

Question 3 (Answer: **A**)

- Lipids are made on the *smooth* endoplasmic reticulum, so that is required.
- Vesicles are needed to carry the lipid to the membrane for secretion.
- Mitochondria supply ATP for the secretion, so all three are involved.

Question 4 (Answer: **A**)

- The organelles shown are eukaryotic, so the ribosomes are 80S, not 70S.
- Antibodies are proteins made by plasma cells, which are animal cells – so this is not plant tissue.
- Rough ER with Golgi and vesicles is exactly the machinery for making and exporting antibodies.

Question 2 (Answer: **A**)

- Cholera is caused by a bacterium, so the cell is prokaryotic.
- Prokaryotes have circular DNA lying free in the cytoplasm, so 1 and 2 both apply.
- Their ribosomes are the smaller 70S type, so all three are present.

Question 5 (Answer: **B**)

- Read the micrograph for the giveaway features before deciding the cell type.
- A peptidoglycan wall belongs only to bacteria; histones and mitochondria belong only to eukaryotes.
- So the three cannot all be present – decide which pair goes together.

Question 2 (Answer: **B**)

- A density gradient separates structures by density, densest travelling furthest.
- Ribosomes are tiny and dense; nuclei are the largest and heaviest organelles.
- So read the order of the fractions to identify each structure by its relative density.

Question 7 (Answer: **B**)

- A virus has a nucleic acid core, which may be DNA *or* RNA, inside a protein coat.
- So features 1, 2 and 4 can all be present.
- No virus has ribosomes of any kind – it borrows the host's, so 3 is impossible.

Question 3 (Answer: **A**)

- Mitochondria and chloroplasts each have their own circular DNA.
- They also have 70S ribosomes and a double membrane.
- Those are prokaryotic features, which is the evidence for the endosymbiotic theory.

Question 4 (Answer: **C**)

- Work through the table column by column, deciding what each combination of structures means.
- A cellulose cell wall and chloroplasts together indicate a plant cell.
- No nucleus and no mitochondria indicates a prokaryote.

1(a)	<i>any two from: allow oras</i> 1 cilium composed of microtubules or microvillus, composed of microfilaments / contains actin (filaments) ; 2 cilium 9+2 (microtubule) arrangement ; 3 cilium has basal body ; A has centrioles at the base 4 cilium shows synchronous, rhythm / movement ; A whip-like / rhythmic, movement 5 cilium, moves / wafts, mucus or microvillus increases, surface area / SA, for, absorption / uptake / secretion ; A increases SA to locate transport proteins AW 6 AVP ; e.g. cilium has dynein (arms) cilium is, longer (10 μm) / wider (0.2 μm) or microvillus is, shorter (1 μm) / narrower (90 nm)
1(b)	<i>any one from:</i> protects (intestinal), epithelium / cells / lining ; A examples of protection e.g. damage from stomach acid / digestion by enzymes A less likely for epithelial cells to be damaged / AW A traps, pathogens or (harmful), bacteria / microbes / microorganisms I dust A prevents, pathogens / AW, from reaching cells eases / reduces friction for, movement of, gut contents / substances (through digestive system) ; habitat / nutrient source, for gut, microorganisms / flora ; AW AVP ; e.g. location for immune system cells R if stated as being in the gas exchange system
1(c)(i)	arteriole ; A (small) artery
1(c)(ii)	<i>any two from:</i> (at arteriole end of capillary) high, <u>hydrostatic</u> / <u>blood</u>, pressure ; A ref. to hydrostatic pressure gradient (ultra)filtration / described ; e.g. fluid / plasma / water <u>and</u> solutes, forced / comes out of, capillaries / blood glucose / amino acids / ions, leave (blood) or (large / plasma) proteins remain (in blood) ; R if stated, red blood cells / platelets, leave through, fenestrations / fenestrae / endothelial pores or pores / gaps / spaces, in, capillary wall / endothelium / between cells ;
1(d)	<i>any three from:</i> <i>after, secreted / released, by enteroendocrine cells</i> transport of, peptide / GLP-1 / ligand, in, blood / circulation ; to, <u>target cells</u> (which are cells of the, stomach / pancreas) ; binding of, peptide / GLP-1 / ligand, to receptor ; <i>context can be cell surface membrane or intracellular</i> <i>ref. to, specificity / complementary ; must be in correct context of GLP-1 binding to receptor</i> (binding) triggers / sets off / AW, events within (target) cell (leading to the response) ; A examples e.g. signal transduction / triggers enzyme cascade
1(e)(i)	prophase metaphase anaphase telophase } ; R if interphase or cytokinesis stated

