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BIOLOGY (US)

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Paper 3 Theory (Core)

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MARK SCHEME

Maximum Mark: 80

Published

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This document consists of **13** printed pages.

Mark schemes will use these abbreviations

- ; separates marking points
- / alternatives
- **I** **I**
- **R** reject
- **A** **A** (for answers correctly cued by the question, or guidance for examiners)
- AW alternative wording (where responses vary more than usual)
- AVP any valid point
- **ecf** credit a correct statement / calculation that follows a previous wrong response
- **ora** or reverse argument
- () the word / phrase in brackets is not required, but sets the context
- underline actual word given must be used by candidate (grammatical variants excepted)
- max indicates the maximum number of marks that can be given

Question	Answer	Marks	Guidance
1(a)(i)	photosynthesis ;	1	
1(a)(ii)	water + carbon dioxide ; → oxygen + glucose ;	2	
1(a)(iii)	large surface area (to absorb light) ; contain chloroplasts / chlorophyll (to absorb light) ; ref. to xylem ; stomata (to allow gas exchange) ; thin (short diffusion distances) ; transparent cuticle / epidermis ; AVP ;	1	
1(b)(i)	<i>Betula pendula</i> = C <i>Fraxinus excelsior</i> = D <i>Laurus nobilis</i> = E <i>Quercus robur</i> = A ⋮	3	All 4 correct = 3 2 or 3 correct = 2 1 correct = 1

Question	Answer	Marks	Guidance
1(b)(ii)	does leaf have only 5 parts? ; does the leaf have less than 7 parts? ; do the leaf parts all join at one place? ; does the leaf have more than one vein? ; does the leaf have branched veins? ; does the leaf have more than one vein in each part? ; does the leaf have pointy ends? ;	1	AW but the statement must fit a correct YES or NO choice

Question	Answer	Marks	Guidance
2(a)(i)	to pump blood / AW ;	1	
2(a)(ii)	(cardiac) muscle ;	1	
2(a)(iii)	ECG ; (counting the) pulse / heart beat ; using a, heart monitor / pulse monitor / blood pressure meter ; listening (to heart valves closing) ;	2	
2(b)(i)	a circle drawn around the coronary artery ;	1	
2(b)(ii)	<i>any one from</i> diet ; stress ; smoking ; genetic factors ; age / gender ; lack of exercise ; high blood cholesterol ; obese ; diabetes ;	1	A family history
2(b)(iii)	arteries veins ;	1	must have both in correct order

Question	Answer	Marks	Guidance
2(c)(i)	right atrium ;	1	A right auricle
2(c)(ii)	ensure one way flow of blood / prevent backflow ;	1	
2(c)(iii)	septum ;	1	

Question	Answer	Marks	Guidance
3(a)(i)	hormones ;	1	
3(a)(ii)	line adrenaline joining to adrenal gland (above kidney) ; line insulin joining to pancreas ; line oestrogen joining to ovary ;	3	
3(a)(iii)	(insulin) pancreas ; (oestrogen) ovary ;	2	
3(a)(iv)	(Insulin) lowers blood, sugar / glucose <i>OR</i> (promotes conversion of) glucose to glycogen ; oestrogen causes lining of uterus to thicken / responsible for (named) secondary sexual characteristics ;	2	I regulates / controls A regulates the menstrual cycle
3(b)	<i>any two from</i> pupils are enlarge / dilated ; increased blood glucose concentration ; increased breathing (rate) ; increased, heart / pulse, rate ; increased blood pressure ; expand air passages of lungs ; increased / divert, blood to muscles ; speeds up reaction time ;	2	A increased depth / volume of breathing A increased mental awareness

Question	Answer	Marks	Guidance
4(a)	break down of molecules ; large to small molecules / insoluble to soluble molecules ;	2	
4(b)(i)	amylase ;	1	
4(b)(ii)	simple sugars / glucose ;	1	A maltose / reducing sugar
4(c)(i)	A ; B ;	2	either order
4(c)(ii)	small intestine / ileum / duodenum ;	1	A villi
4(d)	<i>any two from</i> secretes (named) enzymes ; storage ; mechanical digestion / described ; secretes hydrochloric acid / provides an acidic pH (for enzymes) / lowers pH / adds liquid ; kills bacteria ; digests protein ;	2	

