SULIT
4551/1
BIOLOGI
Ogos
2011
1 1/4 jam

BAHAGIAN PENGURUSAN
SEKOLAH BERASRAMA PENUH DAN SEKOLAH KECEMERLANGAN
KEMENTERIAN PELAJARAN MALAYSIA

PEPERIKSAAN PERCUBAAN SPM SETARA

TAHUN 2011

BIOLOGI

Kertas 1

PERATURAN PEMARKAHAN

MARKING SCHEME
PAPER 1
TRIAL SBP 2011

1.	B	26.	B
2.	B	27.	C
3.	D	28.	A
4.	D	29.	C
5.	D	30.	B
6.	C	31.	A
7.	A	32.	C
8.	A	33.	A
9.	B	34.	B
10.	A	35.	D
11.	B	36.	A
12.	C	37.	C
13.	A	38.	B
14.	D	39.	C
15.	C	40.	D
16.	A	41.	A
17.	D	42.	A
18.	C	43.	A
19.	A	44.	C
20.	B	45.	A
21.	D	46.	B
22.	A	47	D
23.	D	48.	C
24.	C	49.	C
25.	C	50.	D

SULIT
4551/2
BIOLOGI
Peraturan Pemarkahan
Ogos
2011
2 ½ jam

BAHAGIAN PENGURUSAN
SEKOLAH BERASRAMA PENUH DAN SEKOLAH KECEMERLANGAN
KEMENTERIAN PELAJARAN MALAYSIA

PEPERIKSAAN PERCUBAAN SPM SETARA

TINGKATAN LIMA 2011

BIOLOGI

Kertas 2

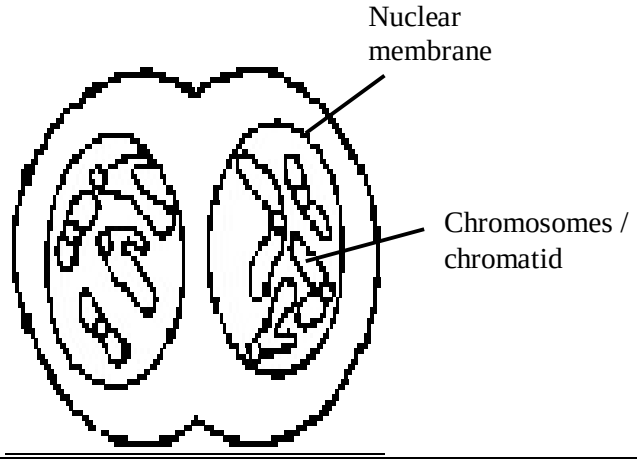
PERATURAN PEMARKAHAN

Untuk kegunaan pemeriksa sahaja

Peraturan Permarkahan ini mengandungi 14 halaman bercetak

No	Mark Scheme	Sub mark	Total Mark
1(a)(i)	Able to name cell P and cell R. Answer : P : White blood cell / monocycte /leucocyte R : Phloem	1 + 1	2
(ii)	Able to state **one** function of cell P and cell R. Sample answer P : to fight infections / engulf / digest bacteria / defence mechanism // carry out phagocytosis R : to transport organic food / sugar / sucrose / glucose from leaves to all parts of plant / example	1 + 1	2
(b)(i)	Able to name the system which consists of cell S. Answer Nervous system	1	1
(ii)	Able to explain **one** role of cell S in the system. Sample answer F : control / coordinate activities of the body E1 : detect stimuli E2 : transmit electrical signals / nerve impulse E3 : to muscle / gland / effector Any two	2	2
(c)	Able to explain one characteristic of cell Q/root hair to facilitate water absorption from soil. Sample answer F1 : have large number E1 : to provide large surface area F2: (cells in tissue Q is) one-cell thick E2 : to increase diffusion / osmosis rate. E2: have a higher concentration of solutes than the water in surrounding soil Any two	2	2
(d)	Able to explain how herbicide is capable to stop the transportation of some mineral into a plant through Sample answer F : Herbicide contains active respiratory poison / toxic E1: denatures the respiratory enzymes E2. which stops cellular respiration E3 : no production of ATP. E4 . Active transport of the ions cannot take place in the absence of ATP Any three	3	3
	TOTAL		**12**

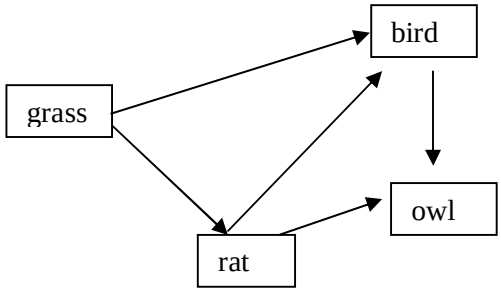
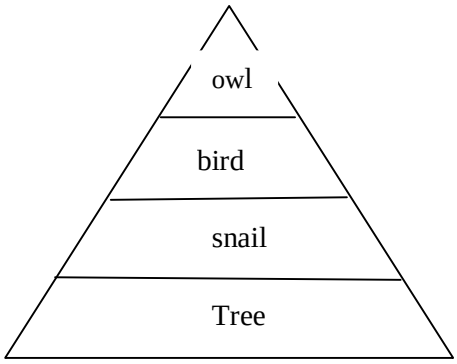
QUESTION 2

No	Mark Scheme	Sub mark	Total Mark
2(a)(i)	Able to state the type of cell division involved in the cell cycle. Answer Mitosis	1	1
(a)(ii)	Able to state **one** reason for the answer in (a)(i). Sample answer Because the cell cycle mitosis occur in skin cell /somatic cell	1	1
(b)(i)	Able to explain the chromosomal behavior in stage N. Sample answer F : N is metaphase E1 : Chromosome align at metaphase plate E2: spindle fibres (fully) formed E3 : attach to centromere of the chromosome Any two	1+1	2
(ii)	Able to state the importance of the chromosomal behavior in mentioned in (b)(i). Sample answer P1. To ensure new cells produced are identical in chromosomal number. P2. to ensure the sister chromatid can separate / move to opposite poles Any one	1	1
(c)	Able to draw a diagram showing the chromosomal behavior after stage M. • Chromosomal number = 1 mark • Chromosomal behavior = 1 mark • Label (at least 2) = 1 Sample answer  	1+1+1	3

