Biological Molecules

Mark Scheme 1

Level	IGCSE
Subject	Biology
Exam Board	CIE
Topic	Biological Molecules
Paper Type	(Extended) Theory Paper
Booklet	Mark Scheme 1

Time Allowed: **59 minutes**

Score: **/49**

Percentage: **/100**

Question		Marks	Guidance Notes
1 **(a)**	homeostasis / negative feedback ;	[1]	
(b) (i)	insulin ;	[1]	
(ii)	liver / muscle / pancreas ;	[1]	
(iii)	glycogen ;	[1]	
(c)	*Symptoms:* fatigue / AW ; thirst / AW ; increased urination / glucose in urine / fruity breath / ketosis / flushed face; weight loss / nausea / vomiting / abdominal pain / hunger ; blurred vision / glaucoma ; behavioural changes / confusion / faint / unconscious / coma(tose) / dizzy / rapid breathing / deep breathing ; slow (wound) healing / poor circulation ; *Treatment:* insulin ; by injection / insulin pump ; regular blood glucose tests ; regular meals / controlled diet ;	[max 5]	max 3 from either section **A** weakness **I** death **A** meal plan / healthy eating / monitoring carbohydrates / avoid sugary foods, drinks and fruit juices / eat complex carbohydrates / intake of sugar if blood sugar concentration is too low
		[Total: 9]	

Question	E answers	Mark	Additional Guidance
2 (a)	**A** – excretion / egestion / defaecation **;** **B** – nitrification / oxidation **;**	[2]	**R** death **A** 'nitrify' / ***ignore*** bacteria
(b) 1 2 3 4 5 6 7 8	root nodules contain, bacteria / *Rhizobium* **;** (bacteria) fix nitrogen / nitrogen fixation / nitrogen fixing **;** form, ammonia / ammonium (ions) **;** provide, fixed nitrogen / ammonia / amino acids, to rest of, plant **;** **R** via soil (fixed nitrogen etc) needed for growth **;** used to make, amino acids / proteins / DNA / RNA / chlorophyll / AW **;** (so) nitrogen made available to, animals / other organisms **;** AVP **;** *only for detail of any of the points above*	[max 4]	***ignore*** incorrect name or type of bacteria **R** if root nodules fix nitrogen ***ignore*** nitrate / **R** if occurs in soil ***ignore*** 'useful' nitrogen **A** useable nitrogen ***ecf*** provide nitrate to plant if penalised in **MP3** **R** chloroplast *do not allow anything for events that occur after bacteria or plants die*
(c) 1 2 3 4 5 6 7 8 9 10 11 12 13	*proteins in* ***cells*** enzymes **;** control / catalyse, reactions / AW **;** e.g. respiration / photosynthesis **; A** ref. to any specific reaction(s) (part of cell) membranes **;** carrier proteins / description of role allowing movement in and out of cell **;** haemoglobin **;** transport of, oxygen / carbon dioxide / gases **;** making cytoplasm / (cell) growth **;** AVP **;** e.g. chloroplast / named organelle / providing energy *DNA in* ***cells*** ref. to, genes / alleles / genetic information / genetic code **;** control functions of the cell **;** code for proteins **;** AVP **;** e.g. a specific feature of cells / cell division / mitosis / meiosis	[max 3] [max 2]	**R** digestion unless clearly **inside** cell, e.g. in a phagocy **A** protein pumps **R** antibodies / hormones / collagen / keratin ***ignore*** repair **R** produce / make energy **R** hereditary material / AW **A** 'sends messages to the cytoplasm' / 'tells the cells what to do' **A** ref. to mRNA

Question		E answers	Mark	Additional Guidance
2 (d)	1	<u>eutrophication</u> ;		
	2	growth of algae / algal bloom / weed growth ;		
	3	reduces light reaching other plants ;		
	4	algae / plants, die ;		e.g. from lack of light / no resourc
	5	bacteria, decompose / feed on, dead plants ; **A** dead animals / 'eat'		**A** decomposers / fungi / microorganisms for bacteria
	6	<u>aerobic</u> respiration ; **A** aerobic bacteria		
	7	(bacteria cause) oxygen (concentration in water) to decrease ;		**R** decrease in oxygen if linked to less photosynthesis
	8	(so) fish / invertebrates / animals, suffocate / die / migrate ;		**R** change in pH / toxins as cause of death
	9	AVP ; e.g. any further detail or consequence of any of the above marking points, e.g. reduces biodiversity / destroys food chains		must be linked to shortage of oxygen (however caused)
			[max 4]	
			[Total: 15]	

