

Question 1

[illegible]

01.5	1. One amine/NH_2 group joins to a carboxyl/COOH group to form a <u>peptide</u> bond; 2. (So in chain) there is a free amine/NH_2 group at one end and a free carboxyl/COOH group at the other OR Each amino acid is orientated in the same direction in the chain;	2 Accept on diagram, for example (at least) two amino acids joining by a correctly drawn peptide bond (MP1) with NH_2 at one end and COOH at the other (MP2). 1. Ignore incorrect names of NH_2 and COOH groups. 2. Allow ECF for incorrect naming of groups.
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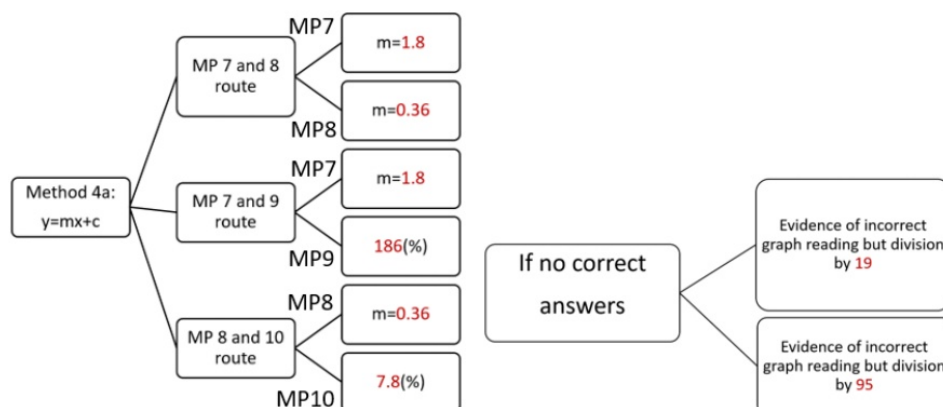
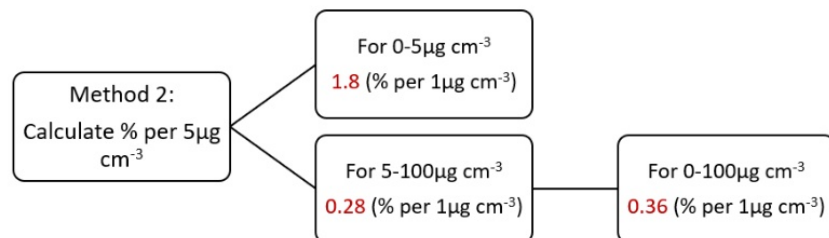
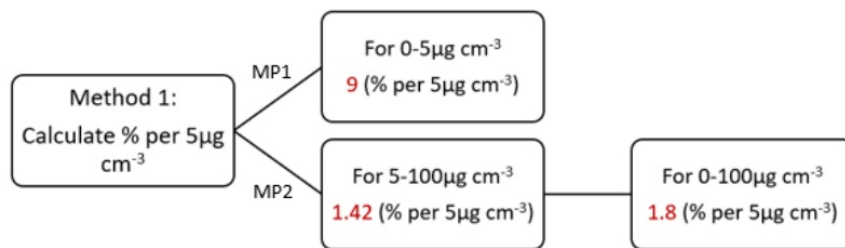
Question 2

