

PAPER 1

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

PAPER 2**Question 1**

No	Criteria	Marks	
(a)	Able to name the molecule X and Y Answers: P1 X : Glucose P2 Y : Fructose (OR vice versa)	1 1	2
(b) (i)	Able to name process Q Answers: P1 Q:Hydrolysis P2 R : Condensation	1 1	2
(ii)	Able to explain process hydrolysis /Q Answers: P1 The breaking of sucrose molecule P2 by adding water P3 into glucose and fructose (Any 2)	1 1 1	2
(c)	Able to explain why the action of enzyme and substrate is specific Sample answers: P1 the active site of an enzyme P2 is compatible/fit/suitable P3 to (specific) substrate	1 1 1	3
(d) (i)	Able to suggest an enzyme that can be used to remove sucrose stain on cloth Sample answers: P1 - Sucrase	1	1
(ii)	Able to explain how to increase enzyme reaction. Sample Answer : P1 use warm water P2 optimum temperature for enzyme activity (to hydrolyse sucrose stain) P3 using suitable / optimum pH P4 Use large amount of enzyme/ sucrase (Any 2)	1 1 1 1	2
TOTAL			12

Question 2

No	Criteria	Marks	
2(a)	Able to state the type of skeleton of an earthworm. Answers: Hydrostatic (skeleton)	1	1
(b)	Able to explain how the earthworm moves forward. Answers: P1 When the circular muscles contract, the longitudinal muscles relax P2 the earthworm becomes thinner and longer P3 When the longitudinal muscles contract, the circular muscles relax P4- the earthworm becomes thicker and shorter P5 the circular and longitudinal muscles contract and relax//antagonistic pair of muscles//to produce peristaltic waves along the body (Any 2)	1 1 1 1 1	2
(c) (i)	Able to name tissue X Answer: Tendon	1	3
(ii)	Able to explain the function of X. Sample answers: P1 Tendons attached muscles to bones P2 the dense connective tissue which is tough/strong/inelastic P3 (skeletal) muscles produce movement by exerting the force to pull on the tendons (which are attached to the bones) (Any 2)	1 1 1	
(d) (i)	Able to name the organelle found in abundance in tissue Y Answer: Mitochondria	1	3
(ii)	Able to explain answer in (d)(i) Answers: P1 Tissue Y is a flight muscle cells P2 which needs high energy / ATP (produced in the mitochondria in the muscles) P3 for the <u>contraction of muscles</u> (for movement) (Any 2)	1 1 1	
(e)	Able to explain the effect to the movement if tissue Y is injured. Answers: P1 Y is pectoralis major muscles P2 Y cannot contract / less contraction P3 less force exerted on tendon/X P4 X cannot / less pull wing P5 The bird will not be able to move its wings / downstroke. (Any 3)	1 1 1 1 1	3
TOTAL			12

Question 3

No	Criteria	Marks	
(a)	Able to state the name of structure M and N Answers: Membrane Plasma membrane Fluid N Blood plasma	1 1	2
(b)	Able to explain why N is isotonic solution to red blood cells Answers: P1 the concentration of N is the same as the fluid in RBC P2 diffusion/movement of water in and out of cell are at equal rate // no net movement of water P3 by osmosis P4 no crenation or hemolysis// remains its normal shape/ unchange (Any 2)	1 1 1 1	2
(c)	Able to explain the difference between solution P and Q Sample answers: P1 Solution P is hypotonic to cell X, solution Q is hypertonic to cell Y P2 the concentration of solution P is lower than solution Q, the concentration of solution Q is higher than solution P	1 1	2
(d)(i)	Able to explain the meaning of high osmotic pressure Sample answers: P1 the concentration of water molecules is lower than inside of the cell P2 the concentration of solute is higher than inside the cell	1 1	2
(d)(ii)	Able to explain the function of ADH when the osmotic pressure increases Sample answers: P1 increase the permeability (of the wall of) distal convoluted tubule / collecting duct P2 to increase the reabsorption of water (into the blood)	1 1	2
(d)(iii)	Able to describe the condition of urine produced Sample answers: P1 small in volume/amount P2 more concentrated	1 1	2
TOTAL			12

Question 4

No	Criteria	Marks	
4(a)	Able to name phase X Answer: Interphase	1	1
(b)	Able to explain the process that occurs in subphase S. Answers: P1 S is synthesis phase P2 by using nucleic acid/ nucleotide P3 in DNA replication P4 DNA in the cell doubled. (Any 3)	1 1 1 1	3
(c)	Able to explain the effect to mitosis if phase X does not occur. Sample answers: P1 There will be no nutrients/no proteins P2 and no cytoplasmic organelles produced which are needed for mitosis P3 to prepare for cell division // cells growth //duplicating its DNA P4 as a result, mitosis cannot proceed/ occurs. (Any 3)	1 1 1 1	3
(d)	Able to explain the importance of phase M in producing new cells Answers: P1 Phase M/ Mitosis increases the number of cells (within organism) P2 (results in the) development of multicellular body (from a single cell// growth) P3 (New cells are formed by mitosis can) replace old /damaged cells P4 (because mitosis produce the) exact copies of the cells being replaced P5 (the production of new cells helps in the) regeneration of some body parts of organisms such as star fish. (Any 2)	1 1 1 1 1	2
(e) (i)	Able to name process Y Answer : Cytokinesis	1	3
(ii)	Able to explain why process Y in plant cell is different from that occurs in animal cell. Answers: P1 Plant cells have cell walls P2 cytokinesis cannot occurs with a cleavage furrow (like animal cells) P3 (Instead) during telophase, a <u>cell plate forms</u> across the cell (in the location of the old metaphase plate). (Any 2)	1 1 1	
TOTAL			12

