OCR GCSE GATEWAY BIOLOGY A · J247

BIOLOGY



MARK SCHEME

B6.3 MONITORING AND MAINTAINING HEALTH (PACK 1)

SCORE	PERCENTAGE
/249	%

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Question			Answer/Indicative content	Marks	Guidance
1			C	1	
			Total	**1**	
2			B	1	
			Total	**1**	
3			B	1	
			Total	**1**	
4			D	1	
			Total	**1**	
5			B	1	
			Total	**1**	
6			A	1	
			Total	**1**	
7			D	1	
			Total	**1**	
8	a		skin forms a barrier (1) enzymes in tears (1) acid in the stomach (1) acid / enzymes break down microbes (1)	1 1 1 1	
	b		**two from:** a chemical (usually) made by fungi / microbes (1) that kills (other) microbes / kills bacteria (1) does not destroy viruses (1)	1 1	
	c		idea that it is a sign of the extent of the disease (1) temperatures far away from normal can be dangerous (1)	1 1	

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Question			Answer/Indicative content	Marks	Guidance
	d	i	to prevent other people taking in the microbe (1)	1	**allow** to prevent other microbes starting to grow / contamination **allow** to prevent release of the bacteria if the dish is dropped / knocked
		ii	correct area = 452(mm^2) (3) or correct measurement of diameter to calculate radius (1) correct calculation using calculated radius (2)	3	**allow** 452.2
		iii	not resistant (1)	1	**allow** ECF from (ii)
			Total	13	

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Question			Answer/Indicative content	Marks	Guidance
9	a	i	a communicable disease ✓ a disease that is caused by defective alleles a non-communicable disease a disease that is affected by lifestyle ✓	1	Both correct answers are required for the mark
		ii	antibodies (1)	1	
		iii	idea that it stops blood flowing backwards (1)	1	
		iii	inefficient circulation to lungs / less blood would go to the lungs (1)	1	
		iii	Increased ventilation required for gaseous exchange (1)	1	
		iii	idea of less oxygen available to the tissues / fatigue / oxygen debt (1)	1	
	b	i	7.5 (years) (1)	1	
		ii	10 years (1)	1	
		ii	idea of time between two peaks (1)	1	
			Total	**9**	
10			A	1	
			Total	**1**	
11			C	1	
			Total	**1**	
12			B	1	
			Total	**1**	
13			D	1	
			Total	**1**	
14			A	1	
			Total	**1**	

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Question			Answer/Indicative content	Marks	Guidance
15			B	1	
			Total	1	

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Question			Answer/Indicative content	Marks	Guidance
16	a		**two from:**		**Allow** broken down
			a chemical (usually) made by fungi / microbes (1)	1	
			that kills (other) microbes / kills bacteria (1)	1	
	b	i	any higher and the bacteria might be killed / bacterial enzymes denatured (1)	1	**allow** optimum temperature for the bacteria / bacterial enzymes
		i	any lower and the erythromycin would diffuse slower / bacteria would reproduce more slowly so takes longer to get the results (1)	1	**allow** spread out slower
		ii	prevent contamination by other microbes (1)	1	**not** germs / bugs
	c	i	correct area = 452(mm^2) (2)	2	**allow** 452.2
		i	not resistant (1)	1	**allow** one mark for correct calculation and interpretation using incorrect radius
		ii	only one plate used / no replicates (1)	1	
		ii	only gives limited information ie one of three choices (1)	1	
	d	i	coat is digested (1)	1	
		i	by enzymes present in small intestine (1)	1	

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Question			Answer/Indicative content	Marks	Guidance
		ii	* Please refer to the marking instructions on point 10 for guidance on how to mark this question. **Level 3** **(5–6 marks)** **Explains the shapes of the two graphs in the effectiveness / safety of the drugs delivery system.** *There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.* **Level 2** **(3–4 marks)** **Explains the shapes of the two graphs the total dosage of the drugs.** *There is a line of reasoning presented with some structure. The information presented is relevant and supported by some evidence.* **Level 1** **(1–2 marks)** **Simply describes the patterns in the graph.** *The information is basic and communicated in an unstructured way. The information is supported by limited evidence and the relationship to the evidence may not be clear.* **0 marks** *No response or no response worthy of credit.*	6	**AO3.2a: Analyse the information and judge the relative effectiveness of the two delivery systems** • links this to the advantages / disadvantages of keeping a steady, intermediate level in the blood • with tablet high levels may be toxic • if reduce the dose, then when levels low it may not kill all bacteria • reference to allowing resistant strains to develop **AO2.2: Apply knowledge to demonstrate an understanding of how the capsules and tablets work in delivering the drug** • any statement regarding the total dosage for the two delivery methods • dosage rises rapidly because of rapid absorption into the blood stream • dosage falls fast because it is rapidly broken down • capsules allow staggered release of drug dosage • this is because walls are different thicknesses of the capsule • therefore different digestion time • conventional tablet releases drug all at once • tablet may not have a coating **AO2.1: Apply knowledge and understanding in reading the graphical information** • Simple description of the patterns of the two lines on the graph.
			Total	**18**	

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Question			Answer/Indicative content	Marks	Guidance
17		i	number of people having strokes is the same after pollution compared to when there is no pollution (1)	1	
		i	pollution is not a risk factor in strokes (1)	1	
		ii	ozone (1)	1	
		iii	data from 28 countries / 6 million people / large sample (1)	1	
		iii	even a small risk factor number means a lot of people (were affected) (1)	1	
			Total	5	

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Question			Answer/Indicative content	Marks	Guidance
18	a		[Level 3] Explains implications of all **three** conditions, at least one of them in detail **and** at least one **calculation** that indicates the number of people that may be involved. Quality of written communication does not impede communication of the science at this level. **(5–6 marks)** [Level 2] Explains implications of **two** conditions **and** at least one **calculation** that indicates the number or a **calculated** percentage of people that may be involved **or two** conditions at least one of them in detail. Quality of written communication partly impedes communication of the science at this level. **(3–4 marks)** [Level 1] Explains implications of at least **one** condition. 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	This question is targeted at grades up to A. **Indicative scientific points at level 3 may include:** • plaque formation / fatty deposits in the coronary arteries can lead to reduced blood supply to heart muscle / lack of oxygen and or glucose to heart muscle / thrombosis • high blood pressure is linked to (an increased risk of) thrombosis / strokes / kidney damage • **allow** Type 2 diabetes causes kidney damage / blindness / poor circulation / ulcers **Indicative scientific points at level 1, 2 may include:** • too much cholesterol in the blood can form plaques in the walls of arteries **ignore** high blood cholesterol is linked to (an increased risk of) heart disease (low demand) • failure to respond to insulin is failure to control blood sugar levels / Type 2 diabetes • **ignore** failure to respond to insulin is diabetes (low demand) **Indicative scientific points at level 1 only:** • high blood pressure is linked to (an increased risk of) heart disease / heart attack • **allow** 1 mark for correct calculation only with no other explanations **example** of calculations • 30 000 people in Singapore have all three conditions (or similar calculation) • 330 000 have high blood pressure only • 68% have a single condition • 60% have at least one heart related / circulatory disease Use L1, L2, L3 annotations in scoris; do