Question	Answer	Marks	Guidance
5(a)(i)	37 / 38 (cm ³) ;	1	
5(a)(ii)	4 (minutes) ;	1	ecf from (a)(i)
5(a)(iii)	more juice extracted / bigger yield ; faster (extraction) / takes less time ; more profit ;	2	
5(b)(i)	(chemical reaction in cells that) breaks down, nutrient molecules, to release energy ; without using oxygen ;	2	
5(b)(ii)	biofuel / bread / carbon dioxide ;	1	A yeast extract / 'marmite' / CO ₂ I any named alcohol
5(b)(iii)	uses oxygen ; releases more energy / makes more ATP ; produces water ; does not produce alcohol / ethanol ; AVP ;	2	e.g. produces more carbon dioxide

Question	Answer	Marks	Guidance
6(a)	shoot grows upwards / AW ;	1	
6(b)(i)	gravity ;	1	
6(b)(ii)	gravitropism ;	1	
6(c)(i)	phototropism ;	1	
6(c)(ii)	the shoot grows towards the, light / stimulus ; (shoot) receives more light ; plants need light, to make food / for photosynthesis ; food / nutrients, needed for, growth / metabolism ;	3	

Question	Answer	Marks	Guidance										
7(a)(i)	<table border="1" data-bbox="347 215 1160 323"> <tr> <td>meiosis</td> <td>/</td> <td></td> <td>/</td> <td></td> </tr> <tr> <td>mitosis</td> <td></td> <td>/</td> <td></td> <td>/</td> </tr> </table> ;;	meiosis	/		/		mitosis		/		/	2	correct answer column 1 and 2 = 1 mark correct answer column 3 and 4 = 1 mark
meiosis	/		/										
mitosis		/		/									
7(b)	selection by humans / AW ; of individuals(s) with desired features / AW ; crossing / mating / breeding, (them together) ; selecting offspring with desired features and breed again ; over many generations ;	3											
7(c)	changing the, genetic material / DNA, of an organism ; by using genes ; from another organism ; (adding genes to) confer resistance to, herbicides / insect pests ; to make vitamins ; examples ;	4	A genetically modify an organism A alleles max 2 for examples A other examples include : salt tolerance / drought resistance / growth in harsh conditions nitrogen fixation virus resistance delayed ripening seedless watermelons flavr savr tomatoes make plants grow faster										
7(d)	herbicides ; insecticide ; fertilisers ; irrigation / watering ; use of machinery ; crop rotation ; biological pest control ; more light ; AVP ;;	2	I weather e.g. pesticides / fungicide										

Question	Answer	Marks	Guidance
8(a)(i)	<input type="text" value="F"/> ; <input type="text" value="C"/> <input type="text" value="A/E"/> & <input type="text" value="E/A"/> ; <input type="text" value="D"/> <input type="text" value="B"/> ;	3	1st box F 1 mark 6th box B 1 mark both A E or E A in the middle 1 mark
8(a)(ii)	mutation ;	1	
8(a)(iii)	mutagens / (named) chemicals e.g. cigarette smoke / dyes ; radiation / x rays / UV ; viruses ;	1	
8(b)(i)	an inherited feature ; that helps an organism to survive / reproduce ; in its environment ;	2	
8(b)(ii)	they all have, hair / fur ; all have (external) ears / pinnae ; middle ear bones ;	2	must be visible features
8(b)(iii)	mammary glands / production of milk (for offspring) / nipples ;	1	
9(a)	<pre> graph LR A[plasma] --- B[not clotting] C[platelets] --- D[burns patients] E[red blood cells] --- F[low immunity] G[white blood cells] --- H[low haemoglobin] </pre>	3	All 4 correct = 3 2 or 3 correct = 2 1 correct = 1
9(b)(i)	rounder / (bi)concave / fixed shape / disc shaped / doughnut shaped ; lacks a nucleus ; it contains haemoglobin ; smaller ;	2	1 colour

Question	Answer	Marks	Guidance
9(b)(ii)	to prevent (further) blood loss / haemorrhage ; to seal wounds / as a barrier to infection idea / stop pathogens entering ;	1	