Question 5

No	Criteria	Marks	
5(a)	<p>Able to explain the formation of cell P.</p> <p>Sample Answers:</p> <p>P1 Pollen mother cell (2n/diploid) undergoes meiosis</p> <p>P2 produces 4 haploid microspores (n)</p> <p>P3 The nucleus of each microspore divide by mitosis</p> <p>P4 to form a tube nucleus and a generative nucleus</p> <p>(Any 2)</p>	1 1 1 1	2
(b)	<p>Able to explain one difference between the number of nuclei in cell P and the nuclei in the embryo sac.</p> <p>Sample Answers:</p> <p>P1 Cell P contains 2 nuclei, but the embryo sac contains 8 nuclei.</p> <p>P2 The nucleus in each microspore divide by mitosis one time only, but the nucleus of megaspore/embryo sac divides (by mitosis) 3 times.</p>	1 1	2
(c)(i)	<p>Able to explain what happen to R and S if the pollen tube fails to develop?</p> <p>Sample answers:</p> <p>P1 the male gametes will not reach the ovary</p> <p>P2 will not penetrate the ovule through micropyle// not enter the embryo sac</p> <p>P3 one of the male gamete will not fertilise/fuse with the egg cell//no diploid zygote form</p> <p>P4 another male gamete will not fused with the two polar body//the triploid nucleus/endosperm will not form</p> <p>(Any 3)</p>	1 1 1 1	3
(c)(ii)	<p>Able to explain double fertilization in plants ensures the survival of plant species.</p> <p>Sample answers:</p> <p>P1 The formation of diploid zygote involves meiosis</p> <p>P2 This produces variation in plants</p> <p>P3 That increase the ability to survive // Avoid extinction</p> <p>P3 Triploid nucleus/endosperm tissues provide nutrients/nourishment to the developing zygote/embryo.</p> <p>(Any 2)</p>	1 1 1 1	2
(d)(i)	<p>Able to name the phenomenon in producing seedless fruits and give one example of hormone X.</p> <p>Answer:</p> <p>The phenomenon : Parthenocarpy</p> <p>Hormone X: Auxin</p>	1 1	2
(d)(ii)	<p>Able to suggest one benefit of producing seedless fruit.</p> <p>Sample answers:</p> <p>P1 useful when pollination is poor / for instance, during freezing temperatures// difficult for some flower to pollinate or fertilize</p> <p>P2 can increase the texture//shelf life of fruits//increase sugar content</p> <p>P3 seedless fruits are very desirable because of their convenience to eat without the hard testa.</p> <p>(Any 1)</p>	1 1 1	1
TOTAL			12