Question	Marking Guidance	Mark	Comments
02.1	1. Triglycerides decrease because of the action of <u>lipase</u> OR Fatty acids increase because of the action of <u>lipase</u>; 2. Triglycerides decrease because of hydrolysis (of triglycerides) OR Fatty acids increase because of hydrolysis (of triglycerides); 3. Triglycerides decrease because of digestion of <u>ester</u> bonds (between fatty acid and glycerol) OR Fatty acids increase because of digestion of <u>ester</u> bonds (between fatty acid and glycerol);	3	Triglycerides decreasing or fatty acids increasing only need to be stated once. Accept 'lower/higher/quoted numbers' for 'decrease/increase'. Only withhold one mark if there is no/incorrect reference to triglycerides decreasing or fatty acids increasing.
02.2	1. To denature the enzymes/lipase; 2. So no further digestion/hydrolysis/catalysis occurred;	2	1. Accept description of denaturation in terms of change in tertiary structure. 2. Accept 'break down' for digestion.
02.3	1. Micelles include bile salts and fatty acids; 2. Make the fatty acids (more) soluble in water; 3. Bring/release/carry fatty acids to cell/lining (of the ileum); 4. Maintain high(er) concentration of fatty acids to cell/lining (of the ileum); 5. Fatty acids (absorbed) by <u>diffusion</u>;	3 max	1. Ignore other correct components of micelles. 2 and 3 only. For 'fatty acids' accept fats/lipids. 5. Reject if absorbed by facilitated diffusion 5. Ignore if micelles themselves are being absorbed. Ignore references to monoglycerides.

Question 3

Question	Marking Guidance	Mark	Comments
06.1	1. Reduced surface area; 2. Increased distance for <u>diffusion</u> ; 3. Reduced rate of gas exchange;	3	1 and 2. Accept description of efficient gas exchange in healthy alveolar epithelium as long as reference made to the damaged tissue changing this.
06.2	See appendix 1 for a flow chart (No) EITHER 1. 9 (percent per $5 \mu\text{g cm}^{-3}$); 2. 1.42/1.8 (percent per $5 \mu\text{g cm}^{-3}$); OR 3. 1.8 (percent per $1 \mu\text{g cm}^{-3}$); 4. 0.28/0.36 (percent per $1 \mu\text{g cm}^{-3}$); OR 5. 9% and 36/27% increase here; 6. (To be linear) 100 ($\mu\text{g cm}^{-3}$) would be 180/171% (increase) OR (To be linear) 5 ($\mu\text{g cm}^{-3}$) would be 1.8% (increase) OR % increase is x4 (0-5 $\mu\text{g cm}^{-3}$ compared with 0-100 $\mu\text{g cm}^{-3}$) but 5-100 is more than x4 OR % increase is x3 (0-5 $\mu\text{g cm}^{-3}$ compared with 5-100 $\mu\text{g cm}^{-3}$) but 5-100 is more than x3; OR 7. (Using $y = mx + c$) at 5 ($\mu\text{g cm}^{-3}$) $m = 1.8$; 8. (Using $y = mx + c$) at 100 ($\mu\text{g cm}^{-3}$) $m = 0.36$; 9. At 100 ($\mu\text{g cm}^{-3}$) y would be 186%; 10. At 5 ($\mu\text{g cm}^{-3}$) y would be 7.8%; If no correct answers accept for one mark Evidence of incorrect graph reading but division by 19 OR Evidence of incorrect graph reading but division by 95	2	Accept any number of significant figures as long as rounding correct, full answer for mp2 is 1.42105263, for mp4 is 0.28421053. Accept 1 and 2 OR 3 and 4 OR 5 and 6 OR 7 and 8 OR 7 and 9 OR 8 and 10

Appendix 1



Question 4

Question	Marking Guidance	Mark	Comments
01.1	Structure 1. Nuclear envelope and pores OR Double membrane and pores; 2. Chromosomes/chromatin OR DNA with <u>histones</u> ; 3. Nucleolus/nucleoli; Function 4. (Holds/stores) genetic information/material for polypeptides (production) OR (Is) code for polypeptides; 5. DNA replication (occurs); 6. Production of mRNA/tRNA OR Transcription (occurs); 7. Production of rRNA/ribosomes;	4 max (4 x AO1)	Max 2 for structure or function 1. Ignore porous for pores 2 Ignore genetic material/information 2. Accept nucleoplasm 2. Ignore promoter regions OR genes OR alleles Accept regulation of gene expression 4. Accept protein OR amino acid sequences OR primary structure for polypeptides 6 Ignore mRNA leaves nucleus

Question	Marking Guidance	Mark	Comments
01.2	Cellulose (plants) and Chitin (fungi);	1 (AO1)	For fungi, accept N-acetylglucosamine

