1)

(a)	(i)	production of vesicles / packaging proteins ; modification of / processing of / adding carbohydrate to , proteins ; production of lysosomes ;	max 1	**Mark the first answer.** If the first answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **ACCEPT** lipids **IGNORE** ref to transport / secretion / exocytosis / substances / materials **DO NOT CREDIT** stores proteins **ACCEPT** makes glycoproteins
(a)	(ii)	allow movement (of substances) in or out of nucleus ; correctly named substance (entering or leaving nucleus) ; ref to correct destination of substance ;	max 2	**IGNORE** messages / information / communication **IGNORE** name of substance for MP 1 **IGNORE** ref to mechanism of movement e.g. RNA / (m)RNA / (r)RNA (t)RNA / polymerase / nucleotides / ribosomes / helicase / proteins / (steroid) hormones **IGNORE** ref nutrients **DO NOT CREDIT** if incorrect direction of movement described (e.g. RNA into nucleus **or** RNA in and out of nucleus) **DO NOT CREDIT** DNA as named substance ***Note*** 'allows mRNA out of nucleus' = **two marks** e.g. RNA to ribosomes or RER helicase to DNA polymerase to , DNA / gene nucleotides to DNA (steroid) hormones to , DNA / gene / chromosome
(a)	(iii)	contain / release , lysins / lytic enzymes / hydrolytic enzymes / digestive enzymes ; digest / break down , organelles / foreign objects / toxins / cells / pathogens ; apoptosis / autolysis / described ;	max 1	**DO NOT CREDIT** 'engulf' **DO NOT CREDIT** 'lysosomes are digestive enzymes' **ACCEPT** destroy **ACCEPT** ref to digestion of contents of phagocytic vesicle **IGNORE** ref to (unwanted) substances / materials / food **IGNORE** ref to acrosomes
(b)		*idea of* more than one (type of) tissue ; working together / performing a function(s) ;	2	**ACCEPT** named examples of tissues **ACCEPT** job or task

2)

(a)		phospholipids ; proteins ; glycoproteins ; cholesterol ; glycolipids ;	max 3	**Mark the first <u>three</u> components in continuous prose or first suggestion in bullet point / (numbered) list.** **IGNORE** lipids, bilayer, hydrophilic head, hydrophobic tail, ref to intrinsic / extrinsic Count all refs to different types of protein as one e.g. intrinsic protein ✓ extrinsic protein Ignore pore protein Ignore glycoprotein ✓ phospholipids ✓ **= 3 marks**
(b)	(i)	(movement of substances) against / up , concentration gradient **or** from low to high concentration ; using , ATP / (metabolic) energy ; using a , transport / carrier , protein ;	2	**CREDIT** diffusion gradient for concentration gradient **DO NOT CREDIT** along / across , concentration gradient **DO NOT CREDIT** 'diffusion against concentration gradient' **DO NOT CREDIT** pore / channel protein

(b)	(ii)	(mineral) ions / salts / named e.g, (into) root hair (cell) ; hydrogen ions (out of) companion cells ; (mineral) ions / salts / named e.g, (across) endodermis ; sucrose out of sieve tube at sink ; AVP ; ;	max 2	**Mark the first <u>two</u> examples.** **Ensure candidate refers to ions e.g. nitrates, phosphates, calcium ions, magnesium ions etc.** **ACCEPT** correct symbols with charge **DO NOT CREDIT** ref to water **ACCEPT** ref to loading of sucrose into , phloem cell / companion cell **ACCEPT** ref to uptake of glucose by cells lining , (small) intestine / nephron / PCT **IGNORE** references to endocytosis / exocytosis / phagocytosis / secretion **DO NOT CREDIT** incorrect direction of movement if stated e.g.
(c)		osmosis ; <u>facilitated diffusion</u> ; diffusion ;	3	**Mark the first answer for each example.** If the first answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks**
		Total	[10]	

substance	cell	(direction)
sodium/potassium ion(s)	neurone	K^+ in Na^+ out
sodium/potassium ion(s)	named cell	Ion pump to drive cotransport
potassium ion(s)	guard cell (to open stomata)	in
sodium ion(s)	cell of loop of Henle	out
calcium <u>ion</u>(s)	muscle cell	(into sarcoplasmic reticulum)
calcium ions	presynaptic knob	out
hydrogen ions	in cell , respiring (aerobically) / photosynthesising	for chemiosmosis
named ion(s)	cells lining distal convoluted tubule	in / out

