Mark Scheme

Q1.

Question number	Answer	Notes	Marks
(a) (i)			1
(ii)	In the following order only: phagocytes; enzymes;		 1 1
(iii)	produce antibodies/release antitoxins;		1
(b)	<table><tr><th>Bacterial cell</th><th>Human skin cell</th></tr><tr><td></td><td>✓</td></tr><tr><td>✓</td><td>✓</td></tr><tr><td></td><td></td></tr><tr><td>✓</td><td></td></tr></table>	One mark for each correct row	3
(c)	**D** (a single-stranded helix containing the bases AUGC); A is incorrect as RNA is not a double-stranded helix B is incorrect as RNA is not a double-stranded helix C is incorrect as RNA does not contain the base T		1
		Total question = marks	

Q2.

Question number	Answer	Notes	Marks
(a) (i)	C; (pathogen) A not all bacteria cause disease B not all fungi cause disease D not all protozoa cause disease		1
(ii)	• Ebola caused by a virus; • antibiotics only affect bacteria/not active against viruses;		2
(b) (i)	• 700 - 180 = 520; • 520 ÷ 5 (= 104); • 100 (AU per hour);	Ecf max 2 marks if first mp incorrect but value divided by 5 to arrive at correct answer Max 1 if first answer correct but division is incorrect	3
(ii)	• B is bactericidal; • because population decreases/kills bacteria;		2
(iii)	• antibiotic B; • because it kills bacteria/causes population to decrease; • but symptoms may be less severe/mild/reduced; • antibiotic A leaves large numbers alive/bacterial population remains constant/only stops/reduces population growth; • these can still cause disease;		3 Total 11

Q3.

Question number		Answer	Notes	Marks
(a)	(i)	A (psychrophiles); B is incorrect as the temperature of a fridge is not between 12 and 45 degrees C is incorrect as the temperature range is too high for a fridge D is incorrect as the temperature range is too high for a fridge		1
	(ii)	increase in growth/maximum growth; (near) optimum/best temperature;	Allow optimum growth.	1 1
(b)	(i)	measure diameter/area of inhibition/of the clear zone/area of no bacterial growth; greater the diameter, the more effective the antibiotic;	Allow observe size of the clear zone.	2
	(ii)	wash hands/work surface after carrying out procedure; reduces transfer of bacteria; Heat inoculating loop/spreader; To kill bacteria/to prevent contamination; do not open dish following incubation/seal the Petri dish (prior to incubation); reduces risk of bacteria being transferred to student/infection; do not incubate over 25°C; prevents growth of pathogenic bacteria; Sterilise/clean all equipment before/after use; Reduces cross contamination; Seal petri dish/do not open lid of petri dish too far/reduce exposure of contents of dish to air; Reduces contamination by airborne bacteria/to prevent bacteria escaping;	Max 4 if no explanation given.	6 max
			Total question = 11 marks	

Q4.

Question number	Answer	Notes	Marks
(a)	$\frac{30\,000}{100}$ x 40; 12 000;	Full marks for final correct answer ecf	1 1
(b)	a microorganism/named microorganism that causes disease;		1
(c)	It cannot be transmitted from one person to the next		1
(d)	• use a sample of people/use two groups of people; • feed each sample/group of people a different diet/feed one group a diet with vitamin B and the other without vitamin B; • monitor health/compare (health) of two groups;		1 1 1
(e)	• breakdown of cartilage/cartilage not formed properly/damaged; • bones rub together/more friction between bones/less shock absorption;		1 1
		Total question = 9 marks	

Q5.

Question number	Answer	Notes	Marks
(a) (i)	• temperature of incubation; • volume of milk; • composition of nutrients in agar/type of agar;		3
(ii)	size of bacterial growth;		1
(b) (i)	$\frac{7.1}{5}$ = 1.42; $\frac{36.5}{5}$ = 7.3;		2
(ii)	• more bacteria in B; • at start of investigation; • because extra added to tube; • some bacteria in A/milk which grew;		4
(c)	• transfer loop sterilised/heated in flame; • transfer performed quickly;		2
(d)	• repeat investigation; • using other organisms;		2
			Total 14 marks

Q6.

Question number	Answer	Mark
(a)	A	1

Question number	Answer	Mark
(b)(i)	45 000	1

Question number	Answer	Mark
(b)(ii)	A description that makes reference to any two of the following points: • large (1) • increase (1) • more than doubled (1)	2

Question number	Answer	Mark
(c)(i)	One mark for each of the following: • abstain from/reduce sexual partners (1) • use condom (1)	2

Question number	Answer	Mark
(c)(ii)	Antibiotics/named antibiotic	1

Question number	Answer	Mark
(d)	An explanations that makes reference to any two of the following points: • lack of barrier (1) • allows fluids to mix (1) • fluids contain bacteria/viruses/fungi (1)	2

Q7.