Question 6

No	Criteria	Marks																																										
6(a)	<p>Able to explain the mechanisms used by antibody to destroy antigens.</p> <p>Sample answers:</p> <p>P1 Agglutination</p> <p>P2 Antibody binds/join with the antigen</p> <p>P3 (Antibody causes) the pathogens to clump together</p> <p>P4 (the clumping) makes it easier for the pathogens to capture/destroy pathogens.</p> <p>P5 Neutralisation</p> <p>P6 antibody neutralizes the toxins produced by bacteria</p> <p>P7 by binding to a toxin molecules</p> <p>P8 this prevent toxin molecule from attaching to a cell/causes damage</p> <p>(Any 6)</p>	<p>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> <p>1</p>																																										
(b)	<p>Able to explain the differences between the immunity achieve in situation X and situation Y.</p> <p>Sample answers:</p> <table border="1"> <thead> <tr> <th></th><th>X</th><th>Y</th></tr> </thead> <tbody> <tr> <td>P1</td><td>(Artificial acquired) active immunity</td><td>(Artificial acquired) passive immunity</td></tr> <tr> <td>P2</td><td>Body produces own antibody</td><td>Body receive antibody from outside sources</td></tr> <tr> <td>P3</td><td>(Obtained through) an injection with a vaccine</td><td>(Obtained through) an injection with a serum</td></tr> <tr> <td>P4</td><td>Dead or weakened pathogen</td><td>Suspension of certain antibodies</td></tr> <tr> <td>P5</td><td>Does not result in immediate immunity against a disease</td><td>Result immediate immunity against a disease</td></tr> <tr> <td>P6</td><td>Antibodies need to be synthesized by the body</td><td>Antibodies do need to be synthesized by the body</td></tr> <tr> <td>P7</td><td>The induced immunity last longer//last long protection</td><td>The immunity lasts only for a short term//temporary protection</td></tr> <tr> <td>P8</td><td>The antibody is naturally produced by the body</td><td>The antibody is not produced by the body</td></tr> <tr> <td>P9</td><td>Vaccination is given before a person is infected with the disease</td><td>An injection of antiserum is given when a person is infected with the disease//has a high risk of getting the disease.</td></tr> <tr> <td>P10</td><td>Need time to synthesized antibody</td><td>Antibody is obtained directly from the source</td></tr> <tr> <td>P11</td><td>second injection (booster) is necessary to increase the antibody production (to a level that protects the person against the disease)</td><td>second injection is given when the person still infected (and his antibodies has dropped below immunity level)</td></tr> <tr> <td>P12</td><td>Memory cell present</td><td>No memory cells</td></tr> <tr> <td>P13</td><td>Protection from diseases like chicken pox/ measles/ rubella/ polio/ hepatitis B/ diphtheria/ tuberculosis.</td><td>Treatment of rabies/ botulism/ tetanus /snake bites.</td></tr> </tbody> </table> <p>(Any 8)</p>		X	Y	P1	(Artificial acquired) active immunity	(Artificial acquired) passive immunity	P2	Body produces own antibody	Body receive antibody from outside sources	P3	(Obtained through) an injection with a vaccine	(Obtained through) an injection with a serum	P4	Dead or weakened pathogen	Suspension of certain antibodies	P5	Does not result in immediate immunity against a disease	Result immediate immunity against a disease	P6	Antibodies need to be synthesized by the body	Antibodies do need to be synthesized by the body	P7	The induced immunity last longer//last long protection	The immunity lasts only for a short term//temporary protection	P8	The antibody is naturally produced by the body	The antibody is not produced by the body	P9	Vaccination is given before a person is infected with the disease	An injection of antiserum is given when a person is infected with the disease//has a high risk of getting the disease.	P10	Need time to synthesized antibody	Antibody is obtained directly from the source	P11	second injection (booster) is necessary to increase the antibody production (to a level that protects the person against the disease)	second injection is given when the person still infected (and his antibodies has dropped below immunity level)	P12	Memory cell present	No memory cells	P13	Protection from diseases like chicken pox/ measles/ rubella/ polio/ hepatitis B/ diphtheria/ tuberculosis.	Treatment of rabies/ botulism/ tetanus /snake bites.	<p>8</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>1</p> <p>1</p> <p>1</p> <p>1</p>
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(c)	<p>Able to explain why mothers are advised to feed their babies with mother's milk.</p> <p>Sample answers:</p> <p>P1 mother's milk contain colostrum</p> <p>P2 which contains (large number of) antibodies</p> <p>P3 which protect newborns against diseases</p> <p>P4 naturally acquired immunity</p> <p>P5 passive immunity</p> <p>P6 higher in protein (than ordinary milk) and</p> <p>P7 easy to digest</p> <p>P8 lower in lipid (which is hard to digest)</p> <p>P9 Colostrum contains high concentration of leucocytes</p> <p>P10 protect the body from bacteria/ pathogens.</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> <p>1</p>	6
TOTAL			20

Question 7

No	Criteria	Marks																								
(a)	<p>Able to explain the regulatory mechanism of glucose level in human blood.</p> <p>Sample answers:</p> <p>Organs : pancreas</p> <p>liver</p> <p><u>Blood glucose increase</u></p> <p>P1 (Beta cell of) pancreas secretes insulin</p> <p>P2 <u>Excess</u> glucose is converted into glycogen</p> <p>P3 Store in the liver</p> <p>P4 <u>More</u> glucose is oxidized / respired / burnt / used / converted into lipid</p> <p><u>Blood glucose decrease</u></p> <p>P5 (Alpha cell of) pancreas secretes glucagon</p> <p>P6 Glycogen in the liver</p> <p>P7 is converted into glucose</p> <p>P8 <u>Less</u> glucose is oxidized / respired / burnt / used / converted into lipid</p> <p>(Any 6)</p>	<p>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> <p>1</p>																								
(b)	<p>Able to explain the differences between the transmission of information throughout human body via the nervous system and the endocrine system.</p> <p>Sample answers:</p> <table border="1"> <thead> <tr> <th>Nervous system</th><th>Aspect</th><th>Endocrine system</th></tr> </thead> <tbody> <tr> <td>Neurons</td><td>P1 – Means</td><td>Hormones</td></tr> <tr> <td>Body cell</td><td>P2 – Explanation</td><td>Chemicals</td></tr> <tr> <td>Fast</td><td>P3 – Speed</td><td>Slow</td></tr> <tr> <td>Electrical signal</td><td>P4 – Explanation</td><td>Chemical signal</td></tr> <tr> <td>Shorter</td><td>P5 – Lasting</td><td>Longer</td></tr> <tr> <td>The effect is immediate</td><td>P6 – Explanation</td><td>The effect takes longer time</td></tr> <tr> <td>One way</td><td>P7 – Direction</td><td>Depends on target cells/organs</td></tr> </tbody> </table>	Nervous system	Aspect	Endocrine system	Neurons	P1 – Means	Hormones	Body cell	P2 – Explanation	Chemicals	Fast	P3 – Speed	Slow	Electrical signal	P4 – Explanation	Chemical signal	Shorter	P5 – Lasting	Longer	The effect is immediate	P6 – Explanation	The effect takes longer time	One way	P7 – Direction	Depends on target cells/organs	<p>8</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>
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	Involves synapse	P8 – Explanation	No junction	1	
	One	P9 – Target cell/organs	Can be more than one	1	
	Specific	P10 – Explanation	Send to many organs	1	
	Neurons	P11 – Via	Blood(stream/vessel)	1	
	Use neurons / Not involve duct	P12 – Explanation	No ducts	1	
	Example of expected answers: ▪ Nervous system function by the means of neurons while endocrine system by the means of hormones ▪ Neurons are body cells while hormones are chemicals (Any 8)				
(c)	Able to explain the transmission of nerve impulses across a synapse after a stimulant drug is injected into human body. Sample answers: P1 Synapse P2 (The transmission of nerve impulses) increase P3 <u>More</u> stimulation by neurotransmitter/any example P4 <u>More</u> impulses received by adjacent neurons P5 <u>More</u> impulses received by target cell / organs / effectors P6 Neurotransmitters do not disintegrate after stimulating the next neurons P7 More responses P8 Stimulates the body function/metabolism P9 Gives more energy / sense of energetics P10 Example of drugs: nicotine/caffeine/heroin (Any 6)			1 1 1 1 1 1 1 1 1 1	6
TOTAL					20