(d)(i)	Able to suggest a suitable method to be used which involved the cell cycle in mitosis. Sample answer Cloning / tissue culture	1	1
(ii)	Able to explain how the cloning / culture tissue can increased the crop yield. Sample answer F : large numbers of clones can be produced E1: within a short period of time / any time E2 : clones inherited good characteristic E3 : example on good characteristic /resistance to diseases/ fast growth rate / large fruit / Any three	Max 3	3
	TOTAL		12

QUESTION 3

No	Mark Scheme	Sub mark	Total Mark
3(a)(i)	Able to state the definition of ecosystem Sample answer An ecosystem is a community of organisms / biotic components which interact with their non-living environment/abiosis components.	1	1
(ii)	Able to state an example of niche Criteria : • Organism • Activity • place Sample answer Squirrel eat fruits from the tree // big bird eat mouse in the garden.	1	1
(b)(i)	Able to construct a food web showing the interaction of **four** organisms. Criteria : C1 : producer C2 : correct arrows C3 : At least 2 food chains C4 : 4 organisms correctly	1+1	

	Sample answer  All C`s correct = 2marks At least 3 C = 1 mark . Without C1 = no marks		2
(ii)	Able to construct a pyramid of numbers showing the interaction of **four** organisms. criteria C1 : 4 trophic levels C2 : sequence and position of organism in pyramid is correct. Sample answer  	1 1	2
(c) (i)	Able to calculate the total energy transferred to the organisms in the third trophic level. Sample answer C1 : 10% × 1500 kJ C2 : = 150 kJ	1 1	2
(c)(ii)	Able to state **two** ways in which energy may be lost in the food web. Sample answer P1 lost to atmosphere as heat energy P2 used to decompose dead matter (by decomposer) P3 used to carry out metabolism reaction in cells P4 respiration	1+1	

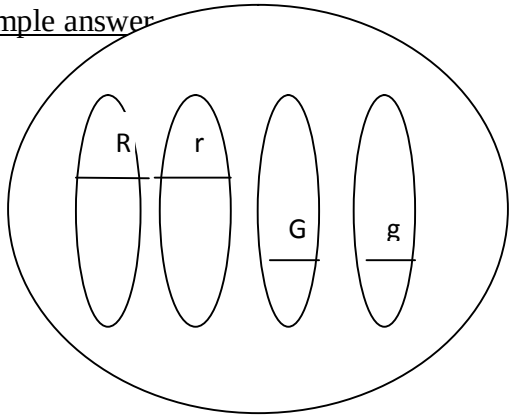
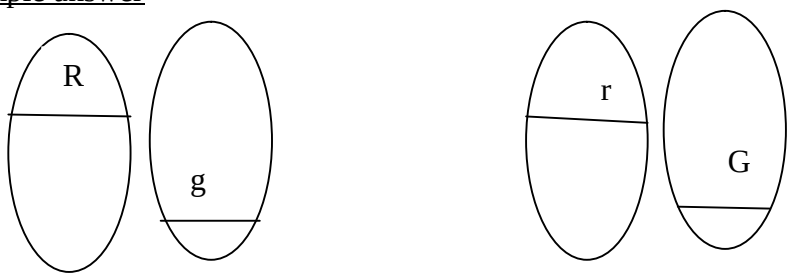
	P5 excretion P6 defaecation Any two		2
(d)	Able to explain **one** bad effect of human activities on the ecosystem. Sample answer F : deforestation / logging / open burning E1 : extinction / destroy of flora / fauna E2 : loss of biodiversity E3 : disruption of food chain/web E4 : Land slides / soil erosion / water pollution / flash flood Any two	1+1	2
	TOTAL		12

QUESTION 4

No	Mark Scheme	Sub mark	Total Mark
4(a)	Able state the importance of fluid S. Sample answer P1 : protect the foetus by absorbing shock P2 : protects foetus from physical damage P3 : allow movement of the foetus Any one	1	1
(b)(i)	Able to name both blood vessels. Answer 1. Umbilical artery 2. umbilical vein.	1+1	2
(b)(ii)	Able to tate the function of each blood vessels named in (b)(i) Sample answer Umbilical artery : carry waste product / deoxygenated blood from the foetus to the placenta. Umbilical vein : carry oxygenated blood from placenta to the Foetus	1+1	2
(c)	Able to explain why the foetus is aborted . Sample answer F : Q secrete progesterone to stimulate / induce the thickening endometrium E1 : infection caused Q does not secrete progesterone E 2 : endometrium are no longer thicken // endometrium break down	1+1	

	(so, foetus is aborted). Any two		2
(d)	Able to explain why the foetus has a separate blood circulatory system from his mother. Sample answer F : Prevents the mixing of blood groups of the mother and the foetus which may be incompatible. E1 : If incompatible bloods mix, they clot / agglutinate E2 : and cause blockage in important organs / death Any Two **OR** F : Protect the foetus from the high blood pressure of the mother. E1 : Foetus has fine and delicate blood vessel. E2 : High pressure of mother's blood will cause the foetal blood vessels burst and damage. Any two **OR** F : Prevent the action of maternal hormones / chemicals / harmful bacteria E1 : from crossing the foetal blood E2 : which could harm the development of the foetus. Any two	1+1	2
(d)	Able to explain how HCG injections enable the process of pregnancy Sample answer P1: (the function of HCG is similar to that of LH so) HCG stimulates Ovulation. P2 : ovum / secondary oocyte is released from the ovary to fallopian tube. P3: ovum fuses with sperm in fallopian tube forming a zygote . P4: corpus luteum secretes progesterone. P5 : progesterone maintains the thickness of the uterine wall / endometrium P6: the thickness of the uterine wall enables implantation to occur. Any three	1+1+1	3
	TOTAL		**12**

