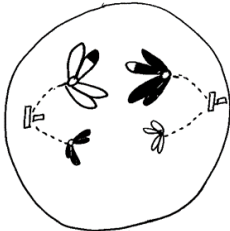


Question 1

BIL	SUGGESTED ANSWER	MARK	
1. (a)(i)	P : Centromere Q : Chromatid /chromosome	1 1	2
(ii)	<ul style="list-style-type: none"> <li>• <b>Crossing over</b> (occur at chiasmata)</li> <li>• Exchange of genetic materials/ informations// genes</li> <li>• Producing new combination of genes / variation</li> </ul>	1 1 1	2
(iii)	Metaphase 1	1	1
(b)	 <p>N : Correct number of chromosome C : Shape of animal cell, different size and colour of chromosome, centromere in front</p>	1 1	2
(c)(i)	Tumour / cancer / melanoma formed	1	1
(ii)	Ultraviolet rays / x- rays / radioactive rays / alpha ( $\alpha$ ) rays / Beta ( $\beta$ ) rays , gamma rays any suitable answer	1	1
(d)	<ul style="list-style-type: none"> <li>• The nucleus of liver cell is fused/insert into the egg cell <b>without nucleus</b>/ anucleated ovum.</li> <li>• Using electric shock/ by electrofusion</li> <li>• The diploid cell (is stimulated) to start dividing / undergo</li> <li>• mitosis</li> <li>• An embryo forming</li> </ul>	1 1 1 1	3
Total			12

Question 2

BIL	SUGGESTED ANSWER	MARK							
(a) (i)	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%;">Plant</th> <th style="width: 50%;">Total number</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">R</td> <td style="text-align: center;">8</td> </tr> <tr> <td style="text-align: center;">S</td> <td style="text-align: center;">5</td> </tr> </tbody> </table>	Plant	Total number	R	8	S	5	1 1	2
Plant	Total number								
R	8								
S	5								
(ii)	Plant R	1	1						
(iii)	The number of Plant R is more / higher than Plant S. <b>Reject : The number of plant S is less/lower</b> <b>(a)(ii) must be correct</b>	1	1						
(b)	i) Density of plant R : $8/5 = 1.6$ ii) Frequency of floating plant S : $3/5 \times 100 = 60 \%$ <b>*must show calculation</b>	1 1	2						

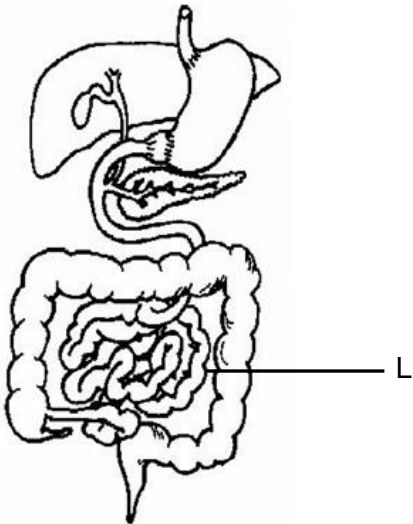
(c)	Organisms	X	Y	1	3	
	Similarity	Both are unicellular organisms /plasma membrane/ genetic material Accept : any suitable similarity Reject : nucleus				
	Difference	Taxonomy: (Kingdom) Monera	Taxonomy: (Kingdom) Protista			1
		Movement: (Able to move) using cilia/flagela	Movement: (Able to move) using pseudopodium			1
(d)	<ul style="list-style-type: none"> <li>• Rate of contraction of contractile vacuole <b>increases</b></li> <li>• Distilled water is <b>less concentrated</b> compared to pond water</li> <li>• Distilled water is hypotonic to (cytoplasm) of amoeba cell</li> <li>• <b>more</b> water diffuse into <b>contractile vacuole</b> by <b>osmosis</b></li> <li>• the contractile vacuole expand to maximum size <b>faster</b></li> <li>• <b>more</b> water is expelled from organism Y/contractile vacuole</li> </ul>			1	3	
<b>Total</b>			<b>12</b>			