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Question			Answer/Indicative content	Marks	Guidance
					not use ticks. Examiner's Comments There were some good descriptions of the effects of cholesterol and high blood pressure. A number of candidates simply repeated the data given in the pie chart without any type of numerical calculations. The distinction between type 1 and 2 diabetes was often confused and this often limited access to the higher marks.
	b		29% have two of the conditions only but we do not know which two (1)	1	**allow** some people have two conditions but we don't know which one Examiner's Comments This was generally well answered.
			Total	7	

Question			Answer/Indicative content	Marks	Guidance
19			**Level 3 (5-6 marks)** Answer includes reference to heart disease AND diabetes. The link between **type 2** diabetes and failure to respond to insulin AND between high blood pressure / cholesterol and heart disease is made. At least one calculation indicates the number of people that might be involved. Quality of written communication does not impede communication of the science at this level. **Level 2 (3-4 marks)** Answer includes reference to heart disease OR diabetes. There is some attempt to link diabetes with failure to respond to insulin OR to link heart disease with high blood pressure / cholesterol Quality of written communication partly impedes communication of the science at this level. **Level 1 (1-2 marks)** Answer includes some reference to heart disease OR diabetes. Quality of written communication impedes communication of the science at this level. **Level 0 (0 marks)** Insufficient or irrelevant science. Answer not worthy of credit.	6	**This question is targeted at grades up to C** **Relevant points include:** • high blood pressure is linked to an increase risk of heart disease • high blood cholesterol is linked to an increase risk of heart disease • failure to respond to insulin indicates type2 diabetes • too much cholesterol in the blood can form plaques in the walls or arteries • 30 000 people in Singapore have all three conditions (or similar calculation). **allow** higher level answers involving blood pressure and strokes / kidney damage and the consequences of plaque formation in the coronary arteries Level 3 - full answer but no/wrong calculation then max 5 marks **allow** level 1 (2 marks max) for correct calculation with no reference to heart disease/diabetes if refer only to heart attacks instead of heart disease then allow 1 mark (level 1) or 3 marks (level 2) Use L 1, L2, L3 annotations in scoris. Do not use ticks. **Examiner's Comments** This 6 mark extended answer question was targeted across low and standard demand. Accordingly, although two thirds of candidates gained some credit, very few went beyond 4, the most common mark. The question asked candidates to not only use the data provided but also their own biological knowledge and also to include calculations. Some candidates wrote at great length but only described what the pie chart showed, without adding anything

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Question			Answer/Indicative content	Marks	Guidance
					extra, and were not awarded any marks. To gain level 1 (1 or 2 marks) candidates had to appreciate that the conditions could lead to heart disease or diabetes. For level 2 (3 or 4 marks) they had to correctly link heart disease or diabetes to the specific conditions tested for. To gain level 3 (5 or 6 marks), candidates should have stated that failure to respond to insulin is linked specifically to type 2 diabetes, as well as include at least one calculation using the data given, eg to state that 30 000 people had all three conditions. Very few attempted any calculations.
			Total	6	
20			increased salt (in diet) leads to higher blood pressure (1) high blood pressure leads to increased risk of developing heart disease / risk of stroke / blood vessels bursting (1)	2	**allow** positive correlation between salt in diet and blood pressure **ignore** high salt in urine causes high blood pressure **Examiner's Comments** The main issue for some candidates was the failure to differentiate between salt in the diet leading to higher blood pressure and the salt in the urine being an indicator of salt in the diet.
			Total	2	
21			Comment 1 / about being better for health overall is an opinion (1) Comment 2 / difference in fat content / link between fat and heart disease are scientific facts (1)	2	must clearly link each statement to opinion or fact **allow** comment one is opinion and comment 2 is fact (2)
			Total	2	

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Question			Answer/Indicative content	Marks	Guidance
22	a		pathogen (1)	1	**allow** answer ringed, underlined or ticked more than one answer= 0
	b		**any two from:** trapped by mucus (in the airways) (1) (hydrochloric) acid in the stomach (1) blood clotting (1) skin (providing a barrier) (1) **and** the virus is injected into the body / the virus is injected bloodstream (by a mosquito) / virus enters directly into the blood (1)	3	**Allow** ear wax prevents the entry of pathogens via the ear canal **Allow** tears prevent the entry of pathogens via the eye **ignore** reference to cilia / hairs **Allow** mosquito can break the skin
	c		**any two from:** to see if they work / are effective (1) to see if there are any side effects / to see if they are harmful (1) to work out the dose (1)	2	**allow** prevent deaths caused by vaccine / allergic reactions
			Total	**6**	
23			red blood cells – carry oxygen (1) platelets – clotting (of blood) (1)	2	 **allow** stops bleeding **ignore** heals / forms scabs / blocks wounds
			Total	**2**	

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Question			Answer/Indicative content	Marks	Guidance
24			comment 1 / about being better for health overall is an opinion (1) comment 2 / difference in fat content / link between fat and heart disease are scientific facts (1)	2	must clearly link each statement to opinion or fact **allow** comment 1 is opinion, comment 2 is fact (2)
			Total	2	
25	a		contains a dead / weakened / harmless form of the virus (1) (white blood cells) make antibodies (1) the antibodies / memory cells remain / are still present (1)	3	**allow** pathogen / antigens **not** bacteria **ignore** small amount of the virus / weakened dose of disease **ignore** antitoxins / antivirals **allow** on reinfection then antibodies made faster (2)
	b		a tablet / dose / medicine that does not contain any drug / medicine (1) idea to see if any effect is psychological / to see if thinking you had the drug makes a difference (1)	2	**allow** fake drug / sugar pill / inactive drug **ignore** pill that has no effect **allow** effect of drug can be compared to placebo effect / feel good factor / to prevent bias / to compare the results between the real drug and the placebo / to see if the drug works / has any effect
			Total	5	

