

Question 5 (Answer: **D**)

- A virus is not a cell at all – it has no cytoplasm, membrane or ribosomes.
- It is a particle consisting of nucleic acid inside a coat.
- That coat, the capsid, is built from protein subunits, not phospholipids.

Question 36 (Answer: **A**)

- Better housing and nutrition reduce crowding and improve resistance to infection.
- Effective antibiotics and the BCG vaccination programme reduce cases directly.
- The fall begins well before antibiotics existed, so improved living conditions must be part of it.

Question 37 (Answer: **C**)

- A vector is an organism that carries the pathogen between hosts.
- Malaria's vector is the *Anopheles* mosquito, which breeds in standing water.
- Draining pools removes the breeding sites; cholera is waterborne and the others need no vector.

Question 38 (Answer: **C**)

- Malaria needs both a suitable climate and its mosquito vector, so 1 and 3 apply.
- There is no vaccine that has eradicated malaria anywhere, so 2 is false.
- That combination of climate and vector is what confines it to the tropics and subtropics.

Question 36 (Answer: **B**)

- Malaria is caused by *Plasmodium*, which is a protoctist.
- Tuberculosis is caused by *Mycobacterium*, which is a bacterium.
- Neither is a virus, and a protoctist is eukaryotic, not prokaryotic.

Question 37 (Answer: **A**)

- Cholera is spread by the faecal–oral route, through water contaminated with sewage.
- So treating sewage breaks the transmission route.
- Insecticide targets mosquitoes (malaria), antivirals do not work on bacteria, and needles spread HIV.

Question 36 (Answer: **C**)

- Cholera is faecal–oral, HIV/AIDS is sexually transmitted, malaria needs a vector.
- Tuberculosis is spread by airborne droplets.
- Match each disease to its own route rather than assuming any pattern.

2(a)	<i>Vibrio cholerae</i> ; must be spelled correctly
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2(b)	any four from: <i>within general response, in correct context</i> 1 ref. to, <u>contamination</u> / <u>contaminated</u> ; A presence of, pathogen / <i>V. cholerae</i> / bacterium <i>in correct context (can look for ora)</i> 2 ref. to breaking the <u>transmission cycle</u> ; <i>providing access to safe drinking water</i> 3 cholera is transmitted by <u>faecal-oral</u> route ; A described e.g. ref. to (contaminated) faeces <u>and</u> ref. to, food washed in contaminated water or drinking (contaminated) water or eating (contaminated) food <i>practise personal hygiene</i> 4 ref. to using method to make sure faeces do not enter drinking water ; e.g. use of, toilets / latrines A do not defaecate in or near, rivers / reservoirs / lakes AW <i>accept</i> urinate I non-scientific terms for, defaecation / urination 5 washing hands ; 6 detail ; e.g. use, soap / antibacterial gel / AW after, urination / defaecation A after going to the toilet before handling foods <i>context is preparation or eating a meal</i> scrub under fingernails cafes, restaurants / AW, provide places for washing hands do not share towels / use disposable towels / AW 7 AVP ; e.g. water, is / should be, chlorinated / boiled / bottled / filtered to remove pathogens / UV-treated / other water, is / should be, kept separate from sewage / piped direct from water treatment plant keep fingernails short safe disposal of vomit
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- 2(c)(i) *antigen is a standalone mark then move to rows 3,4,5*
if no marks gained from rows 3,4,5, check for correct answers in these rows going down the column to award 1 mark

row	feature	oral cholera vaccine	passive immunisation for cholera
1	component causing the desired response	<u>antigen(s)</u> ; I weak / weakened / toxin A toxoid / inactivated toxin R dead antigen A weakened / attenuated / dead, pathogen / <i>V. cholerae</i>	antibody
2	type of immunity gained	artificial active	artificial passive
3	stimulates production of memory lymphocytes	<u>yes</u> / no	yes <u>(no)</u> ;
4	length of time needed to have an effect	shorter same <u>longer</u>	longer same <u>shorter</u> ;
5	duration of immunity	shorter same <u>longer</u>	longer same <u>shorter</u> ;

- 2(c)(ii) B-lymphocyte / plasma cell / splenocyte, and, myeloma / tumour, cell ;
 A B-cell for B-lymphocyte
 A cancer cell for myeloma cell
- plus two from:*
 (B-lymphocyte) synthesises (specific / desired) / AW, antibody ; I has the antibody
 (B-lymphocyte) cannot survive (for long) / dies, in culture ;
 (myeloma cell) can divide / can carry out mitosis / long-lived ; I rapidly / fast
 A plasma cell cannot divide
 R (hybridoma cell) divides uncontrollably

- 2(a) cholera = prokaryotic
and
 malaria = eukaryotic
and
 TB = prokaryotic ;

- 2(b) pathogen ;