QUESTION 5

No	Mark Scheme	Sub mark	Total Mark
5(a)(i)	Able to label the alleles for F1 genotype. Sample answer  All correct	1	1
(a)(ii)	Able to state the phenotype for F1 generation Answer Round , yellow (colour)	1	1
(b)	Able name the process that occurred during meiosis which produced different gametes in second possibilities. Answer Crossing-over // cross-over	1	1
(c)	Able to draw gametes J and gamete Kwhich are produced in second possibility. Sample answer  Gamete J / K	1+1	2
(d)(i)	Able to state which possibilities will cause more variation to the offsprings Answer Second possibility	1	1
(ii)	Able to explain **one** reason for your answer in (d)(i).	1+1+1	

<table>
<tr><td></td><td>Sample answer

F : crossing over occurred between (chromatids from a pair of) homologous chromosomes
E1 : in prophase 1 /meiosis 1 / meosis
E2 : (the exchange of parts between chromatids) results in new genetic Combinations // a different genetic composition.
E3 : (four) different gametes produced.
E4 : (thus, each time) gametes from two individuals fertilize randomly, it produced large number of variations between offspring
Any three</td><td></td><td>3</td></tr>
<tr><td>(e)</td><td>Able to Complete Digram 5.3 by filling in F1 generation gametes drawn in (c), genotype of F2 generation and phenotypeof F2 generation which will be produced.

Criteria :
• All Gametes from F1 generation correct = 1mark
• All Genotype of F2 generation = 1 mark
• All Phenotype of F2 generation = 1mark

Sample answer

<table><tr><th>Gametes from F1 generation.</th><th>Gametes from parent</th><th>Genotype of F2 generation</th><th>Phenotype of F2 generation</th></tr><tr><td>Rg</td><td></td><td>Rrgg</td><td>Round, Green</td></tr><tr><td>rG</td><td></td><td>rrGg</td><td>Wrinkle, Yellow</td></tr></table></td><td>1+1+1</td><td>3</td></tr>
<tr><td></td><td>TOTAL</td><td></td><td>12</td></tr>
</table>

QUESTION 6

No	Mark Scheme	Sub mark	Total Mark
6(a)(i)	Able to explain the adaptation of vertebrae P and vertebrae Q to function efficiently. Sample answer F1 : P is thoracic vertebrae E1 : Have long spinous processes E2 : and directed downwards E3 : for muscle / ligament attachment E4 : articulate with ribs to make up the side of the thoracic cavity.		

	Any three F2 : Q is lumbar vertebrae E1 : Largest / strongest vertebrae E3 : Their processes are short / thick E4 : Have large centrum which bear the weight of lower back E5 : To provide support to the (upper) body E6 : Are attach to many of the back muscles Any three	3 3	 6
(a)(ii)	Able to explain why human requires endoskeleton for efficient daily activities <u>Sample answer</u> P1 : Mechanical support P2 : Protection for internal organs P3 : A firm base the attachment of muscles P4 : Gives shape to the organism P5 :Helps in movement of the organism P6 :Site for production of blood cells P7 : Storage for phosphate and calcium Any four	Max 4	 4
(b)	Able to explain why : • An athlete must do a warming up before the event • Elderly people experiences pain at their joint. <u>Sample answer</u> An athlete must do a warming up before the event F: to increase temperature of body / muscle E1 : enabling more efficient use of energy E2 : more efficient of glucose oxidation E3 : increase blood circulation / increase heartbeat/supply oxygen faster E4 : prevent injuries to muscle E5 : muscle can contract more efficiently E6 : prevent muscle cramp / allow muscle to be stretch more easily Any 5 <u>Sample answer</u> Elderly people experiences pain at their joint. F1 : small amount of synovial fluid produced (by the synovial membrane) E1 : thus increase friction between the end of the bones E2 : cartilage has become thinner E3 : thus cartilage is unable to cushions the joint / absorbs shock / further increases the friction between the end of bone E4 : ligaments become shorter / loss elasticity E5 : result in stiff / painful joint	5+5 Max 10	

	E6 : difficulty in movement Any 5		10
	TOTAL		20

QUESTION 7

No	Mark Scheme	Sub mark	Total Mark
7 (a)(i)	Able to explain the importance of plasma membrane for the survival of living organism. <u>Sample answer</u> F : living organism need nutrients / oxygen / glucose / mineral / any suitable example to continue their life`s processes E1 : ions inside cells must be kept at different concentration to outside the cells. E2 : to maintain a constant internal environment/ (homeostasis) E3 : The substances across the plasma membrane from the external environment E4 : cells produce waste products which exit through the plasma membrane E5 : The movement / types / amount of substances in and out of the cells is regulated by plasma membrane. E6 : the cells need to maintain suitable pH of the cells for enzyme activity E7 : so that cell can secretes useful substances / hormones / enzymes Any four	Max 4	4
(a)(ii)	Able to explain active transport and facilitated diffusion of substances through plasma membrane <u>Sample answer</u> Type 1 F1 : facilitated diffusion occur E1 : diffusion of small molecules / ions E2 : move from higher concentration to the higher concentration of solute E3 : through pore protein E4: does no need energy Any three Type 2 F : Active transport occur E1 : The molecules such as sodium ions / potassium ions / glucose / amino acid E2 : move against concentration gradient / from lower concentration to the higher concentration E3 : through carrier protein E4 : have active site with bind with particular molecule	3+3 3	

