

Question 19 (Answer: **A**)

- A centromere holds the two sister chromatids of one chromosome together.
- In prophase and metaphase there are still 46 chromosomes, so 46 centromeres.
- At anaphase each centromere splits, giving 92.

Question 21 (Answer: **A**)

- Put the stages in the order the chromosomes move: condensing, lining up, separating, re-forming nuclei.
- Metaphase is the one with chromosomes in a single line across the equator.
- Anaphase follows, with V-shaped chromatids being pulled to the poles.

Question 22 (Answer: **D**)

- Mitosis is the division of the *nucleus*: prophase, metaphase, anaphase and telophase.
- Interphase happens before mitosis begins.
- Cytokinesis divides the cytoplasm afterwards, so only prophase is part of mitosis itself.

Question 23 (Answer: **A**)

- A centromere is where the spindle fibres attach and where the sister chromatids are held together.
- Count the cells in telophase and divide by the total number of cells shown.
- The proportion in a stage reflects how long that stage lasts.

Question 23 (Answer: **C**)

- In metaphase the chromosomes are lined up in a single plane across the equator.
- In anaphase they are already separating towards the poles.
- In interphase no individual chromosomes are visible at all.

Question 21 (Answer: **A**)

- No chromosomes visible means interphase, so that stage comes before condensation.
- Two visible chromosomes each with two chromatids means prophase or metaphase.
- DNA replication must therefore come earlier, and cytokinesis last.

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 <i>abbreviating rough endoplasmic reticulum previously</i> 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</i> only if <i>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 differentiation / not specialised ;