

**SULIT**  
4551/1  
Biologi  
Kertas 1  
September  
2015

4551/1



**MAKTAB RENDAH SAINS MARA**

**PEPERIKSAAN SIJIL PENDIDIKAN MRSM 2015**

**PERATURAN PEMARKAHAN**

**BIOLOGI**

**Kertas 1**

Satu jam lima belas minit

**UNTUK KEGUNAAN PEMERIKSA SAHAJA**

**AMARAN**

Peraturan pemarkahan ini SULIT dan Hak Cipta Bahagian Pendidikan Menengah MARA. Kegunaannya khusus untuk pemeriksa yang berkenaan sahaja. Sebarang maklumat dalam peraturan pemarkahan ini tidak boleh dimaklumkan kepada sesiapa.

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## 4551/1 PERCUBAAN SPM MARA 2014 (BIOLOGI)-KERTAS 1

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

**CONFIDENTIAL**

4551/2

4551/2

Biologi

Kertas 2

September

2015

2½ jam



**MAKTAB RENDAH SAINS MARA**

**PEPERIKSAAN SIJIL PENDIDIKAN MRSM 2015**

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**PERATURAN PEMARKAHAN**

**BIOLOGI**

**Kertas 2**

Dua jam tiga puluh minit

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**UNTUK KEGUNAAN PEMERIKSA SAHAJA**

**AMARAN**

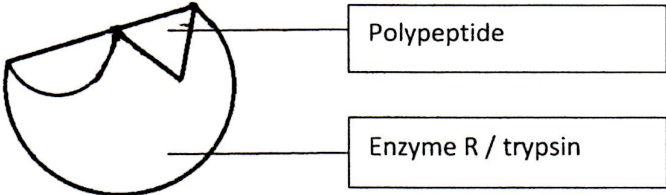
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**MARKING SCHEMES PAPER 2 (STRUCTURE) TRIAL SPM 2014 BIOLOGY**

<b>QUESTION 1</b>													
<b>ITEMS</b>	<b>MARKING CRITERIA</b>		<b>MARKS</b>										
(a)	R: Sperm (cell) S: Meristem (cell) P: Mitochondria		1 1 1	2									
(b)	F: Generate/produce energy E: For sperm to swim (towards ovum)		1 1	2									
(c)	F1: <b>more</b> energy release/produce/generate. E2: to form (more) spindle fiber/ replication of DNA/ movement of chromosome to opposite poles (any related proses in mitosis)		1 1	2									
(d)	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th align="center"><b>Cell R</b> <i>Sel R</i></th> <th align="center"><b>Cell S</b> <i>Sel S</i></th> </tr> </thead> <tbody> <tr> <td>Ploidy of chromosome</td> <td align="center">Haploid / n</td> <td align="center">Diploid / 2n</td> </tr> <tr> <td>Type of cell division</td> <td align="center">meiosis</td> <td align="center">mitosis</td> </tr> </tbody> </table>			<b>Cell R</b> <i>Sel R</i>	<b>Cell S</b> <i>Sel S</i>	Ploidy of chromosome	Haploid / n	Diploid / 2n	Type of cell division	meiosis	mitosis	1 1	2
	<b>Cell R</b> <i>Sel R</i>	<b>Cell S</b> <i>Sel S</i>											
Ploidy of chromosome	Haploid / n	Diploid / 2n											
Type of cell division	meiosis	mitosis											
(e)	E1: contain chemical substance E2: create unsuitable environment / condition for sperms E3: destroy (acrosome) membrane of sperm E4: to kill/immobile cell R/sperm E5: No fertilization occurs / No zygote form / no sperm reach to fallopian tube to fuse with ovum  Any 3		1 1 1 1 1	3									
			<b>TOTAL</b>	<b>12</b>									



QUESTION 2			
ITEM	MARKING CRITERIA		MARKS
(a)		Enzyme P	Enzyme Q
	Name	<i>Renin</i> Pepsin	Trypsin // <i>Lipase // Pancreatic amylase</i>
	Optimum pH	2.0	8.5
			<i>4 ✓</i> <i>2-3 ✓</i> 1+1 1+1 4
(b)	F: Increases enzyme concentration E1: More active site of enzyme P / more enzyme-substrate complex formed E2: More substrate X can be hydrolysed E3: More product produced F + Any E		1 1 1 1 2
(c)(i)	 <p>Correct drawing = 1m 2 Label = 1m</p>		1 1 2
(c)(ii)	Trypsin-polypeptide <b>complex</b> //Enzyme R polypeptide <b>complex</b> <b>Reject: enzyme substrate complex</b>		1 1
(d)	F1: Enzyme R has specific site / specific shape F2: Enzyme R has specific substrate / complimentary/compatible shape to substrate F3: Enzyme R is not destroyed / does not changed at the end of reaction <b>Reject:</b> Speed up the reaction//reversible//effected by temperature/pH. Any 2		1 1 1 2
(e)	Prediction: dress burnt/destroyed/holed/dull/damaged <b>Reject:</b> crumpled/shrink Explanation: E1: silk is made of protein E2: high temperature will damage/denature the silk/fibre/protein//change structure of protein <b>*Reject:</b> change structure of active site		1 1 1 3
<b>TOTAL</b>			<b>12</b>

QUESTIONS 3			
ITEM	MARKING CRITERIA	MARKS	
(a)	G: Pectoralis minor H: Pectoralis major	1 1	2
(b)	F: G and H/pectoralis major and pectoralis minor (are pair of muscle)(that works together) E: G contracts and H relaxes / vice versa // Works oppositely <b>*Reject:</b> works in different way/against each other	1 1	2
(c)	F1: Pectoralis major/G contracts while pectoralis minor/H relaxes E1: pulls the wings downwards // allow the wings move downwards  F2: pectoralis minor/G contract while pectoralis major/H relaxes E2: pulls the wings upwards // allow the wings move upwards  E3: produced uplift force for the birds to fly.  Any 3	1  1  1  1	3
(d)	Problem: F: Arm cannot be bent  Explanation: E1: pulling force (from contraction of muscle R) cannot be transmitted to bone P / radius E2: bone P/radius cannot be pulled upwards  F + Any 1E	1  1  1	2
(e)	F1: milk contain <b>more</b> calcium/intake of (high calcium) milk <b>regularly</b> E1: stimulate/produce more bone cell  or F2: exercise <b>regularly</b> E2: bone become stronger//increase bone mass  or F3: increase intake of vitamin D E3: increase absorption of calcium into the bone  or F4: calcium supplement E1: stimulate/produce more bone cell  Any 2	1 1  1 1  1 1  1 1	2 +1
<b>TOTAL</b>			<b>12</b>