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Question			Answer/Indicative content	Marks	Guidance
26	a		Any two from: less industrial disease / accidents (1) healthier diet (1) healthier life style (1) better medical treatments / healthcare / cures for disease (1) better housing / sanitation / hygiene (1)	2	**allow** better health and safety (1) **allow** better diet / balanced diets (1) **allow** more exercise / less smoking (1) **ignore** less pollution **ignore** better standard of living **ignore** just better technology
	b	i	life expectancy continues to rise (1) life expectancy for males and females will become the same / converge / get closer together (1)	2	**allow** people will live longer (1) **allow** answers that match their lines drawn e.g. life expectancy for females remains higher than males (1) **allow** marks for age quoted for 2030 that matches line drawn e.g. women may live till they are 90 (1) e.g. women may live till they are 90 and males 86 (2) e.g. people will live longer women may live till they are 90 (2)
		ii	Idea that line of the graphs may not rise at the same gradient. Other factors could stop the age reaching the predicted level	1	e.g. slope of graph may change / rise more steeply / level off (1) e.g. trend may change (1) **ignore** no evidence / no data e.g. such as **new** diseases / epidemics / outbreak of disease / increased resistance of bacteria to antibiotic / increased pollution levels / natural disasters (1) **ignore** illnesses can occur / the future is uncertain
			Total	5	

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Question			Answer/Indicative content	Marks	Guidance
27	a		Any two from: less industrial disease / accidents (1) healthier diet (1) healthier life style (1) better medical treatments / healthcare / cures for disease (1) better housing / sanitation / hygiene (1)	2	 **allow** better health and safety (1) **allow** better diet / balanced diets(1) **allow** more exercise / less smoking (1) **allow** better lifestyle (1) **ignore** less pollution **ignore** better standard of living **ignore** just better technology
	b	i	life expectancy continues to rise (1) life expectancy for males and females will become the same / converge / get closer together (1)	2	**allow** people will live longer (1) **allow** answers that match their lines drawn e.g. life expectancy for females remains higher than males(1) **allow** marks for age quoted for 2030 that matches line drawn e.g. women may live till they are 90 (1) e.g. women may live till they are 90 and males 86 (2) e.g. people will live longer women may live till they are 90 (2)
		ii	idea that line of the graphs may not rise at the same gradient / other factors could stop the age reaching the predicted level (1)	1	e.g. slope of graph may change / rise more steeply / level off (1) e.g. trend may change (1) **ignore** no evidence / no data e.g. such as **new** diseases / epidemics / outbreak of disease / increased resistance of bacteria to antibiotic / increased pollution levels / natural disasters (1) **ignore** illnesses can occur / the future is uncertain
			Total	5	
28			D ✓	1 (AO1.1)	
			Total	1	

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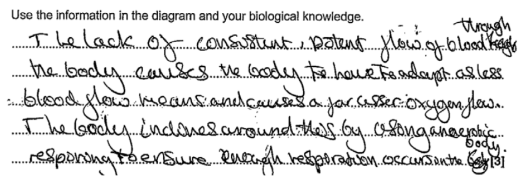
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Question			Answer/Indicative content	Marks	Guidance
29			A ✓	1 (AO1.1)	
			Total	1	
30			A ✓	1 (AO1.1)	
			Total	1	
31		i	idea that stem cells are not differentiated / can still specialised✓ they can replace damaged cells / develop into/change/divide/become retina cells ✓	2 (AO 1.2)	ALLOW stem cells are unspecialised / can differentiate/grow into any (type of) cell ALLOW can differentiate/specialise into retina cells = 2 marks IGNORE can repair retina Examiner's Comments There were some good examples demonstrating their knowledge and understanding of stem cells in this answer. Most common non-credited answers were just repeating the question that they can repair the retina but not describing how. Exemplar 6 gained full marks. Exemplar 6 Why might stem cells be able to repair the retina? stem cells are undifferentiated cells meaning they can be modified to do anything. So scientists are able to modify stem cells to replace the faulty cells in the retina. [2]
		ii	any two from: to see if it works ✓ make sure it is safe / identify side effects✓ to find the correct dosage✓	2 (AO 1.2)	ALLOW see results ALLOW could go wrong / unknown effect IGNORE can't test on humans Examiner's Comments The vast majority of candidates scored at least 1 mark here for side effects / make sure it is safe. The least scored marking point was to find the correct dosage.
			Total	4	

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Question			Answer/Indicative content	Marks	Guidance
32	a		blood vessels / arteries are blocked/narrowed ✓ (heart muscle) gets less blood ✓ (heart muscle) gets less oxygen ✓	3 (AO 2.1)	ALLOW atheroma / plaque formed IGNORE no blood IGNORE no oxygen IGNORE references to blood circulation to body cells <u>Examiner's Comments</u> Over half of candidates scored at least one mark here mainly for less blood flow (to the heart muscle). A lot of candidates got confused with the blood flow to the heart muscle with blood flow to the body cells, therefore not gaining credit. Exemplar 8 demonstrates this confusion and is not credited any marks. Exemplar 8  Use the information in the diagram and your biological knowledge. The lack of consistent, potent flow of blood through the body causes the body to have to adapt as less blood flow means and causes a increase oxygen loss. The body includes around this by using anaerobic respiring to ensure enough respiration occurs in the body. [3]
	b	i	Three / 3 ✓	1 (AO 2.2)	<u>Examiner's Comments</u> The majority of candidates scored this mark. Those who didn't gain the mark incorrectly identified the age range 31-40 instead of the number of points.
		ii	the older a person is, the greater the risk ✓	1 (AO 3.1a)	ORA IGNORE the older the more points

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Question			Answer/Indicative content	Marks	Guidance
		iii	Person A has total of 8 points ✓ Person B has a total of 7 points ✓ Person A has a greater risk ✓	1 (AO 2.2) 1 (AO 2.2) 1 (AO 3.2b)	**If no totalled points on the answer lines then check text boxes** must be correct deduction based on the total of points **ALLOW** correct deduction even if there is an error in the calculation of points Examiner's Comments Most candidates scored at least one mark here for person A. Higher ability candidates achieving full marks here was common.
	c	i	idea that it widens/opens the (lumen) of the artery ✓ more blood/oxygen will be able to reach the heart muscle ✓	1 (AO 2.2) 1 (AO 3.1b)	**IGNORE** expands the artery Examiner's Comments Most common credited mark was for the idea the stent widens/opens up the artery. Few candidates stated that more blood/oxygen would be able to reach the heart muscle.
		ii	advantage: avoids an operation ✓ disadvantage: could be side effects of the drug / must take it on a regular basis ✓	2 (AO 2 × 2.1)	**ALLOW** named side effect e.g. liver damage/upset stomach **ALLOW** may forget to take the drug / misuse of the drug Examiner's Comments Most candidates didn't gain the marks for the advantage of taking statins because they just repeated the question and stated it lowers the level of cholesterol in a person's blood. A number of candidates achieved the disadvantage marking point, with the most common answer being that they have to take it on a regular basis. A number of candidates stated that the blood cholesterol would become too low, which wasn't credited.
			Total	12	

