1)

(a)	Capsule / glycocalyx / slime layer; Circular / ring of / non-linear DNA / DNA without histones; Plasmid; Flagellum; Pilus; Small / less dense / 70s ribosomes;	3 max	**Q** *Reject:* capsid *Neutral:* slime *Neutral:* mesosome *Accept:* cell wall if qualified as murein / peptidoglyclan *Neutral:* structures *absent* from prokaryotes
(b)	Lower / more negative water potential (in lumen / intestine / gut); Water enters (intestine) / leaves (body) cells by osmosis;	2	**Q** Use of correct terminology. Do not credit references to 'water concentration'. *Neutral*: hypertonic instead of lower water potential *Neutral*: water does not leave lumen by osmosis Must be in the correct context.
(c)(i)	Kills / destroys bacteria; ***OR*** Does not contain bacteria / removes bacteria / sterile / prevents bacteria entering body;	1	**Q** Do not allow 'kills germs' *Accept:* microorganisms / pathogens / examples *Neutral:* denatures bacterial enzymes *Neutral:* to make it easier to dissolve the powder *Reject:* denatures bacteria / kills toxins
(c)(ii)	Sodium (ions) / potassium (ions) / chloride (ions) / citrate (ions);	1	**Q** *Reject*: chlorine *Neutral:* salts *Accept*: chlorine ions *Accept*: sodium chloride / salt *Neutral:* water *Neutral:* amino acids

2)

(a)	Peptide;	1	**Q** Do not accept polypeptide *Neutral:* covalent
(b)	(F) H J E (K);	2	All three boxes correct = 2 marks Two boxes correct = 1 mark
(c)	(Site of aerobic) respiration; Release ATP / energy; Active transport / transport against the concentration gradient / protein synthesis / exocytosis;	2 max	**Q** *Reject*: anaerobic respiration **Q** *Reject*: produces / makes energy *Accept:* produces ATP for energy *Reject:* produces ATP for respiration *Neutral:* protein secretion
(d)(i)	Breaks open cells / disrupts cell membrane / releases cell contents / releases organelles / break up cells;	1	*Reject:* breaks down cell wall *Neutral:* separates the cells *Reject:* breaks up cells so they can be separated *Reject:* breaks up / separates organelles
(d)(ii)	Removes (cell) debris / complete cells / tissue;	1	*Neutral:* to isolate organelle **G** / mitochondria *Neutral:* removes unwanted substances / impurities *Reject:* removes organelles / cell walls
(d)(iii)	Reduces / prevents enzyme activity;	1	*Reject:* ref. to denaturation

(d)(iv)	Prevents osmosis / no (net) movement of water / water does not enter organelle / water does not leave organelle; So organelle / named organelle is not damaged / does not burst / does not shrivel;	2	*Neutral:* ref. to water potential **Q** Ref. to cells rather than organelles negates the second mark only *Reject:* ref. to turgid / flaccid for second mark *Reject:* organelle 'explodes' for second mark

3)

(a)	(yes): Many women (with cervical cancer) have HPV 16 (18 &31); (no): Few women (with cervical cancer) have HPV 6 /11; (HPV infection does not mean causation because): Could be caused by another factor / example given / may be due to coincidence; No control group / did not study HPV in healthy women / did not study all HPV types / having cancer may increase susceptibility to HPV / does not add up to 100% / not all women with cancer have HPV / individual may have more than one HPV type;	3 max	*Neutral:* correlation between HPV (16) and cervical cancer *Reject:* many women with HPV 16 (18 &31) have cervical cancer / not all women have cancer *Accept:* figures from graph for 'many' and 'few' *Accept:* minor errors in reading HPV frequencies from graph *Reject:* does not mean HPV vaccine causes cancer; *Neutral:* refs. to sample size and factors that should have been kept constant
(b)(i)	Protein / glycoprotein / glycolipid / polysaccharide; Causes immune response / antibody production;	2	 *Accept:* B / T cell production
(b)(ii)	Memory cells produced / remain / stored (from previous infection); (When individual) comes into contact with virus / antigen (again); Rapid / secondary / greater response / many or more antibodies produced; Destroys virus / antigen before it can cause harm / symptoms / cancer;	3 max	*Neutral:* antibodies produced / remain *Neutral:* 'cell' instead of 'virus' *Reject:* 'bacteria' once only *Accept:* B cells / T cells *Reject:* if destroys the virus / antigen *in the vaccine* before it can cause harm **Q** Do not allow 'fights HPV' **Q** Do not allow 'memory cells remember'