QUESTION 4			
ITEM	MARKING CRITERIA	MARKS	
(a)	<p>                     The diagram illustrates a monohybrid cross. At the top, two pairs of homologous chromosomes are shown. The left pair consists of two large chromosomes, each with a black band and a checkmark, labeled 'R'. The right pair consists of two small chromosomes, each with a black band and labeled 'r'. Lines connect these to four circles representing gametes: two large chromosomes labeled 'R' and two small chromosomes labeled 'r'. Below the gametes, a circle shows the F2 generation with four possible genotypes: two large chromosomes labeled 'R' (RR), two large and one small chromosome labeled 'Rr', one large and two small chromosomes labeled 'Rr', and two small chromosomes labeled 'rr'.                 </p> <p>Remarks: Both must be same size</p> <p>Remarks: One big one small</p>	1	1
		1	3
(b)	<p>Parents: <math>\sqrt{Rr} \quad \times \quad \sqrt{Rr}</math></p> <p>(Meiosis)</p> <p>Gamete: <math>\sqrt{R} \quad \sqrt{r} \quad \sqrt{R} \quad \sqrt{r}</math></p> <p>(Fertilization)</p> <p>F2 generation: <math>\sqrt{RR} \quad \sqrt{Rr} \quad \sqrt{Rr} \quad \sqrt{rr}</math></p> <p>Genotype</p> <p>F2 generation: round seed      round seed      round seed      wrinkled seed</p> <p>Phenotype</p>	1	1
		1	1
		1	4

(c)	E1: Qualitative // seed shape cannot be measured E2: Differences in characters are distinctive E3: No intermediate character E4: Graf shows a discrete distribution E5: Genetic factor / not influenced by environmental factors E6: Control by a pair/ single of allele Any 1	1 1 1 1 1 1	1
(d)	F1: Crossing over E1: During prophase 1 E2: Exchange of gene/ dna segment between homologous chromosome/ non-sister chromatid E3: At chiasma E4: Produces new combination of gene Any 3	1 1 1 1 1	3
(e)	E1: Provide new genetic material E2: For survival ≠ more adapted environment E3: Prevent extinction Any 1	1 1 1	1
<b>TOTAL</b>			<b>12</b>



QUESTIONS 5									
ITEM	MARKING CRITERIA	MARKS							
(a)(i)	Light reaction is a process of photolysis of water molecule into hydrogen ion and <b>X ion</b> // Light reaction is a process of break down / split of water molecule into hydrogen ion and <b>X ion</b> by sunlight energy.	1	1						
(ii)	E1 : Reduction of CO <sub>2</sub> E2: Hydrogen atom ( From light reaction ) combine with / reduce carbon dioxide E3 : To form (CH <sub>2</sub> O) <sub>n</sub> / basic unit of carbohydrate E4 : To form water and glucose Any 2	1 1 1	2						
(b)	Similarity: Both produce water molecule  Difference: <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%; text-align: center;">Light reaction</td> <td style="width: 30%;"></td> <td style="width: 30%; text-align: center;">Dark reaction</td> </tr> <tr> <td style="text-align: center;">Oxygen</td> <td style="text-align: center;">Product of reaction</td> <td style="text-align: center;">Glucose</td> </tr> </table>	Light reaction		Dark reaction	Oxygen	Product of reaction	Glucose	1   1	2
Light reaction		Dark reaction							
Oxygen	Product of reaction	Glucose							
(c)	F1: leaves at branch A receive less sunlight/ Leaves at branch B receive more sunlight E1: The rate of photosynthesis increase/ higher/faster  F2: Concentration of carbon dioxide is lesser in gray plastic/branch A E2: Sodium hydroxide absorb carbon dioxide in gray plastic/branch B E3: The rate of photosynthesis lower  F3 : Phloem is absent at/removed from branch A E4 : No translocation/transport of sucrose/organic substances <b>Reject : glucose/starch/food</b> <i>product of photosynthesis</i> <i>storage in plant</i> 3 F + any correspond 1 E	1  1  1 1  1 1	4						
(d)	E1: Green house is designed to trap solar energy / heat / infrared E2 :Maintain the optimum temperature / at the range of 25°C - 30°C E3: Increases the enzymatic activity E4: Increase rate of photosynthesis E5: Increase productivity of lime fruit Any 3	1 1  1 1 1	3						
<b>TOTAL</b>			<b>12</b>						

MARKING SCHEMES PAPER 2 (ESSAY) TRIAL SPM 2015 BIOLOGY

QUESTION 6			
ITEMS	MARKING CRITERIA	MARKS	
(a)(i)	<p><i>Able to explain the cellular respiration process that occur in hind leg muscles cells of individual P and Q correctly</i></p> <p><b>Answer:</b>            Process in hind leg muscles cells individual P            F1 : Aerobic respiration            E1: The glucose is <b>completely oxidized/ broken down</b>            E2: Release much energy/ 2898 kJ of energy (per mole of glucose) // 38 ATP            E3: Produce carbon dioxide and water            *Remarks: If word equation/chemical equation → only accept E2 &amp; E3 (max 2m)</p> <p style="text-align: right;">Any 3</p> <p>Process in hind leg muscles cells individual Q            F1: Anaerobic respiration            E1: The glucose is <b>not completely oxidized/ broken down</b>            E2: Release less energy/ 150 kJ of energy (per mole of glucose) // 2 ATP            E3: produce lactic acid            *Remarks: If word equation/chemical equation → only accept E2 &amp; E3 (max 2m)</p> <p style="text-align: right;">Any 3</p>	<p style="text-align: center;">1</p> <p style="text-align: center;">1</p> <p style="text-align: center;">1</p> <p style="text-align: center;">1</p> <p style="text-align: center;">1</p> <p style="text-align: center;">1</p> <p style="text-align: center;">1</p> <p style="text-align: center;">1</p> <p style="text-align: center;">1</p> <p style="text-align: center;">1</p> <p style="text-align: center;">1</p>	3
a(ii)	<p><i>Able to explain the reason of gasping</i></p> <p><b>Answer:</b>            E1: Breathing rate increase            E2: To obtain <b>more</b> oxygen            E3: Sent to the muscle cells            E4: To oxidize lactic acid into <b>carbon dioxide and water</b>            E5: This process is called <b>paying / caused by / pay off oxygen debt</b></p> <p style="text-align: right;">Any 4E</p>	<p style="text-align: center;">1</p> <p style="text-align: center;">1</p> <p style="text-align: center;">1</p> <p style="text-align: center;">1</p> <p style="text-align: center;">1</p>	4