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Question			Answer/Indicative content	Marks	Guidance
33			A ✓	1 (AO1.1)	
			Total	1	
34			D ✓	1 (AO1.1)	
			Total	1	
35			A ✓	1 (AO2.1)	
			Total	1	
36			B ✓	1 (AO1.1)	Examiner's Comments This question was designed to test recall of knowledge AO1.1. It was clear from the responses of the majority of candidates, that there was a lack of the knowledge of white blood cells and their ability to move out of capillaries by changing their shape. The ability of white blood cells to leave the circulatory system through the capillary walls should be taught in the context of white blood cells destroying pathogens.
			Total	1	
37			D ✓	1 (AO1.2)	Examiner's Comments This AO1.2 question required knowledge of scientific enquiry and procedures linked to interactions of diseases. Higher ability candidates were able to identify the link between HPV and cervical cancer, but some candidates assumed incorrectly that the vaccine prevents cervical cancer.
			Total	1	

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Question			Answer/Indicative content	Marks	Guidance
38		i	stem cells are not differentiated/can still specialise ✓ they could become rod cells ✓	1 (AO 1.2) 1 (AO 2.1)	ALLOW stem cells are unspecialised / can grow into any type of cell / have ability to differentiate Examiner's Comments Most candidates were able to describe what a stem cell is assessing AO1.1, and many had the AO2.1 idea that they could become rod cells. Some missed the AO2.1 mark by referring to damaged or mutated cells, instead of the rod cells.
		ii	idea it would not be detected as foreign cells (by the immune system/WBC) ✓ OR idea it would not be rejected (by the body) ✓	1 (AO2.2)	ALLOW accepted (by the body) / (body) more likely to accept Examiner's Comments This AO2 question was generally answered well. Lower ability candidates stated that stem cells from another person "wouldn't work". Marks are scored more frequently when candidates avoid general terms, and responses are specific to the question asked.
			Total	3	

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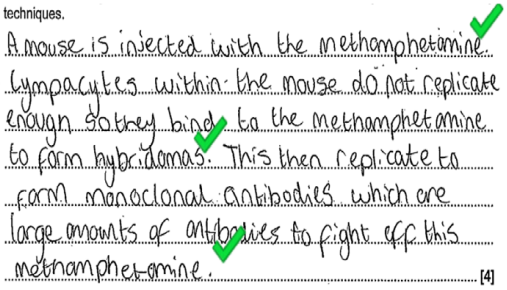
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Question			Answer/Indicative content	Marks	Guidance
39	a		Any two from: a protein molecule ✓ made by the immune system ✓ destroys/kills pathogens / clumps them together / attaches to antigens ✓	2 (AO 2 × 1.1)	 ALLOW made by WBC / found in WBC IGNORE germs and disease IGNORE attack or fight pathogens <u>Examiner's Comments</u> This AO1 recall question did identify some areas for improvement. Candidates struggled with using correct terminology, referring to disease instead of pathogen and attacking and fighting instead of describing the mode of action of antibodies. Few candidates stated that an antibody is a protein. When developing examination technique, candidates should be encouraged to use mark schemes to appreciate the importance of detail and terminology appropriate to GCSE level of study.
	b		Any four from: (inject) methamphetamine/drug into mice ✓ lymphocytes made/collected ✓ fuse with tumour cells ✓ hybridoma cells made ✓ hybridoma make antibodies against methamphetamine/drug ✓	4 (AO 4 × 1.2)	 ALLOW WBC made/collected ALLOW fuse with cancer/myeloma cells <u>Examiner's Comments</u> This AO1.2 question allowed candidates to demonstrate their knowledge of a scientific technique. There were some excellent maximum mark responses by higher ability candidates and most were able to gain 1 or 2 marks. Whilst some candidates knew this process, many forgot what the role of the

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Question			Answer/Indicative content	Marks	Guidance
					antibodies specific to this question was, talking in generic terms and mixing up this example with others. Those that did know this process often wrote about fusing antibodies not lymphocytes with cancer cells, however, many scored the mark for knowing the term hybridoma. Those that scored zero often got confused and wrote about genetic engineering in terms of cutting and splicing DNA. Exemplar 4  techniques. A mouse is injected with the methamphetamine. Lymphocytes within the mouse do not replicate enough so they bind to the methamphetamine to form hybridomas. This then replicate to form monoclonal antibodies which are large amounts of antibodies to fight off this methamphetamine. [4] This candidate has been credited with 3 marks. They have identified specifically that it is methamphetamine that is injected rather than generic antigens. The have identified that lymphocytes are involved, but not gained a mark as they haven't recognised the need to harvest these. Likewise they have incorrectly linked the fusing of these to methamphetamine rather than tumour cells, so have missed that marking point. However, they have recognised that a hybridoma is formed, so get that marking point. Although this last marking point was seldom seen due to many candidate responses describing antibody production in generic terms, here the candidate has identified that the production of large amounts of antibodies is specifically for the methamphetamine so gets a third mark.

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Question			Answer/Indicative content	Marks	Guidance
	c		Any two from: antibodies are specific ✓ only (binds) to **one** drug/antigen (shape) ✓	2 (AO 1.1) (AO 1.1)	**ALLOW** they would not fit together with other drugs Examiner's Comments Although this AO1.1 question was mostly answered successfully there were common errors shown by lower ability candidates. Often lower ability candidates referred to specific antigen rather than specific antibody. Occasionally they would write about bacteria, and in some cases confused this with the lock and key hypothesis and ideas about enzymes.
			Total	8	
40			D	1 (AO 1.1)	
			Total	1	
41			B	1 (AO 1.1)	
			Total	1	
42			B	1 (AO 1.2)	
			Total	1	
43			B	1 (AO 2.2)	
			Total	1	

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Question			Answer/Indicative content	Marks	Guidance
44	a		antigens ✓ white blood cells ✓	2 (AO 1.1)	Examiner's Comments This question differentiated well, with the majority of higher ability candidates correctly gaining full marks here and the lower ability candidates did not. This question required the candidates to demonstrate their knowledge and understanding on the immune response.
	b	i	as a control / to compare the results ✓	1 (AO 1.2)	ALLOW show the drug is having the effect/works /no psychological effect Examiner's Comments This question was correctly answered by about half of all candidates, which required demonstration of their knowledge of the role of a placebo group. Most responses which didn't score focused on the placebo not receiving the antibody, which repeated the stem of the question.
		ii	FIRST CHECK ANSWER ON THE ANSWER LINE If answer = 75 (patients) award 2 marks 480/6.4 ✓ =75 (patients) ✓	2 (AO 2.2)	Examiner's Comments Just over half of candidates were able to correctly calculate the number of patients in the placebo group. This question contributed to the papers ten percent allocation to the mathematical element.
	c		Any two from: for peer review ✓ idea of checking the results ✓ to increase the number of patients tested ✓ conclusions more valid ✓	2 (AO 2.2)	IGNORE get accurate results ALLOW check for safety/bias ALLOW conclusions are more reliable Examiner's Comments The majority of candidates did not gain full marks on this question, but a significant number of candidates gained one mark. The most common awarded mark was the idea of checking. Most candidates did not use the accepted language of measurement and the correct use of the term validity.
			Total	7	