Question	Marking Guidance	Mark	Comments
01.3	Individual organisms could not be identified/separated OR Too small/numerous to count individuals OR Too time consuming;	1 (AO2)	Ignore too difficult to identify/distinguish different species Ignore too difficult to count unless qualified Accept reference to fungi for plants

Question	Marking Guidance	Mark	Comments
01.4	Correct answer for 2 marks, 0.7– 0.71;; Accept for 1 mark, 0.29 – 0.3 (correct calculation not subtracted from 1) OR 120 (correct total shoot biomass)	2 (2 x AO2)	A common correct answer is 0.707 Accept numbers rounding down to 0.71

Question	Marking Guidance	Mark	Comments
01.5	1. Plant (bio)diversity is lower on (previously used) crop land OR Plant (bio)diversity is higher on land not used (previously to grow crops); 2. Farming reduces (bio)diversity of fungi OR Farming reduces fungi species richness;	2 (2 x AO3)	Assume index of diversity refers to plants If no context is given assume answer refers to land previously used to grow crops 1. Accept farming reduces plant (bio)diversity 2. Accept farming reduces number of fungi species

Question 5

Question	Marking Guidance	Mark	Comments
08.1	1. (Smooth) muscle absorbs/resists/withstands high (blood) pressure; 2. Elastic (tissue/layer) stretches and recoils maintains/smooths blood pressure; 3. (Smooth) endothelium reduces friction; 4. Protein (coat) prevents (artery) wall splitting OR Protein (coat) absorbs/resists/withstands high (blood) pressure;	2 max (2 x AO1)	1. Ignore contraction 1. Ignore maintains pressure 2. Reject contracts/relaxes for recoils 2. Accept dilate OR expand for stretch 4. Accept fibrous OR collagen for protein

Question	Marking Guidance	Mark	Comments
08.2	1. Small diameters are low risk of tears so unlikely to/do not have aneurysms OR As diameter increases, risk of tears increases and (risk of developing) aneurysms increase; 2. Few people have/at high risk of tear OR Few people have/at high risk of aneurysms; 3. Diameters > / above 4.5 (cm) at high risk (of tears) so may have aneurysms; 4. (High risk of) tear does not mean aneurysm will/has occurred;	3 max (3 x AO3)	1. Accept the converse 1. Accept ≤ 4.5 for small 2. Accept the converse, eg most people at low risk of tear/aneurysm 2. Accept 7/98/105 for few 3. Accept 'increases significantly'

Question	Marking Guidance	Mark	Comments
08.3	1. and 2. Correct answer of 35 / 35.1 / 35.3 / 35.7 / 36 / 40(%) = 2 marks ;; Accept for 1 mark , incorrect answer but shows: Evidence of 45 (correct stroke volume for diseased heart) OR Evidence of 69.6 OR 70 (correct stroke volume for healthy heart) OR	3 (3 x AO3)	Accept positive or negative values
	Evidence of 24.6 OR 25 (correct difference between stroke volumes) OR Evidence of 48.6 to 50 (correct calculated volume change, not percentage change) 3. (Mathematical error) incorrect rounding;		

Question 6

Question	Marking Guidance	Mark	Comments
01.1	1. Genetic material, capsid and attachment protein; 2. Genetic material codes for (viral) protein OR Capsid protects the genetic material/RNA/DNA OR Attachment protein bind to receptors (on cell);	2 (2 x AO1)	1. Accept 'DNA or RNA' (the 'or' OR '/' is needed) OR nucleic acid OR genome for 'genetic material' 1. Ignore genetic information 1. and 2. Accept glycoprotein for attachment protein 1. Accept nucleocapsid for 'capsid and nucleic acid' 1. and 2. Accept capsomeres for capsid 2. Accept DNA OR RNA OR genome for genetic material 2. Accept contains OR stores OR encloses for protects 2. Accept glycoprotein for receptor 2. Accept ECF for correct function of incorrect viral structural feature; eg reverse transcriptase produces DNA from RNA
Question	Marking Guidance	Mark	Comments
01.2	1. (Acellular) no cell(-surface) membrane OR Not made of cells; 2. (Non-living) have no metabolism/metabolic reactions; OR Cannot (independently) move/respire/replicate/excrete OR (Have) no nutrition;	2 (2 x AO1)	1. Accept have no organelles/cytoplasm Ignore 'do not contain membrane-bound organelles' 1. Accept 'do not have cell structure(s)' 2. Accept correct named metabolic reaction 2. Accept reproduce for replicate
Question	Marking Guidance	Mark	Comments