(b)	<p><i>Able to explain the exhalation process if the operculum of the fish is torn</i></p> <p><b>Answer:</b></p> <p>E1: When the mouth open</p> <p>E2: The floor of the buccal cavity is lowered</p> <p>E3: The volume of buccal cavity will increase</p> <p>E4: Water (from surrounding) will flow into buccal cavity through the mouth</p> <p>E5: The opened part (created by torn operculum) also provide a pathway for water to flow into buccal cavity (from surrounding)</p> <p>E6: Pressure in the buccal cavity and the surrounding is equal</p> <p>E7: Gaseous exchange less efficient</p> <p style="text-align: right;">Any 5E</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>5</p>
(c)	<p><i>Able to explain how the regulatory mechanism of carbon dioxide occur in an individual during vigorous activity</i></p> <p><b>Sample answers:</b></p> <p>F1: (Rate of cellular) respiration increase</p> <p>E1: CO<sub>2</sub> produced reacts with water to forms <b>carbonic acid</b></p> <p>E2: (As a result) blood pH value <b>drop</b> / decreased // blood become <b>acidic</b></p> <p>E3: Is detected by <b>central chemoreceptor</b> (in medulla oblongata)</p> <p>E4: And peripheral chemoreceptors / aortic bodies / carotid bodies</p> <p>E5: Send impulse to control center / respiratory centre / medulla oblongata</p> <p>E6: Then send impulse to effectors / diaphragm / intercostals muscle to contract (and relax) at a <b>faster</b> / higher rate</p> <p>E7: Cause breathing rate / ventilation rate <b>increase</b></p> <p>E8: Excess carbon dioxide is eliminated from the body (during exhalation)</p> <p>E9: Carbon dioxide concentration (decreased) back to normal // pH value of blood return / back to normal level</p> <p style="text-align: right;">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>5</p>
		<b>TOTAL</b>	<b>20</b>

QUESTION 7		
ITEM	MARKING CRITERIA	MARKS
(a)(i)	<p><i>Able to state differences between the immunity obtained by each individual.</i></p> <p><b>Answer:</b></p> <p>E1: Type of immunity for individual M is active immunity <b>while</b> individual N is passive immunity</p> <p>E2: Individual M is injected with vaccine / weakened / dead pathogen <b>while</b> individual N is injected with antiserum/serum</p> <p>E3: In individual M antibody is produced in the body (by lymphocytes) <b>while</b> in individual N antibody is received from outside sources</p> <p>E4: (after injection) level of antibody in individual M increase gradually <b>while</b> in individual N the level of antibody increase rapidly / immediately</p> <p>E5: Immunity in individual M is long lasting / last longer <b>while</b> in individual N is temporary / short term</p> <p>E6: Immunity in individual M is for prevention from disease <b>while</b> immunity in individual N is for (immediate) treatment.</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>6</p>
(a)(ii)	<p><i>Able to explain why both individual required second injection</i></p> <p><b>Answers:</b></p> <p><b>Individual M</b></p> <p>F1: To stimulate lymphocyte / body / leucocyte to produce <b>more</b> antibody</p> <p>E1: Concentration of antibody increased beyond / exceed / over level of immunity</p> <p>E2: Concentration of antibody is still below immunity level after 1<sup>st</sup> injection // Body takes time to recognize the pathogen / produce antibody</p> <p style="text-align: right;">Any 2</p> <p><b>Individual N</b></p> <p>F2: To increase the concentration of antibody beyond the level of immunity</p> <p>E1: Concentration of antibody decrease below immunity level (a few days after 1<sup>st</sup> injection) // The individual still infected</p> <p>E2: The antibody will be used to kill the all/ remaining pathogen</p> <p style="text-align: right;">Any 2</p>	<p>1</p> <p>1</p> <p>1</p> <p>2</p> <p>1</p> <p>1</p> <p>1</p> <p>2</p> <p>4</p>

(b)(i)	<p><i>Able to explain the effects of the HIV on the body defence mechanism.</i></p> <p><b><u>Answer:</u></b>  F: The immune system gradually / slowly / become weakened / defenceless against disease  E1: T cell cannot recognize / detect antigen / pathogen / microbes / bacteria / virus  E2: Lymphocytes cannot produce (specific) antibodies  E3: The person is prone to infection / easily infected</p> <p style="text-align: right;">Any 3</p>	<p style="text-align: center;">1 1 1 1</p>	<b>3</b>
(b)(ii)	<p><i>Able to explain how the transmission of HIV occur from one person to another</i></p> <p><b><u>Answer:</u></b>  E1: The blood of the individual A contain HIV  E2: The needle has been used by individual A // contaminated when the individual A use it to inject drugs  E3: HIV will be transmitted to individual B when the same / contaminated needle is used by individual B</p>	<p style="text-align: center;">1 1 1</p>	<b>3</b>
(c)	<p><i>Able to explain the defence mechanism shown by human skin</i></p> <p><b><u>Answer:</u></b>  <b>Structure X / epidermis layer</b>  F1: Contain Keratinized layer  E1: That is impermeable / tough to bacteria  F2: Contain dead cells  E2: Which continuously shed / bacteria cannot grow</p> <p style="text-align: right;">Any compatible F + E</p> <p><b>Structure Y / Sebaceous gland</b>  F1: Secretes sebum  E1: Which is acidic (medium) / has pH 5.5  E2: Which is not suitable for the growth of bacteria</p> <p style="text-align: right;">Any 2</p>	<p style="text-align: center;">1 1 1 1</p>	<p style="text-align: center;">2</p> <hr style="width: 10%; margin: 0 auto;"/> <p style="text-align: center;"><b>4</b></p>
<b>TOTAL</b>			<b>20</b>



QUESTION 8		
ITEM	MARKING CRITERIA	MARKS
(a) i	<p><i>Able to state the problems faced by the mangrove plant and explain the adaptive characteristics to overcome the problems</i></p> <p><b>Answer:</b>            F1: Soft muddy soil            E1: Highly branched underground cable roots / prop roots            F2: Waterlogged condition and lack of oxygen            E2: Have breathing root/ pneumatophores root with pores / lenticels on the bark of the tree            F3: Seeds cannot germinate in water logged / soft muddy soil // seed washed away by water            E3: Viviparous seedlings that are able to germinate while still attached to the mother plant</p> <p>(Accept)            F4: Direct sunlight / rate of transpiration high / increase            E4: Leaves covered with thick layer of cuticle / sunken stomata            F5: High salinity of sea water // seawater is hypertonic            E5: <b>Cell sap</b> of root cell has higher osmotic pressure than sea water // excess salt excreted through hydathodes / salt gland</p> <p><b>*Remark: F (✓) + E (✓) = 2m</b>  <b>F (✓) + E (x) = 1m</b>  <b>F (x) + E (✓) = 0m</b></p> <p style="text-align: right;">Max 3F</p>	<p>1 1 1 1 1 1 1 1 1 1</p> <p style="text-align: right;"><b>6</b></p>
(a)ii	<p><i>Able to state why mangrove ecosystem need to be preserved</i></p> <p><b>Answer:</b>            E1: Act as a wave breaker to prevent coastal erosion // As natural barrier against tsunami / storm            E2: Act as breeding ground for fishes / shrimps / crustaceans / mollusc            E3: As a natural habitat for specific flora and fauna            E4: Maintain the food chain / web            E5: Sources for timber product / charcoal            E6: Has a potential for ecotourism</p> <p style="text-align: right;">Any 4</p>	<p>1 1 1 1 1 1</p> <p style="text-align: right;"><b>4</b></p>