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Question			Answer/Indicative content	Marks	Guidance
45	a		quadrat ✓	1 (AO 1.2)	Examiner's Comments The majority of higher ability candidates gained this mark. Those candidates that didn't score couldn't recall the piece of equipment as a quadrat. Common errors included square frame and Punnett square.
	b	i	FIRST CHECK ANSWER ON THE ANSWER LINE If answer = 0.1 (%) award 3 marks 10x0.25 or 2.5 (m^2)✓ 2.5 ?00 / 0.001 ✓ = 0.1 (%) ✓	3 (AO 2 x 2.2)(AO 1.2)	ALLOW correct conversion of the fraction of the area sampled into a percentage Examiner's Comments Just over half of candidates did not achieve any marks for this mathematical application question and lower ability candidates found having to work out the fraction of the field sampled then convert it into a percentage challenging. The candidates benefited if they showed their working out as there was an error carried forward mark for the correct percentage from an incorrect fraction.
		ii	(student A): has taken more samples/quadrats than B ✓ has sampled all over/spread out/ random over the marsh ORA ✓ samples more likely to be representative / not bias / valid ✓	3 (AO 3.1a x2) (AO 3.2a)	If student B chosen = No marks IGNORE A = 10 and B = 8 samples IGNORE plants more spread out Examiner's Comments The majority of higher ability candidates achieved at least one mark here, with the most common credited mark that student A's sample was random. Very few candidates appreciated the sample would be more valid/representative, using the accepted language of measurement.

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Question			Answer/Indicative content	Marks	Guidance
		iii	**Any two from:** wash hands (after sampling) ✓ not to eat / do not put hands to mouth (whilst sampling) ✓ protective clothing (whilst sampling) ✓ Cover cuts with plasters ✓	2 (AO 3.3b)	**ALLOW** sterilise equipment after use Examiner's Comments Half of candidates achieved one mark on this question. The most common credited response was protective clothing, which was given by candidates analysing the information and making suggestions to improve experimental procedures.
			Total	9	

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<table>
<tr><th colspan="2">Question</th><th>Answer/Indicative content</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>46</td><td>a</td><td></td><td>
<table>
<tr><th colspan="3">Communicable disease</th><th>Non-communicable disease</th></tr>
<tr><th>Caused by a disease bacterium</th><th>Caused by a fungus</th><th>Caused by a virus</th><th></th></tr>
<tr><td>crown gall disease</td><td>barley powdery mildew</td><td>AIDS</td><td>type 2 diabetes</td></tr>
</table>
✓✓✓
</td><td>3 (AO 1.1)</td><td>4 correct = 3 marks,
2 or 3 correct = 2 marks,
1 correct = 1 mark

<u>Examiner's Comments</u>

The majority of candidates were able to achieve at least one mark on this question which required demonstration of knowledge and understanding on causes of various diseases. Roughly half of all candidates were given full marks.</td></tr>
<tr><td></td><td>b</td><td>i</td><td>viruses are not destroyed/killed by antibiotics ✓

wants to avoid the spread of antibiotic resistant (bacteria) ✓</td><td>2 (AO 2.1)</td><td>ALLOW antibiotics are ineffective in treating viruses / antibiotics only kill bacteria

DO NOT ALLOW viruses can become antibiotic resistant

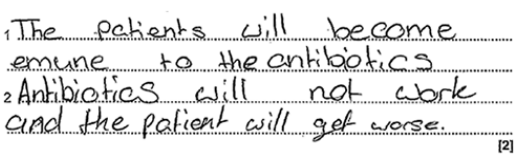
<u>Examiner's Comments</u>

Candidates found this question one of the most challenging on the paper. Only the higher ability students scored a mark here, with the most common mark awarded for antibiotics only work on bacteria or don't work on viruses. There were a lot of responses which were too vague and not specific. Very few candidates were given the antibiotic resistance mark.


Misconception

Candidates demonstrated confusion between immunity and resistance to antibiotics. Exemplar 3 highlights this misconception

Exemplar 3


1 The patients will become emune to the antibiotics
2 Antibiotics will not work and the patient will get worse.
[2]</td></tr>
</table>

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Question			Answer/Indicative content	Marks	Guidance
		ii	virus sinusitis patient's should be getting better / the symptoms should have disappeared/only last 14 days ✓ any symptoms/infection (after 14 days) is caused by bacteria ✓	2 (AO 3.1a)	IGNORE time for bacteria need to grow Examiner's Comments This question required the candidates to analyse and interpret the graph. There were some good responses that correctly explained why doctors wait 14 days after infection before giving antibiotics.
			Total	7	
47			B	1 (AO 2.2)	
			Total	1	
48			A	1 (AO 1.1)	
			Total	1	
49			C	1 (AO 1.2)	
			Total	1	
50			B	1 (AO 1.1)	Examiner's Comments This is an AO1.1 question testing recall of HIV and interaction with cervical cancer. In general, candidates chose either B or C. Candidates who performed well overall chose the correct answer B.
			Total	1	
51			B	1 (AO 1.1)	Examiner's Comments In this AO1.1 question, many candidates incorrectly put A, indicating they are unsure of what an infection is, and also why cancer is not an infection. They do, however, seem to be aware of cancer being linked to uncontrollable cell division.
			Total	1	

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Question			Answer/Indicative content	Marks	Guidance
52			B	1 (AO 1.2)	Examiner's Comments Recalling their knowledge of a scientific technique in this AO1.2 question; this was generally well answered by candidates. Some candidates were distracted by A and this may show a rushed approach to reading each option. Care must be taken to read technical terms very carefully.
			Total	1	
53			B	1 (AO 1.1)	
			Total	1	
54			B	1 (AO 1.2)	Examiner's Comments Recalling their knowledge of a scientific technique in this AO1.2 question, candidates generally answered this well. Some candidates were distracted by A and C.
			Total	1	