	E5 : need energy / ATP Any three	3	6
(b)	Able to explain what happen to the cell at point P, Q and R. <u>Sample answer</u> Isotonic to the sap cell : 0.27 moldm^{-3}/ 0.28 moldm^{-3} /0.29 moldm^{-3} **Point P** F1 : The mass of potato increase E1 : (This occur because) the solution concentration is hypotonic to the sap cell of the potato E2 : The water molecule diffuse out from lower concentration/ hypotonic region to the higher concentration/ hypertonic region E3 : by osmosis E4 : cell becomes turgid (so the mass increased) **Point Q** F2 : The potato does not lose or gain mass E1 : This occur because the concentration o the solution is isotonic to the cell sap E2 : Diffusion of water molecule is at equilibrium / equal rate E3 : no net gain or loss of water molecule (so the mass is matained) **Point R** F3 : The mass of potato decrease E1 : (This occur because) the solution is hypertonic to the cell sap E2 : The water molecule diffuse out from cells / from higher concentration to the lower concentration / solution at surrounding E3 : by osmosis E4 : cell becomes flaccid (so the mass decreased) Any 10	Max 10	10
	TOTAL		**20**

QUESTION 8

No	Mark Scheme	Sub mark	Total Mark
(a)	Able to describe how cellulose in the plant fibres are digested and how the products of digestion of cellulose are absorbed into the body of the herbivore. <u>Sample answer</u> P1 : This is the digestive system of a non ruminant example a rabbit. P2 : Mouth: Plant tissues are cut, crushed and grind by the teeth/ incisors/premolars/ molars . P3 : Plant cell walls are disrupted / cellulose exposed P4 : Stomach/ duodenum/ ileum – No enzyme cellulase secreted / No digestion of cellulose. P5 : Caecum (Enlarged)/ contains microorganisms/ bacteria / protozoa which secrete cellulase P6 : to digest the cellulose P7 : Appendix Enlarged / contains mi.croorganisms/ bacteria / protozoa which secrete cellulase P8 : to digest the cellulose. P9 : Cellulase hydrolyse cellulose to glucose in the caecum and appendix Able to describe absorption of glucose. <u>Sample answer:</u> P10 :Some glucose are absorbed by the caecum. P11 : No absorption of glucose in rectum P12 : Re-swallow the digested cellulose/glucose / pallet from the caecum after it has left the anus / coprophagy P13 : All the glucose is absorbed into the blood capillaries of the villus in the ileum **Any 10**	Max 10	10
(b)	Able to explain how a teenager may be able to plan his daily diet wisely to maintain his normal growth and good health. <u>Sample answer:</u> A good dietary habit for normal growth and good health of an adolescent: P1 : practicing a daily balance diet P2 : the diet comprises all food classes // carbohydrates, lipoids, proteins, vitamins, mineral salts and fibers // foods from level 1, level 2, level 3 and level 4. P3 : in the correct amount	Max 10	

	P4 : should take more foods from level 1, 2 and 3 / containing carbohydrates, fruits and vegetables / proteins P5 : for sustaining better general body growth / normal metabolism of the body. P6: the adolescent requires more carbohydrates (as level 1) P7 : for example energy production / energy resources in the body P8 : More proteins (as level 3) P9: for rapid muscular growth / replacement of dead tissues / cells / repairing damaged cells P10 : and synthesis of functional proteins/ enzymes / antibody /hormones / insulin P11 : vitamins / minerals serve as co-enzyme / co-factor for normal enzyme activities P12 : elements like Ca/ P / iodine are important for growth of bones / teeth / development of endocrine gland / thyroid P13 : fibers helps peristalsis in the alimentary canal / avoiding constipation P14 : should avoid from consuming excessive fats (as level 4) P15 : which is the principal cause of cardiovascular problems / heart problem / hypertension / thromboses coronary / arterosclerosis / obesity Any 10		10
	TOTAL		**20**

QUESTION 9

No	Mark Scheme	Sub mark	Total Mark
9(a)	Able to explain the mechanism of blood clotting <u>Sample answer:</u> P1 : Wall of blood vessel is broken / damage / injured / severed P2 : The connective tissue in the vessel wall is exposed to blood. P3 : Platelets stick to the collagen fibres in the connective tissue. P4 : Then aggregation of platelets forms platelet plug. P5 : The clumped platelet, damaged cells and clotting factors in the plasma P6 : forms activators known as thromboplastine. P7 : Thromboplastine, in the presence of Ca2+ and vitamin K P8 : convert prothrombin (inactive plasma protein) into thrombin (active plasma protein). P9 : Thrombin catalyses the conversion of soluble fibrinogen to insoluble fibrin. P10 : Fibrin threads form a network that mesh over the wound trapping red blood cells P11 : and sealing the wound. P13 : A blood clot is formed preventing further blood loss from the	Max 10	

	vessel. P14 : prevent bacteria / pathogen / microbe from entering the cell through wound Any 10		10
(b)	Able to explain how lymphatic system complement to the blood circulatory system. <u>Sample answer:</u> Statement 1 : P1 : In the small intestine, the products of lipid which are fatty acids and glycerol P2 : are first transport into the lacteals in the villi. P3 : The lacteals fuse to form larger lymphatic vessels P4 : and enter the lymphatic system. P5 : Lymphatic fluid carrying the products of lipid digestion eventually drains into the thoracic duct. P6 : The thoracic duct merges into the left subclavian vein which is a part of the blood circulatory system. P7 : Thus the lymphatic system complements the circulatory system in transporting the products of digestion. Statement 2 : P8 : (90% of) tissue fluid form at capillary network (interstitial fluid) must be return to the circulatory system. P9 : The remaining (10%) flows into blind-ended lymph capillaries P10 : which are found in capillary network. P11 : These lymph capillaries drain into larger lymph vessels P12 : which eventually drain back into the blood circulatory system P13 : via the thoracic duct and the right lymphatic duct. P14 : Thus, the lymphatic system complements the circulatory system in ensuring that the volume of blood in blood vessels is kept constant. Any 10	Max 10	10
	TOTAL		**20**

