Question Number	Answer	Mark
1(a)	1. {one / few / similar} cell types ; 2. working together / for the { same / eq } function / often cells come from the same origin / eq ;	**(2)**

Question Number	Answer	Mark
1(b)(i)	1. three (or more) cisternae drawn ; 2. cisternae curved ; 3. cisternae getting smaller ; 4. cisterna /pre- or post-Golgi vesicle correctly shown ; **max 2 for drawing** 5. arrow(s) pointing from convex / forming side to concave / mature side ;	**max (3)**

Question Number	Answer	Mark
1(b)(ii)	1. some (amino acids) do not enter the cell / eq ; 2. some amino acids are not used (in protein synthesis) / eq ; 3. some protein is {elsewhere in the cell / on ribosome / in RER / in cytoplasm / in mitochondria / in vesicles / in nucleus /eq} ; 4. not modified / eq ; 5. some {metabolised / eq} ; 6. some has been ejected from cell / eq ; 7. reference to radioactive decay / decrease ;	**max (3)**

Question Number	Answer	Mark
2(a)	chloroplast / (sap / large / permanent) {vacuole / vacuole membrane / tonoplast} / cellulose cell wall ;	**(1)**

Question Number	Answer	Mark
2(b)(i)	1. spindle fibres contract / eq ; 2. {chromatids / daughter chromosomes / eq} ; 3. {pull apart / separate / eq} ; 4. reference to kinetochore / centromere leads ; 5. move to opposite {poles / eq} of cell ;	**max (3)**

Question Number	Answer	Mark
2(b)(ii)	1. membrane bound organelles {present / eq} / correctly named organelle e.g. mitochondrion ; 2. has {80s / large} ribosomes ; 3. nucleus will reform / eq ; 4. presence of cellulose cell wall ;	**max (2)**

Question Number	Answer	Mark
2(c)(i)		**(2)**

Stage of the cell cycle	**Number of cells in each stage**	**Percentage in each stage (%)**
Interphase		
Prophase		
Metaphase	2 ;	
Anaphase		
Telophase		
Cytokinesis	4 ;	
TOTAL		

Question Number	Answer	Mark
2(c)(ii)	1. interphase ; 2. most found at this stage (at any one time) / correct reference to figure from table ;	**(2)**

Question Number	Answer	Mark
2(c)(iii)	not enough {data / samples / cells / slides} {observed / counted} / (data) only taken from one point in time ;	**(1)**

Question Number	Answer	Mark
3(a)(i)	graph shows {positive correlation / eq} between nitrate concentration and seedling growth ;	**(1)**

Question Number	Answer	Mark
3(a)(ii)	some seedling growth without any nitrates added / eq ;	**(1)**

Question Number	Answer	Mark
3(a)(iii)	0 (mmol dm^{-3}) ;	**(1)**

Question Number	Answer	Mark
3(a)(iv)	reference to seedlings could have all been different lengths to start off / final length is not a measure of growth / growth needs to take into account change (and time) / eq ;	**(1)**

Question Number	Answer	Mark
3(a)(v)	plants grow in other {dimensions / eq} / idea of more likely to be an error in measuring length ;	**(1)**

Question Number	Answer	Mark
3(a)(vi)	1. temperature ; 2. volume of solution ; 3. light / eq ; 4. measuring technique / eq ; 5. stage of development e.g. same number of leaves / eq ; 6. idea of seedlings raised in same {environment / eq} / named environmental condition ; 7. idea of seedlings being genetically similar to start with e.g. same parent plant ;	**max (3)**

Question Number	Answer	Mark
3(b)	0.125 to 0.13 ; mmol dm^{-3} ;	**(2)**

Question Number	Answer	Mark
3(c)		**(2)**

Inorganic ion	**Molecule made**	**Main role of the molecule in a plant**
nitrate	amino acid / protein / named protein / enzyme / nucleic acid / named nucleic acid / base ;	plant growth
calcium	calcium pectate (pectin)	{sticking / holding / eq} (adjacent) plant cells {together / eq} / component of middle lamella ;

Question Number	Answer	Mark
4(a)(i)	1. idea that {cell B / eq} can give rise to {many / eq} cell types ; 2. idea that cell B cannot give rise to {embryonic cells / eq} ;	**max (2)**

Question Number	Answer	Mark
4(a)(ii)	(red) bone marrow (of long bones / ribs) ;	**(1)**

Question Number	Answer	Mark
4(a)(iii)	1. different genes active in different cells / different genes active at different times / some genes {active / inactive} / eq ; 2. active genes make mRNA / eq ; 3. active genes make proteins / polypeptides /eq ; 4. (proteins) control cell {processes / eq} ; 5. idea of permanent change (to cell) / eq ;	**max (3)**

Question Number	Answer	Mark
4(b)	the gender of turtles is determined by the temperature of the ground in which the eggs are laid ;	**(1)**

Question Number	Answer	Mark
5(a)(i)	**A**= acrosome ; **B** = flagellum ;	**(2)**