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Question			Answer/Indicative content	Marks	Guidance
55	a		spread by wind ✓ spores ✓ enters leaves through the stomata ✓	3 (AO 1.1)	ALLOW spread by water/ air / contact ALLOW enters leaf pores IGNORE holes in leaf / wounds / roots / stem Examiner's Comments On this AO1.1 recall question, most candidates were able to describe a method of spread. Fewer were able to recall the term spore. A much smaller number of candidates knew that the point of entry was stomata, however, responses referring to entry through damage, cuts or wounds and via the roots were more common but did not score.
	b	i	kills the spores / fungus ✓	1 (AO 2.1)	ALLOW kills/burns/eradicates the (barley) powdery mildew Examiner's Comments Many candidates did not score on this AO2.1 question because of the lack of reference to the specific organisms in the question. A common mistake is to give generic responses using terms like disease and infection. Rather unexpected, but throughout this question about a fungus a lot of candidates referred to bacteria and viruses.
		ii	the spores left by the fungus growing on the barley cannot infect wheat / the fungus does not grow on wheat / wheat is not a host for the fungus✓ (after two years) there will be less spores/fungus population / the spores/fungus will die✓	2 (AO 2.1)	AW barley powdery mildew for fungus AW pathogen for fungus ALLOW wheat resistant to barley powdery mildew Examiner's Comments This AO2.1 question was approached more like a recall question by many candidates. A substantial number described crop rotation ideas about depletion/replacement of nutrients. Again, many candidates wrote about killing infections or diseases rather than spores or fungi.

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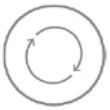
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Question			Answer/Indicative content	Marks	Guidance
	c		(control using) the same field and divide it into two ✓ because different fields may have different types of soil / different minerals / different levels of light ✓	2 (AO 3.3b)	ALLOW any suitable improvement e.g. control light / pH / temperature / same location / use optimum concentration of each fungicide / a control explanation must link to suitable improvement e.g. light because photosynthesis would affect growth/yields Examiner's Comments This AO3.3b question was considering ways of improving experimental design. Many candidates were able to describe the need for a control, less were able to apply their ideas to the scenario in the question, often describing inappropriate ideas such as putting plants in greenhouses or closed systems.
			Total	8	
56			(made by) white blood cells / lymphocytes ✓ when stimulated by antigens / antigens detected ✓	2 (AO 1.1)	DO NOT ALLOW phagocytes IGNORE fight off/combat antigens Examiner's Comments Candidates have a very good understanding of this AO1.1 question recalling knowledge of antibody production. Most used the correct term lymphocyte and knew antibody production was in response to antigens.
			Total	2	

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Question			Answer/Indicative content	Marks	Guidance
57	a		an allele is a form/version of a gene ✓ dominant means that it always expresses itself when present ✓	2 (AO 1.1)	**ALLOW** only needs one allele present to be expressed/shown in the phenotype **ALLOW** allele which is expressed instead of another <u>Examiner's Comments</u> This AO1.1 question proved to be very challenging, even for some higher ability candidates. Many candidates did not define the term allele at all, limiting their maximum mark to 1.  **AfL** Candidates should be encouraged to learn definitions. Many candidates didn't seem to really understand the term dominant, in a biological context, using words like stronger, override or overpower.
	b		Please refer to the marking instructions on page 4 of this mark scheme for guidance on how to mark this question. **Level 3 (5-6 marks)** What the results of the test tell the patient. **AND** Correctly interprets the information in the graph. **AND** Includes an analysis of usefulness of having the test. *There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.* **Level 2 (3-4 marks)** What the results of the test tell the patient. **OR** Correctly interprets the information in the graph. **AND** Includes an analysis of usefulness of having the test.	6 (AO 3 x 2.2) (AO 3 x 3.2a)	**AO2.2 Applies knowledge and understanding to interpret the results of the test and the information in the graph** • the test can tell them if they have the allele and are therefore likely to get the disease • the test will tell them the number of repeats they have • the graph will tell them the mean age that symptoms first develop in somebody who has a certain number of repeats • symptoms develop earlier with an increased number of CAG repeats / ORA • lower number of CAG repeats means a much larger age range in which symptoms first develop / ORA **AO3.2a Analyses information and ideas to make judgements and draw conclusions.** • the person may decide not to have

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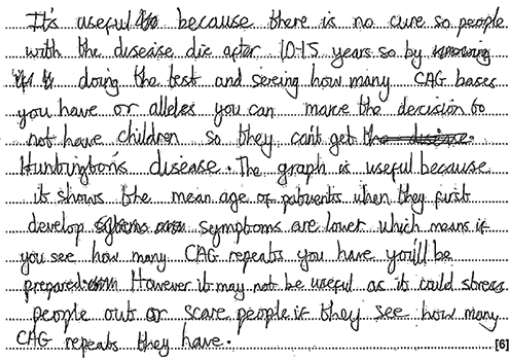
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Question	Answer/Indicative content	Marks	Guidance
	There is a line of reasoning presented with some structure. The information presented is relevant and supported by some evidence. Level 1 (1-2 marks) What the results of the test tell the patient. OR The answer correctly interprets the information in the graph. OR Includes an analysis of usefulness of having the test. *There is an attempt at a logical structure with a line of reasoning. The information is in the most part relevant.* 0 marks *No response or no response worthy of credit.*		children and therefore will not pass on the allele • there is a wide range of ages that a person of a certain age can first show symptoms • it does not show how bad the symptoms are or how long the person will live for • some people would rather not know when, or if, they are likely to become ill • it's useful to be aware and prepare for when the first symptoms will show • less useful/reliable/predictable test of when the first symptoms will show with a lower number of CAG repeats. • less useful as there is no cure only limited treatment for symptoms <u>Examiner's Comments</u> There were a lot of good responses to this Level of Response question covering AO2 and AO3. Many candidates understood what was going on regarding the test and graph, and were able to evaluate the usefulness of these, in some cases in a very well-developed response. Most candidates understood that the test could tell the patient how many CAG repeats they have, and this information, together with the graph, may tell them when symptoms may present. Higher ability candidates appreciated that the information from the graph had limitations. There was, however, some confusion about what the test and graph were for in lower ability candidates. Some were using the graph to decide if they were old enough the take the test so they could find out if they had a history of Huntington's disease. Quite a few suggested the test and graph would allow them to be cured. Quite a few incorrectly explained how somebody's age determined the number of repeats they would have and that this would decrease as they got older. A common misconception was that if 'caught' early, the disease could be prevented or cured. Some candidates seemed to have read the next part of the question (Q22(c)) about

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Question			Answer/Indicative content	Marks	Guidance
					potential treatments and adapted their Level of Response answer, despite it saying a cure was not possible in the stem of the question. Exemplar 1  It's useful ~~to~~ because there is no cure so people with the disease die after 10-15 years so by ~~knowing~~ ~~if~~ doing the test and seeing how many CAG bases you have or alleles you can make the decision to not have children so they can't get ~~the disease~~ Huntington's disease. The graph is useful because it shows the mean age of patients when they first develop ~~sickness and~~ symptoms are lower which means if you see how many CAG repeats you have you'll be ~~prepared~~ However it may not be useful as it could stress people out or scare people if they see how many CAG repeats they have. [6] This exemplar represents an excellent example of how to gain maximum marks. The candidate has clearly identified that the gene test identifies how many CAG bases are present. They also identify that the test will show if the allele is present and links this to a usefulness of making decisions about having children. The graph analysis is also evidenced in the recognition that it identifies the mean age when first symptoms develop and there is a link to the usefulness of being able to prepare, avoid stress and also mentioned about being scared. Communication is clear, concise and as all aspects of the AO2 and AO3 assessment targeted by the question have been covered it gains maximum 6 marks.