PERATURAN PEMARKAHAN TAMAT

SULIT
4551/3
BIOLOGI
Kertas 3
Peraturan Pemarkahan
Ogos 2011
1½ jam

BAHAGAN PENGURUSAN
SEKOLAH BERASRAMA PENUH DAN SEKOLAH KECEMERLANGAN
KEMENTERIAN PELAJARAN MALAYSIA

PEPERIKSAAN PERCUBAAN SPM SETARA
2011

BIOLOGI

Kertas 3

PERATURAN PEMARKAHAN (PP)

Untuk kegunaan pemeriksa sahaja

Peraturan pemarkahan ini mengandungi 15 halaman bercetak.

QUESTION 1

<table>
<tr><th>No</th><th>MARK SCHEME</th><th>Score</th></tr>
<tr><td rowspan="4">1(a)</td><td>Able to record all 12 data for the volume of urine produced and the average volume of urine produced correctly.

<u>Sample answers:</u>

<table>
<tr><th rowspan="2">Group</th><th rowspan="2">Volume of water intake, ml</th><th colspan="2">Volume of urine produced,ml</th><th rowspan="2">Average volume of urine produced, ml</th></tr>
<tr><th>Student 1</th><th>Student 2</th></tr>
<tr><td>P</td><td>100</td><td>80</td><td>80</td><td>80</td></tr>
<tr><td>Q</td><td>200</td><td>134</td><td>136</td><td>135</td></tr>
<tr><td>R</td><td>300</td><td>205</td><td>207</td><td>206</td></tr>
<tr><td>S</td><td>400</td><td>303</td><td>305</td><td>304</td></tr>
</table>
</td><td>3</td></tr>
<tr><td>Able to record 8 - 11 data correctly</td><td>2</td></tr>
<tr><td>Able to record 4 – 7 data correctly</td><td>1</td></tr>
<tr><td>Able to record only 0 - 3 data or not able to respond / wrong response.</td><td>0</td></tr>
<tr><td>(b) (i)</td><td>Able to state two different observations correctly based on two criteria:

C1- Volume of water intake // Group
C2 – Volume of urine produced // Average volume of urine produced

<u>Sample answers</u>:

1. When the volume of water intake is 100 ml /200 ml /300 ml /400 ml / Group P / group Q / Group R / Group S, the average volume of urine produced is 80ml / 135 ml / 206 ml /304 ml.

2. When the volume of water intake is 100 ml /200 ml /300 ml /400 ml / Group P / group Q / Group R / Group S, the volume of urine produced is 80 / 134 ml / 136 ml / 205 ml / 207 ml / 303 ml / 305 ml.
3. The average volume of urine produced in Group P is lower / smaller than that in Group Q / R / S // The average volume of urine produced in Group S is higher than that in Group P / Q / R.</td><td>3</td></tr>
</table>

	Able to state one correct observation and one inaccurate observation . Sample answer (inaccurate): 1. When the volume of water intake is 100 ml /200 ml /300 ml /400 ml // Group P / group Q / Group R / Group S, the average volume of urine produced is the least / less / high / the highest.	2
	Able to state only one correct observation or two observation at idea level. Sample answer (idea level): 1. The volume / average volume of urine produced is different. 2. The volume of water intake affects the (average) volume of urine produced.	1
	No response or incorrect response or two inaccurate observation or one idea only.	0
(b) (ii)	Able to make two accurate inferences based on **two** criteria: C1 – more / less (amount) of water reabsorbed C2 – higher / lower osmotic pressure // permeability of kidney / tubule to water increases / decreases // more / less ADH / aldosterone secreted to kidney tubule Sample answer: (For observation 1 and 2 in sample answers) 1. **More/high/much**/ (amount) of water reabsorbed due to high osmotic pressure // vice versa (For observation 3 in sample answers) 2.**More / higher** (amount) of water reabsorbed due to higher osmotic pressure in Group P compared to Group Q/R/S.	3
	Able to state one correct inference **and** one inaccurate inference or able to state two inaccurate inferences. Sample answer (inaccurate): 1. **More/high/much**/ (amount) of water reabsorbed // inversely. 2. **Higher / high / lower / low** osmotic pressure. 3. **Less / more** ADH is secreted to the kidney tubule.	2

	Able to state one correct inference or two inferences at idea level. Sample answer for idea level: 1. ADH is secreted. 2. Salt reabsorbed. 3. Water reabsorbed.	1
	No response or inaccurate respons.	0

Summary of scoring for 1(b)(i) and 1(b)(ii) :

Score	Correct	Inaccurate	Idea	Wrong
3	2	-	-	-
2	1	1	-	-
	-	2	-	-
1	1	-	1	
	-	-	2	-
	1	-	-	1
	-	1	1	-
0	-	1	-	1
0	-	-	1	1

<table>
<tr>
<td>(c)</td>
<td>
Able to state all 3 variables and methods to handle each variable correctly.