Question 3

BIL	SUGGESTED ANSWER	MARK	
(a) (i)	Vein	1	1
(ii)	Oxygen / Carbon dioxide / Glucose / Amino acid / Fatty acid and glycerol / Hormones / Mineral salts / ion / Urea / Uric acid	1	1
(b) (i)	<ul style="list-style-type: none"> <li>• Thin wall // one cell thick wall</li> <li>• Allow rapid/faster diffusion (of substances)/ increase rate of diffusion</li> <li>• Increase (efficiency) rate of exchange/ diffusion of</li> <li>• nutrients, respiratory gases and wastes.</li> </ul>	1	2
	<ul style="list-style-type: none"> <li>• Network/numerous of blood capillaries</li> <li>• Increase total surface area/ volume ratio [TSA/V ratio]</li> <li>• More substances can be filtered/forced out</li> </ul>	1 1 1	
(ii)	• 85 – 90% / most of the interstitial fluid is reabsorbed/diffused/ re-entered/ flowed back into the blood capillaries (at the venous end)	1	2
	• Blood plasma at the venous end is hypertonic compared to interstitial fluid // vice versa	1	
	• Blood pressure/hydrostatic pressure in the blood capillaries at the venous end is lower	1	

(c)	<ul style="list-style-type: none"> <li>• Lymph nodes produce lymphocytes</li> <li>• Lymphocytes produces antibodies</li> <li>• Antibodies destroy pathogen / antigen</li> <li>• Antibodies neutralises the toxin produced by the antigen / pathogen</li> <li>• Antibodies assist phagocytes to undergo phagocytosis</li> </ul> <p><b>OR</b></p> <ul style="list-style-type: none"> <li>• Phagocytosis occur</li> <li>• Phagocytes / Neutrophils / Monocytes surround and engulf the pathogen</li> <li>• Lysozymes/hydrolytic enzyme digest the pathogens (to destroy it).</li> </ul>	<p>1 1 1 1 1 1 1 1</p>	<p>2</p>
(d)	<ul style="list-style-type: none"> <li>• Skeletal muscles contract and relax regularly/intensively/more rapidly (producing pressure)</li> <li>• (The pressure) squeeze the lymphatic vessel//vein and</li> <li>• Open the valve</li> <li>• Force the lymph to flow forward</li> <li>• Valve ensure lymph flow in one direction only</li> <li>• Valve prevent backflow of lymph.</li> </ul>	<p>1 1 1 1 1 1</p>	<p>4</p>
<b>TOTAL</b>			<b>12</b>

Question 4

<b>BIL</b>	<b>SUGGESTED ANSWER</b>	<b>MARK</b>	
(a)(i)	Pancreas	1	1
a) (ii)		1	

(b)	M : Blood capillary Substances : Water / glucose / amino acid / vitamin B & C / ions/ minerals N : Lacteal Substances : lipid / fatty acid & glycerol / Vit A,D,E & K	1 1 1 1	4
(c) (i)	<ul style="list-style-type: none"> <li>• Stool remain too long time in the rectum</li> <li>• more absorption of water</li> <li>• Lack of dietary fibres / roughage</li> <li>• stool accumulated in the rectum</li> </ul>	1 1 1 1	2

(ii)	<ul style="list-style-type: none"> <li>• Constipation</li> <li>• Lead to haemorrhoids</li> <li>• Causing rectal bleeding</li> <li>• Increases the risk of colon cancer</li> </ul>	1 1 1 1	2
(c)	<ul style="list-style-type: none"> <li>• Hepatic portal vein contain <b>more</b> glucose (than hepatic vein)</li> <li>• Digestion/hydrolysis of carbohydrate/sucrose/maltose into glucose occur in the small intestine</li> <li>• Glucose from small intestine is transported by hepatic portal vein (to liver)</li> <li>• <b>Excess</b> glucose in the liver is converted to glycogen (by insulin)</li> <li>• level of glucose in hepatic vein (that is transported to body cells) is <b>lower</b></li> </ul>	1 1 1 1 1	2
<b>Total</b>			<b>12</b>

