Question			Expected Answers	Marks	Additional Guidance
1	(a)	(i)	collection / group**,** of cells (of one or more types) **;**	**2 max**	**IGNORE** ref similar cells
			(cells)**,** working together **OR** with**,** common / same**,** function **;**		**ACCEPT** a group of cells with a function = 2 marks
			specialised (cells) **;**		**DO NOT CREDIT** differentiated
1	(a)	(ii)	squamous / ciliated **;**	**1**	**ACCEPT** endothelium / columnar **DO NOT ACCEPT** cilia, goblet cell, ciliated *cells*
1	(b)		(organ is) a collection of tissues / named tissues **;**	**2**	Look for idea of more than one tissue **ACCEPT** two or more correctly named tissues from: epithelium, elastic, glandular, smooth muscle, blood, nervous, cartilage, connective
			(working together) to enable gas exchange / AW **;**		**DO NOT ACCEPT** perform a function unqualified – we want to know *what* function (can be named or described) **DO NOT ACCEPT** respiration **IGNORE** breathing

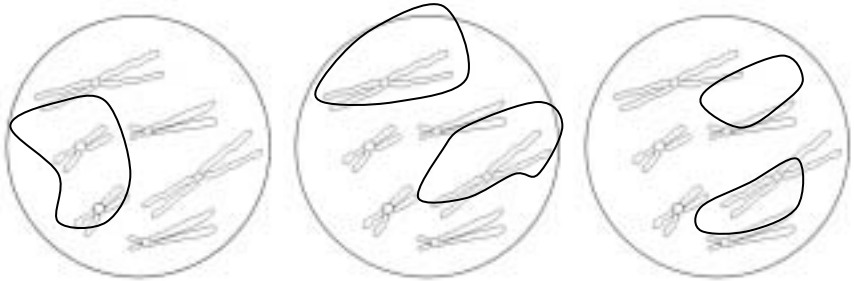
Question			Expected Answers	Marks	Additional Guidance
1	(c)	(i)	(*release of energy*) mitochondria **;**	1	
		(ii)	*(movement of cilia)* cytoskeleton **;**	1	**ACCEPT** mitochondria if not used in **(i)**
		(iii)	*(secretion of mucus)* Golgi (vesicle) **;**	1	**ACCEPT** cytoskeleton if not used in **(ii)** **ACCEPT** Golgi body / apparatus **DO NOT ACCEPT** Golgi vessel
			Total	**8**	

Question			Expected Answers	Marks	Additional Guidance
2	(a)	(i)			*MP 1 awarded for observation that the stain was no longer in the surrounding solution and not for the % of cells containing the stain.*
			1 at low temperatures, all stain is in cells **OR** no stain in surrounding solution **;**		**ACCEPT** the stain is not evenly distributed between cells and solution **ACCEPT** stain doesn't move out of cells
			2 (taken up / held) against**,** diffusion / concentration**,** gradient **;**		**ACCEPT** *up* the diffusion gradient
			3 at high temperature stain not held in cells **;**		**ACCEPT** solution now contains stain **ACCEPT** 0% = none / no cells (stained) *MP **1** and **3** - must be stated rather than inferred from quoted figs*
			4 at high temperature enzymes denatured so no ATP for active transport (of stain) **;**		**IGNORE** 'enzymes denatured' alone **CREDIT** active transport / carrier, proteins denatured **ACCEPT** mitochondria stopped working so no ATP produced
			5 use of correct comparative figs to illustrate a point **;**		e.g. 97% at 30°C but 0% at 80°C **IGNORE** figs without units
			AVP **; ;**	max 2	

