OCR GCSE 21ST CENTURY BIOLOGY B · J257

BIOLOGY



MARK SCHEME

B2.2 HOW DO ORGANISMS PROTECT THEMSELVES AGAINST PATHOGENS? (HIGHER)

SCORE	PERCENTAGE
/30	%

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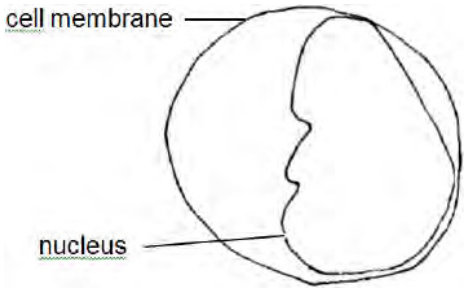
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Question			Answer/Indicative content	Marks	Guidance
1		i	Antigen ✓	1	
		ii	Antibody ✓	1	
		iii	Whole cell could cause disease ✓	1	
			Total	**3**	
2			Correct cell drawn ✓ Continuous, unfeathery lines, no shading ✓ Label lines drawn with a ruler ✓ Nucleus **AND** cell membrane correctly labelled ✓	4	Drawing should take up approximately 50% of space e.g. 
			Total	**4**	
3	a		microorganisms / bacteria / pathogens are reproducing / dividing / multiplying	1	**accept** idea that there is not yet enough antibody to fight the infection **do not credit** “it / they” unqualified (as this refers to the antigen) **accept** asexual reproduction **Examiner's Comments** This was a challenging question. Candidates found it difficult to link increasing antigen concentration to the reproduction of microorganisms.
	b		4.5 (days)	1	**Examiner's Comments** The majority of candidates could identify how long the infection lasted.

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Question			Answer/Indicative content	Marks	Guidance
	c		symptoms only occur when antigen concentration is above 2.6 (au) / ORA	1	**accept** 2.5 **Examiner's Comments** This question was difficult as students had to be able to interpret the graph to describe the relationship.
	d		2.8	1	**accept** any concentration between 2.8 and 3.0 **Examiner's Comments** This was a challenging question which relied on candidates being able to interpret the 2 lines to identify the correct antibody concentration.
			Total	**4**	

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Question			Answer/Indicative content	Marks	Guidance
4	a		White blood cells fight infection / fight microbes / produce antibodies; Platelets clot blood; Plasma transports or carries (substances / cells);	3	Examiner' Comments Although this question was answered well by most candidates, a significant number failed to score all three marks. Credit was not given for simply naming the parts. Good answers stated that white blood cells fought infection, platelets clot blood and plasma transported nutrients around the body. Answers that referred to red blood cells did not score.
	b		No nucleus; Concave / bi concave / large surface area;	2	Examiner' Comments This question was surprisingly well answered and most candidates were not put off by the context. Many candidates scored both marks for realising that a lack of a nucleus provided extra space for haemoglobin and the shape gave a large surface area for the absorption of oxygen.
			Total	0	
5			A – (low white blood cell count), likely to get infection / disease / weak immune system (1) B – (low haemoglobin so) anaemic / get tired easily / less oxygen / breathless (1) C – (low platelets so) blood not clot as quickly / bleed for longer (1)	3	ignore illness ignore pale ignore scabs / wounds not healing Examiner's Comments This question discriminated well and stronger candidates scored all three marks on this question. Regarding A, credit was not given for reference to illness and to score candidates had to refer to disease, infection, or the immune system. In C credit was not given for reference to scabs or wounds not healing.
			Total	0	

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Question			Answer/Indicative content	Marks	Guidance
6	a		'A' because bacteria stimulate antibodies production / once antibodies B are produced A goes down	1	**ignore** reference to antibodies 'engulfing' bacteria **Examiner's Comments** Most candidates correctly identified A as the line showing the number of bacteria but some then failed to use the graph to explain their reasoning but simply stated a fact about bacteria and so failed to gain credit. The commonest explanation was that the number of bacteria went down as the number of antibodies increased.
	b		<table><tr><td>engulf the bacteria</td><td>✓</td></tr><tr><td>stop the bacteria entering the body</td><td></td></tr><tr><td>cause the bacteria to mutate</td><td></td></tr><tr><td>cause the bacteria to reproduce</td><td></td></tr><tr><td>digest the bacteria</td><td>✓</td></tr><tr><td>produce antibodies against the bacteria</td><td>✓</td></tr></table>	2	3 correct = 2 marks 2 correct = 1 mark **Examiner's Comments** Most candidates scored at least one mark here knowing that white blood cells produce antibodies and engulf bacteria, fewer also knew that white blood cells digest the bacteria and managed to gain both marks.
	c		V; idea that **shape** fits	2	explanation must make reference to shape **accept** "same shape" / lock and key idea do not allow just the idea that they 'stick' together **Examiner's Comments** Most candidates understood that antibodies have to fit the antigen and a great variety of appropriate shapes were drawn. A significant number of candidates drew a white blood cell engulfing the bacteria. Some lost the second mark by not clearly indicating the need for a complementary shape for the antibody to attach to the antigen.

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Question			Answer/Indicative content	Marks	Guidance
	d	i	60–65	1	**Examiner's Comments** Common wrong answers here were 10 or 20 days referring to the first rather than the second infection, perhaps thinking that the graph showed three infections at day 0, then at day 10 and day 65.
		ii	memory	1	**Examiner's Comments** Only slightly more than half the candidates knew the role memory cells play in responding to second infections by the same microorganism. White blood cell was a common answer.
		iii	first conclusion correct and second incorrect (1) (first conclusion correct as) **higher / faster** level of antibody response after second infection (1) (second conclusion incorrect as) no information provided about antibiotics / explanation that because of high antibody level Jake does not need antibiotics (1)	2	**accept** implications that first statement is correct and second incorrect maximum 2 marks **Examiner's Comments** Only the best candidates recognised that there were two distinct conclusions that they needed to comment on and so gave answers suggesting that the student was either correct or incorrect and so failed to gain credit. A significant number of candidates clearly thought that as Jake has a second infection he could not be immune and failed to realise the rapid large scale production of antibodies shown in the graph was evidence for immunity. Many attributed the fall in antibodies round day 83 to Jake taking antibiotics, or that antibiotics were making Jake immune suggesting a confusion between the roles of antibodies and antibiotics.
			Total	9	

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Question			Answer/Indicative content	Marks	Guidance
7			chemical defence – antimicrobials ✓ physical defence – cell walls/ leaf cuticle/ waxy cuticle ✓	2 (AO 1.1 x 2)	ALLOW any correct chemical defence Examiner's Comments Question 4 (b) and 4 (c) tested new content to the biology specification. Both questions did not score as well as may have been anticipated. In 4 (c) very few candidates gained both marks, those that did gain one mark often did so for stating a physical defence. Examples of chemical defences were seen less often.
			Total	2	

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