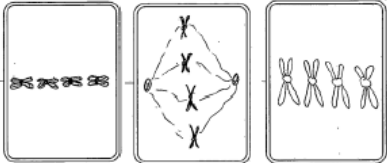
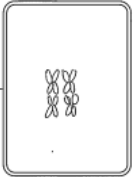
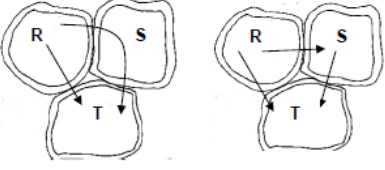
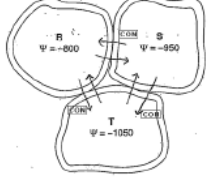


1)

(a) (i)	<p>A <u>nucleus</u> ; B <u>chloroplast</u> ;</p>	<p>2</p> <p>Mark the first answer on each prompt line. If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks</p> <p>DO NOT CREDIT nuclear envelope / nucleolus IGNORE chlorophyll</p>
	<p>(ii)</p> <p>C <u>mitochondrion</u> (aerobic) respiration / producing ATP / release energy ;</p> <p>D <u>SER / smooth endoplasmic reticulum</u> transport / production / processing, of, fats / lipids / steroids / carbohydrates ;</p>	<p>2</p> <p>Mark the first answer on each prompt line. If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks</p> <p>DO NOT CREDIT Function of organelle if organelle identified / named incorrectly (as this would be an incorrect biological statement).</p> <p>DO NOT CREDIT makes / produces, energy ACCEPT produces ATP for respiration</p> <p>IGNORE ref to transport / modification of proteins DO NOT CREDIT ref production of proteins</p>
(b)	<p>C / mitochondrion / cristae, too small ;</p> <p>resolution (of light microscope), not high (enough) OR <i>idea of only</i>, 0.2μm / 200nm ;</p> <p>wavelength of light too long ;</p>	<p>max 2</p> <p><i>idea of</i> too small / not big enough important IGNORE very small</p> <p>ACCEPT resolution low IGNORE ref to magnification for resolution accept any value in range 0.05 - 0.2 μm</p> <p>IGNORE ref to electron microscope</p>
(c)	<p>makes visible / easier to see / see more detail ;</p> <p>(staining) provides / increases, <u>contrast</u> ;</p> <p>identify / recognise, cell types / organelles / parts of cell ;</p> <p>identify / recognise, different (named), compounds / molecules ;</p>	<p>max 2</p> <p>ACCEPT distinguish, cells / organelles, (from background) IGNORE ref to clarity</p> <p>IGNORE substances</p>

2)

(a) (i)	<p>mitosis / mitotic ;</p>	<p>1</p>	<p>Correct spelling only</p>
	<p>(ii)</p> <p>four chromosomes on equator ;</p> <p>(each chromosome as) two sister chromatids ;</p>	<p>2</p>	<p>If the image is unclear then pencil or a different colour may have been used - RAISE AN EXCEPTION</p> <p>Award 2 marks for the following</p>  <p>DO NOT CREDIT mp 1 if nuclear membrane shown DO NOT CREDIT mp 1 if homologous chromosomes paired e.g.</p>  <p>DO NOT CREDIT mp 2 if sister chromatids are not joined (at centromere)</p>