2(c)(i)	magnification (x) 12 000 ;; for line X-Y measuring 24 mm A calculated values for line X-Y measured between 23 to 25 mm for one mark: • correct calculation for 23.5 or 24.5 but not to 3 sig. figs = 1 mark • incorrect answer e.g. conversion factor incorrect, but – shows correct measurement for image – uses correct formula for calculation – answer to 3 sig. figs • measurement 22 mm or 26 mm – correct answer for their measurement – uses correct formula for calculation – answer to 3 sig. figs
2(c)(ii)	any three from: 1 by a vector / carrier / mosquito / insect / (female) <i>Anopheles</i> ; 2 takes, blood meal / sucks blood / feeds on blood ; context is transmission from infected to uninfected 3 <i>Plasmodium</i> / pathogen / parasite, is in blood ; in correct context 4 injects <i>Plasmodium</i> / AW, together with, anticoagulant / saliva ; 5 AVP ; e.g. <i>Plasmodium</i> / AW, migrates, after ingestion / from insect gut / AW, to salivary glands if another mode of transmission stated, e.g. transfusion, allow mp1 and mp3 and a relevant AVP

2(d)(i)	any two from: (phagocyte) has (specific) <u>receptors</u> (for PS) ; R antigens A named e.g. macrophage / monocyte / Kupffer cell / neutrophil PS binds to (phagocyte / cell surface) receptor (to stimulates a response) ; A phagocyte has a binding site for PS / PS binds to a binding site <i>ref. to (PS presence / change in membrane) causes chemotaxis / attracts phagocyte (to red blood cell)</i> <i>treat as neutral suggested chemicals that trigger chemotaxis</i> AVP ; e.g. PS acts as an antigen
2(d)(ii)	any one from: <i>why uninfected red blood cells are destroyed</i> (some) PS is present in outer layer so can be, recognised / detected ; AW <i>why only some red blood cells are destroyed</i> only a few PS in outer layer so lower chance of being recognised ; parts of, parasite / pathogen / <i>Plasmodium</i> (in circulation), may become attached to, surface / cell surface membrane ; (cell) displays, a foreign antigen / a non-self, antigen ; displays an antibody (attached to antigen) ; damaged (by other means) / at end of life-span / non-functioning, (so need destroying) ;
2(e)(i)	R if context is, red blood cell / entry into red blood cell by pathogen any one from: <i>context is Plasmodium</i> for, cell membrane(s) / cell surface membrane ; maintain / regulate, stability / fluidity, of membrane ; I affects / changes, <i>if not qualified</i> A phospholipid bilayer <i>for membrane</i> to, convert / AW, to other products needed ; to (breakdown and) use as an energy source ; cannot / does not have gene to, synthesise cholesterol ; AVP ; e.g. to form, vesicle / vacuole (to contain replicated cells)

2(e)(ii)	I <i>ref. to temperature</i> <i>any two from:</i> 1 make more fluid / increase fluidity ; 2 decrease / reduces, membrane stability ; 3 increases, entry / exit, of, polar molecules / ions / water ; A increases, permeability / described 4 allow increased (lateral) movement of cell components within bilayer ; 5 reduced interaction with fatty acid tails ; 6 AVP ; e.g. decreased interaction with proteins, so affecting their function may affect ability to distort shape when passing through capillaries <i>if no marks gained, allow one compensation mark for</i> - changes two of: fluidity / stability / permeability ecf from 'decreases fluidity'
2(f)(i)	<i>any one from:</i> active / energy-requiring, process ; A need energy, for the process / to move phospholipids moving, phospholipids / named, against the concentration gradient / to area with higher quantity / AW ; to allow conformational change (of enzyme) ; I active transport but R if described as movement across the membrane
2(f)(ii)	<i>any one from:</i> actively transport / pump, Ca^{2+} / calcium ions, out of cell (once entered) ; transports Ca^{2+} / calcium ions, (out) against the concentration gradient ; cell surface membrane impermeable to, Ca^{2+} / calcium ions ; no / very few, transport / pump / carrier / channel, (membrane) proteins ; <i>context is for entry of calcium ions</i>

2(f)(iii)	<i>any three from:</i> 1 scramblase, activated / becomes active / begins functioning / AW ; <i>context is, increase in Ca^{2+} / when Ca^{2+} binds</i> A Ca^{2+} increases, more scramblase binds to Ca^{2+} ora scramblase, suppressed / inactive (only), in low Ca^{2+} concentration 2 scramblase moves, PC from outer to inner layer or PE / PS, from inner to outer layer ; I scramblase randomly moves, PC / PE / PS 3 described effect on, distribution / organisation / asymmetry / AW (of phospholipids in cell surface membrane) ; e.g. becomes, disrupted / disorganised / more random is uncontrolled / not regulated becomes more, symmetrical / even / evenly balanced higher proportion of, PC in inner layer higher proportion of, PE / PS, in outer layer (than normal) <i>(idea that the phospholipids are in the incorrect location)</i> 4 scramblase activity higher than activity of, flippase / floppase or <i>idea that, flippase / floppase, action cannot counteract effect of scramblase ;</i> 5 ATP runs out, qualified ; e.g. to maintain asymmetry for (increased), flippase / floppase, activity to move phospholipids (against their gradient) 6 AVP ; e.g. Ca^{2+} is, a cofactor / needed for scramblase function
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