Question			E	Answers	Marks	Additional Guidance
3	(a)	(i)		lymphocyte ;	[1]	***ignore*** leucocyte **A** phonetic spellings
		(ii)	**1** **2** **3** **4** **5** **6** **7** **8**	attach to, bacteria / viruses / pathogens ; cause them to, aggregate / stick together / AW ; stop them spreading ; help phagocytes engulf them ; cause bacteria to burst / kill bacteria / destroy bacteria ; stop bacteria moving / immobilise bacteria ; neutralise, toxins / poisons / harmful substances ; stop, viruses / bacteria, entering cells ;	[max 2]	**A** antigens **R** 'fight' against *anywhere in the answer* **A** opsonisation / described **A** 'makes bacteria more detectable by phagocytes' ***ignore*** 'dissolve bacteria **A** 'detoxify'
	(b)	(i)	**1** **2** **3** **4**	when blood clots / following a cut / when wounded / AW ; when blood vessels are damaged ; on exposure of, blood / fibrinogen, to air ; flows over rough surfaces / AW ;	[max 1]	**A** injury
		(ii)	**1** **2** **3** **4** **5** **6**	(fibrinogen is converted into) insoluble (fibrin) ; forms, mesh / net / network / strands ; traps, (red) blood cells / platelets ; (dries) to form a scab ; prevents, loss of blood / more bleeding ; prevents infection / AW ;	[max 3]	*assume answer is about fibrin* **A** 'gauze' / threads / fibres / web **A** prevents entry of (named) pathogens **R** foreign bodies

Question			E Answers	Marks	Additional Guidance
3	(c)	(i)	5°C – low (kinetic) energy / slow movement of molecules ; low frequency of / few, collisions ; 70°C – enzyme <u>denatured</u> ; ref. to active site / shape of enzyme ;	[max 3]	*accept that 'it' refers to the enzyme* denatures active site = 2 marks, **A** thrombin for enzyme **R** if 'die' / 'die and denature'**A** 'deformed' / AW, active site / enzyme
		(ii)	time taken for fibrin to form / liquid to become sticky / AW ; time taken for fibrinogen / substrate to disappear ; how much fibrin produced in, unit time / stated time ; how much fibrinogen converted, in unit time / stated time ;	[max 1]	**A** rate of fibrin production / how long it takes blood to clot / form a mesh / to reach same viscosity **R** 'how long it took a scab to form' **A** product for fibrin **A** substrate for fibrinogen
		(iii)	pH ; volume of, enzyme / thrombin (solution) ; concentration of, enzyme / thrombin (solution) ; volume of, substrate / fibrinogen (solution) / blood ; concentration of, substrate / fibrinogen (solution) ; calcium ions ; AVP ; e.g. equilibration time	[max 2]	**R** temperature **A** 'amount' for concentration **A** 'amount' for concentration **R** blood **R** size of fibrinogen / substrate
				[Total: 13]	

	Answers	Marks	Guidance for Examiners
4 (a) (i)	provides, sufficient energy / energy for needs ; provides, molecules / materials, for metabolism / equivalent ; provides, nutrients / named nutrients i.e. CPFVM H_2O fibre ; in correct / right, quantities / proportions / amounts ;	[max 3]	**A** substances fibre – accept roughage and non-starch polysaccharide. **A** minimum of any three named nutrients **A** contains (all the) food, groups / types / classes **R** 'substances' **A** adequate / sufficient **R** 'equal'
(ii)	age ; sex / gender ; activity / exercise; pregnancy / lactation ; growth / body building ; ambient temperature / climate / weather ; disease / medical condition / illness ; allergy / food intolerance ; size / body mass / build ;	[max 3]	**A** weight **I** height
(b) (i)	horizontal line at 180 mg per 100 cm^3 ;	[1]	**A** tolerance of half-square up or down
(ii)	60 to 300 minutes *Units essential*	[1]	**A** 240 minutes / 4 hours
(iii)	increases after time when glucose is ingested, decreases, but stays below or touches 180 / line from b(i) throughout ;	[1]	
(c)	insulin secreted / produced / released ; by pancreas ; glucose absorbed (by liver / muscles) ; stored as / converted to , glycogen ;	[max 3]	
		[Total:12]	