3)

(a)				**Mark the first <u>two</u> suggestions.**
		(just behind) tip / apex , of root ;		**ACCEPT** behind root cap **IGNORE** root unqualified
		(just behind) tip / apex , of shoot ;		**IGNORE** stem / root unqualified / shoot unqualified
		cambium / pericycle / vascular bundle ;		**ACCEPT** between xylem and phloem
		bud ;	**max 2**	
(b)	(i)			**IGNORE** ref to organelles throughout
		1 chromosomes / chromatin / nucleus , can be seen / are visible ;		1 **ACCEPT** DNA for chromosomes / chromatin **ACCEPT** chromosomes / chromatin / DNA / nucleus , not normally visible
		2 determine / distinguish between , different stages (of mitosis / division / cell cycle) ;		
		3 (staining) provide contrast (between cell structures) / AW ;		3 **IGNORE** different structures can be seen (this is visibility not contrast)
		4 (because) different , structures / chemicals , take up different amounts of stain ;	**max 2**	4 **IGNORE** different tissues or cells , take up different amounts of stain
(b)	(ii)	mitosis / mitotic ;	**1**	spelling must be correct
(c)		***Two** marks for correct answer, even if no working shown*		
		18.00 ; ;		**CREDIT** 18 / 18.0 If answer is incorrect or missing allow one mark for working 100 – 82 **or** 4.34.+ 3.23 + 3.23 + 7.20 **or** 18 somewhere in working
			2	
(d)				**Mark the first answer.** If the first answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks** **IGNORE** ref to cells produced by mitosis (as qu asks about meiosis)
		in meiosis		
		(cells produced are) not <u>genetically</u> identical ;		**ACCEPT** not clones **Award** in context of genetically different from parent or from each other
		one set of chromosomes / haploid ;		**ACCEPT** half number of chromosomes / half genetic material
		(they are) gametes ;		
		four cells produced ;	**max 1**	
		Total	**[8]**	

4)

(a)	(i)			**Mark the first answer.** If the first answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks**
		sucrose ;	**1**	
(a)	(ii)			**Mark the first answer for each tissue.** If the first answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = **0 marks**
		sink ; neither ; sink ;	**3**	
(b)				**Mark the first <u>two</u> adaptations.**
		1 elongated elements ;		1 **ACCEPT** cells
		2 elements , joined end to end / form column ;		2 **ACCEPT** cells
		3 sieve plates / pores in end walls / perforated end plates / sieve pores ;		3 response must refer to pores at ends of sieve elements
		4 little cytoplasm / cytoplasm pushed to cell edges / thin (layer of) cytoplasm ;		4 **IGNORE** hollow
		5 no nucleus / few organelles ;	**max 2**	5 **IGNORE** no organelles / few cell contents

(c)		1 active transport of, **hydrogen ions** / **protons** / H^+, out of **companion** cells ;		1 **ACCEPT** description of active transport **DO NOT CREDIT** hydrogen, H, H_2, hydrogen molecules
		2 creates , hydrogen ion / **concentration** / diffusion , **gradient** ;		2 **ACCEPT** description of gradient created
		3 **(facilitated) diffusion** (of H^+) back into companion cells ;		
		4 sucrose / assimilates , move in with hydrogen ions ;		
		5 by **cotransport** / through cotransport protein ;		5 **IGNORE** carrier protein
		6 sucrose / assimilates , (diffuse) through **plasmodesmata** (from companion cell to sieve element) ;		
		7 into **sieve, tube / element** ;		
			max 3	**For mark points 4 and 6** **IGNORE** sugar If wrong assimilate is named e.g. glucose penalise once and then apply ECF
		QWC ;	1	Any **three** with correct spelling and a suitable context from: **companion, diffuse / diffusion, gradient, concentration, facilitated, cotransport, plasmodesmata, sieve tube, sieve element, hydrogen ions / protons**
		Total	**[10]**	