(b)	<p><i>Able to discuss the effect of the activity to the ecosystem</i></p> <p><b>Answer:</b>  F1: Cause the imbalance in biodiversity  E1: Food webs in an ecosystem will be disrupted/ in disorder  E2: Less / no interaction of animals and plants with one another to form various types of ecosystem</p> <p>F2: Extinction of many species of organisms/ flora and fauna  E3: Loss of varieties of medicinal plants / herbs / and animals which can be used to treat diseases  E4: less/ loss of insects and birds as agents of pollination</p> <p>F3: Cause soil erosion // land slide  E5: Caused flash flood / reduced clarity of river / river become Shallow  E6: Reduce fertility of soil</p> <p>F4: Less/loss of sites for recreational activities / ecotourism  E7: Less source of inspiration for songwriters, poets and the film industry  E8: Less diversity of flora and fauna to fulfil the inner human needs to seek spiritual experience and rest in tranquillity// loss of aesthetic and spiritual needs</p> <p>F5: Increase the concentration of atmospheric CO<sub>2</sub> gases  E9: Caused greenhouse effect // climate change // increase surrounding temperature // global warming // rate of photosynthesis decrease</p> <p>F6: Less/ loss natural water catchment area  E10: Disruptions/ disturbance of natural water cycles // Caused flash flood at lowerland</p> <p><b>*Remark: F (✓) + E (✓) = 2m</b>  <b>F (✓) + E (x) = 1m</b>  <b>F (x) + E (✓) = 0m</b></p> <p style="text-align: right;">Max 5F</p>		<b>10</b>
<b>TOTAL</b>			<b>20</b>





9 (c)	<p><i>Able to explain the growth response of root and shoot at concentration of auxin between <math>10^{-4}</math> to <math>10^{-1}</math> mg/l.</i></p> <p><b><u>Sample answer:</u></b></p> <p><b>Root</b>  F1: At concentration (<math>10^{-4}</math> to <math>10^{-1}</math> mg/l), the growth response decrease  E1: Because high concentration of auxins will inhibit cell elongation  E2: Decrease root growth  (<b>reject</b> cell division//cell growth)</p> <p><b>Shoot</b>  F2: At concentration (<math>10^{-4}</math> to <math>10^{-1}</math> mg/l), the growth response increase  E2: Because high concentration of auxins will stimulate cell elongation  // shoot growth  (<b>reject</b> cell division//cell growth)  E3: Cause the primary growth</p> <p style="text-align: right;">Any 5</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>5</p>
	<b>TOTAL</b>		<b>20</b>

**CONFIDENTIAL**

4551/3

Biologi

Kertas 3

September

2015

1½ jam



4551/3

**MAKTAB RENDAH SAINS MARA**

**PEPERIKSAAN SIJIL PENDIDIKAN MRSM 2015**

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**PERATURAN PEMARKAHAN**

**BIOLOGI**

Kertas 3

Satu jam tiga puluh minit

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**UNTUK KEGUNAAN PEMERIKSA SAHAJA**

**AMARAN**

Peraturan pemarkahan ini **SULIT** dan Hak Cipta Bahagian Pendidikan Menengah MARA. Kegunaannya khusus untuk pemeriksa yang berkenaan sahaja. Sebarang maklumat dalam peraturan pemarkahan ini tidak boleh dimaklumkan kepada sesiapa.

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[Lihat sebelah  
**SULIT**]

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ANSWER SCHEME PAPER 3  
TRIAL BIOLOGY 2015

No.	Mark Scheme	Score										
1(a)	<b>Able to record all the 4 reading accurately</b> <u>Sample answer</u>											
	<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th style="text-align: center;">Number of burning cigarettes</th> <th style="text-align: center;">Final temperature (°C)</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">1</td> <td style="text-align: center;">30</td> </tr> <tr> <td style="text-align: center;">3</td> <td style="text-align: center;">32</td> </tr> <tr> <td style="text-align: center;">5</td> <td style="text-align: center;">36</td> </tr> <tr> <td style="text-align: center;">7</td> <td style="text-align: center;">41</td> </tr> </tbody> </table>	Number of burning cigarettes	Final temperature (°C)	1	30	3	32	5	36	7	41	
	Number of burning cigarettes	Final temperature (°C)										
	1	30										
	3	32										
5	36											
7	41											
	3											
	<b>Able to record any 3 readings correctly</b>	2										
	<b>Able to record any 2 readings correctly</b>	1										
	<b>Able to record any 1 or no response or incorrect response</b>	0										
1(b)(i)	<b>Able to state 2 different observations correctly following these criteria:</b>  MV – Number of burning cigarettes RV – final temperature/increase in temperature/percentage increase in temperature inside the U-tube with unit.  <u>Sample answer</u>  1. When 1 cigarette was burned, the final temperature inside the U-tube is 30°C.  2. When 7 cigarettes were burned, the final temperature inside the U-tube is 41 °C	3										
	<b>Able to state one observation correctly and one - two inaccurate observations</b> <u>Sample answer</u>  1. When 1 cigarette was burned, the final temperature is the lowest.  2. When 7 cigarettes were burned, the final temperature is the highest.  3. When 1 cigarette was burned, the final temperature is 30 (without unit)	2										
	<b>Able to state the observation at idea level</b> <u>Sample answer</u>  1. The final temperature of U-tube is 30 °C / 32 °C / 36 °C/ 41 °C.	1										
	<b>No response or incorrect response</b>	0										