(c)	HPV destroyed in males / prevents males being carriers of HPV; Prevents males passing on HPV (to unvaccinated females) / HPV may cause (other) cancers in males;	2	*Neutral:* prevents males catching HPV *Accept*: reference to herd effect protecting the population

4)

(a)	Active site; (Complementary / specific) structure / shape; (Only) fits / binds to gangliosides; Forms enzyme-substrate complexes; ***OR*** Active site; (Complementary / specific) structure / shape; (Does not) fit / bind with other lipids; Does not form enzyme-substrate complexes;	3 max	Note: 'active site has a specific shape' = 2 marks; *Reject*: same shape Second mark for either route can refer to the enzyme or the substrate *Accept:* converse of second mark point and (different) structure / shape if referring to other lipids
(b)(i)	No change / substrate remains high / horizontal line;	1	Curve should be labelled If curve **H** correctly labelled then assume other is curve **T** *Reject:* obvious rise or fall / rise then plateau
(b)(ii)	Curve decreases rapidly at first then more slowly;	1	Curve should be labelled If curve **T** correctly labelled then assume other is curve **H** *Reject*: falling at a slower rate initially
(c)	(Enzymes are) proteins; Digested / broken down / destroyed (by enzymes / acid); ***OR*** (Enzymes are) too large; To cross cell membranes / be absorbed / enter the bloodstream;	2	*Accept:* denatured (by acid) *Neutral:* digested by saliva *Reject:* digested by amylase *Neutral:* will not reach the bloodstream

5)

(a)		Helical /spiral/coiled; Compact / description e.g. 'tightly packed'; Insoluble; Prevents osmosis/uptake of water / does not affect water potential / (starch) does not leave cell; Large molecule / long chain; Does not leave cell;	1 1 1 1 1 1	2 max Feature = one mark Explanation = one mark These must be related for both marks but can be in reverse order. Allow idea of compact/helical/spiral/coiled due to bonding for two marks.
(b)	(i)	β/beta Glucose;	1	**Q** Reject alpha glucose
(b)	(ii)	Glycosidic;	1	
(c)		Long/straight/unbranched chains (of glucose); (Joined by) hydrogen bonds; Form (micro)fibrils/(macro)fibrils; Provide rigidity/strength/support;	1 1 1 1	3 max **Q** Ignore reference to alpha glucose Allow suitable descriptions for last point e.g. 'prevents bursting';

6)

(a)		Light (intensity) / temperature / air movement / humidity;	1	
(b)		Prevent air entering / continuous water column;	1	Allow answer in context of shoot, xylem or potometer.
(c)		Distance and time; Radius/diameter/area (of capillary tube);	1 1	Reject 'amount bubble moves'
(d)		(used to provide) turgidity/support/description of; (used in) photosynthesis / (produced in) respiration; Apparatus not sealed/'leaks';	1 1 1	2 max
(e)	(i)	Returns bubble (to start);	1	
(e)	(ii)	Increases reliability (of results) / anomalous result can be identified;	1	**Q** Ignore references to validity/precision/accuracy etc.

7)

(a)		Isolation / quarantine / 'kept separate'; Screening/testing (of patients/doctors etc); Sterilisation of wards/equipment / method to improve hygiene;	1 1 1	2 max Do not allow improve 'hygiene' or 'cleanliness' without named example such as 'washing hands' use of gloves etc.
(b)		May not all be absorbed; May be broken down /metabolised/excreted quickly; To kill the microorganisms/bacteria; Reference to antibiotic resistance;	1 1 1 1	2 max Reference to becoming 'immune' negates last marking point.
(c)	(i)	P;	1	
(c)	(ii)	S;	1	
(d)	(i)	Prevents bias; Vested interest (of scientists); Prevents 'placebo'/positive/negative/psychological effects/'demand characteristics' (in volunteers);	1 1 1	

(d)	(ii)	Age; Ethnicity; Lifestyle; Body mass; Health; Sex of person;	1 1 1 1 1 1	2 max Ignore references to same or different
(e)	(i)	Gradual/slight increase followed by rapid/greater increase;	1	Allow more detailed descriptions which describe similar trend of gradual increase followed by rapid increase.
(e)	(ii)	1. No/little resistance shown to drug X; 2. Mutation present (for antibiotic resistance); 3. Gene/allele for (antibiotic) resistance; 4. Bacteria with (antibiotic) resistance survive; 5. Vertical gene transmission; 6. Frequency of gene/allele (for resistance) increases;	1 1 1 1 1 1	max 4 Reference to horizontal gene transmission = neutral Reject mark for mutation if context suggests presence of antibiotic causes bacteria to mutate. Resistance is passed on by vertical gene transmission = two marks i.e. points 3 and 5.