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)	**1** at low temperatures, all stain is in cells **OR** no stain in surrounding solution **;**		*MP 1 awarded for observation that the stain was no longer in the surrounding solution and not for the % of cells containing the stain.* **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**	