OCR GCSE 21ST CENTURY BIOLOGY B · J257

BIOLOGY



MARK SCHEME

B2.6 HOW CAN WE TREAT DISEASE? (HIGHER)

SCORE	PERCENTAGE
/47	%

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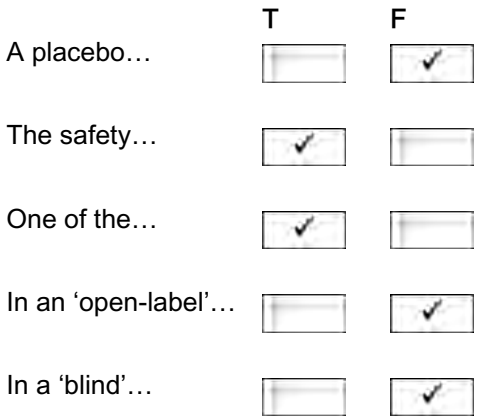
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Question			Answer/Indicative content	Marks	Guidance
1			<table><tr><th>Preclinical tests</th><th>Safety</th><th>Effectiveness</th><th>Both</th></tr><tr><td>Cultured human cells</td><td></td><td></td><td>✓</td></tr><tr><td>Whole animals</td><td></td><td></td><td>✓</td></tr></table> <table><tr><th>Clinical tests</th><th>Safety</th><th>Effectiveness</th><th>Both</th></tr><tr><td>Healthy volunteers</td><td>✓</td><td></td><td></td></tr><tr><td>Humans with the disease</td><td></td><td></td><td>✓</td></tr></table>	2	Tick in correct box for mark If more than one box is ticked in each empty row, do not award the mark even if the correct box is also ticked
			Total	2	
2		i	FIRST CHECK TO SEE IF ANSWER ON THE ANSWER LINE π (7.5 × 7.5) ✓ 177.63 mm^2 ✓	2	
		ii	✓ Antibiotic B has the least effect. Jack should not be given antibiotic B	1	
		iii	Any one from: Used as a comparison ✓ To show that it is the antibiotic that has the effect ✓		
			Total	4	
3			Calculated risk is 5.7% / based on data / stats / results / numbers; Perceived risk is what the patient thinks (the risks are) / opinion;	2	Ignore risk is calculated / probability / value Ignore doctors opinion Examiner's Comments This question discriminated well between candidates. Many candidates struggled with this. Good answers included responses such as perceived risk is what the patients think the risk is and calculated risk includes data/statistics/numbers. Candidates should avoid tautology such as saying perceived risk is what the patient perceives and calculated risk is what the patient calculates.
			Total	2	

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Question			Answer/Indicative content	Marks	Guidance
4		i		3	**ignore** any row in which there is more than one tick all correct = 3 marks four correct = 2 marks three correct = 1 mark **Examiner's Comments** The majority of candidates were able to identify at least 3 statements concerning drug trials to score 1 mark.
		ii	some side-effects may only appear years after taking the drug (1) the drug may become less effective over time (1)	2	**accept** specific examples if clearly linked to long-term / years later **ignore** ref. to resistance **Examiner's Comments** Only some candidates could discuss the long term effectiveness of the drug as well as long term side effects to score full marks.
		iii	**[Level 3]** Answer suggests how it could help the woman AND describes why it might not work, including at least one Level 3 idea from either area. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **[Level 2]** Answer suggests how it could help the woman AND describes why it might not work. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **[Level 1]** Answer suggests how it could help the woman OR describes why it might not	6	**This question is targeted at grades up to A*** **Indicative scientific points may include**: *How it could help the woman:* • the man's blood / it may contain antibodies against Ebola virus • the man's blood may contain white blood cells against Ebola virus • the man's blood may contain memory cells • (antibodies / white blood cells from) the man's blood will help to destroy the Ebola virus **Level 3 idea**: • the memory cells (from the man's blood) can respond / produce antibodies more quickly (than the