<u>Sample answer</u>
<table>
<tr><th>Variable</th><th>Method to handle the variable</th></tr>
<tr><td><u>Manipulated variable</u>

Volume of water intake</td><td>(The students) drink different volume of (plain) water // Change the volume of water (from 100 ml to 200 ml, 300 ml and 400 ml).</td></tr>
<tr><td><u>Responding Variable</u>:

Average volume of urine produced (after one hour)</td><td>Measure and record the volume of urine produced by using a measuring cylinder. //
Calculate the (average) volume of urine produced by using formula :
Volume of urine produced by student 1 + student 2

2</td></tr>
<tr><td><u>Constant variable:</u>

Number of students in each group // Time taken to collect/measure/record the urine// type of water</td><td>Fix the number of student // Fix the time taken (to collect/measure/record the urine) at one hour/ use only plain water</td></tr>
</table>
</td>
<td>3</td>
</tr>
<tr><td></td><td>Able to state 4 – 5 ticks</td><td>2</td></tr>
<tr><td></td><td>Able to state 2 – 3 ticks</td><td>1</td></tr>
<tr><td></td><td>No response or incorrect respons or 1 tick only</td><td>0</td></tr>
</table>

(d)	Able to state the hypothesis relating the manipulated variable and the responding variable correctly based on three criteria: **P1** : manipulated variable (Volume of water intake) **P2** : responding variable (Volume of urine produced) **H** : relationship <u>Sample answer</u> P1 + P2 + H 1. As the volume of water intake increases, the volume of urine produced increase // vice versa.	3
	Able to state a hypothesis based on any two criteria. <u>Sample answer :</u> P1 + P2 // P1/P2 + H 1. The volume of urine produced depends on the volume of water intake. 2. Different group of students has different volume of urine produced.	2
	Able to state a hypothesis based on any one criterion or at idea level. <u>Sample answer</u> 1. Volume of urine produced is different.	1
	No response or incorrect respons	0
	Any two correct aspect	2
	Any one aspect correct	1
	No response or incorrect respons	0

<table>
<tr><td>(e) (i)</td><td>Able to construct a table correctly with the following aspects:
T : Titles with correct units - 1 mark
D : Data - 1 mark
C : Average volume of urine produced - 1 mark

<u>Sample answer :</u>
Title, T
<table><tr><th rowspan="2">Volume of water intake, ml</th><th colspan="2">Volume of urine produced,ml</th><th rowspan="2">Average volume of urine produced, ml</th></tr><tr><th>Student 1</th><th>Student 2</th></tr><tr><td>100</td><td>80</td><td>80</td><td>80</td></tr><tr><td>200</td><td>134</td><td>136</td><td>135</td></tr><tr><td>300</td><td>205</td><td>207</td><td>206</td></tr><tr><td>400</td><td>303</td><td>305</td><td>304</td></tr></table>C
Data, D
C – Calculation</td><td>3</td></tr>
<tr><td></td><td>Any two correct aspect</td><td>2</td></tr>
<tr><td></td><td>Any one aspect correct</td><td>1</td></tr>
<tr><td></td><td>No response or incorrect respons</td><td>0</td></tr>
<tr><td>(e) (ii)</td><td>Able to draw the graph of average volume of urine produced against volume of water intake based on the following aspects :

P(paksi) : title of x-axis and y-axis - 1 mark
T(Titik) : four points plotted correctly - 1 mark
B(bentuk) : all points connected smoothly - 1 mark

All three correct aspects</td><td>3</td></tr>
<tr><td></td><td>Any two correct aspects</td><td>2</td></tr>
<tr><td></td><td>Any one aspect correct</td><td>1</td></tr>
<tr><td></td><td>No response or incorrect response</td><td>0</td></tr>
</table>

(f)	Able to explain the relationship between the volume of water intake to the volume of urine produced based on the following criteria. R1 : Relationship – The higher the volume of water intake, the higher the (average) volume of urine produced R2 : Osmotic pressure decreases R3 : Less water reabsorbed (from the kidney) // less ADH is produced // Kidney tubules become less permeable to water <u>Sample answer :</u> The higher the volume of water intake, the higher the (average) volume of urine produced because the osmotic pressure decreases. Thus, less water reabsorbed from the kidney.	3
	Able to explain the relationship using any two aspects.	2
	Able to explain the relationship using one aspect only.	1
	No response or incorrect respons	0
(g)	Able to predict and explain the volume of urine produced based on the following criteria: P1 : Prediction – volume of urine less than 80 ml // any value less than 80 ml P2 : Explanation - Osmotic pressure of increases P3 : More water reabsorbed (from the kidney) <u>Sample answer</u> Volume of urine in less than 80 ml // 75 ml Because the osmotic pressure increases, so more water reabsorbed (from the kidney)	3
	Able to predict and explain the volume of urine produced based on any two criteria:	2
	Able to predict and explain the volume of urine produced based on any one criterion:	1
	No response or incorrect response	0

<table>
<tr><td>(h)</td><td>Able to define osmoregulation operationally based on the following criteria.
D1 : A <u>process</u> that causes
D2 : (Average) volume of urine produced by the students / group A,B,C and D after one hour
D3 : after taking different volume of water // depends on the volume of water intake // the higher the volume of water intake, the higher the volume of urine produced.