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1(b)(ii)	<p><b>Able to state two inferences correctly based on the following aspects:</b></p> <p><u>Note</u> : inferences must match to the observation</p> <p><b>CRV</b> : Final temperature  <b>ARV / Compare</b> : Increase in temperature/percentage increase in temperature of U-tube</p> <p><b>Reason 1</b> : Less/more heat was released  <b>Reason 2</b> : Temperture in the lung/alveolus increase least/most</p> <p><u>Sample answer</u></p> <p>1. (When 1 cigarette was burned,) the final temperature/increase in temperature/percentage increase in temperature is the lowest because less heat was released (from the burning cigarettes), therefore lung temperature increase least.</p> <p>2. (When 7 cigarettes were burned,) the final temperature/increase in temperature/percentage increase in temperature is the highest because more heat was released (from the burning cigarettes), therefore lung temperature increase most.</p>	3
	<p><b>Able to make one correct inference and one inaccurate inference or two inaccurate inferences.</b></p> <p><u>Sample answer</u></p> <p>1. (When 1 cigarette was burned,) the final temperature/increase in temperature/percentage increase in temperature is the lowest because less heat was released (from the burning cigarettes)</p> <p>2. (When 7 cigarettes were burned,) the final temperature/increase in temperature/percentage increase in temperature is the highest because more heat was released (from the burning cigarettes).</p>	2
	<p><b>Able to state the inference at idea level</b></p> <p><u>Sample answers</u></p> <p>1. Burning cigarettes release heat.</p> <p>2. Burning cigarettes causes increase in temperature.</p>	1
	<p><b>No response or incorrect response</b></p>	0



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No.	Mark Scheme	Score								
1(c)	<p><b>Able to state all 3 variables and the 3 methods to handle the variable</b></p> <p><u>Sample answers</u></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Variable</th> <th style="text-align: center;">Method to handle the variable</th> </tr> </thead> <tbody> <tr> <td> <u>Manipulated variable</u>            Number of burning cigarettes         </td> <td>Use <b>different</b> Number of cigarettes which are 1,3,5 and 7</td> </tr> <tr> <td> <u>Responding variable</u>             Final temperature inside the U-tube   <b>OR</b>             Increase/different in temperature   <b>OR</b>             Percentage increase/different in temperature         </td> <td> <b>Measure and <u>record</u></b> the final temperature of U-tube by using a <b>thermometer</b>   <b>Calculate and <u>record</u></b> the increase/different in temperature by using formula:            Increase/different in temperature =  <b>Final temperature-initial temperature</b>   <b>Calculate and <u>record</u></b> the percentage increase/different in temperature by using formula:   <math display="block">\frac{\text{Final temperature} - \text{initial temperature}}{\text{Initial temperature}} \times 100\%</math> </td> </tr> <tr> <td> <u>Constant Variable</u>             Type of cigarettes             Initial temperature         </td> <td> <b>Fix/use the same</b> type of the cigarettes   <b>Use the same</b> initial temperature at <b>27°C</b> </td> </tr> </tbody> </table>	Variable	Method to handle the variable	<u>Manipulated variable</u> Number of burning cigarettes	Use <b>different</b> Number of cigarettes which are 1,3,5 and 7	<u>Responding variable</u>  Final temperature inside the U-tube  <b>OR</b>  Increase/different in temperature  <b>OR</b>  Percentage increase/different in temperature	<b>Measure and <u>record</u></b> the final temperature of U-tube by using a <b>thermometer</b>  <b>Calculate and <u>record</u></b> the increase/different in temperature by using formula: Increase/different in temperature = <b>Final temperature-initial temperature</b>  <b>Calculate and <u>record</u></b> the percentage increase/different in temperature by using formula:  $\frac{\text{Final temperature} - \text{initial temperature}}{\text{Initial temperature}} \times 100\%$	<u>Constant Variable</u>  Type of cigarettes  Initial temperature	<b>Fix/use the same</b> type of the cigarettes  <b>Use the same</b> initial temperature at <b>27°C</b>	3
Variable	Method to handle the variable									
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<u>Constant Variable</u>  Type of cigarettes  Initial temperature	<b>Fix/use the same</b> type of the cigarettes  <b>Use the same</b> initial temperature at <b>27°C</b>									
	All corrects									
	<b>Able to state any 4-5 correctly</b>	2								
	<b>Able to state 2-3 correctly</b>	1								
	<b>No response or incorrect response</b>	0								

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No.	Mark Scheme	Score
1(d)	<p><b>Able to make a hypothesis based on the following aspects :</b></p> <p>MV : <i>Manipulated variable</i> <b>Number of burning cigarettes</b></p> <p>RV : <i>Responding variable</i> <b>Final temperature/increase in temperature/percentage increase in temperature inside the U-tube</b></p> <p>R : Relationship between variables</p> <p><u>Sample answer :</u></p> <ol style="list-style-type: none"> <li>As the number of burning cigarettes increases, the final temperature / increase in temperature/ percentage increase in temperature inside the U-tube increases.</li> <li>The higher the number of burning cigarettes, the higher the final temperature inside the U-tube.</li> </ol> <p style="text-align: right;"><i>*must contains all listed MV</i></p>	3
	<p><b>Able to make a hypothesis relating the manipulated variable and the responding variable inaccurately</b></p> <p><u>Sample answer :</u></p> <ol style="list-style-type: none"> <li>Different number of burning cigarettes shows different in final temperature/increase in temperature/percentage increase in temperature inside the U-tube</li> <li>Final temperature/increase in temperature/percentage increase in temperature inside the U-tube is affected by number of burning cigarettes</li> </ol>	2
	<p><b>Able to make a hypothesis at idea level</b></p> <p><u>Sample answer :</u></p> <ol style="list-style-type: none"> <li>The final temperature / increase in temperature / percentage increase in temperature inside the U-tube increases.</li> <li>The burning cigarettes release heat.</li> </ol>	1
	<p><b>No response or incorrect response</b></p>	0