	<p>(iii) arrow from R to T ; arrow from R to S AND arrow from S to T OR arrow from R to S to T ;</p>	<p>e.g.</p>  <p>If contradictory arrows to the above are drawn, apply CON for each arrow going from low Ψ to high Ψ. e.g.</p>  <p>gets 0</p>
	<p>(b) this is where cambium / meristem / xylem / phloem / vascular bundle, is found ;</p> <p>mitosis/cell division, occurs in cambium (to produce new cells for growth) ; new cells, differentiate / specialise, (into xylem and phloem) ; xylem supplies water for, (cell) elongation / (cell) growth ; phloem supplies, sugars / assimilates, for, energy / growth /respiration ;</p>	<p>2</p> <p>CREDIT from a labelled diagram CREDIT description of position being close to the edge of trunk DO NOT CREDIT responses that suggest that cambium etc. are in or outside bark OR under cut surface</p> <p>ACCEPT cambium differentiates IGNORE nutrients</p> <p>max 2</p>
	<p>(c) tip / apex, of, shoot / root ; meristem ; bud ;</p>	<p>max 1</p> <p>Mark the first answer on each prompt line. If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks</p> <p>IGNORE root or shoot unqualified ACCEPT behind root tip</p>
	<p>(d) allow <u>oxygen</u> to reach, cells / tissues (under bark) ; for (aerobic) respiration ; animals transport oxygen in, blood / circulation / transport system ; plants do not transport (much) oxygen in transport system ;</p> <p><i>idea that (oxygen not supplied from leaves as) stomata only open in day / no leaves in winter ;</i></p>	<p>max 2</p> <p>IGNORE refs to need for CO₂ / photosynthesis throughout ACCEPT correct formula O₂ DO NOT CREDIT oxygen for photosynthesis ACCEPT gas(es) for oxygen ACCEPT gas(es) for oxygen</p>
<p>3)</p>		
	<p>(a) forms, vesicles / (named) organelle(s) ; separate (contents of) organelles from cytoplasm / compartmentalisation ;</p> <p>site of (named), processes / reactions ; provides surface for attachment (of enzymes / ribosomes) ; control what substances, enter / leave, organelles ; AVP ;</p>	<p>max 2</p> <p>ACCEPT transport in vesicles</p> <p>e.g. isolates DNA from cytoplasm / separate different environments / separate organelles e.g. lysosomes isolate enzymes (and prevent damage to cells) e.g. separates (metabolic) reactions IGNORE any ref to nuclear pores</p> <p>DO NOT CREDIT substances, enter / leave, cells</p> <p>e.g. allow creation of concentration gradients e.g. ref to intracellular communication e.g. hold binding sites for movement of organelles</p>

(b)	<p>A1 phospholipids form bilayer /described OR phospholipid hydrophobic tails pointing inwards and hydrophilic heads pointing out ;</p> <p>F1 provide barrier to, large / polar / (named) molecules OR ions OR described ;</p> <p>A2 proteins form, pores / channel / carriers OR extrinsic / intrinsic / transmembrane / described, proteins ;</p> <p>F2 for (active) transport / cotransport / facilitated diffusion OR enzymes ;</p> <p>A3 cholesterol molecules fit, within bilayer / between phospholipid / between fatty acids / between (phospholipid OR hydrophobic) tails ;</p> <p>F3 stabilise membrane (structure) / regulates fluidity ;</p>	<p>Mark the first <u>two</u> components listed only</p> <p>Award marks for suitably labelled diagram(s)</p> <p>Mark points are linked – ensure the function matches the component e.g. DO NOT CREDIT an enzyme arranged as a channel protein</p> <p>ACCEPT phospholipid bilayer</p> <p>ACCEPT ORA – only allow small / non-polar molecules to pass through e.g. prevents movement of glucose across membrane</p> <p>ACCEPT pore / channel / carrier, protein</p> <p>ACCEPT protein embedded in bilayer</p> <p>ACCEPT correct ref to movement of (appropriate) substance(s) across membrane</p> <p>ACCEPT between bilayer</p> <p>IGNORE increases fluidity / reduces rigidity / strengthens / keeps it fluid</p> <p>max 4</p>
	<p>A4 glycoproteins / glycolipids , on surface / sticking out from surface, (of cell surface membrane) ;</p> <p>F4 cell signalling / receptor sites / adhesion / antigens / recognition OR stabilising (cell shape) ;</p> <p>QWC ;</p>	<p>Ensure candidate is referring to the <i>surface</i> of a membrane rather than the cell surface membrane unqualified CREDIT <i>Idea</i> of glycoproteins / glycolipids on inner surface or outer surface of (cell surface) membrane IGNORE glycoprotein / glycolipids embedded in membrane</p> <p>Note: only award this mark for terms used in description of first two components – and only award if given in correct description as shown below.</p> <p>award if any two terms spelt correctly and used in correct context from: for phospholipids accept: phospholipid, bilayer, hydrophilic, hydrophobic for proteins accept: protein, pore, channel, carrier, enzyme, intrinsic, extrinsic, transmembrane, cotransport, facilitated diffusion for cholesterol accept: cholesterol, fatty acid, phospholipid for glycoprotein / glycolipid accept: glycoprotein, glycolipid, cell signal(l)ing, receptor, adhesion, antigen</p> <p>1</p>
(c)	<p>(i) (phospholipid) bilayer ;</p> <p>(ii) (named) proteins ;</p> <p>(iii) <i>idea that:</i> freezing / defrosting, damages the, peroxisome / (plasma) membrane ;</p> <p>increases permeability of membrane to, enzyme / hydrogen peroxide ;</p> <p>more hydrogen peroxide broken down (so more oxygen released) ;</p>	<p>1</p> <p>1</p> <p>ACCEPT glycoproteins DO NOT CREDIT coenzymes</p> <p>eg formation of ice crystals causes membrane damage / peroxisomes burst IGNORE denatured for damaged IGNORE membranes become more leaky unqualified</p> <p>ACCEPT release enzyme</p> <p>ACCEPT hydrogen peroxide / substrate, broken down at a higher rate IGNORE higher rate of reaction unqualified / higher rate of oxygen production</p> <p>max 2</p>

