PEARSON EDEXCEL A-LEVEL BIOLOGY B · 9BI0

BIOLOGY



MARK SCHEME

TOPIC 1: BIOLOGICAL MOLECULES

PROTEINS

SCORE	PERCENTAGE
/65	%

STEMUP

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Mark Scheme

Q1.

Question Number	Acceptable Answer	Additional Guidance	Mark
	An explanation that makes reference to the following: • substitution of val for glu, which has a different { R / residual } group (1) • val (R-group) has no positive charge (1) • therefore ionic bond lost (1) • therefore tertiary structure changes (1)	Allow glu has a positive charge	**(4)**

Q2.

Question Number	Answer	Additional Guidance	Mark
(i)	C 3 *A is incorrect because palmitic, myristic and stearic acid are saturated fats* *B is incorrect because palmitic, myristic and stearic acid are saturated fats* *D is incorrect because palmitic, myristic and stearic acid are saturated fats*		**1**

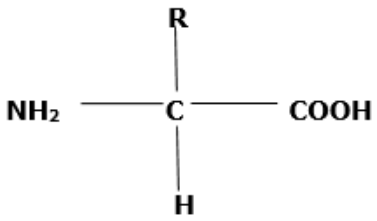
Question Number	Answer	Additional Guidance	Mark
(ii)	An answer that makes reference to four from the following: • %SFC for both decreases as temperature increases for both cocoa butter and palm oil / both have 5% SFC at 35 °C (1) • the % SFC of cocoa butter is higher at all temperatures (except 35 °C) (1) • because cocoa butter has higher percentage of / more saturated fat (1) • so fatty acid chains can associate with each other more easily (1) • the % SFC of cocoa butter decreases more steeply above 25 °C / larger decrease after 25°C (1)	**Accept** converse **Accept** converse **Accept** pack more tightly together / has straight chains/rods which pack tightly together higher density of intermolecular contacts/bonds	4

Q3.

Question Number	Answer	Mark
(i)	The only correct answer is A hydrogen only *B is incorrect because ionic bonds are not involved in the secondary structure* *C is incorrect because disulfide bonds are not involved in the secondary structure* *D is incorrect because ionic bonds are not involved in the secondary structure*	1

Question Number	Answer	Additional Guidance	Mark
(ii)	An explanation that makes reference to three of the following: • {tyrosinase active / melanin made} in cooler regions (1) • tyrosinase denatures / {hydrogen / ionic} bonds break (in warm / light regions) (1) • active site changes shape / tertiary structure changes (1) • no enzyme substrate complexes form / tyrosine does not bind (to tyrosinase / enzyme) (1)	**ACCEPT** converse throughout **ACCEPT** enzyme for tyrosinase for all mark points **ACCEPT** optimum temperature is cool / low	3

Q4.

Question Number	Acceptable Answer	Additional guidance	Mark
	 • central carbon atom bonded to NH_2 and COOH group (1) • central carbon atom bonded to R group and H atom (1)	Allow opposite orientation with R group and R may be replaced with appropriate group	**(2)**

Q5.

Question Number	Answer	Additional Guidance	Mark
	An explanation that makes reference to five of the following: • DNA synthesis is needed for {mitosis / cell division} (1) • Dox prevents {DNA synthesis / DNA strands separating / promotors binding} (1) • because the strands are not available (for nucleotides to align) (1) • Dox prevents {transcription / transcription factors from binding} (1) • so no proteins synthesised (1) • repair enzyme will not be able to remove the drug (1)	ACCEPT without DNA synthesis the cell will remain in interphase ACCEPT mRNA cannot be made ACCEPT {cell cycle stops / cells destroyed} if damaged DNA is not repaired	

Q6.

Question Number	Acceptable Answer	Additional Guidance	Mark
	An answer that makes reference to the following: • { selective pressure against / loss of } sickle cell alleles due to effects of sickle cell anaemia (1) • heterozygote advantage due to protection against malaria increases { HbS frequency / number of heterozygotes } (1) • heterozygote advantage increases with increased prevalence of malaria (1) • HbS frequency depends on whether malaria or sickle cell disease represents a greater risk to survival (1)		**(4)**

Q7.

Question Number	Acceptable Answer	Additional Guidance	Mark
	D (proteins, nucleic acids, starch)		**(1)**

Q8.

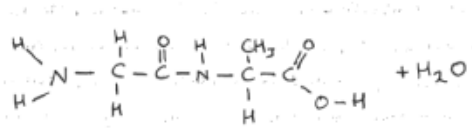
Question Number	Answer	Additional Guidance	Mark
(i)	**The only correct answer is D** **A** is incorrect because antibodies have two antigen binding sites **B** is incorrect because the two binding sites attach to the antigen and not the macrophage **C** is incorrect because there is only one macrophage binding site		(1) COMP

Question Number	Answer	Additional Guidance	Mark
(ii)	**The only correct answer is B** **A** is incorrect because hydrolysis reactions breakdown molecules **C** is incorrect because nucleotides are the monomers of polynucleotides not proteins **D** is incorrect because nucleotides are the monomers of polynucleotides not proteins		(1) COMP

Question Number	Answer	Additional Guidance	Mark
(iii)	An explanation that makes reference to the following: • (because water enters part of cell) by osmosis (1) • from a high water potential to a low water potential / because the osmotic potential inside the cell is lower / from a low solute concentration to a higher solute concentration (1)	**ACCEPT** more concentrated cytoplasm solute potential for osmotic potential **IGNORE** concentration gradient unqualified water concentration	(2) EXP

Question Number	Answer	Additional Guidance	Mark
(iv)	A description that makes reference to three of the following: • bacteria engulfed and {digested / broken down} (1) • antigen attached to MHC antigen (1) • macrophage becomes an antigen-presenting cell (to the T helper cell) (1) • CD4 (antigen) of T (helper) cell binds to {antigen / macrophage} (1)	**ACCEPT** macrophage presents the antigen (to the T helper cell) **NB** CD4 (antigen) of T (helper) cell binds to {antigen-MHC complex = 2 marks	(3) EXP

Q9.