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Question			Answer/Indicative content	Marks	Guidance
	c		mRNA prevented from carrying the code (for the protein to the ribosomes) ✓ this stops protein synthesis ✓	2 (AO 2.1 x2)	ALLOW translation cannot take place / ribosomes don't receive the code from mRNA IGNORE references to transcription ALLOW protein (that causes symptoms) is not made/less is made Examiner's Comments In this AO2.1 question a significant number of candidates thought that blocking the code meant the code would not be made at all (i.e. no transcription). A large number thought the method would somehow reduce the number of CAG repeats, and lower ability candidates thought this would get rid of the defective allele somehow. For candidates gaining 2 marks this was often for responses including ideas on 'preventing translation' so 'no protein synthesis or protein made'.
			Total	**10**	
58			C ✓	1 (AO2.2)	
			Total	**1**	
59			D ✓	1 (AO1.1)	
			Total	**1**	
60	a		lung ✓	1 (AO2.2)	
	b		mitosis ✓	1 (AO1.1)	
			Total	**2**	

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Question			Answer/Indicative content	Marks	Guidance
61	a		the blood is less likely to clot / wounds bleed for longer/longer to heal ✓	1 (AO1.1)	**ALLOW** bruise easily / excessive bleeding **ALLOW** tiredness / fatigue / infections
	b	i	**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer = 10 000(per mm^3) award 2 marks** 1000 ÷ 0.1 **OR** 1000 x 10 ✓ = 10 000 (per mm^3) ✓	2 (AO2 x 2.2)	
		ii	no (no mark) (because 10 000) is in the normal range / levels / range without Fanconi anaemia✓	1 (AO3.2a)	**ALLOW** ECF from (i) **ALLOW** 10 000 is between 6000 and 16000
			Total	**4**	

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Question			Answer/Indicative content	Marks	Guidance
62			Please refer to the marking instructions on page 4 of this mark scheme for guidance on how to mark this question. **Level 3 (5–6 marks)** Provides a detailed explanation linking cholesterol to heart disease. **AND** Provides a detailed analysis to explain if this link is supported by the graph. *There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.* **Level 2 (3–4 marks)** Provides a detailed explanation linking cholesterol to heart disease. **OR** Provides a detailed analysis to explain if this link is supported by the graph. **OR** Provides a basic explanation linking cholesterol to heart disease. **AND** Provides a basic analysis of the information to explain if this link is supported by the graph. *There is a line of reasoning presented with some structure. The information presented is relevant and supported by some evidence.* **Level 1 (1–2 marks)** Provides a basic explanation linking cholesterol to heart disease. **OR** Provides a basic analysis of the information to explain if this link is supported by the graph. **OR** Demonstrates knowledge of the importance of the blood supply to the heart muscle. *There is an attempt at a logical structure with a line of reasoning. The information is*	6 (AO2 x 1.1) (AO2 x 2.1) (AO2 x 3.1b)	**AO1.1 Demonstrate knowledge and understanding of the importance of the blood supply to the heart muscle.** • coronary artery carries blood to heart/muscle • blood takes oxygen/glucose to the heart/muscle • heart/muscle carries out aerobic respiration/needs energy • energy is needed for the heart/muscle to contract **AO2.1 Apply knowledge and understanding of the requirements of the heart muscle** • cholesterol build up (partially) blocks the blood flow in the artery • this reduces blood/oxygen/glucose carried to the heart/muscle • heart/muscle carries out less aerobic respiration/less energy released • heart/muscle can't contract as forcefully **AO3.1b Analyse information and ideas to interpret the results on the study** **Support the link:** • men with heart disease had (on average) a higher blood cholesterol level. • Men without heart disease had (on average) a lower blood cholesterol level. • build-up of cholesterol can lead to heart disease **Doesn't support the link:** • considerable overlap between the two groups • men can still have heart disease with low blood cholesterol levels • Men without heart disease can still have high blood cholesterol levels

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Question			Answer/Indicative content	Marks	Guidance
			in the most part relevant. 0 marks *No response or no response worthy of credit*		
			Total	6	
63			C ✓	1 (AO2.1)	
			Total	1	
64			B ✓	1 (AO1.1)	
			Total	1	
65			B ✓	1 (AO2.1)	
			Total	1	

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Question			Answer/Indicative content	Marks	Guidance
66	a		**Any two from:** anaemia / tiredness / lack of energy due to lack of red blood cells ✓ inability to fight off infections / prone to infections due to lack of white blood cells/WBC ✓ slow blood clotting due to lack of platelets ✓	2 (AO2 x 1.1)	**DO NOT ALLOW** incorrectly matched symptom to blood cell type **ALLOW** less immunity / reduced immune response / weakened immune system due to lack of white blood cells/WBC **ALLOW** (recurring) nosebleeds / bruise easily due to lack of platelets
	b	i	people may be ill with infection / have a pathogen / just recovering from infection ✓ therefore have produced more white blood cells to destroy the pathogen/produce antibodies ✓ **OR** weakened immune system/cancer/cancer treatment reducing white blood cell number so less white blood cells to defend against pathogens/produce antibodies	2 (AO2 x 2.1)	**IGNORE** fighting(off) pathogens
		ii	Area = 10 × 10 = 100(mm^2) Volume = 100 × 0.001 = 0.1 (mm^3) ✓	1 (AO2.2)	
		iii	No (no mark) 1000 ÷ 0.1 OR 1000 x 10 ✓ number of white blood cells/mm^3 is 10 x 10^3 / 1.0 x 10^4 / 10000 ✓ within the range of 6.0 – 16.0 x 10^3 ✓	3 (AO2 x 2.2) (AO3.2b)	**ALLOW** ECF from (ii) **ALLOW** number of white blood cells /mm^3 = 10 000 **ALLOW** within the normal white blood cell range/ 6000 – 16000