01.3	Do not have bacterial structures/enzymes OR Do not have metabolic processes OR Do not have a cell wall/murein;	1 (AO1)	Accept 'do not have ribosomes' Ignore 70S OR 80S Accept named metabolic processes; for example, 'do not make protein' OR 'do not replicate' Accept peptidoglycan OR glycoprotein for cell wall
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Question 7

Question	Marking Guidance	Mark	Comments
10.1	1. Hydrogen bonds (between DNA bases) break; 2. (Only) one DNA strand acts as a template; 3. (Free) RNA nucleotides align by complementary base pairing; 4. (In RNA) Uracil base pairs with adenine (on DNA) OR (In RNA) Uracil is used in place of thymine; 5. RNA polymerase joins (adjacent RNA) nucleotides; 6. (By) phosphodiester bonds (between adjacent nucleotides); 7. Pre-mRNA is spliced (to form mRNA) OR Introns are removed (to form mRNA);	5 max	Ignore DNA helicase. 1. Reject hydrolysing hydrogen bonds. 3. For 'align by complementary base pairing', accept 'align to complementary bases' or 'align by base pairing'. 4. Do not credit use of letters alone for bases. 5. Reject suggestions that RNA polymerase forms hydrogen bonds or joins complementary bases.
10.2	1. (mRNA attaches) to ribosomes OR (mRNA attaches) to rough endoplasmic reticulum; 2. (tRNA) anticodons (bind to) complementary (mRNA) codons; 3. tRNA brings a specific amino acid; 4. Amino acids join by peptide bonds; 5. (Amino acids join together) with the use of ATP; 6. tRNA released (after amino acid joined to polypeptide); 7. The ribosome moves along the mRNA to form the polypeptide;	6 max	

10.3	(Definition of gene mutation) 1. Change in the base/nucleotide (sequence of chromosomes/DNA); 2. Results in the formation of new <u>allele</u>; (Has no effect because) 3. Genetic code is degenerate (so amino acid sequence may not change); OR Mutation is in an intron (so amino acid sequence may not change); 4. Does change amino acid but no effect on tertiary structure; 5. (New allele) is recessive so does not influence phenotype; (Has positive effect because) 6. Results in change in polypeptide that positively changes the properties (of the protein) OR Results in change in polypeptide that positively changes a named protein; 7. May result in increased reproductive success OR May result in increased survival (chances);	4 max	For 4 marks at least one mark must be scored in each section of the answer. 1. Accept named mutation for 'change'. 3. Accept description of 'degenerate', eg some amino acids have more than one triplet/codon. 6. For 'polypeptide' accept 'amino acid sequence' or 'protein'.
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Question 8