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Question			Answer/Indicative content	Marks	Guidance
			work. Quality of written communication impedes communication of the science at this level. (1 – 2 marks) **[Level 0]** Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)		woman / patient) **do not credit** the idea that the man's blood (or virus it contains) acts as a vaccination, or contains drugs *Why it might not work:* • the blood might not contain enough antibody / memory cells • the woman / patient might already be too ill to recover • the man's blood may be rejected / different blood type • the virus has changed / mutated / new strain **Level 3 ideas**: • changed / mutated / different strain / antigens virus won't be recognised by the man's antibodies / memory cells **ignore** idea that the man's blood may cause an infection **Use the L1, L2, L3 annotations in Scoris; do not use ticks**. **Examiner's Comments** This question tested the full range of abilities. Many candidates produced detailed descriptions of how white blood cells work against a pathogen. Some candidates struggled with this idea in the context of the question, often discussing the concept of vaccinations, which did not gain credit.
			Total	11	

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Question			Answer/Indicative content	Marks	Guidance
5	a		200.96 / 201.06 / 201.14 / 201.1 / 201 (2)	2	correct answer = 2 marks 3.14 × 8 × 8 / ? × 8 × 8 / ? × 8^2 = 1 mark Examiner's Comments Most candidates were able to calculate correctly the total area of A.

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Question			Answer/Indicative content	Marks	Guidance
	b		[Level 3] Answer contains: description AND conclusion AND explanation Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) [Level 2] Answer contains: description AND conclusion OR description AND explanation OR conclusion AND explanation Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) [Level 1] Answer contains a description OR an explanation OR a conclusion. Quality of written communication impedes communication of the science at this level. (1 – 2 marks) [Level 0] Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)	6	• B has the greatest clear area around it • A has a clear area around it (although not as big as B) • C has no / smallest clear area around it • water has the same area as C conclusions: • B is the most effective antibiotic • A is effective against the bacteria but not as effective as B • C is not effective against the bacteria descriptions: • water is as good as C against bacteria explanations: • antibiotics are killing / destroying or inhibiting bacteria • where antibiotics are effective the plate appears clear • bacteria may be resistant to C • mechanism of resistance • water acts as a control • to show that water / paper disc has no effect on the bacteria • allows other results to be compared against it Examiner's Comments A good discriminator. Only some candidates were able to link correct descriptions to explanations and conclusions. Recognition that clear areas were due to antimicrobial action was required to gain level 3 marks.

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	c		controls all variables except that which is being investigated (1) Increase confidence in results (1)	2	allow keep everything the same apart from the thing being tested. have trust in results / to allow results to be compared Examiner's Comments Good responses were able to explain what a fair test is and why it is important.
	d		Any 2 from: (firstly) tested on cells / animals (1) (subsequently) trialled on humans (1) blind trials / use of placebo (1) Total	2 12	Examiner's Comments This was a well answered question, demonstrating that candidates have secure knowledge on how drug trials are carried out.

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Question			Answer/Indicative content	Marks	Guidance
6		i	**Any two pairs of improvement + explanation from:** *improvement:* put on gloves before starting / disinfect the bench (with alcohol) before starting ✓ *explanation:* prevent/reduce risk of contaminating **sample/dish** ✓ *improvement:* use a wire loop to transfer bacteria from sample jar to dish ✓ *explanation:* can be flamed to prevent/reduce risk of contaminating **sample/dish** / regulates the amount of bacteria transferred to each **sample/dish** ✓ *improvement:* pass the neck of the jar through a flame before dipping wire loop in / pass wire loop through a flame (and allow to cool) before dipping into sample jar ✓ *explanation:* prevent/reduce risk of contaminating **sample/dish** ✓ *improvement:* idea of not taking lid fully off Petri dish ✓ *explanation:* prevent/reduce risk of contaminating **sample/dish** ✓ *improvement:* idea of working close to a (roaring) Bunsen flame ✓ *explanation:* prevent/reduce risk of aerial contamination of **sample/dish** ✓	4 (AO 3.3b × 4)	If only improvements given with no explanation, award a suitable improvement if it relates to the improvement. Explanation can only be credited if it relates to the improvement. **ALLOW** 'sets up a convection current' for explanation **Examiner's Comments** Aseptic techniques are a key element to one of the practical activities in section B2.4 of the specification and it was evident that many candidates were aware of methods involved. However, the explanations were not always linked to the improvements.
		ii	**FIRST CHECK THE ANSWER ON ANSWER LINE** $3.14 \times (23 \div 2)^2$ ✓ = 415.265 ✓ = 415 (to 3 s.f.) ✓	3 (AO 2.2 × 3)	**ALLOW:** ecf **If answer = 415 award 3 marks** **Examiner's Comments** Most candidates were able to calculate the area of the clear zone. There were a number of common mistakes including the use of the diameter instead of the radius and giving the answer to 3 decimal places and not to 3 significant figures.

