

Question		Marks	Guidance Notes
1 (a)	homeostasis / negative feedback ;	[1]	
(b) (i)	insulin ;	[1]	
(ii)	liver / muscle / pancreas ;	[1]	
(iii)	glycogen ;	[1]	
(c)	<p><i>Symptoms:</i> 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 ;</p> <p><i>Treatment:</i> insulin ; by injection / insulin pump ; regular blood glucose tests ; regular meals / controlled diet ;</p>	[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	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	1 root nodules contain, bacteria / <i>Rhizobium</i> ; 2 (bacteria) fix nitrogen / nitrogen fixation / nitrogen fixing ; 3 form, ammonia / ammonium (ions) ; 4 provide, fixed nitrogen / ammonia / amino acids, to rest of, plant ; R via soil 5 (fixed nitrogen etc) needed for growth ; 6 used to make, amino acids / proteins / DNA / RNA / chlorophyll / AW ; 7 (so) nitrogen made available to, animals / other organisms ; 8 AVP ; <i>only for detail of any of the points above</i>	[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 <i>do not allow anything for events that occur after bacteria or plants die</i>
(c) 1 2 3 4 5 6 7 8 9 10 11 12 13	proteins in cells 1 enzymes ; 2 control / catalyse, reactions / AW ; 3 e.g. respiration / photosynthesis ; A ref. to any specific reaction(s) 4 (part of cell) membranes ; 5 carrier proteins / description of role allowing movement in and out of cell ; 6 haemoglobin ; 7 transport of, oxygen / carbon dioxide / gases ; 8 making cytoplasm / (cell) growth ; 9 AVP ; e.g. chloroplast / named organelle / providing energy DNA in cells 10 ref. to, genes / alleles / genetic information / genetic code ; 11 control functions of the cell ; 12 code for proteins ; 13 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 phagocytosis 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 2 3 4 5 6 7 8 9	<p><u>eutrophication</u> ;</p> <p>growth of algae / algal bloom / weed growth ;</p> <p>reduces light reaching other plants ;</p> <p>algae / plants, die ;</p> <p>bacteria, decompose / feed on, dead plants ; A dead animals / 'eat'</p> <p><u>aerobic</u> respiration ; A aerobic bacteria</p> <p>(bacteria cause) oxygen (concentration in water) to decrease ;</p> <p>(so) fish / invertebrates / animals, suffocate / die / migrate ;</p> <p>AVP ; e.g. any further detail or consequence of any of the above marking points, e.g. reduces biodiversity / destroys food chains</p>	[max 4]	<p>e.g. from lack of light / no resourc A decomposers / fungi / microorganisms for bacteria</p> <p>R decrease in oxygen if linked to less photosynthesis</p> <p>R change in pH / toxins as cause of death</p> <p>must be linked to shortage of oxygen (however caused)</p>
[Total: 15]			

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

Question			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]	<i>accept that 'it' refers to the enzyme</i> 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)	<p>provides, sufficient energy / energy for needs ;</p> <p>provides, molecules / materials, for metabolism / equivalent ;</p> <p>provides, nutrients / named nutrients i.e. CPFVM H₂O fibre ;</p> <p>in correct / right, quantities / proportions / amounts ;</p>	[max 3]	<p>A substances</p> <p>fibre – accept roughage and non-starch polysaccharide.</p> <p>A minimum of any three named nutrients</p> <p>A contains (all the) food, groups / types / classes</p> <p>R ‘substances’</p> <p>A adequate / sufficient R ‘equal’</p>
(ii)	<p>age ;</p> <p>sex / gender ;</p> <p>activity / exercise;</p> <p>pregnancy / lactation ;</p> <p>growth / body building ;</p> <p>ambient temperature / climate / weather ;</p> <p>disease / medical condition / illness ;</p> <p>allergy / food intolerance ;</p> <p>size / body mass / build ;</p>	[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 <i>Units essential</i>	[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)	<p>insulin secreted / produced / released ;</p> <p>by pancreas ;</p> <p>glucose absorbed (by liver / muscles) ;</p> <p>stored as / converted to , glycogen ;</p>	[max 3]	
		[Total:12]	