Question			Expected Answers	Marks	Additional Guidance
2	(a)	(ii)	cells**,** dead / not respiring **;** no, (metabolic) energy / ATP**,** to take up stain **;** AVP **;**	max1	**DO NOT CREDIT '**burst' as these cannot be seen **ACCEPT** inhibitor present / membrane impermeable **ACCEPT** no functioning mitochondria
2	(b)	(i)	(membrane) structure disrupted **;** (phospho)lipid bilayer**,** melts / more fluid **;** (membrane) proteins / carrier molecules**,** denatured / unable to function **;** (membrane) becomes more permeable **;**	max 1	*Mark first suggestion and if correct award mark – if further answers contradict first answer do not award mark.* **ACCEPT** damaged, destroyed, break down **IGNORE** *membrane**,*** denatured / more fluid **IGNORE** lipid *molecules* melt **ACCEPT** lose shape for denatured **ACCEPT** leaky **IGNORE** refs to bonds breaking

Question			Expected Answers	Marks	Additional Guidance
2	**(b)**	**(ii)**	membrane <u>permeable</u> (to stain) **;** methylene blue, leaked out of cells / released to solution **;** by diffusion / down concentration gradient **;**	max 2	**IGNORE** leaky **ACCEPT** stain / blue / pigment, moved out **IGNORE** lost *colour* / *colour* moved out (it is in stem of question) **ACCEPT** by active transport (assuming thermostable enzymes) blue / stain, diffuses out = 2 marks
2	**(c)**		*accuracy* take readings at intermediate temperatures (between 50 °C – 70 °C) **;** *reliability* take more, readings at each temperature / repetitions **;**	2	*Mark first suggestion only* **DO NOT CREDIT** wider temperature range OR more temperatures unqualified OR more regular intervals **ACCEPT** take readings every 5 degrees / °C **ACCEPT** ref. to haemocytometer **ACCEPT** colorimeter used to measure colour intensity of blue solution **DO NOT CREDIT** ref to use of c<u>a</u>lorimeter **ACCEPT** repeat experiment (ideally 3 readings for each temperature) , increase the number of cells observed **ACCEPT** replica / replicate for repeat

Question			Expected Answers	Marks	Additional Guidance
2	**(d)**		nucleus divides / mitosis **;** *idea of* : cell**,** swells on one side / bulges **;** nucleus / cytoplasm / organelles**,** move into**,** bud / bulge **;** pinches off / cell wall forms**,** (so bud becomes a separate cell) **;**	max 2	**ACCEPT** asexual reproduction / cloning **IGNORE** cell splits, ref to genetically identical cells **IGNORE** *bud* forms on side **IGNORE** replicated DNA enters bud **ACCEPT** cytokinesis **IGNORE** two cells are formed / bud separates unqualified
			Total	**10**	

Question			Expected Answers	Marks	Additional Guidance
3	**(a)**	**(i)**	*plant cell* **/** *Y***,** *has*: a wall **;** chloroplasts **;** vacuole **;**	max 2	Credit reverse argument **ACCEPT** thylakoid**,** discs / membranes OR granum(a) **IGNORE** chlorophyll
3	**(a)**	**(ii)**	**A1** a vacuole **;** **E1** to take up water / to become turgid **;** **A2** cell wall thicker on one side **;** **E2** causes**,** cell to bend / open stoma(ta) **;** **A3** mitochondria **;** **E3** generates ATP (for active transport) **;**	max 2	*Mark adaptation (A) as stand-alone* *Ensure explanation (E) stated is appropriately linked to adaptation* **DO NOT CREDIT** curved cell wall / thick cell wall unqualified **ACCEPT** close stoma(ta) if adaptation correct **IGNORE** ref to chloroplasts
3	**(b)**	**(i)**	two homologous chromosomes circled **;**	1	**ACCEPT** one circle around both chromosomes or two circles The two chromosomes must be of same length 

3	**(b)**	**(ii)**	*three* chromosomes, one from each pair **;** chromosomes drawn as one bar **;**	2	*Chromosomes should be of different lengths however if two are of similar length, look for different centromere position to award mark* **ACCEPT**  **DO NOT CREDIT** two joined together at centromere 
			Total	**7**	