Question 8

No	Criteria	Marks
(a)	Able to explain how light intensity affects the production of crop yield the relationship between the rate of photosynthesis and the rate of respiration at points A, B, C and D to the growth of crop. Sample answer: <u>At A :</u> P1 In the dark / low light (intensity), only respiration occurs / large quantity of CO ₂ is produced/released P2 As light (intensity) increases the quantity of CO₂ produce decreases P3 Because part of CO ₂ produced during respiration is used for photosynthesis P4 Sugar is used in respiration more rapidly than it is produced in photosynthesis P5 No/less growth P6 No production of crop	10 1 1 1 1 1 1

	<p><u>At B:</u></p> <p>P7 (At this point of light intensity) all the CO₂ release from respiration is absorbed for photosynthesis // no net gain or loss in CO₂ 1</p> <p>P8 sugar produced</p> <p>P9 rate of photosynthesis is equal to the rate of respiration (this point is called compensation point) 1 1</p> <p>P10 No growth // no production of crop 1</p> <p><u>At C:</u></p> <p>P11 as light intensity increases, the rate of photosynthesis become faster than / exceed the rate of respiration 1</p> <p>P12 (at the same time) excess O₂ is released (into the atmosphere)</p> <p>P13 Growth occurs 1</p> <p>P14 Production of crop increases 1 1</p> <p><u>At D:</u></p> <p>P15 is the light saturation point</p> <p>P16 an increase in light intensity does not increase the rate of photosynthesis // maximum rate of photosynthesis 1 1</p> <p>P17 Growth rate is maximum</p> <p>P18 production of crop is maximum 1</p> <p style="text-align: right;">(Any 10) 1</p>	
(b)	<p>Able to state whether the menu provides a balanced diet for the pregnant woman or not and able to discuss.</p> <p>Sample answers:</p> <p>F No/ It is not suitable 1</p> <p><u>Reasons</u></p> <p>P1 Contains too much fat 1</p> <p>P2 In fried egg / chicken curry / butter 1</p> <p>P3 Increase cholesterol level 1</p> <p>P4 Cause excess body weight / hypertension / cardiovascular problems 1</p> <p>P5 Carbonated drink contains excess sugar 1</p> <p>P6 Cause diabetes 1</p> <p>P7 Contains coloring / preservatives / chemicals / acids 1</p> <p>P8 Cause cancer / gastritis/ allergy 1</p> <p>P9 Coffee contains caffeine / drugs / chemicals 1</p> <p>P10 Acting on the nerves 1</p> <p>P11 Less / no vegetables and fibre 1</p> <p>P12 Cause constipation 1</p> <p>P13 Less vitamin / minerals / iron // other examples 1</p> <p>P14 for good health / make blood // other examples 1</p> <p style="text-align: right;">(Any 10)</p> <p style="text-align: center;">OR</p> <p>F –Yes/ It is suitable 1</p> <p><u>Reasons :</u></p> <p>P1 Rice/potato chips contain carbohydrates 1</p>	10

P2 for energy	1	
P3 use for activities / body metabolism	1	
P4 chicken curry/fried egg contains protein	1	
P5 for building new cells/ growth/ replace old cells	1	
P6 butter contains lipid/fat	1	
P7 for formation of plasma membrane/ new cells	1	
P8 as a stored energy	1	
P9 for the production of (steroid) hormone/ testosterone/ progesterone/oestrogen	1	
P10 Milk contains calcium/ phosphorus	1	
P11 for the formation of teeth and bones of foetus	1	
P12 Egg (yolk) contains iron/ferum	1	
P13 for the formation of blood cells	1	
P14 to prevent anemia.	1	
(Any 10)		
TOTAL		20