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Question			Answer/Indicative content	Marks	Guidance
	c		(Fanconi anaemia) (no mark) (3 x 10^6 is a) low red blood cell count ✓ must be Fanconi anaemia because: caused by recessive allele ✓ obtained from heterozygous/carrier parents who don't have a blood disorder ✓ OR cannot be D-B anaemia because: neither parents have a blood disorder ✓ it is caused by a dominant allele ✓	3 (AO3x3.2 b)	if incorrect disorder then no marks IGNORE low numbers of all cells
			Total	**11**	
67	a		antigens are different shapes ✓ idea that antigen binding site/antibody needs to fit the antigen ✓	2 (AO2 x 1.1)	ALLOW idea of each antigen being specific ALLOW idea of antigen binding site/antibody complementary to antigen IGNORE 'lock and key' IGNORE antibody bind/bonds to antigen (in stem of question)
	b	i	Any two from: pregnancy testing ✓ detecting diseases/cancer ✓ treating disease/cancer ✓	2 (AO2 x 2.1)	ALLOW specific diseases e.g. malaria ALLOW pathogen identification ALLOW vaccine development ALLOW drug testing
		ii	they divide rapidly / rapid mitosis / divide indefinitely / can produce many cells ✓	1 (AO2.1)	
			Total	**5**	

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Question			Answer/Indicative content	Marks	Guidance
68	a		Please refer to the marking instructions on page 4 of this mark scheme for guidance on how to mark this question. **Level 3 (5–6 marks)** Demonstrates a knowledge of the importance of the blood supply to the heart. **AND** Applies knowledge to explain why a failure of this blood supply can lead to heart disease. **AND** Analyses the information to explain the link between a lack of LDL protein and heart disease. *There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.* **Level 2 (3–4 marks)** Demonstrates a knowledge of the importance of the blood supply to the heart. **AND** Applies knowledge to explain why a failure of this blood supply can lead to heart disease. **OR** Demonstrates a knowledge of the importance of the blood supply to the heart. **AND** Analyses the information to explain the link between a lack of LDL protein and heart disease. **OR** Applies knowledge to explain why a failure of this blood supply can lead to heart disease. **AND** Analyses the information to explain the link between a lack of LDL protein and heart	6 (AO2 x 1.1) (AO2 x 2.1) (AO2 x 3.1a)	**AO1.1 Demonstrate knowledge and understanding of the importance of the blood supply to the heart muscle.** • blood in the coronary artery supplies heart muscle • oxygen / glucose is supplied to the muscle • this is needed for the muscle to contract/for respiration **AO2.1 Apply knowledge and understanding of the requirements of the heart muscle** • without oxygen / glucose the heart muscle cannot respire • energy from respiration is needed for the muscle to contract **AO3.1a Analyse information and ideas to interpret the effects of lack of LDL receptor protein.** • without LDL receptor protein there will be more cholesterol in the blood / cholesterol levels will be too high to be removed/broken down • increased build up of cholesterol in the coronary artery will increase the risk of heart disease / decrease blood flow to the heart muscle

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Question			Answer/Indicative content	Marks	Guidance
			disease. *There is a line of reasoning presented with some structure. The information presented is relevant and supported by some evidence.* **Level 1 (1–2 marks)** Demonstrates a knowledge of the importance of the blood supply to the heart. **OR** Applies knowledge to explain why a failure of this blood supply can lead to heart disease. **OR** Analyses the information to explain the link between a lack of LDL protein and heart disease. *There is an attempt at a logical structure with a line of reasoning. The information is in the most part relevant.* **0 marks** *No response or no response worthy of credit*		
	b		low dose of the drug does not seem to have any effect ✓ because the effect is very similar to the placebo ✓ high dose of the drug lowers blood cholesterol level most and would be the best way to administer the drug ✓	3 (AO3 x 3.1b)	
			Total	9	

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Question			Answer/Indicative content	Marks	Guidance
69		i	use Benedicts (reagent) ✓ heat / boil ✓ no change in colour / stays blue / does not go red ✓	3 (AO3 x 1.2)	
		ii	Yes (no mark) blood sugar levels will be controlled/not rise ✓ idea of a sugar replacement ✓	2 (AO1 x 3.2a) (AO1 x 2.1)	If No chosen = 0 marks IGNORE blood sugar levels will decrease ALLOW less sugar eaten
			Total	5	

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Question			Answer/Indicative content	Marks	Guidance
70	a		idea that water is added from (each) lake to a (separate) Petri dish using (sterile) pipette ✓ filter paper/antibiotic disc is placed in (the centre of) each dish with the (sterile) forceps ✓ Petri dishes are incubated ✓ idea that the inhibition zone/clear area/area with no bacteria growth around the discs is measured ✓	4 (AO4 x 1.2)	**ALLOW** idea of repeats **ALLOW** idea of setting up a control
	b		Lake Bellandur– no mark **Any two from:** more (antibiotic) resistant bacteria / more species of bacteria are resistant to antibiotics / ORA ✓ Lower number of bacteria killed by antibiotics / less species of bacteria killed by antibiotics / ORA ✓ this lake contains a higher ratio of resistant bacteria compared to bacteria killed by antibiotics✓ (antibiotic) resistant bacteria more likely to survive/reproduce with more (antibiotic) pollution ORA✓	2 (AO2 x 3.2a)	Incorrect or no lake given then no marks **ALLOW** bacteria are more resistant (antibiotic) **DO NOT ALLOW** more resistant to bacteria **IGNORE** immune **ALLOW** only 28 species are killed **ALLOW** idea of natural selection causing increased resistant bacteria with more (antibiotic) pollution
			Total	6	

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Question			Answer/Indicative content	Marks	Guidance
71	a		idea that water is added from (each) lake to a (separate) Petri dish using (sterile) pipette ✓ filter paper/antibiotic disc is placed in (the centre of) each dish with the (sterile) forceps ✓ Petri dishes are incubated ✓ idea that the inhibition zone/clear area/area with no bacteria growth around the discs is measured ✓	4 (AO4 x 1.2)	**ALLOW** idea of repeats **ALLOW** idea of setting up a control
	b		Lake Bellandur– no mark **Any two from:** more (antibiotic) resistant bacteria / more species of bacteria are resistant to antibiotics / ORA ✓ Lower number of bacteria killed by antibiotics / less species of bacteria killed by antibiotics / ORA ✓ this lake contains a higher ratio of resistant bacteria compared to bacteria killed by antibiotics✓ (antibiotic) resistant bacteria more likely to survive/reproduce with more (antibiotic) pollution ORA ✓	1 (AO2 x 3.2a)	Incorrect or no lake given then no marks **ALLOW** bacteria are more resistant (antibiotic) **DO NOT ALLOW** more resistant to bacteria **IGNORE** immune **ALLOW** only 28 species are killed **ALLOW** idea of natural selection causing increased resistant bacteria with more (antibiotic) pollution
			Total	6	

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