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Question			Answer/Indicative content	Marks	Guidance
		iii	Any two from: the bacteria are resistant to antibiotic C ✓ is not effective/does not kill the bacteria ✓ the solution of antibiotic C was too dilute ✓ the discs were soaked in only water by mistake ✓	2 (AO 3.2a × 2)	DO NOT ALLOW bacteria are tolerant or immune to antibiotic C ALLOW no antibiotic on disc / not enough antibiotic on disc Examiner's Comments Common mistakes involved the use of the word 'immune' when 'resistance' was required as well as the use of 'antibodies/antigens' instead of 'antibiotic'. Also some candidates wrongly referred to disc A as a placebo.
			Total	9	

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Question			Answer/Indicative content	Marks	Guidance
7		i	<table><tr><th>Justification</th></tr><tr><td>Men do not get ovarian cancer /do not have ovaries /testing for effectiveness ✓</td></tr><tr><td>Testing for effectiveness (so patients needed to have ovarian cancer)/ drugs were to be used in ovarian cancer patients only ✓</td></tr><tr><td>Unethical as patient needs treatment/ patient could die if not treated/ placebos won't treat the cancer ✓</td></tr><tr><td>Patient needs to agree to having the treatment / neither patient or doctor can influence the survival rate ✓</td></tr></table>	4 (AO 3.1b x 4)	<u>Examiner's Comments</u> 5 (c) (i) was designed to test not only candidates' knowledge of the key terms and stages of drug trials, but whether they understood why trials would use particular methods. Most candidates did score between 1-2 marks on this question, it was rare to see a candidate scoring 4 marks. Most candidates could correctly identify why only women would be used in this trial and why it would be necessary for them to have ovarian cancer to take part in this trial. Candidates clearly understood what a placebo was but did not fully understand why placebos are not used routinely in all drug trials. Very few candidates understood why an open trial would be used in such a trial, most answers for this part focussed on what an open trial was, and candidates did not seem to be aware of the reasons to use open trials when testing drugs such as this. Centres should be encouraged to develop candidates understanding of drug trials using case studies. Examples of drug trials can be readily found on the NHS website.

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		ii	*Group A because:* a higher **proportion/percentage** of the women survived ✓ cancer death rate is high, so increased survival outweighs the risk of the severe side effects ✓ OR *Group B because:* the side effects are less severe ✓ increased survival rate using drugs 1 and 2 does not outweigh the more severe side-effects ✓	2 (AO 3.2a x 2)	**ALLOW** 81% of women survived in Group A compared to 71% in Group B Examiner's Comments This question asked candidates to weigh up the evidence presented to decide what drug combination they would recommend for the treatment of ovarian cancer. Candidates were able to gain credit for selecting either drug combination, provided, they could justify their decision. For those that selected Group A (Drugs 1 and 2) many candidates did not score a mark as their analysis of the data was too superficial. Many simply considered the differences in the number of deaths and simply stated that more or less patients died, without taking into consideration the sample sizes. To access this mark candidates needed to process the data as the different number of patients used in the two trials differed. Only those candidates that processed the data were able to score the first mark point for the idea of proportion or percentage survival rate being greater. Higher ability candidates calculated and stated the percentage survival rates within their answer. This question provides a good learning opportunity to demonstrate to for future cohorts how data may need further processing beyond the basic presentation. An additional point worthy of note relates to candidates understanding of side effects. Many felt that because less side effects were observed in Group A, this would be a reason to use this drug combination. They did not consider the difference in the severity of the side effects.

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		iii	Any one from: raises awareness ✓ it allows decisions to be made based on new information ✓ so people (doctors, nurses, NHS trusts, patients) are better informed/ education ✓ so they can be verified/checked/peer reviewed/further tests or research AW ✓	1 (AO 1.1)	ALLOW examples of decisions that could be made in this context e.g what drugs to prescribe, what risks are associated with the drugs being used Examiner's Comments It was very pleasing to see a great variety of responses to this question. Candidates provided some excellent examples of reasons why scientific findings should be communicated to a wide range of audiences and it was refreshing to see candidates thinking out of the box, rather than answers that had been rote learned. Centres should be congratulated for preparing candidates to 'think' and apply their answers to the situations presented.
			Total	7	

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