Question 9

No	Criteria	Marks
(a)	<p>Able to explain how microorganisms play role in producing chemicals such as vaccine, antibiotics, antiserum and insulin.</p> <p>Sample answers:</p> <p><u>Vaccine</u></p> <p>P1 (prepared) from a weakened or dead/ killed form microorganisms/ pathogen 1</p> <p>P2 (contains an) agent that resembles a disease-causing microorganism. 1</p> <p>P3 it stimulates the body immune system 1</p> <p>P4 to recognize the agent as foreign / foreign proteins 1</p> <p>P5 and keep record/memory of it, so that the immune system can more easily recognize 1</p> <p>P6 and destroy these microorganisms 1</p> <p>P7 Improves immunity to a particular disease. 1</p> <p><u>Antibiotics</u></p> <p>P8 Chemicals produce by microorganisms/fungus/bacteria 1</p> <p>P9 can stop bacteria from reproducing 1</p> <p>P10 kill bacteria 1</p> <p>P11 Penicillin-related antibiotics are from fungus. 1</p> <p>P12 Streptomycin are from bacteria 1</p> <p><u>Antiserum</u></p> <p>P13 Prepared by injecting certain animal with (specific) pathogens/microorganisms 1</p> <p>P14 The animal responded and produce antibody 1</p> <p>P15 Blood serum containing antibody is extracted 1</p> <p>P16 The most common use in humans is antitoxin/antivenom</p> <p>P17 Antiserum is used to pass on passive immunity to many diseases.</p> <p><u>Insulin</u></p> <p>P13 technique use is DNA recombinant 1</p> <p>P14 Plasmid DNA of a bacterium is used / Escherichia coli is cut using 1</p>	10

	<p>restriction enzyme</p> <p>P15 Introduce/ insert recombinant DNA into a bacterium/ E.coli</p> <p>P16 (recombinant DNA) in bacterium multiply</p> <p>P17 – and produce human insulin</p> <p>(Any 10)</p>	<p>1</p> <p>1</p> <p>1</p>	
(b)	<p>Able to discuss the benefits of an eco-friendly vehicle.</p> <p><u>Sample answers</u></p> <p>P1 Less the bad impact on the environment.</p> <p>P2 Electric cars don't burn fossil fuels/ used less fossil fuels</p> <p>P3 don't emit CO2 into the atmosphere./</p> <p>P4 Less Greenhouse gas Emissions</p> <p>P5 reduce global warming</p> <p>P6 many plant and animal species could be saved from extinct</p> <p>P7 reduce other air/gas emissions from gas engines, such as:</p> <p>ground level ozone/particulate / NO2./SO2</p> <p>P8 reduce air pollution</p> <p>P9 avoid formation of smog/\</p> <p>P10 reduce acids rain</p> <p>P11 avoid respiratory problems.</p> <p>P12 Power Efficiency</p> <p>P13 Materials used in eco-friendly cars weigh less than traditional ones</p> <p>P14 Fuel Costs -decrease in fuel costs./save money</p> <p>(Any 10)</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>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	10
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PAPER 3

Question 1

1 (a) [KB0603 - Measuring Using Number]

Score	Criteria									
3	<p>Able to state all the number of round seeds, wrinkled seeds and the total number of seeds.</p> <p>Sample answers:</p> <table><tr><td>Type of seed</td><td>Round seed</td><td>Wrinkled seed</td></tr><tr><td>Number</td><td>68</td><td>23</td></tr><tr><td>Total Number</td><td colspan="2">91</td></tr></table>	Type of seed	Round seed	Wrinkled seed	Number	68	23	Total Number	91	
Type of seed	Round seed	Wrinkled seed								
Number	68	23								
Total Number	91									
2	Able to state any 2 the number of round seeds, wrinkled seeds and the total number of seeds.									
1	Able to state any 1 the number of round seeds, wrinkled seeds and the total number of seeds.									

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

Score	Criteria
3	<p>Able to state any two observations correctly according to the criteria: C1 Type of seed C2 Number of seeds</p> <p>Sample answers: <u>Horizontal</u> 1. The number of round seeds is 68. 2. The number of wrinkled seeds is 23. 3. The total number of seeds is 91. (No inference for this observation) <u>Vertical</u> 4. The number of round seeds is more than the (number of) wrinkled seeds.</p>
2	<p>Able to state any one observation correctly. <i>or</i> Able to state any two incomplete observations.</p> <p>Sample answers for incomplete observations: <u>Horizontal/Vertical</u> 1. The number of round seeds is more. 2. The number of wrinkled seeds is less.</p>
1	<p>Able to state any one idea of observation (Any 1 criterion) Sample answers: 1. Two types of seeds; round seed and wrinkled seed. 2. Character is the type of seed, while traits are round seed and wrinkled seed.</p>

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

Score	Criteria
3	<p>Able to make one logical inference for each observation based on the criteria: C1 Type of seed C2 Dominant trait // Controlled by dominant allele/gene</p> <p>Sample answers: <u>Horizontal/Vertical</u> 1. Round seed is the dominant trait. 2. Round seed is controlled by dominant allele/gene. 3. Wrinkled seed is the recessive trait. 4. Wrinkled seed is controlled by recessive allele/gene.</p>
2	<p>Able to make one logical inference for any one observation. <i>or</i> Able to make one logical and incomplete inference base on 2 criteria for each observation.</p> <p>Sample answers: 1. Round seed is the dominant. 2. Wrinkled seed is recessive.</p>
1	<p>Able to make an idea of inference with one criterion.</p> <p>Sample answers: 1. Round seed is more. 2. Wrinkled seed is less. [Reject: strong / weak]</p>