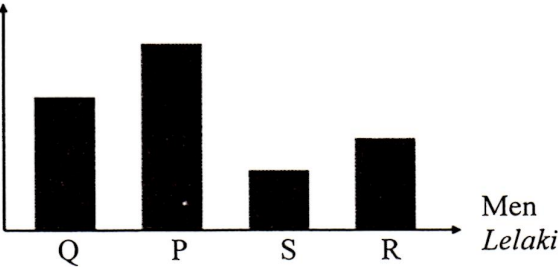
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No.	Mark Scheme	Score																												
1(e)(i)	<p><b>Able to construct a table which contain the following aspects :</b></p> <p><b>T : Title and unit</b>  <b>D : Data recorded correctly</b>  <b>C : Calculate the percentage increase in temperature correctly.</b></p> <p><u>Sample answer</u></p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th rowspan="2" style="text-align: center;">Number of burning cigarettes</th> <th colspan="3" style="text-align: center;">Temperature (°C)</th> <th rowspan="2" style="text-align: center;">Percentage increase in temperature (%)</th> </tr> <tr> <th style="text-align: center;">Initial</th> <th style="text-align: center;">Final</th> <th style="text-align: center;">Increase</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">1</td> <td style="text-align: center;">27</td> <td style="text-align: center;">30</td> <td style="text-align: center;">3</td> <td style="text-align: center;">11.11</td> </tr> <tr> <td style="text-align: center;">3</td> <td style="text-align: center;">27</td> <td style="text-align: center;">32</td> <td style="text-align: center;">5</td> <td style="text-align: center;">18.52</td> </tr> <tr> <td style="text-align: center;">5</td> <td style="text-align: center;">27</td> <td style="text-align: center;">36</td> <td style="text-align: center;">9</td> <td style="text-align: center;">33.33</td> </tr> <tr> <td style="text-align: center;">7</td> <td style="text-align: center;">27</td> <td style="text-align: center;">41</td> <td style="text-align: center;">14</td> <td style="text-align: center;">51.85</td> </tr> </tbody> </table> <p><u>Note :</u>            (T) Titles with correct unit - 1 mark            (D) Record all the data correctly - 1 mark            (C) Calculate the percentage increase in temperature correctly -1 mark</p>	Number of burning cigarettes	Temperature (°C)			Percentage increase in temperature (%)	Initial	Final	Increase	1	27	30	3	11.11	3	27	32	5	18.52	5	27	36	9	33.33	7	27	41	14	51.85	3
Number of burning cigarettes	Temperature (°C)			Percentage increase in temperature (%)																										
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1	27	30	3	11.11																										
3	27	32	5	18.52																										
5	27	36	9	33.33																										
7	27	41	14	51.85																										
	<b>Any two correct</b>	2																												
	<b>Any one correct</b>	1																												
	<b>No response or incorrect response</b>	0																												
No.	Mark Scheme	Score																												
1(e)(ii)	<p><b>Able to draw a graph correctly which include the following aspects:</b>            Axis : Uniform scale for both axis - 1 mark            Points : All points plotted correctly - 1 mark            Curve : Able to join all the points to form a smooth curve. - 1 mark</p> <p><b>*must have table in 1(e)(i), if no table, mark only on scale on both axis.</b></p> <p>Refer to graph provided</p>	3																												
	<b>Any two criteria correct</b>	2																												
	<b>Any one criteria correct</b>	1																												
	<b>No response or incorrect response</b>	0																												

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1(f)	<p><b>Able to state and explain the relationship between the Number of burning cigarettes and percentage increase in temperature.</b></p> <p>R : Number of burning cigarettes (MV) + percentage increase in temperature(RV) + relationship (R)</p> <p>E1 : because more heat is released</p> <p>E2 : therefore lung temperature/ damage the tissue lining of alveoli/ respiratory tract increase.</p> <p><u>Sample answer</u></p> <p>As the number of burning cigarettes increases, the percentage increase in temperature also increases because more heat is released therefore lung temperature / damage the tissue lining of alveoli/ respiratory tract increase.</p> <p style="text-align: right;"><b>(R must correct; R + 2E)</b></p> <p><b>*if no graph in 1(e)(ii), no need to mark 1(f)</b> <b>*if curve in 1(e)(ii) incorrect, no need to mark 1(f)</b></p>	3
	<p><b>Able to interpret the relationship incompletely</b> R + 1E</p>	2
	<p><b>Able to interpret the relationship at idea level</b> R only</p>	1
	<p><b>No response or incorrect response</b></p>	0
<b>No.</b>	<b>Mark Scheme</b>	<b>Score</b>
1(g)	<p><b>Able to predict the final temperature correctly:</b></p> <p>P1 = correct prediction (more than 32°C)</p> <p>E1 = Reason (contain more heat flows into the U-tube)</p> <p>E2 = Effect (therefore more heat is release/contains more fuel/ contains more smoke / longer time to stop burning.)</p> <p><u>Sample answers</u></p> <p>The final temperature will more than 32°C because contain more heat flow to the U-tube compared to filtered cigarettes therefore more heat is release</p> <p style="text-align: right;"><b>P must correct; P +2E</b></p>	3
	<p><b>Able to predict the outcome of the experiment incompletely</b> P + 1E</p>	2
	<p><b>Able to predict the outcome of the experiment at idea level</b> P only</p>	1
	<p><b>No response or incorrect response</b> P wrong</p>	0
	<p><b>No response or incorrect response</b></p>	0