Question 5

BIL	SUGGESTED ANSWER	MARK	
(a)(i)	Adrenaline	1	1
(ii)	<ul style="list-style-type: none"> <li>• breathing rate become <b>faster / increases</b></li> <li>• produce <b>more</b> sweat</li> <li>• blood glucose level <b>increases</b></li> <li>• heart beat <b>increases</b></li> <li>• pupil dilates</li> <li>• rate of muscles contraction <b>increases</b></li> <li>• rate of blood flow <b>increases</b></li> </ul>	1 1 1 1 1 1 1	2
(b)	<ul style="list-style-type: none"> <li>• Hypothalamus sends nerve impulses to adrenal gland</li> <li>• Neurones in the adrenal gland is stimulated</li> <li>• causing adrenal gland to secrete adrenaline / noradrenaline</li> <li>• to convert glycogen into glucose</li> <li>• to produce more energy // rate of cellular respiration increases</li> <li>• skeletal muscle become more energized/contract faster</li> <li>• to produce immediate respond</li> </ul>	1 1 1 1 1 1 1	3
(c)	<ul style="list-style-type: none"> <li>• <b>Less</b> aldosterone is produced</li> <li>• wall of distal convoluted tubule become <b>less</b> permeable to sodium ion</li> <li>• <b>less</b> sodium ion is reabsorbed into the blood capillary</li> <li>• <b>less</b> active transport occurs</li> <li>• causing the urine produced to be <b>more</b> concentrated</li> </ul>	1 1 1 1 1	3
(d)	<ul style="list-style-type: none"> <li>• the percentage of amino acid // glucose in urine is <b>higher</b> in Mr. A compared to healthy individual</li> <li>• the proximal convoluted tubule may be impaired / malfunction</li> <li>• some / less glucose / amino acid is <b>not</b> reabsorbed into the blood capillary</li> <li>• active transport of glucose/ amino acid do not occur completely</li> </ul>	1 1 1 1	3
	<b>Total</b>	<b>12</b>	

Question 6

BIL	SUGGESTED ANSWER	MARK	
6 (a)	<ul style="list-style-type: none"> <li>• Fine / narrow / thin and flexible leaves (bend with water)</li> <li>• Less / little resistance to water flow</li> <li>• Prevent damage by water currents</li>   <li>• Soft / thin stem that bend with water current</li> <li>• Prevent the stem from break / crack</li>   <li>• Has air sacs / air spaces inside leaves / stem</li> <li>• Keep plant floating close the surface (to obtain maximum sunlight) / give water buoyancy / plant to stay upright in water.</li> </ul>	1 1 1  1 1  1 1	





	nucleus		
	• Triploid nucleus develop into endosperm	1	
	• Integument develop into testa /seed coat	1	
	• Ovule develops into seeds	1	
	• Ovary develops into fruit	1	10
<b>TOTAL MARKS</b>			<b>20</b>

Question 8

<b>BIL</b>	<b>SUGGESTED ANSWER</b>	<b>MARK</b>	
(a)(i)	<ul style="list-style-type: none"> <li>• Volume of air breathed in with each breath at rest is <math>0.5 \text{ dm}^{-3}</math></li> <li>• Volume of air breathed in with each breath during exercise is <math>2.0 / 2 \text{ dm}^3</math></li> <li>• Volume of air breathed in per minute at rest is <math>5.5 \text{ dm}^{-3}</math></li> <li>• Volume of air breathed in per minute during is <math>36 \text{ dm}^{-3}</math></li> <li>• Rate of breathing at rest is <math>11 \text{ min}^{-1}</math></li> <li>• Rate of breathing during exercise is <math>18 \text{ min}^{-1}</math></li> </ul>	1 1 1 1 1 1	4
(a)(ii)	<ul style="list-style-type: none"> <li>• Intensive training need/ required more energy</li> <li>• Requires more oxygen</li> <li>• Increases aerobic respiration / cellular respiration</li> <li>• (Intensive training) produce more carbon dioxide</li> <li>• More carbon dioxide need to be remove</li> <li>• To regulate the blood pH / concentration of carbon dioxide in blood</li> <li>• Sufficient oxygen for aerobic respiration.</li> <li>• Prevent (much) anaerobic respiration from occurs</li> <li>• Prevent oxygen debt</li> <li>• Prevent formation of lactic acid.</li> </ul>	1 1 1 1 1 1 1 1 1 1	6
8(b)	<p><u>Wear track suit</u></p> <ul style="list-style-type: none"> <li>• To ensure heat lose occur gradually // to prevent heat lose rapidly / immediately</li> <li>• to trap air</li> <li>• (air) act as heat insulator</li> <li>• prevent from hypothermia</li> </ul> <p><u>Took a few long deep breath</u></p> <ul style="list-style-type: none"> <li>• To expel out more carbon dioxide</li> <li>• To maintain normal carbon dioxide level in blood</li> <li>• Reduce blood acidity // maintain pH of blood at normal level</li> <li>• To obtain more oxygen</li> <li>• To pay oxygen debt</li> </ul>	1 1 1 1 1 1 1 1	2