1(e)(ii)	any three from: <i>ref. to nucleus / nucleolus, is neutral</i> presence of, vesicles / vacuoles, qualified ; e.g. many / secretory / Golgi A storage vesicles correct <i>ref. to</i> exocytosis ; A fusion of, vesicle / vacuole, with <u>cell surface membrane</u> much / high proportion of / a lot of / AW, <u>rough endoplasmic reticulum</u> ; I ER / RER / rough ER A many ribosomes rough endoplasmic reticulum / ribosomes, site of, peptide / polypeptide / protein / enzyme, synthesis ; ecf for abbreviating <i>rough endoplasmic reticulum</i> previously AVP ; e.g. presence of mitochondria to provide, ATP / energy, for, protein synthesis / movement of vesicle to cell surface membrane / exocytosis <i>mp2 can also be awarded here only if ref. has been made within response to vesicles / vacuoles</i>
1(e)(iii)	Paneth cell is, differentiated / specialised (for, secretion / its function) or stem cells are, undifferentiated / not differentiated / not specialised ;

1(a)(i)	explanation semi-conservative replication / DNA replication / S phase, has occurred ; R if replication stated to occur in, G₁ / G₂ I chromatin replicates <i>difference between chromatin in G1 and G2: (allow ecf from mp1 if stated replication occurs in G2)</i> Any one from: double the / doubling in, quantity / number / amount, of, chromatin / DNA ; A chromatin has doubled sister / two identical, chromatids (formed, instead of one structure) ; A two chromatids joined at the centromere (in G2) (each) chromosome with 1 DNA molecule (in G1) has 2 DNA molecules (in G2) ; <i>allow double, helix/ helices for molecule(s)</i> <i>treat as neutral ref. to chromatin / chromosome, state / behaviour</i> e.g. decondensed / diffuse
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1(a)(ii)	any three from: <i>check diagram to see if points can be awarded</i> description of nucleus as having any two listed structures ; two from: nuclear envelope, nuclear pore(s), nucleolus, nucleoplasm <i>correct spelling</i> detail of nuclear envelope ; e.g. two membranes / double membrane <i>accept from diagram</i> encloses / protects, chromatin / DNA / chromosomes / genetic information / genetic material outer membrane continuous with rough endoplasmic reticulum outer membrane with ribosomes (on outer surface) controls exit and entry of substances <i>if nuclear envelope not stated,</i> A the nucleus is surrounded by a double membrane or a double membrane encloses, chromatin / AW or (it is) double-membrane bound / bound by a double membrane detail of nuclear pore(s) ; e.g. allows (m)RNA to, pass through / leave / AW (nucleus) allows ribosomal subunits to leave (nucleus) allows entry of proteins prevents exit of DNA (small) channel / passage, through the nuclear envelope <i>can be shown on a diagram, with a label</i> detail of nucleolus ; e.g. spherical <i>can be shown as circle on diagram, labelled nucleolus</i> one / can be more than one synthesis of, rRNA / ribosomal subunits A ribosomes densely staining / dense region / condensed region <i>allow shaded in on a diagram, labelled nucleolus</i> AVP ; e.g. nucleoplasm is fluid surrounding chromatin
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1(b)(i)	R the mp if feature of cellulose stated and, is incorrect / is not neutral for mps 1, 3, 4 can accept 'cellulose does not have ..' any four from: starch has 1 (monomer of) alpha glucose / α-glucose / α-1,4 (glycosidic) bond ; I glucose / glycosidic bond / 1, 4 bond (all shared with cellulose) 2 monomers / glucose, orientated the same way / AW ; ora for cellulose i.e. monomers rotated 180° to each other I cellulose / cellulose molecule, rotates 180° 3 made of, two different polysaccharides / two different polymers / amylose and amylopectin ; 4 amylopectin / starch, has (α-1,4 and) α-1,6 (glycosidic) bonds ; A 1-6 if alpha noted elsewhere A link / linkage, for bonds R 'can have α-1,4 or α-1,6 bonds' 5 amylose, helical / coiled R α-helix or amylopectin branched ; if both are stated, allow mp3 as well A starch, is branched / has branching (v cellulose, not branched / linear) R 'starch can be helical or branched' 6 no, hydrogen / H, bonds, to hold together / between / AW, molecules / polysaccharides ; A cellulose has 7 AVP ; e.g. forms, starch, grains / granules A 'cellulose does not have ..' does not have microfibrils / fibrils / fibres A 'cellulose has..'
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1(b)(ii)	1 (different) mAbs have, different / specific, <u>antigen binding sites</u> / <u>variable regions</u> ; I active site 2 (each) mAb has complementary shape for, binding / AW, antigen (combining with / attaching to) or mAbs are / a mAB is, specific / complementary, to particular, antigen(s) ; 3 <i>idea that</i> a (particular) pectin / RG-I , has different, <u>shapes</u> / <u>conformations</u> / <u>antigens</u>, in its structure ; 4 <i>idea of</i> (using) different / specific, (sets / combinations, of) mAbs to, recognise / identify / locate / use for, different pectins / types of RG-I / a particular RG-I ; 5 <i>ref. to</i> studying development e.g ; changes occurring / side chains added, during development need different mAbs some mAbs may be specific to side chains not yet added can help to show when modifications occur 6 AVP ; e.g. reason to use more than one mAB • some mAbs may bind to more than one type of pectin • other cell wall components, may have, similar structures / same side chains • some areas of RG-I may be out of reach for a specific mAb • can, obtain information about / investigate, shape / structure of the particular pectin
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