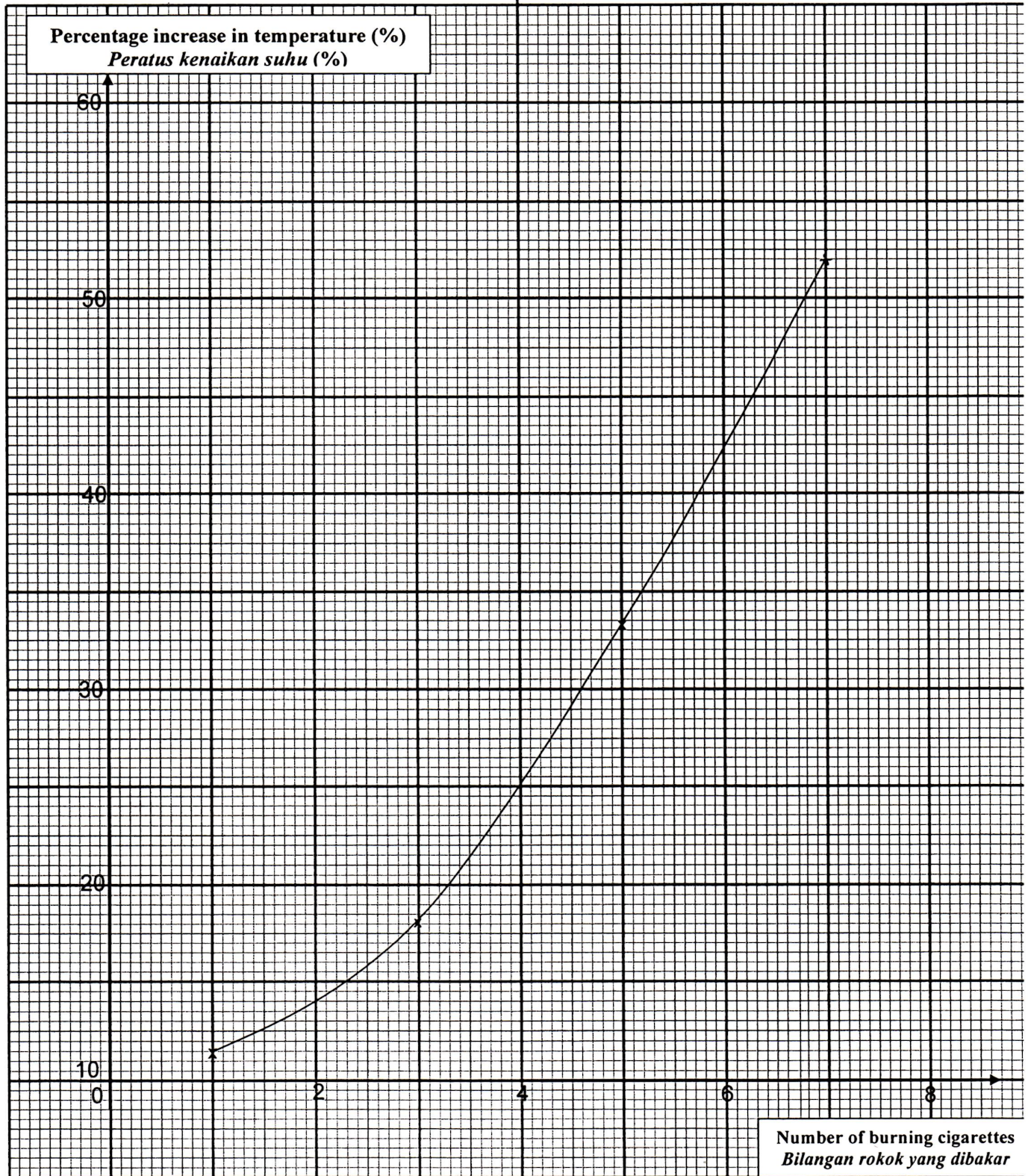
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No.	Mark Scheme	Score
1(h)	<p><b>Able to define operationally on what is unhealthy respiratory system based on the following aspect.</b></p> <p>D1 : (CLASSIFICATION AND FACT) Conditions of the alveolus wall/ lining/respiratory tract become damage/dryness/ irritates/ inflame due to burning cigarettes release smoke containing heat when the cigarettes stop burning</p> <p>D2/CRV : Shown by final temperature / increase in temperature / percentage increase in temperature inside the U-tube</p> <p>D3/MV : Affected by number of burning cigarettes.</p> <p><u>Sample answer:</u></p> <p>Unhealthy respiratory system is the conditions of the alveolus wall/ lining/respiratory tract become damage/dryness/ irritates/ inflame due to burning cigarettes release smoke containing heat when the cigarettes stop burning which can shown by final temperature / increase in temperature / percentage increase in temperature inside the U-tube affected by number of burning cigarettes.</p>	3
	<b>Any two aspects</b>	2
	<b>Any one aspects//theoretical definition</b>	1
	<b>No response/ incorrect response</b>	0
1(i)	<p><b>Able to classify rate gases exchange of four mens with different lifestyle.</b></p> <p><u>Sample answer</u></p> <p>Rate of gaseous exchange (arbitrary) <i>Kadar pertukaran gas (arbitrari)</i></p>  <p style="text-align: center;">Men <i>Lelaki</i></p>	3
	<b>All 3 correct</b>	3
	<b>2 correct</b>	2
	<b>1 correct</b>	1
	<b>no response or incorrect response</b>	0



Graph of percentage increase in temperature inside the U-tube against the number of burning cigarettes.

*Graf peratus kenaikan suhu tiub-U melawan bilangan rokok yang dibakar.*





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No.	Mark Scheme	Score
2(i)	<p><b>Able to state the problem relating the manipulated variable to the responding variable correctly base on the following aspect :</b></p> <p>MV : Manipulated : presence (or absence) of ringed stem/ a stem that is ringed and a stem that is not ringed.</p> <p>RV : Responding : Appearance/conditions of the stem above and below the ring after one month/ at least 3 week</p> <p>Relationship : Relationship between the variable in a question form (Question form)</p> <p><b>Sample answers:</b></p> <ol style="list-style-type: none"> <li>Does/do the stem above the ring swells, whereas the stem below the ring withers/ the diameter of the stem above ring increase whereas that below the ring decreases?</li> <li>What is the effect of removing a bark / phloem tissue on upper part and lower part on bark ringing?</li> </ol>	3
	<p><b>Able to state a problem statement inaccurately based on any two aspect</b></p> <p><b>Sample answers:</b></p> <ol style="list-style-type: none"> <li>Does the stem above the ring swells/ diameter increases?</li> <li>Does the stem below the ring withers/ diameter decreases?</li> <li>What is the effect of removing a bark?</li> <li>What is the effect to upper part/ lower part?</li> </ol>	2
	<p><b>Able to state a of problem statement at idea level</b></p> <p><u>Sample answers:</u></p> <ol style="list-style-type: none"> <li>Does the stem swells/ withers?</li> <li>Does the diameter of the stem increases/ decreases?</li> </ol>	1
	<b>No response or incorrect response</b>	0

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No.	Mark Scheme	Marks
2(ii)	<p><b>Able to state the hypothesis relating the manipulated variable to the responding variable correctly based on the following aspects:</b></p> <p>MV : Manipulated : presence (or absence) of ringed stem/ a stem that is ringed and a stem that is not ringed.</p> <p>RV : Responding : appearance of stem after ringing/ the conditions of the stem above and below the ring (after one month)</p> <p>Relationship : Relationship between the variable</p> <p><u>Sample answers:</u></p> <ol style="list-style-type: none"> <li>1. The stem above the ring swells/swollen whereas the stem below the ring withers/thinners.</li> <li>2. The diameter above the ring increases whereas below the ring decreases.</li> </ol>	3
	<p><b>Able to state a hypothesis inaccurately base on any two aspect.</b></p> <p><u>Sample answers:</u></p> <ol style="list-style-type: none"> <li>1. removing a ring / phloem tissue effect the upper part/ lower part of bark ringing.</li> <li>2. The stem below the ring withers.</li> <li>3. The diameter above the ring increases / the diameter below the bark ring decreases.</li> </ol>	2
	<p><b>Able to state the idea of the hypothesis.</b></p> <p><u>Sample answers:</u></p> <ol style="list-style-type: none"> <li>1. The bark ring swells/ withers.</li> <li>2. The diameter of the bark ring increases/ decreases.</li> </ol>	1
	<p><b>No response or incorrect response</b></p>	0



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No.	Mark Scheme	Marks
2(iii)	<p><b>Able to state all <u>three</u> variables correctly</b> <u>Sample answers:</u></p> <p>MV : Manipulated : Presence or absence of ringed stem/ a stem that is ringed and a stem that is not ringed.</p> <p>RV : Responding : Appearance / conditions of stem /diameter of the stem after ringing above and below the ring (after one month)</p> <p>CV : Constant : Type of plant/ volume of water/ light intensity/ temperature/ concentration of atmospheric/ type / size of pot/vase.</p>	3
	<b>Able to state any <u>two</u> variables correctly</b>	2
	<b>Able to state any <u>one</u> variables correctly</b>	1
	<b>No response or incorrect response</b>	0