	<ul style="list-style-type: none"> <li>• Oxygen is used to breakdown lactic acid (into carbon dioxide and energy)</li> </ul>	1	2
	Walked freely as a `cooling down` activity	1	
	<ul style="list-style-type: none"> <li>• Gradual recovery of heartbeat rate</li> <li>• Breathing rate back to normal</li> <li>• Regulate blood flow to normal level</li> <li>• Blood pressure back to normal</li> <li>• Avoid fainting / dizziness</li> </ul>	1	2
(c )	<ul style="list-style-type: none"> <li>• Larger gills chamber //Smaller gill rakers // Less gill filament / lamellae</li> <li>• To give more space for oxygen to be breath in</li> <li>• Gills moist</li> <li>• Increase the diffusion rate of oxygen</li> <li>• Help functioning for long time out of water</li> <li>• Moist skin /cover by mucus</li> <li>• Increase the diffusion rate of oxygen</li> <li>• Has mouth cavity</li> <li>• Able to gulp air</li> <li>• Has abundance/ a lot of little capillaries in the mouth and throat</li> <li>• Increase the rate of diffusion of oxygen / respiratory gases.</li> </ul>	1 1 1 1 1 1 1 1 1 1	4
			20

Question 9

BIL	SUGGESTED ANSWER	MARK	
9(a)	<p style="text-align: center;">Father    X    Mother</p> <p>P phenotype    normal                      polydactyl</p> <p>P genotype            dd                                      DD</p> <p style="text-align: center;">Meiosis</p> <p>Gamete                      d            d                      D            D</p> <p style="text-align: center;">Random fertilisation</p> <p>Offspring genotype    Dd            Dd            Dd            Dd</p> <p>Offspring phenotype    all polydactyl</p> <p>Offspring phenotype ratio 100% polydactyl</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>	6
(b)	<ul style="list-style-type: none"> <li>• crossing over (between non sister chromatid)</li> <li>• Exchange of DNA segment</li> <li>• Form a new combination of genes</li>   <li>• Independant assortment</li> <li>• During metaphase 1 (meiosis)</li> <li>• Homologous chromosomes arrange randomly at the metaphase plate</li> <li>• Produce new type of gamete</li>   <li>• Random fertilisation</li> <li>• <b>Any</b> of human male gamete / sperm can fertilise with <b>any</b> female gamete / ovum</li> <li>• Produce new form of zygote</li>   <li>• Mutation</li> <li>• (spontaneous) change in the genetic material (DNA) of cell / organism (cause variation)</li> <li>• Causing changes in chromosome structure / number // changes in genetic codes.</li> </ul>	<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> <p style="text-align: center;">1</p>	4
(c)	<p><u>The benefits</u></p> <ul style="list-style-type: none"> <li>• Genetic engineering used to produce disease resistance/pest resistance plants (e.g. legumes, peas, maize and beans)</li>   <li>• less pesticides are used</li>   <li>• less pollution to the environment / better health for consumers</li> </ul>	<p style="text-align: center;">1</p> <p style="text-align: center;">1</p> <p style="text-align: center;">1</p>	

<ul style="list-style-type: none"> <li>• Crops yield increase / profitability</li> <li>• Better livelihood for farmers to solve problems of insufficient food</li> <li>• Increase resistance to herbicide (e.g. soya bean) which allows weeds to be killed without affecting the crop plant</li> <li>• Able to survive on poorer quality grassland // Can resist drought // climatic changes</li> <li>• Crops with longer shelf lives (e.g. tomato)</li> <li>• Crops with higher vitamin content to solve problems of malnutrition</li> <li>• (genetically modified) livestock (e.g. cows) meat with less fat / more milk</li> </ul>	1		
	1		
	1		
	1		
	1		6
	1		10
<u>The risks</u>			
<ul style="list-style-type: none"> <li>• Pest resistance genes may be transferred to weeds (may be difficult to control growth of weeds)</li> </ul>	1		
<ul style="list-style-type: none"> <li>• Some transgenic crops may have animal genes that may not be acceptable to certain groups for religious reasons.</li> </ul>	1		
<ul style="list-style-type: none"> <li>• Genetically modified foods may be harmful to health / may activate human genes to cause cancer.</li> </ul>	1		
<ul style="list-style-type: none"> <li>• Transgenic organisms may affect the survival of other organisms in the ecosystem. // may cause the imbalance of nature / ecosystem</li> </ul>	1		
<ul style="list-style-type: none"> <li>• Reduce diversity</li> </ul>	1		4
<ul style="list-style-type: none"> <li>• Choose only the trait that people want to have / undesirable trait would be eliminate.</li> </ul>	1		10
TOTAL			20