4)

(b)	(ii)	<p>1 peptide bonds , between amino acids / in polypeptide ;</p> <p>2 every 3rd amino acids is , same / glycine ;</p> <p>3 coil / twist / spiral / helix ;</p> <p>4 left-handed (helix) ;</p> <p>5 glycine / small R group , allows closeness / twisting (of polypeptide chains) ;</p> <p>6 three polypeptide chains ;</p> <p>7 hydrogen / H , bonds between (polypeptide) chains ;</p> <p>8 no / few, hydrophilic (R) groups on outside (of molecule) ;</p> <p>9 (adjacent molecules joined by) crosslinks ;</p> <p>10 crosslinks / ends of molecules , being staggered ;</p> <p>11 <u>fibril</u> ;</p>	6	<p>One molecule of collagen is 3 polypeptide chains twisted around each other. CREDIT annotated diagrams unless contradicted by text</p> <p>2 ACCEPT high proportion of / 35% , glycine / same amino acid</p> <p>3 CREDIT in context of single polypeptide or 3 polypeptides but DO NOT CREDIT 'α-helix' in the context of a single polypeptide 3 IGNORE wound</p> <p>4 'α-helix, which is left handed' – AWARD mp4 but DO NOT CREDIT mp3</p> <p>7 Must be in correct context 7 DO NOT CREDIT H⁺ / H₂ bonds</p> <p>9 ACCEPT covalent bonds between adjacent molecules 9 DO NOT CREDIT in context of bonding between 3 polypeptides 9 IGNORE disulfide</p> <p>11 IGNORE micro</p>
(a)	(i)	primary structure ;	1	<p>ACCEPT 1^o structure IGNORE polypeptide</p>
(a)	(ii)	<p>NH₂ at one end ; COOH at opposite end ;</p> <p>C in centre (of a single amino acid) bonded (separately) to one R and one H ;</p>	3	<p>If R group not shown as 'R' then award max 2 (as general structure asked for in Q) IGNORE labels</p> <p>ACCEPT displayed structure of NH₂ / HNH ACCEPT displayed structure of COOH if correct double bond shown</p> <p>AWARD only if the candidate has drawn a single 'amino acid' molecule</p> $ \begin{array}{c} \text{H} \\ \\ \text{H}_2\text{N} - \text{C} - \text{COOH} \\ \\ \text{R} \end{array} $
(b)	(i)	strength / toughness / insolubility ;	1	<p>Mark the first answer. If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks</p> <p>ACCEPT strong / tough IGNORE flexible / inelastic IGNORE withstand pressure</p>

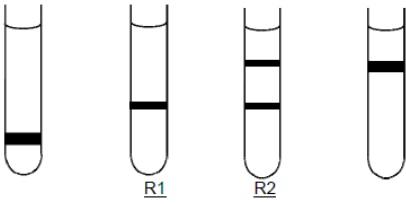
(c)	(i)	transport / AW , of, oxygen / O ₂ ;	1	<p>Mark the first answer. If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks</p> <p>ACCEPT buffering blood / carrying CO₂ / storing oxygen IGNORE binding oxygen IGNORE Iron</p>
(c)	(ii)	<p>1 <i>haemoglobin (has / is):</i> globular ;</p> <p>2 hydrophobic (R) groups on inside / hydrophilic (R) groups on outside ;</p> <p>3 4 , chains / sub-units / polypeptides ;</p> <p>4 <i>idea that</i> subunits are (two) different types ;</p> <p>5 α / alpha , helix ;</p> <p>6 <i>idea that</i> proportion of glycine similar to that , of other amino acids / in other proteins ;</p>	3	<p>IGNORE prompt lines – mark as prose but max 2 if an incorrect statement about haemoglobin is given IGNORE statements about collagen even if incorrect, answers must refer to haemoglobin</p> <p>1 IGNORE not fibrous / ball shaped</p> <p>3 IGNORE strands / molecules / proteins 4 ACCEPT in haemoglobin the subunits are not all the same</p> <p>3&4 "two alpha and two beta chains" = 2 marks (mp 3 and 4)</p> <p>5 ACCEPT α-helix</p> <p>6 ACCEPT wide(r) range of amino acids</p> <p>IGNORE refs to Fe (as part of prosthetic group)</p>

5)