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

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

1 (c) [KB061001 - Controlling Variables]

Score	Criteria								
3	<p>Able to state all 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> Manipulated variable: Type of seed / Trait </td><td>Use / Observe round seeds and wrinkled seeds</td></tr> <tr> <td> Responding variable: The number of seeds // Probability / percentage of seed // The phenotypic ratio </td><td> (Count and) record the number of seeds // Calculate (the percentage of seed) using formula: $\frac{\text{Number of seed} \times 100\%}{\text{Total number of seed/91}}$ // Calculate (the ratio) using formula: $\frac{\text{No of round seed/68}}{91} : \frac{\text{No of wrinkled seed/23}}{91}$ (and change to round number) </td></tr> <tr> <td> Controlled variable: Type of plant // Number of fruits </td><td> Fix / use legume plant // Use 10 fruits. </td></tr> </tbody> </table>	Variables	Method to handle the variables	Manipulated variable: Type of seed / Trait	Use / Observe round seeds and wrinkled seeds	Responding variable: The number of seeds // Probability / percentage of seed // The phenotypic ratio	(Count and) record the number of seeds // Calculate (the percentage of seed) using formula: $\frac{\text{Number of seed} \times 100\%}{\text{Total number of seed/91}}$ // Calculate (the ratio) using formula: $\frac{\text{No of round seed/68}}{91} : \frac{\text{No of wrinkled seed/23}}{91}$ (and change to round number)	Controlled variable: Type of plant // Number of fruits	Fix / use legume plant // Use 10 fruits.
Variables	Method to handle the variables								
Manipulated variable: Type of seed / Trait	Use / Observe round seeds and wrinkled seeds								
Responding variable: The number of seeds // Probability / percentage of seed // The phenotypic ratio	(Count and) record the number of seeds // Calculate (the percentage of seed) using formula: $\frac{\text{Number of seed} \times 100\%}{\text{Total number of seed/91}}$ // Calculate (the ratio) using formula: $\frac{\text{No of round seed/68}}{91} : \frac{\text{No of wrinkled seed/23}}{91}$ (and change to round number)								
Controlled variable: Type of plant // Number of fruits	Fix / use legume plant // Use 10 fruits.								
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: C1 Manipulated variable C2 Responding variable C3 Relationship (more/less) (Accept if wrong theory/ratio/1:3/any ratio)</p> <p>Sample answers:</p> <ol style="list-style-type: none"> The number/amount/percentage (RV) of round seed (MV) is more (R) than wrinkled seed (MV). Round seed (MV) is more (RV+R) than wrinkled seed (MV). The ratio (RV) of round seeds (MV) and wrinkled seeds (MV) is 3:1 (RV+R).
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"> The number/amount/percentage (RV) of round seed is more (R). Round seed is more (RV+R). Round seeds (MV) and wrinkled seeds (MV) is 3:1 (R). The ratio (RV) of round seeds (MV) and wrinkled seeds (MV) is more.
1	Able to state idea of hypothesis to show a relationship between manipulated variable and responding variable base on 1 criterion.

	<p>Sample answers:</p> <ol style="list-style-type: none"> 1. Round seeds are 68. 2. Two type of seeds/trait. 3. The ratio/probability is 3:1
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1 (e) (i) [KB0606 - Communicating]

Score	Criteria								
3	<p>Able to tabulate a table and fill in data accurately base on three criteria: C1 Title: Type of seeds, Number of seeds, Ratio of seeds C2 Data: Round=68, Wrinkled=23 C3 Calculation: 3Round : 1wrinkled</p> <p>Sample answers:</p> <table><tr><td>Type of seed</td><td>Number of seeds</td><td>Ratio of seeds</td></tr><tr><td>Round (seed)</td><td>68</td><td rowspan="2">3Round : 1Wrinkled</td></tr><tr><td>Wrinkled (seed)</td><td>23</td></tr></table> <p>[Accept if the ratio is in a different table]</p>	Type of seed	Number of seeds	Ratio of seeds	Round (seed)	68	3Round : 1Wrinkled	Wrinkled (seed)	23
Type of seed	Number of seeds	Ratio of seeds							
Round (seed)	68	3Round : 1Wrinkled							
Wrinkled (seed)	23								
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 bar graph based on three criteria below:</p> <p>C1 Labels x-axis (Type of seed: Round and Wrinkled) and Constants scale on y-axis</p> <p>C2 All point transferred correctly</p> <p>C3 2 Bar (Similar width) [Accept 2 similar line] [Accept if touching]</p>
2	Any two criteria
1	Any one criterion