Question	Marking Guidance	Mark	Comments
10.1	1. Homogenise (tissue) to break open cells OR Homogenise (tissue) to release organelles/nuclei; 2. Filter to remove (intact) tissue/cells/debris; 3. Cold (solution) to prevent enzyme activity; 4. (Solution with) equivalent water potential to prevent osmosis OR (Solution with) equivalent water potential to prevent organelles bursting/shrinking; 5. Buffered (solution) to stop enzymes/protein denaturing; 6. Centrifuge/spin at low(er) speed so <u>nuclei</u> in pellet/move to bottom OR Centrifuge at low(er) speed and supernatant/solution discarded;	6 (6 x AO1)	1. Accept blend OR grind OR chop for homogenise 3. Accept 'slow down' for prevent 4. Accept isotonic for 'equivalent water potential' 4. Reject if reference is made to cells 6. Accept up to 1000 revolutions min⁻¹ OR 1000 x gravity for identified slow spin speed
Question	Marking Guidance	Mark	Comments
10.2	1. DNA in nucleus codes for enzyme/protein (production); 2. Ribosomes/rough endoplasmic reticulum produce enzyme/protein OR Translation on ribosomes/rough endoplasmic reticulum; 3. Rough endoplasmic reticulum transports/modifies/processes enzymes/protein; 4. Mitochondria produce ATP; 5. Golgi apparatus modify/process/package/transport enzymes/protein OR Golgi apparatus make/transport glycoprotein OR Golgi apparatus forms/releases vesicles; 6. Vesicles move (protein) to cell(-surface) membrane OR Vesicles fuse with cell(-surface) membrane;	5 max (5 x AO1)	1. Accept genetic material/code OR gene for DNA Accept polypeptide for protein/enzyme 3. Ignore rER/RER only once 4. Reject produce energy 5. Accept body for apparatus 5 Accept 'adds lipid/carbohydrate to' for modify 5. Accept lipoprotein for glycoprotein 5 and 6 Accept lysosome for vesicle 6. Accept exocytosis for 'fuse with cell membrane'
Question	Marking Guidance	Mark	Comments

10.3	1. Ribose, Adenine and 3 phosphates; 2. ATP to ADP + Pi by ATP hydrol ase in hydrolysis (reaction); 3. ADP + Pi to ATP by ATP synth ase ; 4. (In) condensation (reaction);	4 (4 x AO1) 1. Accept a labelled diagram showing ribose, adenine and 3 phosphates 1. Accept adenosine and 3 phosphates 1. Reject Adenosine and 3 phosphates if ribose/pentose is also mentioned 1. Ignore pentose sugar 2. Accept ATPase for ATP hydrolase 2. Accept hydrolayse 3. Accept synthayse
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Question 9

Question	Marking Guidance	Mark	Comments
10.1	1. Amino acids joined by peptide bond(s); 2. (By) condensation reaction(s); 3. Secondary structure is formed by hydrogen bonding; 4. Tertiary structure formed by interactions (between R groups); 5. Quaternary structure contains >1 <u>polypeptide</u> OR Quaternary structure formed by interactions/bonds between <u>polypeptides</u> ;	5 (5 x AO1)	3. Accept alpha helix OR β -pleated sheet for 'secondary structure' 4. Accept 3° for tertiary 4. and 5. Accept for 'interactions', hydrogen bonds OR disulfide bridges OR ionic bonds OR hydrophobic OR hydrophilic interactions 5. Ignore peptide
Question	Marking Guidance	Mark	Comments
10.2	1. Polymer of nucleotides; 2. (Nucleotide) consists of deoxyribose, phosphate and an organic/nitrogenous base; 3. Phosphodiester bonds (between nucleotides); 4. DNA double helix held by H bonds OR 2 strands held by H bonds; 5. (Hydrogen bonds/pairing) between adenine, thymine and cytosine, guanine; 6. DNA is associated with histones/proteins; 7. (During mitosis/when visible) chromosome consists of two chromatids joined at a centromere;	6 max (6 x AO1)	1. Accept 'polynucleotide' 2. Accept 'phosphoric acid' for phosphate 5. Ignore bases identified with letters (A, T, G, C) 5. Reject adenosine and cysteine Accept correctly annotated diagram(s) for equivalent marking points
Question	Marking Guidance	Mark	Comments
10.3	1. Independent segregation of homologous Chromosomes/pairs; 2. Crossing over between homologous chromosomes/pairs; 3. Random fertilisation of gametes; 4. (Produces) new combinations of <u>alleles</u> ;	4 (4 x AO1)	If no marks awarded accept one principle mark 'Meiosis producing cells that are genetically different (from one another)' 1. For 'independent' accept 'random' 1. For 'segregation' accept 'assortment' 2. Accept 'within bivalent' for 'between homologous pair' 3. Ignore 'random mating' 3. Accept 'random fusion' for 'random fertilisation' Accept as an

		additional mark point 5. (Produces) new combinations of maternal and paternal chromosomes Ignore reference to epigenetics
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