(a)		enzymes ;	1	<p>IGNORE protein / catalysts ACCEPT enzymic</p>
(b)	(i)	<p>1 similar, shape / structure ;</p> <p>2 example of similarity ;</p> <p>3 both , will fit into / complementary (shape) to / bind to / bond to , <u>active site</u> (of alcohol dehydrogenase) ;</p>	3	<p>1 IGNORE same shape 1 ACCEPT 'ethanol same shape as part of DEG'</p> <p>2 IGNORE they contain C, H and O 2 IGNORE the end is the same 2 ACCEPT e.g. they both have OH 2 ACCEPT similar parts identified on diagram if they are clearly indicating an example of similarity</p> <p>3 ACCEPT implication of both 3 IGNORE attach / enter 3 IGNORE both will form ESC (with alcohol dehydrogenase)</p>
(b)	(ii)	<p>1 (ethanol) <u>competes</u> with DEG ; ora</p> <p>2 (when at high(er) concentration) ethanol more likely to , collide with / bind to / bond to , active site ; ora</p> <p>3 less , DEG breakdown / toxic product ; ora</p>	3	<p>1 ACCEPT ethanol / DEG , is , a <u>competitive</u> inhibitor</p> <p>2 ACCEPT 'ethanol more likely to form ESC' 2 ACCEPT implication of 'more likely' from context 2 IGNORE attach / enter</p> <p>3 ACCEPT DEG product is diluted 3 ACCEPT no DEG breakdown</p> <p>IGNORE 'you will drink less of it'</p>

6)

(a)	(i)	<p>X cytosine / pyrimidine ;</p> <p>Y nucleotide ;</p>	2	<p>Mark the first answer on each prompt line. If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks</p> <p>X ACCEPT <u>nitrogenous</u> base / <u>organic</u> base X IGNORE C</p>
(a)	(ii)	<p>at least one line between all opposite bases ;</p> <p>two lines between A and T and three lines between both instances of C and G ;</p>	2	<p>IGNORE bond labels / H / O / δ⁺ / δ⁻</p> <p>Bases on left strand do not need to be labelled but CON this mark if incorrectly labelled</p>
(a)	(iii)	<p>polypeptide ;</p> <p>ribosome ;</p>	2	<p>ACCEPT protein</p>
(a)	(iv)	<p>(usually) single stranded / would not have 2 strands ;</p> <p>uracil / U, instead of thymine / T ;</p>	2	<p>Mark the first answer on each prompt line. If the answer is correct and an additional answer is given that is incorrect or contradicts the correct answer then = 0 marks</p> <p>IGNORE shorter ACCEPT only one backbone</p> <p>DO NOT CREDIT incorrect spelling of thymine with 'a'</p> <p>IGNORE difference in sugar as on the diagram ribose and deoxyribose would appear the same</p>

(b)	(i)	<p>one strand, from original DNA and one strand newly formed ; an , (original) strand / polynucleotide , acts as template (for new strand) ;</p>	2	<p>ACCEPT one old and one new strand ACCEPT each strand is copied</p>
(b)	(ii)	<p>(DNA) can be replicated without error / same sequence of nucleotides is produced ; reduces occurrence of mutation ; allows (re-)formation of , hydrogen / H , bonds ;</p>	2	<p>ACCEPT formation of identical DNA ACCEPT same / correct , order / sequence , of bases This mark point is for the correct use of the term 'mutation' and does not imply without error. ACCEPT prevents mutation DO NOT CREDIT H⁺ / H₂ bonds</p>
(c)	(i)	<p>horizontal band drawn in tube R1 clearly higher than band in ¹⁵N tube and clearly lower than band in ¹⁴N tube ;</p>	1	<p>DO NOT CREDIT if more than one band drawn IGNORE thickness of bands and whether bands are shaded DO NOT CREDIT if there is any overlap with a band in another tube</p>
(c)	(ii)	<p>one band (in R2) clearly at the same height as that in tube R1 and one band (in R2) clearly at the same height as that in the ¹⁴N tube ;</p>	1	<p></p> <p>DO NOT CREDIT if more than two bands drawn IGNORE thickness of bands and whether bands are shaded</p>
(d)		<p>same concentration of sugar (solution in each tube) ; same volume of, mixture / solution / sugar solution (in each tube) ; spin (all tubes) at same , speed / acceleration ; spin (all tubes) for same (length of) time ;</p>	3	<p>IGNORE prompt lines - mark as prose IGNORE amount throughout IGNORE mass IGNORE mass IGNORE volume , of sugar / DNA extract ACCEPT tubes spun at constant speed IGNORE temperature / pH IGNORE mass of DNA</p>