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

Score	Criteria																								
3	<p>Able to state the ratio of the two types of seeds and explain the answer, based on three criteria.</p> <p>C1 The ratio: 3Round : 1Wrinkled</p> <p>C2 Explanation 1: Round seeds is the dominant trait // Wrinkled seed is the recessive trait</p> <p>C3 Explanation 2: Round seed is determined by a dominant allele /gene // Wrinkled seed is determined by recessive alleles/genes</p> <p>*Score 3 if show in the form of a schematic genetic cross/inheritance.</p> <p>Sample answers:</p> <p>1. (The ratio is) 3Round : 1Wrinkled. Round seeds is the dominant trait which is determined by a dominant allele /gene</p> <p>2. Symbols: R-round seed (dominant allele), r-wrinkled seed (recessive allele) =1m</p> <table><tr><td>Trait:</td><td>Round seed</td><td></td><td>Round seed</td><td></td><td>= 1m</td></tr><tr><td>Parent:</td><td>Rr</td><td>x</td><td>Rr</td><td></td><td></td></tr><tr><td>Offspring:</td><td>RR</td><td>Rr</td><td>Rr</td><td>rr</td><td></td></tr><tr><td></td><td colspan="3">3 Round</td><td>: 1 Wrinkled</td><td>= 1m</td></tr></table>	Trait:	Round seed		Round seed		= 1m	Parent:	Rr	x	Rr			Offspring:	RR	Rr	Rr	rr			3 Round			: 1 Wrinkled	= 1m
Trait:	Round seed		Round seed		= 1m																				
Parent:	Rr	x	Rr																						
Offspring:	RR	Rr	Rr	rr																					
	3 Round			: 1 Wrinkled	= 1m																				

2	Able to state the ratio of the two types of seeds and explain the answer, based on two criteria.
1	Able to state the ratio of the two types of seeds and explain the answer, based on one criteria or idea level (inaccurate 2 criteria).

1 (f) [KB0609 - Define Operationally]

Score	Criteria
3	Able to state the meaning of discontinuous variation operationally, based on the experiment. Criteria: C1 The difference between type of seeds is clear / distinct / with no intermediate C2 Round seed and wrinkled seed C3 Determined by the number of seeds // Depends on the type of seeds / different traits Sample answer: 1. Discontinuous variation is the difference between the types of seeds is clear that are the round seed and the wrinkled seed. The variation is determined by the number of seeds.
2	Able to state any two criteria Sample answers: 1. Discontinuous variation is the difference between the types of seeds is clear that are the round seed and the wrinkled seed. 2. Discontinuous variation is the number of round seed and the wrinkled seed.
1	Able to state at idea level only. Sample answers: 1. Discontinuous variation is the difference between the types of seeds. 2. Discontinuous variation is the round seed and the wrinkled seed. 3. Discontinuous variation is the number of seed. 4. Discontinuous variation is the difference between individual of the same species is distinct / very clear / with no intermediate value // Theory

1 (g) [KB0605 - Predicting]

Score	Criteria
3	Able to predict the number of round seeds and wrinkled seeds when the experiment is repeated by using 100 legume fruits that contained 900 seeds, and explain the prediction based on three criteria. C1 Prediction: Round seed= 675 // 671-679, Wrinkled seed=225 // 221-229 C2 Explanation 1: The ratio of <u>round seed and wrinkled seed</u> is <u>3:1</u> // 3Round:1Wrinkled C3 Explanation 2: Round seeds is the dominant trait // Wrinkled seed is the recessive trait // Round seed is determined by a dominant allele /gene // Wrinkled seed is determined by recessive alleles/genes Sample answer: 1. Round seed is 675 and wrinkled seed is 225. The ratio of round seed and wrinkled seed is 3:1. This is because the round seed is the dominant trait.
2	Able to predict less accurately (Prediction+1explanation//Prediction (idea)+ 2 Explanations) Sample answer: 1. Round seed is more (idea). The ratio of round seed and wrinkled seed is 3:1. This is because the round seed is the dominant trait.

1	Able to give idea of prediction. (Prediction // Prediction (idea)+ 1 Explanation) Sample answer: 1. Round seed is more (idea). The ratio of round seed and wrinkled seed is 3:1.
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1 (h) [KB0602 - Classifying]

Score	Criteria								
3	Able to classify each character to the correct type of variation. Sample answer: <table border="1"> <tr> <td>Continuous Variation</td><td>Discontinuous Variation</td></tr> <tr> <td>Height</td><td>Ability to roll tongue</td></tr> <tr> <td>Intelligence</td><td>Blood group</td></tr> <tr> <td>Body weight</td><td>Attachment of earlobe</td></tr> </table>	Continuous Variation	Discontinuous Variation	Height	Ability to roll tongue	Intelligence	Blood group	Body weight	Attachment of earlobe
Continuous Variation	Discontinuous Variation								
Height	Ability to roll tongue								
Intelligence	Blood group								
Body weight	Attachment of earlobe								
2	Able to classify any 4 correctly.								
1	Able to classify any 2 correctly.								

Question 2**Problem Statement**

Score	Criteria
3	Able to state the problem statement of the experiment correctly that include criteria: C1 Manipulate variables : different/type of activity C2 Responding variables : content/amount/percentage of carbon dioxide in exhaled air C3 Relation in question form and question symbol [?] Sample answers: 1. What is the effect of different activity on the content of carbon dioxide in exhaled air? 2. Does type of activity affect the percentage of carbon dioxide in exhaled air? 3. How different activity affecting the amount of carbon dioxide in exhaled air?
2	Able to state the problem statement of the experiment with two criteria. Sample answers: 1. What is the effect of activity on the content of carbon dioxide in exhaled air? 2. Does type of activity affect the percentage of carbon dioxide? 3. How different activity affecting the amount of carbon dioxide in exhaled air.
1	Able to state the of problem statement with one criteria or at idea level. Sample answers: 1. What is the effect of activity on exhaled air? 2. Does activity affect the carbon dioxide?