Question Number	Answer	Additional Guidance	Mark
(i)	**A** CH_3 *B is incorrect because it is the carboxylic acid group* *C is incorrect because it is not the R group* *D is incorrect because it is the amino group*		**1**
(ii)	*An answer that makes reference to:* • correct peptide bond between the amino acids(1) • a water molecule (1)		**2**
(iii)	*An answer that makes reference to three from:* • three polypeptide chains (1) • that are (left hand) helices joined together (1) • (helices are held together) by hydrogen bonds (1) • many tropocollagen molecules / triple helicesjoined together (1)	**Allow** repeating sequences of aminoacids / every third amino acid is glycine / lots of proline **Allow** triple helix	**3**

Q10.

Question Number	Correct Answer	Additional guidance	Mark
(a)	An explanation that makes reference to the following: • {Active site changes shape / not correctly formed} and no longer an efficient 'fit' to substrate (1) • because if one amino acid is changed then these bonds cannot form (1) • because only certain amino acids (e.g. cysteine needed for S –S bonding) can form disulphide bridges/hydrogen bonds/ionic bonds (1) • and these bonds are important in the formation of a tertiary/3D protein structure (1)		**(4)**

Question Number	Correct Answer	Additional guidance	Mark
(b)(i)	An explanation that makes reference to the following: • (reduced activity of GA_{20} oxidase means) less active GA_{20} is produced (1) • therefore less GA_{20} means more DELLA proteins present (1) • hence more DELLA proteins means fewer transcription factors binding to growth regulator genes (1) • therefore resulting in growth regulator genes not expressed / growth less because transcription factors needed for expression of genes (1)	Less DELLA protein broken down	**(4)**

Question Number	Correct Answer	Additional guidance	Mark
(b)(ii)	• equation $p^2 + 2pq + q^2 = 1$ (1) • $p^2 = 0.36$ so $p = 0.6$ (1) • $q = 0.4$ so $2pq = 2 \times 0.6 \times 0.4$ (1) • correct answer 48% (1)		**(4)**

Q11.

Question Number	Answer	Additional Guidance	Mark
(i)	• multiplication (1) • division (1)	2×10^{10} divisions per day x 10^{-7} mutations per division / 2×10^{10} = 20 000 000 000 ÷ 10 000 000 / = 2 000 / 2×10^{3} Correct answer gains full marks, with no working shown ALLOW one mark for 20 000 000 000 / ÷ 10 000 000 / 10×10^{6} / 1×10^{7}	**(2)**

Question Number	Answer	Additional Guidance	Mark
(ii)	An explanation that makes reference to three of the following: • different {R groups / disulphide bonds / hydrogen bonds / ionic bonds} (1) • therefore different secondary / tertiary structure (1) • therefore different shaped ribosome (1) • therefore streptomycin cannot bind (to ribosome) (1)		**(3)**

Q12.

Question Number	Answer	Additional Guidance	Mark
	A description that makes reference to two of the following: • has a {tertiary structure / three dimensional structure (and quaternary structure)} (1) • held by named bond (1) • hydrophilic on the outside of the molecule (1)	**ACCEPT** hydrophobic R groups in the centre of the structure	**(2)**

Q13.

Question Number	Acceptable Answer	Additional Guidance	Mark
	D (mRNA)		**(1)**

Q14.

Question Number	Answer	Additional Guidance	Mark
	A description that makes reference to three of the following: • (folded into) {spherical / rounded / 3D} shape (1) • {polar / hydrophilic} {R groups / amino acids} on outside (1) • {non polar / hydrophobic} {R groups / amino acids} on inside (1) • ionic / hydrogen / disulfide bonds (1)	Accept disulfide bridges	**(3)**

Q15.

Question Number	Answer	Additional Guidance	Mark
(i)	The only correct answer is **B** (hydrogen, ionic and disulfide) **A** is not correct because glycosidic and ester bonds are not tertiary structure bonds **C** is not correct because glycosidic bonds are not tertiary structure bonds **D** is not correct because ester bonds are not tertiary structure bonds		**(1)**

Question Number	Answer	Additional Guidance	Mark
(ii)	A explanation that makes reference to three of the following: • different {sequence of amino acids / primary structure} (1) • so there will be different R groups (1) • therefore {secondary / tertiary / quaternary} structure is different (1) • {active site is not complementary to monophenol / active site has different shape} so {monophenol cannot bind / enzyme substrate complexes cannot form} (1)	**Accept** insertion of a stop codon leads to shorter polypeptide (1) **Accept** different hydrogen bonds / disulfide bonds / ionic bonds **Accept** correct references to α-helix and β-sheet **Accept** references to substrate for monophenol	**(3)**