Unit 1 - Mark scheme

Question number	Answer	Mark
1(a)(i)	D the hydrophobic tails move away from the aqueous (water) environment	(1)

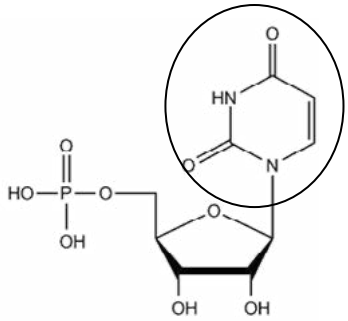
Question number	Answer	Mark
1(a)(ii)	B Q	(1)

Question number	Answer	Mark
1(b)	• diffusion of water molecules down a water potential gradient through a partially permeable membrane	(1)

Question number	Answer	Additional guidance	Mark
1(c)	An answer that includes the following points: similarities: • both used to transport large particles / large quantities of material (1) • both involve (phospholipid) membrane vesicles (1) difference: • exocytosis is export and endocytosis is import of material (1)	Accept a description of both processes	(3)

Question number	Answer	Mark
1(d)	An explanation that includes the following points: • oxygen molecule is small (1) • oxygen molecule is non-polar (1) • (it can, therefore) pass between gaps {in cell membrane / between hydrophobic tails} (1)	(3)

Question number	Answer	Mark
2(a)(i)	D ribose	(1)

Question number	Answer	Mark
2(a)(ii)		(1)

Question number	Answer	Mark
2(a)(iii)	• synthesis of RNA	(1)

Question number	Answer	Additional guidance	Mark
2(b)(i)	An answer that includes the following points: • OMP decarboxylase acting as a biological catalyst (1) • it lowers the activation energy of this reaction (1)	Allow forms an enzyme – substrate complex	(2)

Question number	Answer	Mark
2(b)(ii)	An explanation that includes the following points: • OMP decarboxylase is specific (for this substrate) (1) • because the active site of this enzyme has a particular shape (1) • therefore binds only with orotidine monophosphate (1)	(3)

Question number	Answer	Mark
3(a)(i)	A	(1)

Question number	Answer	Mark
3(a)(ii)	C	(1)

Question number	Answer	Mark
3(b)(i)	B at 0.4 seconds	(1)

Question number	Answer	Additional guidance	Mark
3(b)(ii)	A calculation in which: • volume of blood per beat from graph = 59 cm^3 (1) • heart rate calculated from graph = 75 bpm (1) • volume of blood converted into dm^3 (1) Example of calculation: (59 × 75) ÷ 1000 = 4.425 dm^3	Accept 109 − 50 Correct answer with no working shown gains all three marks	(3)

Question number	Answer	Mark
3(c)	An explanation that includes the following points: • dissociation curve for the llama is to the left of that for the human (1) • therefore llama haemoglobin has a higher affinity for oxygen (1) • llama haemoglobin will be fully saturated with oxygen at lower partial pressures (1) • this is necessary as there is less oxygen available in the atmosphere at high altitudes where llamas live (1)	(4)

Question number	Answer	Mark
4(a)(i)	D hydrolysis	(1)

Question number	Answer	Mark
4(a)(ii)	A calculation in which: kJ of energy = mass of lactose in 200 g of milk × energy per gram Example of calculation: 4.9 × 2 × 16 = 156.8 kJ	(1)

Question number	Answer	Additional guidance	Mark
4(b)	An answer that includes the following points: similarities: • both polysaccharides / formed from many (alpha) glucose monomers (1) • joined by glycosidic bonds (1) differences: • starch is composed of two polysaccharides, glycogen only one (1) • amylose is a {straight / helical} chain, amylopectin and glycogen are both branched molecules (1)	Allow description of glycosidic bonds as 1,4 and 1,6	(4)

Question number	Answer	Additional guidance	Mark
4(c)(i)	An answer that includes one of the following points: • saturated lipids have no carbon – carbon double bonds **and** unsaturated lipids have a carbon – carbon double bond or • saturated lipids have straight chains **and** unsaturated lipids have bent chains or • saturated lipids have a greate**r** ratio of hydrogen to carbon / unsaturated lipids have a lowe**r** ratio of hydrogen to carbon	Answer must be comparative	(1)

Question number	Answer	Mark
4(c)(ii)	An description that includes the following points: • one glycerol molecule and three fatty acid molecules (1) • which react via a condensation reaction (1) • and are joined by ester bonds (1)	(3)

Question number	Answer	Mark
5(a)	• sequence of bases of DNA that code for a polypeptide	(1)

Question number	Answer	Mark
5(b)	A description that includes the following points: • complementary bases / named pair of complementary bases (1) • it enables the formation of {two hydrogen bonds between adenine and thymine / three hydrogen bonds between cytosine and guanine} (1)	(2)