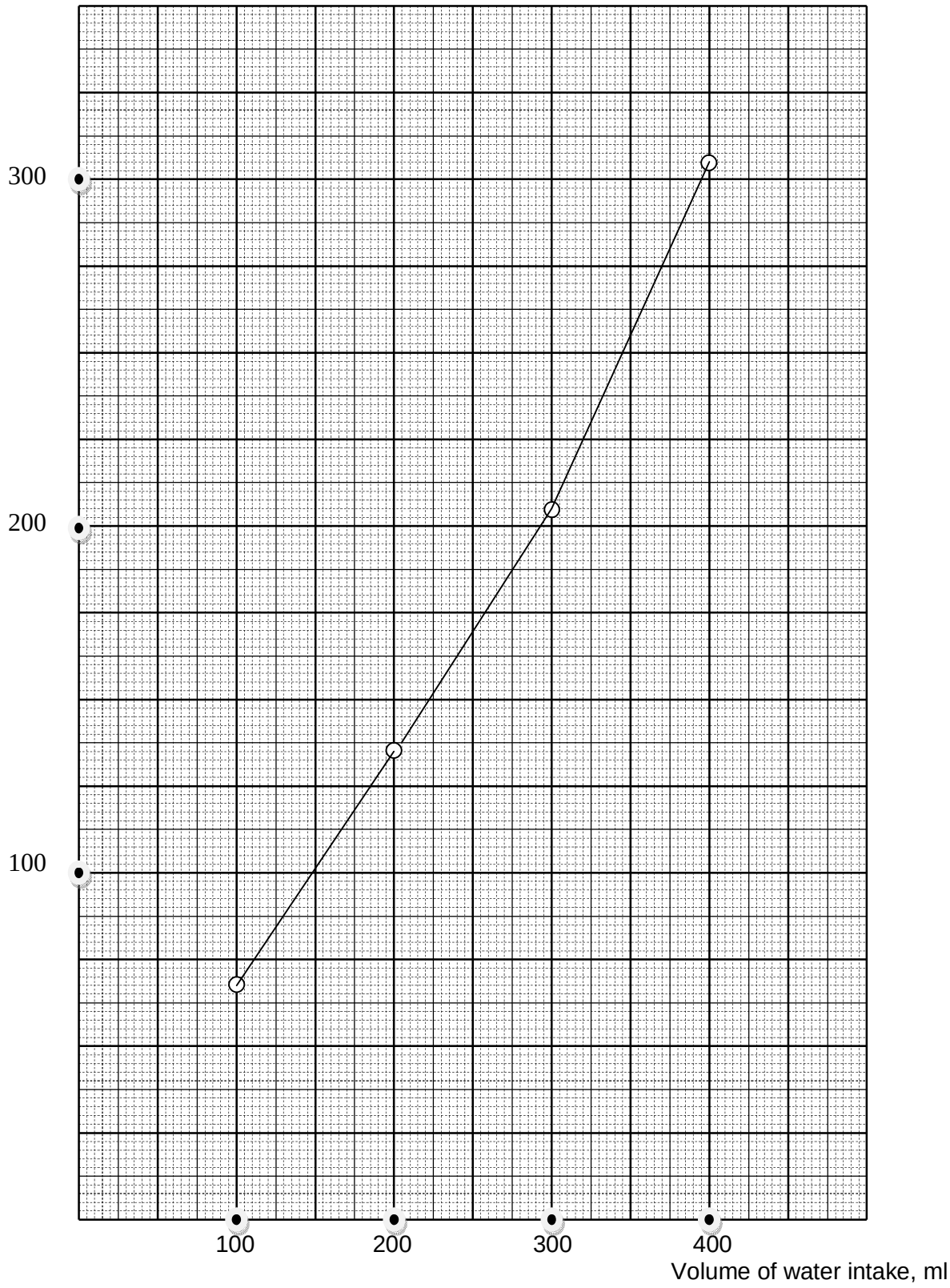
<u>Sample answer :</u>

Osmoregulation is the process that causes the (average) volume of urine produced by the students / group P,Q,R and S after one hour. The average volume of urine produced depends on the volume of water intake.</td><td>3</td></tr>
<tr><td></td><td>Any two criteria stated</td><td>2</td></tr>
<tr><td></td><td>Any one criteria stated</td><td>1</td></tr>
<tr><td></td><td>No response or incorrect response</td><td>0</td></tr>
<tr><td>(i)</td><td>Able to classify apparatus and materials into their respective variables.

<u>Sample answer :</u>

<table><tr><th></th><th>Manipulated Variable</th><th>Responding Variables</th><th>Fixed Variable</th></tr><tr><td>Apparatus / Materials</td><td>cup
Beaker //
Measuring cylinder</td><td>Measuring cylinder // beaker</td><td>stopwatch
students
mineral water</td></tr></table>
.
All 6 corrects</td><td>3</td></tr>
<tr><td></td><td>1 – 2 wrongs</td><td>2</td></tr>
<tr><td></td><td>3 – 4 wrongs</td><td>1</td></tr>
<tr><td></td><td>5 – 6 wrongs or no response</td><td>0</td></tr>
</table>

e(i) Sample answer



QUESTION 2

Aspect	Mark Scheme	Marks	Notes on scoring
Problem statement	Able to state a problem statement relating manipulated variable to the responding variable correctly based on criteria: **P1 : MV (**Carbon dioxide concentration) **P2 : RV** (The rate of photosynthesis) **R : Relationship in question form** (What is the effect of……..? // Does the…affect…?) Sample answers: 1. Does the percentage/concentration of carbon dioxide affect the rate of photosynthesis? 2. What is the effect of percentage of / concentration of carbon dioxide on the rate of photosynthesis?	**3**	**P1+P2+R**
	Able to state a problem statement inaccurately based on any two criteria: Sample answers: 1. What is the effect of different concentration of carbon dioxide on the rate of photosynthesis. (No R) 2. What can affect the rate of photosynthesis? (No P1) 3. What is the effect of different concentration of carbon dioxide on photosynthesis? (No P2) 4. Different concentration of carbon dioxide can affect the rate of photosynthesis. (No R) 5. Can carbon dioxide affect the rate of photosynthesis? (No P1)	**2**	**P1 and P2 only** **P1/P2 and R only**
	Able to state a problem statement based on any one criterion at idea level. 1. Does carbon dioxide affect photosynthesis? (No P1 and P2) 2. Does the rate of photosynthesis affected by carbon dioxide gas.(No P1 and R) 3. What is the factor that affect the rate of photosynthesis.(No P1and R) 4. Does percentage / concentration of carbon dioxide affect the photosynthesis. (No P2 and R)	**1**	

