</p>								
<p>Controlled variable:</p> <p>Type /species of plant // Plant age // Plant height</p>	<p>Use rose plant / <i>Rosa</i> sp. // All are the same // All are the same</p>								

2	Able to state 4 - 5 of the variables and the method to handle the variables correctly.
1	Able to state 1 - 3 of the variables and the method to handle the variables correctly.

1 (d) [KB0611 - Making Hypothesis]

Score	Criteria
3	<p>Able to state a hypothesis to show a relationship between the manipulated variable and responding variable and the hypothesis can be validated, base on 3 criteria:</p> <p>C1 - MV, Manipulated variable Eg. Location / the school hall, the plant nursery and the science garden Eg. Environmental condition : Light intensity // Amount of nutrients/minerals/water // Type/fertility of soil OR Characteristic / leaf length</p> <p>C2 - RV, Responding variable : Length of leaf // Average length of leaf // (Rate of) growth OR Type of variation</p> <p>C3 - R, Relationship : more/high/higher // little/less/lesser OR, 'is' // 'is not' (Accept if wrong theory)</p> <p>Sample answers:</p> <ol style="list-style-type: none"> 1. The average leaf length for Rose plant 3 is the longest compared to Rose plants 1 and 2. 2. The growth of rose plant taken from the science garden is the fastest/best compared to the plants taken from the school hall and the plant nursery. 3. The length of leaves of rose plant is a continuous variation.
2	<p>Able to state less accurate hypothesis to show a relationship between manipulated variable and responding variable base on 2 criteria.</p> <p>Sample answers:</p> <ol style="list-style-type: none"> 1. The average leaf length for Rose plant 3 is the longest. 2. The (rose) plant that receive the most lighth (intensity) grows the best. 3. The growth of plant (rose) leaf is a continuous variation.
1	<p>Able to state idea of hypothesis to show a relationship between manipulated variable and responding variable base on 1 criterion.</p> <p>Sample answers:</p> <ol style="list-style-type: none"> 1. The leaf length are different. 2. Environment affect the leaf.

1 (e) (i) [KB0606 - Communicating]

Score	Criteria																				
3	<p>Able to tabulate a table and fill in data accurately base on three criteria:</p> <p>C1 - T, Title with units (Leaf length, cm)</p> <p>C2 - D, Recording data (The ranges of the leaf length)</p> <p>C3 - C, Calculation / Counting (Number of leaves)</p> <p>Sample answer:</p> <table border="1"> <thead> <tr> <th>Leaf length (cm)</th><th>Number of leaf</th></tr> </thead> <tbody> <tr><td>0.0 - 0.9</td><td>0</td></tr> <tr><td>1.0 - 1.9</td><td>0</td></tr> <tr><td>2.0 - 2.9</td><td>1</td></tr> <tr><td>3.0 - 3.9</td><td>3</td></tr> <tr><td>4.0 - 4.9</td><td>5</td></tr> <tr><td>5.0 - 5.9</td><td>2</td></tr> <tr><td>6.0 - 6.9</td><td>1</td></tr> <tr><td>7.0 - 7.9</td><td>0</td></tr> <tr><td>8.0 - 8.9</td><td>0</td></tr> </tbody> </table> <p>[Note: The number of leaf is according to the readings in 1 (a)]</p>	Leaf length (cm)	Number of leaf	0.0 - 0.9	0	1.0 - 1.9	0	2.0 - 2.9	1	3.0 - 3.9	3	4.0 - 4.9	5	5.0 - 5.9	2	6.0 - 6.9	1	7.0 - 7.9	0	8.0 - 8.9	0
Leaf length (cm)	Number of leaf																				
0.0 - 0.9	0																				
1.0 - 1.9	0																				
2.0 - 2.9	1																				
3.0 - 3.9	3																				
4.0 - 4.9	5																				
5.0 - 5.9	2																				
6.0 - 6.9	1																				
7.0 - 7.9	0																				
8.0 - 8.9	0																				
2	Able to tabulate a table base on two criteria.																				
1	Able to tabulate a table base on one criterion.																				