Question number	Answer	Notes	Marks
(a)	<table><tr><th>Name of disease</th><th>Type of organism</th><th>Method of transmission</th></tr><tr><td>malaria</td><td>protozoan;</td><td>mosquito;</td></tr><tr><td>poliomyelitis</td><td>virus;</td><td>air/water;</td></tr><tr><td>typhoid</td><td>bacterium;</td><td>food/water/housefly;</td></tr></table>	For methods of transmission: Allow anopheles/vector Allow droplets for water Allow vector for housefly	6
(b)	• caused by a fungus (1) • (antibiotics) only effective against bacteria/ not effective against fungi (1)	Allow (antibiotics) do not kill fungi	2

Q8.

Question number	Answer	Notes	Marks
(a) (i)	• genetic material made of RNA (1) • no DNA (1)		2
(ii)	<table><tr><th>Disease</th><th>Blood Tested (✓)</th></tr><tr><td>anaemia</td><td></td></tr><tr><td>cystic fibrosis</td><td></td></tr><tr><td>gonorrhoea</td><td>✓</td></tr><tr><td>HIV</td><td>✓</td></tr><tr><td>scurvy</td><td></td></tr></table>	-1 for each extra tick	2
(iii)	• donor/blood transfused into person with Ebola (1) • needs to be compatible/matched/same group/not rejected (1) • otherwise agglutination/clumping occurs (1)	R clotting	3
(iv)	• cause blood cells to burst/cells are damaged/destroyed/lose structure (1) • results in loss of function (1)		2
(v)	• antibodies in donated blood (1) • can destroy virus in infected person (1)		2
(b)	• uracil present, not thymine (1) • guanine would pair with cytosine/adenine with uracil (1) • percentage of G and C/A and U would be the same (1)		3
		Total for question = 14 marks	

Q9.

Question number	Answer	Notes	Marks
(a)	• plasma contains no cells (1) • plasma colourless/whole blood red (1)	Allow reverse for whole blood	2
(b)	any six from • blood of patient contains antibodies (1) • (antibodies) bind to Ebola/virus antigens/antibody-antigen complex formed/antibodies complementary to (virus) antigens (1) • phagocytes engulf (antibody-antigen complex) (1) • Ebola/virus destroyed (1) • testing of patient's blood ensures no disease present/prevents transfer of disease (1) • removal of red blood cells ensures no reaction when blood transfused/no agglutination (1) • anti-Ebola antibodies in transfused blood help person with disease to recover (1) • more effective than medicine (1) • quicker effect (1)	Ignore fight disease/virus Allow passive artificial immunity	6

Q10.

Question number	Answer	Notes	Marks
(a)	Three from: • (parasite) carried by mosquito/mosquito is a vector; • mosquito bites human; • parasite/infected blood drawn/sucked up into mosquito; • infected blood transmitted to other people;		Max 3
(b)(i)	• fewer deaths caused by *P.vivax* in R than Q • (but) more deaths caused by *P.vivax* in R than in Q as a proportion of the total; • 190 000 fewer deaths caused by *P.vivax* in R/300 less deaths in Q caused by *P.vivax*; • 0.5% deaths caused by *P.vivax* in Q/62.5% of deaths caused by *P.vivax* in R;		1 1 1
(ii)	more mosquitoes in one region than another/climate favours breeding of mosquitoes/more dense population of people/better health care/use of (named) preventative measures;		1
(c)	Three from: Fewer people with malaria/reduced incidence of malaria; Immunity/antibodies against parasite/herd immunity; Reduction in population of/death of parasite; Less transmission (from one person to another);		Max 3
(d)	Three from: (sexual reproduction) • gives rise to variation in offspring; • variation provides a survival advantage; • parasite more likely to survive in a changing environment; (asexual reproduction) • parasite can reproduce faster; • no need to find a mate/only one parent needed; • larger number of offspring produced;	Answer must contain at least one advantage of each method	Max 3

Q11.

Question number	Answer	Notes	Marks
(a) (i)	A (bacterium); B doesn't cause it C doesn't cause it D doesn't cause it		1
(ii)	• no of cases decreases as vaccination rate increases; • lag in effect; • fluctuations in number of cases; • despite percentage of vaccinations remaining constant;		4
(b)	2.75 per 100 000; $\frac{2.75 \times 3\,450\,000}{100\,000}$; = 95 people;	correct answer without working = 3 ECF = 2	3
(c)	• inject weakened/attenuated organism; • causes antibody production; • antibodies remain in blood; • memory cells formed; • on infection antibodies can respond quickly;		5
			Total 13 marks