Question number	Answer	Additional guidance	Mark
5(c)	A explanation that includes the following points: • enough codons needed for 20 different amino acids (1) • four bases are used in the genetic code (1) • (triplet code) provides {enough / 43 / 64} possible codons (1)	Allow descriptions of single and doublet code providing insufficient alternatives	(3)

Question number	Answer	Additional guidance	Mark
5(d)	A answer that includes the following points: • correct genotypes of parents (1) • affected genotype of children correctly identified (1) • correct calculation of probability is 0.5 (1)	Accept 50%, 1 in 2, ½	(3)

Question number	Answer	Marks
6(a)	An explanation that includes the following points: • many small alveoli to provide a large surface area to increase the rate of diffusion (1) • thin epithelium to increase rate of diffusion (1) • good blood supply to maintain diffusion gradient (1)	(3)

Question number	Answer	Mark
6(b)(i)	• a version of a gene	(1)

Question number	Answer	Mark
6(b)(ii)	An explanation that includes the following points: • there will be a different sequence of R groups (1) • therefore the CFTR protein has a different tertiary structure (1) • because of different {types of / position of} bonds between the R groups (1) • therefore the movement of chloride ions through the cell membrane is affected (1)	(4)

Question number	Answer	Mark
6(b)(iii)	An explanation that includes any four of the following points: • produces very thick, sticky mucus (1) • because of reduced water transport from cells (1) • cilia lining airways are unable to move mucus (1) • therefore microorganisms get trapped in the mucus (1) • mucus provides suitable growth conditions for growth of microorganisms (1)	(4)

Question number	Answer	Mark
7(a)	A description that includes any five of the following points: • an mRNA molecule codes for each of the polypeptide chains in collagen (1) • mRNA carries a copy of the genetic code for collagen out of the nucleus to ribosome (1) • each tRNA carries its own specific amino acid to the {ribosome / mRNA} (1) • anticodon on tRNA binds to codons on the mRNA (1) • tRNA holds the amino acid in place while peptide bonds form (1) • reference to start and stop codons on mRNA (1)	(5)

Question number	Answer	Mark
7(b)	An explanation that includes any four of the following points: • insoluble because there are hundreds of amino acids (1) • insoluble because there are many hydrophobic R groups (1) • strong because of the triple helix (1) • therefore there are many repeating amino acid sequences (1) • many small R groups so that the triple helix can form (1)	(4)

Question number	Answer	Additional guidance	Mark
8(a)	A calculation which: • measured widths of wall as 10 mm and 30 mm (1) • shows the difference between widths, divided by smaller value (1) • × 100% (1) Example of calculation: (30 − 10) = 20 mm (20 ÷ 10) × 100 = 200%	Accept measurements consistent with printed image Correct answer with no working gains all 3 marks	(3)

Question number	Answer	Mark
8(b)	An explanation that includes the following points: • formation of blood clot / thickening of artery wall (1) • therefore {blocks / narrows} coronary arteries (1) • therefore reduces blood flow (1) • therefore deprives heart muscle of {oxygen / nutrients} (1)	(4)

Question number	Answer	Additional guidance	Mark
8(c)	Answers will be credited according to candidate's deployment of knowledge and understanding of the material in relation to the qualities and skills outlined in the generic mark scheme. The indicative content below is not prescriptive and candidates are not required to include all the material indicated as relevant. Additional content included in the response must be scientific and relevant. **Indicative content** • increased cholesterol increases chance of dying from CVD • cholesterol concentrations are different in different countries • same cholesterol level does not confer same risk in different countries • greater the cholesterol to HDL ratio, the greater the risk of CVD • the smaller the diameter the LDL, the greater the risk of CVD • individuals at greatest risk of CVD are those with a large cholesterol to HDL ratio and small LDL diameter and a high cholesterol concentration • not possible to say if different risks for a particular cholesterol concentration in the first study are due to differences in cholesterol to HDL ratio / diameter of LDL	Allow differences in the first study may be due to differences in cholesterol to HDL ratio / diameter of LDL	**(6)**

Level	Marks	Descriptor
	0	No awardable content.
1	1-2	A scientific assessment is made of a factor, supported by the application of limited relevant evidence from the scientific information provided. No conclusion is attempted.
2	3-4	A scientific assessment is made of some of the factors, supported by the application of some relevant evidence from the analysis and with some interpretation of the scientific information. A conclusion, where needed, is made, demonstrating linkages to elements of biological knowledge and understanding, with some evidence to support the assessment being made.
3	5-6	A scientific assessment is made of the factors, supported throughout by sustained application of relevant evidence from the analysis and interpretation of the scientific information. A conclusion, where needed, is made, demonstrating sustained linkages to biological knowledge and understanding, with sufficient evidence to support the assessment being made.