1 (e) (ii) [KB0608 - Space and Time Relationship]

Score	Criteria
3	<p>Able to draw a histogram based on the criteria below:</p> <p>C1 - P, Constants scale (both axes) and correct label with unit</p> <p>C2 - T, All point transferred correctly</p> <p>C3 - B, Histogram (bars of the same width)</p> <p>(Extrapolation, cannot more than 3 small squares)</p>
2	Any two criteria
1	Any one criteria
0	No table in 1(e)(i)

1 (e) (iii) [KB0607 - Interpreting Data]

Score	Criteria
3	<p>Able to explain the relationship between the number of leaves and the leaf length, based on three criteria.</p> <p>C1 - R, Relationship: Leaf length 4.0-4.9 cm is the <u>most/highest</u> number of leaves // Leaf length 2.0-2.9 cm <u>and</u> leaf length 6.0-6.9 cm is the least/lowest number of leaves // The number of leaf/leaves increases as the leaf length increase from range 2.0-2.0cm until range 4.0-4.9cm // Any similar relationship</p> <p>C2 - E1, Explanation 1: Leaf length is a continuous variation</p> <p>C3 - E2, Explanation 2: The characteristic /leaf length is affected by the environment (//Environmental factors //Light intensity //Amount of nutrients/minerals/water // Type/fertility of soil // Locations) // The difference in the leaf length is not obvious /not in distinct categories</p> <p>Sample answer:</p> <ol style="list-style-type: none"> 1. Leaf length 4.0-4.9 cm is the most/highest number of leaves. Leaf length is a continuous variation. The characteristic is affected by the environment. 2. Leaf length 2.0-2.9 cm <u>and</u> leaf length 6.0-6.9 cm is the least/lowest number of leaves. Leaf length is a continuous variation. The difference in the leaf length is not obvious.
2	<p>Able to state clearly but less accurate the relationship base on 2 criteria.</p> <ul style="list-style-type: none"> ▪ R + E1/E2 ▪ R inaccurate/idea + E1 + E2 <p>Sample of inaccurate R:</p> <ol style="list-style-type: none"> 1. One leaf with length 2.0-2.9 cm, three leaves with length 3.0-3.9 cm, five leaves with length 4.0-4.9 cm, two leaves with length 5.0-5.9 cm, and one leaf with length 6.0-6.9 cm. <p>Sample answer:</p> <ol style="list-style-type: none"> 1. Leaf length 4.0-4.9 cm is the most/highest number of leaves. Leaf length is affected by the environment. 2. One leaf with length 2.0-2.9 cm, three leaves with length 3.0-3.9 cm, five leaves with length 4.0-4.9 cm, two leaves with length 5.0-5.9 cm, and one leaf with length 6.0-6.9 cm. Leaf length is a continuous variation. The characteristic is affected by the environment.
1	<p>Able to state the idea of the relationship base on 1 criterion.</p> <ul style="list-style-type: none"> ▪ R only ▪ R inaccurate/idea + E1/E2
0	<ul style="list-style-type: none"> ▪ No histogram in 1(e)(ii) // Histogram is wrong ▪ Without reading ▪ No R // E1/E2 only

1 (f) [KB0609 - Define Operationally]

Score	Criteria
3	<p>Able to define operationally continuous variation, based on the experiment.</p> <p>Criteria:</p> <p>C1 - Leaf length of rose plant / <i>Rosa</i> sp.</p> <p>C2 - Measure by using a ruler // Shows a (complete) range of measurements from one extreme to the other / from the shortest (length) to the longest (length)</p> <p>C3 - Affected by the environment (//Environmental factors //Light intensity //Amount of nutrients/minerals/water // Type/fertility of soil // Locations)</p> <p>Sample answer:</p> <ol style="list-style-type: none"> 1. Leaf length of rose plant is a continuous variation. The leaf length is measured by using a ruler, and (the leaf length) is affected by the environment. 2. Continuous variation is shown by the leaf length of rose plant. The leaf length shows a (complete) range of measurements from one extreme to the other / from the shortest (length) to the longest (length). Continuous variation depends on different locations.
2	Able to state any two criteria
1	Able to state at idea level only.

1 (g) [KB0605 - Predicting]

Score	Criteria
3	<p>Able to predict the type of variation, and explain the prediction based on three criteria.</p> <p>C1 - P, Discontinuous variation</p> <p>C2 - E1, Explanation 1: The characteristic /the colour of flower is not affected by the environment /environmental factors.</p> <p>C3 - E2, Explanation 2: The difference in the characteristic /the colour of flower is obvious /can be classify in distinct categories /group.</p> <p>Sample answers:</p> <ol style="list-style-type: none"> 1. (The colour of flower in a species of rose plants is a) discontinuous variation. The characteristic is not affected by the environmental factors. The difference in the flower colour is obvious / and can be put in distinct categories. 2. Discontinuous variation. The colour of flower is not affected by the environment. It can be put in certain groups.
2	<p>Able to predict the result less accurately (2 criteria).</p> <ul style="list-style-type: none"> ▪ P + E1/E2 ▪ P inaccurate/idea + E1 + E2
1	<p>Able to give idea of the result.</p> <ul style="list-style-type: none"> ▪ P only ▪ P inaccurate/idea + E1/E2
0	<ul style="list-style-type: none"> ▪ No R // E1/E2 only