Variables

Score	Criteria
3	Able to state the three variables correctly Sample answers: Manipulated variable: Different / Type of activity Responding variable: Percentage / concentration of carbon dioxide in exhaled air Controlled variable: (Type of) air (sample) // Exhaled air // Concentration of potassium hydroxide // J-tube // Duration (of activity) [Accept: Time]
2	Able to state any two variables correctly
1	Able to state any two variable correctly

Hypothesis

Score	Criteria
3	Able to state the hypothesis correctly according to the criteria. C1 Manipulate variables C2 Responding variables C3 Relationship of the variables Sample answers: 1. The more vigorous/active the activity, the higher the percentage of carbon dioxide in exhaled air. 2. Vigorous activity gives higher the percentage of carbon dioxide in exhaled air 3. Running on the spot gives highest concentration of carbon dioxide in exhaled air compared to pumping and sitting. [At least 3 activities]
2	Able to state the hypothesis with two criteria. Sample answers: 1. Different activities give different percentage of carbon dioxide in exhaled air. 2. Type of activity affects the percentage of carbon dioxide in exhaled air.
1	Able to state the hypothesis with one criterion. Sample answers: 1. Different activities affect the carbon dioxide in exhaled air. 2. Type of activity affects exhaled air. 3. Activities change the content of carbon dioxide in exhaled air.

Materials and Apparatus

Score	Criteria
3	Able to state all functional materials / 2*materials + 3*apparatus + 2 other apparatus for the experiment. Materials: *Potassium hydroxide (solution), and *water. Apparatus: *J-tube, *basin/trough, *test tube/boiling tube, beaker, delivery tube, and stopwatch. (Accept if not separately)(Reject if in wrong category)
2	Able to state all functional materials / 2*materials + 3*apparatus + 1 other apparatus for the experiment.
1	Able to state all functional materials / 2*materials + 3*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 (5P1) 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 basin with water.	P1
2. <u>Place</u> a J-tube in the water.	P1
3. Start the <u>stopwatch</u> .	P1
4. Run on the spot for <u>5 minutes</u> .	P2
5. <u>Immediately</u> , <u>collect</u> (sample of) exhaled air under water as shown in diagram. [Diagram with 5 functional labels]	P5 P1 P1
6. <u>Trap</u> about 5cm of exhaled air in (the arm of) the J-tube.	P1
7. <u>Place</u> a J-tube in the water for 5 minutes to get a <u>constant temperature</u> . P5 P2	P5 P2
8. <u>Measure under water</u> the (initial) length of the air column and <u>record</u> in a table. P1 P5 P1	2 P1 P5
9. <u>Screw out/Remove</u> the water from the J-tube until about 1cm from the trapped air.	P1
10. <u>Fill 3cm</u> of potassium hydroxide into the J-tube. P1 P2	P1 P2
11. <u>Screw/Move</u> the trapped air (forward and backward) to <u>mix</u> with potassium hydroxide.	P1
12. <u>Place</u> a J-tube in the water for 5 minutes to get a <u>constant temperature</u> . P5 P2	P5 P2
13. <u>Measure under water</u> the (final) length of the air column and <u>record</u> in a table. P4 P5 P4	2 P4 P5
14. Repeat the experiment / steps 1-14 to get <u>average</u> readings.	P5
15. <u>Tabulate</u> the data (in a table).	P4
16. Repeat the experiment / steps 1-14 for other activities; <u>pumping and sitting</u> .	P3

Data

Score	Criteria																														
2	<p>Able to construct a correct table for the data tabulation.</p> <p>C1 Titles with correct units (1 mark)</p> <p>C2 Manipulated variables (at least 3 activities) (1 mark)</p> <p>Sample answers:</p> <table><tr><th rowspan="2">(Type of) Activities</th><th colspan="2">Length of exhaled air (cm)</th><th rowspan="2">Percentage of carbon dioxide (%) (in exhaled air)</th></tr><tr><th>Initial</th><th>Final</th></tr><tr><td>Running on the spot</td><td></td><td></td><td></td></tr><tr><td>Pumping</td><td></td><td></td><td></td></tr><tr><td>Sitting</td><td></td><td></td><td></td></tr></table> <p>OR</p> <table><tr><th>(Type of) Activities</th><th>Change in length of exhaled air (cm)</th><th>Concentration of carbon dioxide (%) (in exhaled air)</th></tr><tr><td>Running on the spot</td><td></td><td></td></tr><tr><td>Pumping</td><td></td><td></td></tr><tr><td>Sitting</td><td></td><td></td></tr></table>	(Type of) Activities	Length of exhaled air (cm)		Percentage of carbon dioxide (%) (in exhaled air)	Initial	Final	Running on the spot				Pumping				Sitting				(Type of) Activities	Change in length of exhaled air (cm)	Concentration of carbon dioxide (%) (in exhaled air)	Running on the spot			Pumping			Sitting		
(Type of) Activities	Length of exhaled air (cm)		Percentage of carbon dioxide (%) (in exhaled air)																												
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END OF MARKING SCHEME