2(iv)	<p><b>Able to list all the important apparatus and materials correctly</b> <u>Sample answer:</u></p> <p>Apparatus: (2) pots/ vases/ any container, scalpel/ knife/ secateurs, measuring tapes/ ruler</p> <p>Materials: Hibiscus species/ any example of woody or shrub plant/ a healthy tree with small stem, Vaseline/ petroleum jelly, water</p> <p style="text-align: right;"><b>3A + 3M</b></p>	3
	<b>Able to state/list at least 2 of the apparatus and 2 materials correctly</b>	2
	<p><b>Able to state/list at least 2 apparatus and 1 material correctly</b></p> <p style="text-align: right;"><b>2A+1M</b> <b>2A must be pot/vase+knife</b> <b>1M must be plant</b></p>	1
	<p><b>No response or incorrect response</b></p> <p style="text-align: right;"><b>Less than 2A+1M</b></p>	0

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No.	Mark Scheme	Marks	
2(v)	<p><b>Able to describe the steps of the experiment procedure or method correctly based on the following aspects:</b></p> <p><i>K1 : Preparation of materials &amp; apparatus (at least 5K's)</i>  <i>K2 : Operating the constant variable</i>  <i>K3 : Operating the responding variable</i>  <i>K4 : Operating the manipulated variable</i>  <i>K5 : Steps to increase reliability of result accurately/precaution</i></p>	K's	
Sample answer :			
No	Description	Keywords	K's
1	2 different hibiscus plant/ any example of woody/ shrub plant <b>is selected.</b>	...is selected...	K1
2	2 pots <b>is filled</b> with the <b>same</b> amount of soil	..is filled.. ..same..	K1 K2
3	The plant <b>is planted</b> in 2 different pots	..is planted..	K1
4	The pot <b>is labelled</b> as pot A and pot B	..is labelled..	K1
5	A stem of plant A <b>is measured</b> 3/4/5 cm by using a <b>ruler/measuring tape.</b>	..is measured.. ruler/measuring tape.. ..3/4/5 cm..	K1 K2
6	A complete ring of bark from plant A/hibiscus A / any example <b>is removed</b> by using a <b>sharp knife</b> but not in plant B	.. is removed..knife ..sharp.. ..plant A...plant B..	K1 K5 K4
7	Make sure only the <b>phloem / tissues external</b> to the xylem is removed.	.. phloem / tissues external..	K5
8	Vaseline <b>is applied</b> on the tissue that is exposed to prevent air from entering the xylem tissue (maybe cut accidentally).	.. is applied..	K5
9	The <b>initial</b> condition above and below the ring <b>is observed</b>	.. initial..is observed..	K1
10	Plant A and plant B <b>is placed</b> near a window	.. is placed..	K1
11	The plants <b>is left for a month</b>	.. is left.. .. a month..	K1 K2
12	The plants <b>is watered everyday</b>	.. is watered.. .. everyday..	K1 K2
13	<b>After one month</b> the conditions above and below the ring is observed	.. After one month..	K2
14	<b>Observed and record/draw in table</b> the conditions above and below the ring.	.. observed and record/draw.. .. in table..	K3 K1
15	Correct diagram of experiment setup with at least 5 correct labels		K1

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**Sample Procedure :**

1. 2 different (healthy) hibiscus plant/ any example of woody/ shrub plant is selected.
2. 2 pots is filled with the same amount of soil
3. The plant is planted in 2 different pots
4. The pot is labelled as pot A and pot B
5. A stem of plant A is measured 3/4/5 cm by using a ruler/measuring tape.
6. A complete ring of bark from plant A/hibiscus A / any example is removed by using a sharp knife, but not in plant B
7. Make sure only the phloem / tissues external to the xylem is removed.
8. Vaseline is applied on the tissue that is exposed to prevent air from entering the xylem tissue (maybe cut accidentally).
9. The initial condition above and below the ring is observed
10. Plant A and plant B is placed near a window
11. The plants is left for a month
12. The plants is watered everyday
13. After one month the conditions above and below the ring is observed
14. Draw and record in table the conditions above and below the ring.
15. Correct diagram of experiment setup with at least 5 correct labels

**Scoring rubrics**

K1: steps 1,2,3,4,5,6,8,9,10,11,12,14,15 (any 5 K1)

K2: steps 2,5,11,12,13 (at least 1)

K3: steps 14 (at least 1)

K4: step 1 (at least 1)

K5: steps 6,7,8 (at least 1)

<b>Able to state all 5K</b>		<b>3</b>
<b>Able to state at least 3 - 4K</b>		<b>2</b>
<b>Able to state 1 - 2K</b>		<b>1</b>
<b>No response or incorrect response</b>		<b>0</b>



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No.	Mark Scheme	Marks																	
2(vi)	<p><b>Able to construct a table to record data based on the following aspects:</b></p> <p>P1: Correct Manipulated variable P2: Correct Operating/ Responding variables with units (must have both CRV and ARV)</p> <p>Sample answers:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="2" style="text-align: center;">Treatment.</th> <th colspan="2" style="text-align: center;">Conditions / appearance of bark ring (after one month)</th> </tr> <tr> <th style="text-align: center;">Upper part</th> <th style="text-align: center;">Lower part</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">Stem with bark ring</td> <td></td> <td></td> </tr> <tr> <td style="text-align: center;">Stem without bark ring</td> <td></td> <td></td> </tr> </tbody> </table> <p>Or</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Treatment.</th> <th style="text-align: center;">Conditions / appearance of bark ring (after one month)</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">Stem with bark ring</td> <td></td> </tr> <tr> <td style="text-align: center;">Stem without bark ring</td> <td></td> </tr> </tbody> </table> <p>P1 and P2</p>	Treatment.	Conditions / appearance of bark ring (after one month)		Upper part	Lower part	Stem with bark ring			Stem without bark ring			Treatment.	Conditions / appearance of bark ring (after one month)	Stem with bark ring		Stem without bark ring		2
Treatment.	Conditions / appearance of bark ring (after one month)																		
	Upper part	Lower part																	
Stem with bark ring																			
Stem without bark ring																			
Treatment.	Conditions / appearance of bark ring (after one month)																		
Stem with bark ring																			
Stem without bark ring																			
	<b>Able to present a table with P1 / P2</b>	1																	
	<b>No response <u>or</u> incorrect response</b>	0																	