1 (h) [KB0602 - Classifying]

Score	Criteria				
3	<p>Able to classify all (8) the characteristics according to different types of variation</p> <p>Sample answer:</p> <table border="1"> <tr> <th>Continuous variation</th><th>Discontinuous variation</th></tr> <tr> <td> Skin colour Length of feet Intelligence </td><td> Type of hair Shape of nose Dimple on cheek Eye iris colour Rh factor </td></tr> </table>	Continuous variation	Discontinuous variation	Skin colour Length of feet Intelligence	Type of hair Shape of nose Dimple on cheek Eye iris colour Rh factor
Continuous variation	Discontinuous variation				
Skin colour Length of feet Intelligence	Type of hair Shape of nose Dimple on cheek Eye iris colour Rh factor				
2	Able to classify any 5-7 correctly.				
1	Able to classify any 2-4 correctly.				

Question 2**Problem Statement**

Score	Criteria
3	<p>Able to state the problem statement of the experiment correctly that include criteria:</p> <p>C1 - MV, Manipulate variables : The surface area of leaves (Inaccurate: Number of leaves, Operation of MV)</p> <p>C2 - RV, Responding variables : (Rate/Process of) photosynthesis (Inaccurate: Number of air bubbles released in 5 minutes, Operation of RV)</p> <p>C3 - R, Relation in question form and question symbol [?]</p> <p>Sample answers:</p> <ol style="list-style-type: none"> 1. What is the effect of surface area of leaves on photosynthesis? 2. Does the surface area of leaves affect the process of photosynthesis? 3. Does the rate of photosynthesis depend on the surface area of leaves?
2	<p>Able to state the problem statement of the experiment with two criteria.</p> <p>Sample answers:</p> <ol style="list-style-type: none"> 1. What is the effect of surface area of leaves on the rate of photosynthesis. 2. Does the surface area affect the photosynthesis? 3. Does the number of leaves affect on the rate of photosynthesis?
1	<p>Able to state the of problem statement with one criteria or at idea level.</p> <p>Sample answers:</p> <ol style="list-style-type: none"> 1. What is the effect of leaves on the rate of photosynthesis. 2. Does the surface area affect the number of air bubbles? 3. Does photosynthesis depend on leaves.

Variables

Score	Criteria
3	<p>Able to state the three variables correctly</p> <p>Sample answers:</p> <p>Manipulated variable: The surface <u>area</u> of leaves // The <u>number</u> of leaves</p> <p>Responding variable: The <u>rate</u> of photosynthesis</p> <p style="padding-left: 40px;">// The number of air/gas bubbles released in 5 minutes</p> <p style="padding-left: 40px;">// The number of air/gas bubbles</p> <p>Controlled variable: Type /species of plant // <i>Hydrilla</i> sp. // Hydrilla</p> <p style="padding-left: 40px;">// Time /duration (of photosynthesis /process /experiment)</p>
2	Able to state the two variables correctly .
1	Able to state the one variable correctly .

Hypothesis

Score	Criteria
3	<p>Able to state the hypothesis correctly according to the criteria:</p> <p>C1 - MV, Manipulated variable</p> <p>C2 - RV, Responding variable</p> <p>C3 - R, Relationship (more/high/higher // little/less/lesser)</p> <p>(Accept if wrong theory)</p> <p>Sample answers:</p> <ol style="list-style-type: none"> 1. The larger the surface area of leaves, the higher the rate of photosynthesis. 2. The number of air bubbles released increases with the number of leaves.
2	<p>Able to state the hypothesis with two criteria.</p> <p>Sample answers:</p> <ol style="list-style-type: none"> 1. The surface area of leaves affects the rate of photosynthesis. 2. The rate of photosynthesis depends on the surface area of leaves.
1	<p>Able to state the hypothesis with one criterion / idea level for two criteria.</p> <p>Sample answers:</p> <ol style="list-style-type: none"> 1. The leaves affects the gas bubbles. 2. Photosynthesis occurs in the leaves. 3. The rate of photosynthesis increases.