Question Number	Answer	Mark
5(a)(ii)	1. has {23 / half} the (required) chromosome complement ; 2. (so at fertilisation) full {complement / 46} (of chromosomes) is restored / diploid number restored / eq ; 3. correct reference to allowing mixing of alleles / allowing for {genetic variation / eq} ;	**max (2)**

Question Number	Answer	Mark
5(a)(iii)	1. idea of {jelly layer / eq} hydrolysed ; 2. sperm {nucleus/eq} enters the egg cell / egg cell membrane penetrated (by sperm) / eq ; 3. reference to meiosis completes / eq ; 4. cortical {granules / vesicles / eq} (in egg) {move towards / fuse with} egg cell surface membrane ; 5. release {contents / enzymes} ; 6. zona pellucida hardens / eq ; 7. to prevent polyspermy / eq ; 8. egg nucleus envelope breaks down / eq ; 9. spindle forms / eq ;	**max (3)**

Question Number	Answer	Mark
5(b)(i)	1. length increases between 15°C to 30°C ; 2. decreases after 30°C ; 3. correct manipulation of the data ;	**(2)**

Question Number	Answer	Mark
5(b)(ii)	1. mean pollen tube length increases as temperature increases (from 15°C) to 30°C for both ; 2. variety B has a greater mean pollen tube length than A (up to 30°C) / allow converse ; 3. both have {longest length / maximum length} at 30°C ; 4. correct comparative manipulation of the data e.g. mean pollen tube length is 50% more for cotton variety B at 30°C ;	**max (2)**

Question Number	Answer	Mark
5(b)(iii)	pollen tube dies / enzyme(s) denature / eq ;	**(1)**

Question Number	Answer	Mark
6(a)	<table><tr><th>Statements</th><th>true</th><th>false</th></tr><tr><td>Polymer of glucose</td><td>✓ ;</td><td></td></tr><tr><td>Molecule contains α and β glucose</td><td></td><td>✓ ;</td></tr><tr><td>Glycosidic bonds present</td><td>✓ ;</td><td></td></tr><tr><td>Molecule may have side branches</td><td></td><td>✓ ;</td></tr><tr><td>Molecule can form H bonds with adjacent molecules</td><td>✓ ;</td><td></td></tr></table>	**(5)**

Question Number	Answer	Mark
6(b)	1. starch from a renewable {resource / eq} ; 2. plastic from oil / eq ; 3. oil is a non-renewable resource/ eq ;	**max (2)**

Question Number	Answer	Mark
6(c)	**Similarity** (sclerenchyma fibres and xylem vessels) both for {support / eq} / both contain lignin / both associated with vascular bundles / both dead / eq ; **Differences** only xylem vessels transport {water / mineral / mineral ion / named ion} / position within vascular bundle / only xylem has open ends / type of lignin deposition / eq ;	**(2)**

Question Number	Answer	Mark
7(a)(i)	1. appropriate feature ; 2. linked to appropriate explanation ; e.g. 1. {streamlined / hydrodynamic / flattened /eq} {body / shape} 2. reduces {drag / eq} 1. {hooked feet / claws / eq} 2. to {cling / attach / hold / eq} onto {rocks / eq} 1. wide spread legs 2. {to spread over rock / grab rocks / eq}	**max (4)**

Question Number	Answer	Mark
7(a)(ii)	1. (tube) {breaks water surface / reaches into the air / eq} ; 2. acts as a snorkel / description ; 3. (atmospheric) air / oxygen obtained ;	**max (2)**

Question Number	Answer	Mark
7(b)	1. camouflaged in its environment ; 2. (more likely) to catch {prey / eq} / {selective advantage / eq} ; 3. (therefore) survive to adulthood / eq ; 4. to breed / eq ; 5. pass on {coat colour allele /genetic information / eq} ; 6. to offspring / eq ; 7. change in allele frequency over generations ; 8. reference to disruptive selection ; 9. idea of genetic variation present in ancestral population ;	**max (4)**

Question Number	Answer	Mark
8(a)	1. eukarya / eukaryote ; 2. archaea ; 3. bacteria ;	**(3)**

Question Number	Answer	Mark
8(b)(i)	1. idea that the species is reproductively isolated ; 2. produce offspring that are {sexually viable /fertile / eq} ; 3. many features in common / reference to homologous ;	**max (2)**

Question Number	Answer	Mark
8(b)(ii)	1. the number of different alleles / eq ; 2. in a population / gene pool ; 3. reference to allele frequency ;	**(2)**

Question Number	Answer	Mark
8(b)(iii)	1. breeding programme / eq ; 2. careful selection of mate / eq ; 3. allowing only to mate with a different individual to previous mating / eq ; 4. only allowing those with different genes to mate / eq ; 5. use of genetic testing / eq ; 6. record keeping (studbooks) ; 7. reason for outbreeding ; 8. reintroduction to the wild / eq ;	**max (4)**