5)

(a)	(i)	blue-black / black / dark blue ;	1	**ACCEPT** dark purple / purplish-blue **DO NOT CREDIT** blue or purple unqualified by darkness **ACCEPT** acceptable colour change
(a)	(ii)			**CREDIT** marking points from clearly labelled diagram max 1 if incorrect charges are on atoms
	1	between oxygen and hydrogen (atoms) ;		1 **DO NOT CREDIT** molecules / ions
	2	(between) electronegative / δ^-, and electropositive / δ^+ ;	2	2 **DO NOT CREDIT** ions / + and – 2 **ACCEPT** slight / partial (negative / positive), charge
(a)	(iii)			**IGNORE** refs to denaturation
	1	hydrogen / H, bonds break ;		
	2	helix, lost / unravels / AW ;		2 **ACCEPT** spiral / coil
	3	iodine, released / no longer in complex / AW ;	2 max	3 **ACCEPT** no longer contained in helix

(b)	1	take samples at a range of times / AW ;		
	B2	same volumes (of solutions) added / removed (each time) ;		B2 must be in context of Benedict's test rather than reaction mixture
	B3	heat with, Benedict's (solution) / $CuSO_4$ and NaOH ;		B3 **DO NOT CREDIT** boil / warm B3 **DO NOT CREDIT** if Benedict's added to the mixture at the beginning
	B4 B5	(use of) excess Benedict's ; changes to, green / yellow / orange / brown / (brick) red ;		
	C6	remove precipitate / obtain filtrate ;		C6 **CREDIT** description of method e.g. filtering / centrifuging / decanting
	C7	colorimeter ;		
	8	calibrate / zero, using, a blank / water / (unreacted) Benedict's ;		8 **IGNORE** 'control'
	9	use (red / orange) filter ;		9 **DO NOT CREDIT** if colour of filter is incorrect
	T10	reading of, transmission / absorbance **OR** mass of precipitate ;		T10 **ACCEPT** 'measure how much light, does / does not, pass through'
	11	more transmission / less absorbance, of filtrate, **OR** greater mass ppt, = more maltose present ; **ora**		11 if unfiltered Benedict's / precipitate is **clearly indicated** as being present **in sample**, **ACCEPT** 'less transmission / more absorbance, = more maltose present' 11 **DO NOT CREDIT** if precipitate is added to colorimeter
	12 13 14 15	using, standard / known, concentrations (of maltose) ; (obtain) calibration curve ; plot, transmission / absorbance / mass of ppt, against (reducing sugar) concentration ; use graph to read off concentration of maltose / AW ;	6 max	12 **CREDIT** 'serial dilutions'
		QWC – correct sequence ;	1	1 of mps **B2 to B5**, *then* mp **C6 or C7**, *then* mp **T10**

(c)	(iii)			**Mark the first three answers only regardless of which line they are on** **DO NOT CREDIT** refs to, time
	1	temperature ;		
	2	pH ;		
	3	enzyme / amylase / chloride, concentration ;		3 **IGNORE** 'amount' or 'volume' 3 **DO NOT CREDIT** 'concentration' unqualified
	4	substrate / starch / amylose, concentration ;		4 **IGNORE** 'amount' or 'volume' 4 **DO NOT CREDIT** 'concentration' unqualified
	5	constant / regular, stirring ;		
	6	(fixed) volume of solution (removed each time for sampling) ;	3 max	
		Total	**19**	