Apparatus and Materials

Score	Criteria
3	Able to state all *functional apparatus /2*apparatus + 5 other apparatus, and all *functional materials /2*materials + 1 other material for the experiment. Apparatus: <u>*Stop watch</u> , beaker, <u>*boiling tube</u> , table lamp (60W), ruler, clips /plasticine, thermometer, filter funnel, measuring cylinder, blade /knife Materials: <u>*Hydrilla sp.</u> , sodium hydrogen carbonate solution / (soda) bicarbonate (powder), <u>*(distilled) water</u> (Reject if wrong category) (Accept if not separately)
2	Able to state all *functional apparatus and materials / 2*materials + 2*apparatus + 4 other apparatus or materials for the experiment.
1	Able to state all *functional apparatus and materials / 2*materials + 2*apparatus for the experiment.

Procedure

Score	Criteria
3	Able to state five procedures P1, P2, P3, P4 and P5 correctly. P1 : How to Set Up The Apparatus (4P1) P2 : How to Make Constant The Control Variable (1P2) P3 : How to Manipulate The Manipulated Variable (1P3) P4: How to Record The Responding Variable (2P4) P5 : Precaution (1P5)
2	Able to state three or four of any procedures P1, P2, P3, P4 and P5 completely.
1	Able to state two of any procedures P1, P2, P3, P4 and P5 completely.

Example of Procedure:

1. <u>Fill</u> a boiling tube with <u>30ml</u> of <u>1%</u> sodium hydrogen carbonate solution. (Note: Maximum volume of a boiling tube is 40ml)	P1 P2 P2
2. <u>Cut 10 cm</u> of <u>Hydrilla</u> sp. by using a blade. <u>Cut off</u> some of the leaves and leave 40 leaves only. <u>Record</u> the number of leaves.	P1 P2 P1 P1
3. <u>Fix</u> a small piece of plasticine to a twig/sprig of <u>Hydrilla</u> sp.	P1 P2
4. <u>Submerged</u> the aquatic plant into the boiling tube (containing 1% of sodium hydrogen carbonate).	P1
5. Place the <u>cut end</u> of the <u>Hydrilla</u> sp. <u>stem facing upward</u> .	P5 P2
6. <u>Immerse</u> the boiling tube into a <u>water bath</u> at <u>room temperature</u> . <u>Place</u> the boiling tube at distance of <u>50cm</u> from table lamp/light source.	P5 P1 P1 P2
7. Wait until the rate of <u>bubble released</u> is <u>constant</u> . <u>Start</u> the stopwatch. <u>Count/record</u> the number of bubbles released in 5 minutes by using a stop watch.	P5 P1 P4
8. Repeat steps 1 to 7, using twigs of Hydrilla with <u>number of leaves 10, 20 and 30</u> .	P3
9. <u>Record</u> the number of bubbles released in table.	P1

10. <u>Calculate</u> the rate of photosynthesis by using formula : <div style="text-align: right;">$\frac{\text{Number of (air) bubbles released}}{5 \text{ minutes}}$</div>	P4
11. Repeat the experiment / steps 1-10 to get <u>average readings</u> .	P5
12. <u>Tabulate</u> the data (in a table) // Record the data in a <u>table</u> .	P1
13. <u>Plot</u> a graph of the rate of photosynthesis against the number of leaves of <u>Hydrilla</u> sp.	P4

Data

Score	Criteria															
2	<p>Able to tabulate the correct table based on two criteria:</p> <p>C1 - Heading with correct units</p> <p>C2 - Manipulated variable (at least 3 values)</p> <p>Sample answers:</p> <table><tr><th>Number of leaves</th><th>Number of (air) bubbles</th><th>Rate of photosynthesis (Number per minute) / (Num min⁻¹)</th></tr><tr><td>10</td><td></td><td></td></tr><tr><td>20</td><td></td><td></td></tr><tr><td>30</td><td></td><td></td></tr><tr><td>40</td><td></td><td></td></tr></table>	Number of leaves	Number of (air) bubbles	Rate of photosynthesis (Number per minute) / (Num min ⁻¹)	10			20			30			40		
Number of leaves	Number of (air) bubbles	Rate of photosynthesis (Number per minute) / (Num min ⁻¹)														
10																
20																
30																
40																
1	<p>Able to tabulate the table based on one criterion.</p>															

Note:

Other ways to operate manipulated variables, the surface area of leaves, by covering the leaves using nail varnish, paint or other non-water soluble or water repellent substances, except oil.

END OF MARKING SCHEME
PERATURAN PEMARKAHAN TAMAT