

Question number	Answer	Marks	Guidance
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GCSE Biology only

1	<p>Any six from:</p> <ul style="list-style-type: none"> • make culture of floor bacteria or standard bacterial culture • add circles of filter paper soaked in different concentrations of disinfectant • seal, turn upside down • measure diameter of circles of clear jelly (zone of inhibition) • calculate area of clear circles as measure of effectiveness of different concentrations of disinfectant • health and safety considerations: <ul style="list-style-type: none"> ○ bacterial culture could grow dangerous pathogens ○ incubate culture at no more than 25 °C <p>do not open sealed Petri dishes</p>	6	Credit other sensible suggestions.
2 a	<p>fridge temperature: cooler</p> <p>all enzyme-controlled reactions in bacteria are slowed down so they cannot divide so quickly</p> <p>room temperature: nearer optimum temperature for enzymes</p>	<p>1</p> <p>1</p> <p>1</p>	
2 b i	<p>bacteria divide every hour, so 24 times in 24 hours</p> <p>1×2^{24}</p> <p>= 16 777 216</p>	<p>1</p> <p>1</p> <p>1</p>	
2 b ii	<p>bacteria divide every 6 hours, so 4 times in 24 hours</p> <p>1×2^4</p> <p>= 32</p>	<p>1</p> <p>1</p> <p>1</p>	

2 c	$\frac{16777184}{16777216} \times 100$ <p>= 99.9% more bacteria formed at room temperature</p>	1 1	
2 d	<p>pros: would kill bacteria</p> <p>cons: would boil water in strawberries</p> <p>denature enzymes</p> <p>killing cells and turning strawberries to mush</p>	1 1 1 1	
3 a	<p>HIV is virus</p> <p>that causes disease AIDS</p>	1 1	
3 b i	<p>35 million people living with HIV globally, 70% in sub-Saharan Africa</p> $\frac{35000000}{100} \times 70 = 24\,500\,000 \text{ people living with HIV in sub-Saharan Africa}$ <p>1.5 million AIDS-related deaths globally, 70% in sub-Saharan Africa</p> $\frac{1500000}{100} \times 70 = 1,050,000 \text{ deaths from AIDS in sub-Saharan Africa}$	1 1 1 1	
3 b ii	<p>numbers of people affected by HIV and dying from AIDS not known precisely</p> <p>not all cases diagnosed</p> <p>not all deaths properly accounted for</p>	1 1 1	
3 c i	<p>$13.6/26 \times 100 = 52.3$</p> <p>52% of people on treatment</p>	1 1	
3 c ii	<p>poor health care infrastructure</p> <p>many HIV/AIDS sufferers live in poor countries that cannot afford drugs</p> <p>or system of health workers to administer drugs</p>	1 1 1	

3 d i	Any three from: <ul style="list-style-type: none"> • use condoms when having sex • avoid sharing needles • limit number of sexual partners • screen blood for transfusions • HIV-positive mothers should not breastfeed 	3	
3 d ii	condoms: prevent virus passing from one person to another needles: reduce risk of getting virus from infected blood limited partners: reduces chance of having sex with an infected person blood screening: prevents infected blood being given to a healthy patient no breastfeeding: avoids passing virus on in milk to baby	6	Explanations must match methods given in 3 d i. Maximum 2 marks for each explanation.
4 a	award marks for well-drawn graph or chart correctly labelled	5	
4 b	cotton as crop loss reduced by $82.0 - 28.8 = 53.2\%$	1 1 1	
4 c	wheat as crop loss reduced by $49.8 - 28.2 = 21.6\%$	1 1 1	
4 d i	Accept any three plant diseases.	3	
4 d ii	Accept any appropriate effects on crop yield.	6	Explanations must match diseases given in 4 d i. Maximum 2 marks for each explanation.

4 e	Any three from: <ul style="list-style-type: none"> • good field hygiene • keeping plants well apart • controlling insect pests to prevent spread of pathogens • planting disease-resistant strains 	3	
4 f	<p>Crop protection measures can protect crop yields (particularly cotton, potatoes, rice, and maize).</p> <p>improved crop yields provide economic stability</p> <p>(reducing impact on human health of diseases associated with poverty)</p> <p>and reduce risk of food shortage and starvation</p> <p>(communicable diseases more dangerous and prevalent in starving populations)</p> <p>graph/chart demonstrates that research into plant disease prevention increases crop yields</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	