	No response/wrong response	**0 mark**	
Hypothesis	Able to state a hypothesis by relating the manipulated variable to the responding variable correctly based on criteria: **P1 : MV (**Carbon dioxide concentration / percentage) **P2 : RV** (The rate of photosynthesis) **R** : **Relationship** between P1 and P2. Sample answer: 1. As/When the percentage/concentration of carbon dioxide increases/decreases the rate of photosynthesis/number of bubble release increases/decreases.	**3 marks**	**P1+P2+R** **R:….increases/ decreases….. increases /decreases**
	Able to state a hypothesis inaccurately correctly based on any two criteria: 1. As/When the concentration of carbon dioxide increases the photosynthesis increases.(no P2) 2. As/When the carbon dioxide increases the rate photosynthesis increases.(no P1) 3. Carbon dioxide concentration influence/affect the rate of photosynthesis (no R)	**2**	**P1 + P2 only** **P1/P2 + R only**
	Able to state a hypothesis at idea level based on any one criterion: 1. Carbon dioxide influence/affect the rate of photosynthesis.(P2 only) 2. Carbon dioxide concentration influence/affect the photosynthesis.(P1 only) 3. Carbon dioxide influence/affect the photosynthesis. (idea)	**1**	
	No response/wrong response/R only.	**0 mark**	

Variables	Able to state all three variables correctly. Sample answers: Manipulated variable : Concentration / percentage of carbon dioxide Responding variable : The rate of photosynthesis// The number of bubbles released per minute Constant variable : Light intensity / temperature / type of plant / size of plant	**3**	
	Able to state any two variables correctly.	**2**	
	Able to state any one variable correctly.	**1**	
	No response / wrong response	**0**	
Apparatus and materials	Able to list all the apparatus and materials correctly. 4A + 3M Sample answers: Materials : ***Elodea/Hydrilla/aquatic plant** , different concentration of ***sodium bicarbonate**, distilled ***water** Apparatus : Beaker, boiling tube, clip, table ***lamp** *** - *compulsory***	**3**	
	3A + 3M including * - *compulsory materials and apparatus*	**2**	
	1-2 A + 1-2 M including aquatic plant and a **light source.**	**1**	
	No response / wrong response	**0**	

Procedure	Able to describe the steps of the experiment procedure or method correctly based on the following criteria: **K1** : How to set up the apparatus (at least 3 steps) **K2** : How to operate the the control variable (Any one) **K3** : How to operate the responding variable (Any one) **K4**: How to operate the manipulated variable (Any one) **K5** : Precaution // steps to increase accuracy (Any one) K1- How to set up the apparatus • Diagram of apparatus and material set up with 5 correct labels. • Choose / Cut 7 cm length of fresh *Elodea/Hydrilla* • Clip the tip with a paper clip • and put it in the boiling tube (with the clip down) K2- How to operate the constant variable • Pour 40 ml of 1% sodium bicarbonate solution into the boiling tube. • Place the apparatus at 20 cm(other suitable example) distant from a light source K3 – How to operate the responding variable • Count and record the number of bubbles released in 5 minutes by using stopwatch. • Calculate the rate of photosynthesis using formula : number of bubbles released / time K4 – How to operate the manipulated variable • Change the concentration of sodium bicarbonate solution to 2% sodium bicarbonate solution, 3% sodium bicarbonate solution, 4% sodium bicarbonate solution and 5% sodium bicarbonate solution. (at least 4 different concentration) K5 - Precaution • Place the boiling tube in a beaker of water /water bath at room temperature throughout the experiment • Give a time duration of five minutes for the plant to adjust to the new carbon dioxide concentration before taking the reading.	**3**	

<table>
<tr><td></td><td>All 5K</td><td></td><td></td></tr>
<tr><td rowspan="3"></td><td>3 - 4K</td><td>2</td><td></td></tr>
<tr><td>2 K</td><td>1</td><td></td></tr>
<tr><td>0 K or wrong response / no response</td><td>0</td><td></td></tr>
<tr><td>Presentation of data</td><td>Able to present all the data with the units correctly based on criteria:

Titles and units : 1m
• MV – Concentration of sodium bicarbonate solution (%)
• Operating RV - Number of bubbles released in 5 minutes
• RV - Rate of photosynthesis - number of bubbles/minute)
Data : 1m
• At least four different concentration of sodium bicarbonate

<u>Sample</u> :

<table>
<tr><th>Concentration of sodium bicarbonate solution / carbon dioxide (%)</th><th>Number of bubbles released in 5 minutes</th><th>Rate of photosynthesis (number of bubbles/minute)</th></tr>
<tr><td>1</td><td></td><td></td></tr>
<tr><td>2</td><td></td><td></td></tr>
<tr><td>3</td><td></td><td></td></tr>
<tr><td>4</td><td></td><td></td></tr>
</table>
</td><td>2</td><td></td></tr>
</table>

Sample answer for procedure:

No	Steps	**Criteria**
1.	Choose / Cut 7 cm length of fresh *Elodea/Hydrilla.*	**K1,K2**
2.	Clip the tip the plant with a paper clip.	**K1**
3.	Pour 40 ml of 1% sodium bicarbonate solution into the boiling tube.	**K1,K2**
4.	Put the plant into the boiling tube (with the clip down)	**K1,K2**
5.	Place the apparatus at 20 cm(other suitable example) distant from a light source.	**K1,K2**
6.	Count and record the number of bubbles released in 5 minutes by using stopwatch.	**K2,K3**
7.	Change the concentration of sodium bicarbonate solution to 2% sodium bicarbonate solution, 3% sodium bicarbonate solution, 4% sodium bicarbonate solution and 5% sodium bicarbonate solution. (at least 4 different concentration)	**K4**
8.	Calculate the rate of photosynthesis by using formula : number of bubbles released / time	**K3**
9.	Place the boiling tube in a beaker of water at room temperature throughout the experiment	**K5**
10	Give a time duration of five minutes for the plant to adjust to the new carbon dioxide concentration before taking the reading.	**K5**
11	Record the results in a table.	**K1**