



Mock Exam 1

BIOLOGY

9700

Paper 2 AS Level Structured Questions

MARK SCHEME

Maximum Mark: 60

Published

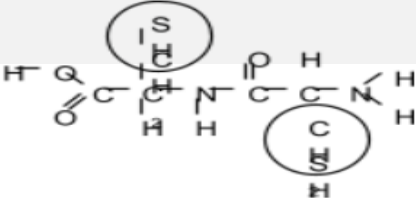
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Q1.

<p>either R group circled ;</p> 	<p>1</p>
<p>disulfide (bonds) ;</p>	<p>1</p>
<p><u>exocytosis</u> ;</p> <p><i>plus any two from:</i> (idea of) vesicles will be large enough to contain many mucins / ref. to bulk transport ; vesicles forming from Golgi, body / apparatus ; vesicles fuse with cell surface membrane ; active process / requires ATP ; AVP ; e.g. mucins polar / hydrophilic, (so) cannot cross, phospholipid bilayer / hydrophobic part of membrane</p>	<p>3</p>
<p><i>any two from:</i> (because mucus is too thick) cilia, have difficulty / AW, moving the mucus upwards ; pathogens, build up / not removed / AW ; more chance of; infection / disease ; AVP ;</p>	<p>2</p>
<p>deletion ;</p>	<p>1</p>
<p>transcribed / template ; R transcription strand I anti-sense / coding, strand</p>	<p>1</p>
<p>AUC AUU GGU GUU ;</p>	<p>1</p>
<p><i>any three from:</i> idea of 3 bases coding for 1 amino acid ; introns / non-coding DNA, removed from primary transcript RNA / AW ; accept gene splicing accept mRNA does not contain introns R if not in correct context (primary transcript to mRNA) because introns, are non-coding / do not code for amino acids ; DNA triplet / mRNA codon for STOP does not code for an amino acid ; methionine at start / first amino acid / amino acid coded for by START codon, removed ; AVP ; e.g. ref. to (upstream) enhancer sequences ref. to (downstream) terminator sequences ref. to (non-coding) regulatory sequences / promoter</p>	<p>3</p>

Q2.

<p>half V_{max} / AW, = $\underline{7}$ ($\mu\text{mol dm}^{-3} \text{min}^{-1}$) / take half of V_{max} of 14 ($\mu\text{mol dm}^{-3} \text{min}^{-1}$); A description of using the graph to find $\frac{1}{2} V_{max}$ without reference to figures</p> <p>read (substrate concentration) from x-axis / AW ;</p> <p><i>alternative</i> plot $1 / [S] = x$</p>	2
<p>allow phosphate group(s) / organic compound for substrate <i>if affinity not used, accept idea of ability to form ESC</i> check for ora I ref. to competitive inhibition</p> <p>1 enzyme B has a lower affinity for its substrate (than enzyme A) or the higher the K_m the lower the affinity of the enzyme for its substrate ; R if substrate has affinity for the enzyme</p> <p>2 enzyme B needs a higher concentration of substrate to reach, $V_{max} / \frac{1}{2}V_{max} / K_m$ (than enzyme A) ;</p> <p>3 AVP ; e.g. enzyme B forms fewer ESC in the same unit of time enzyme B active site is a less good fit for substrate <i>idea that</i> in normal cell enzyme A is saturated (with substrate) so works at a constant rate variations in substrate concentration will have less effect on the rate of formation of product by enzyme A I ref. to turnover number(s)</p>	max 2
<p><i>marks can be taken from a sketch graph</i></p> <p>1 competitive inhibitor, occupies / competes with substrate for / AW, <u>active site</u> (of the enzyme) ;</p> <p>2 reduces frequency of collisions (with substrate) / fewer ESCs form ; R no ESCs form</p> <p>3 reduces reaction rate at low substrate concentrations ;</p> <p>4 <i>idea that</i> curve with inhibitor is to the right of the curve without inhibitor ;</p> <p>5 at high substrate concentration / with increasing substrate concentration, the inhibitor has, no / less, effect ; A <i>idea that</i> substrate outcompetes inhibitor at high substrate concentration</p> <p>6 therefore V_{max} is the same as it is determined by the enzyme concentration / AW ; A explanation in terms of active sites, saturated / fully occupied</p> <p>7 <i>idea of</i> intercept to curve gives a higher value for K_m ;</p>	max 4

Q3.

- (a) habitat ;
all the organisms / plants and animals / populations / AW, in the ecosystem / forest / place / area / habitat ;
niche ;
population ; [4]
- (b) (i) primary consumer / herbivore ; [1]
- (ii) (sloth) cannot digest, cellulose / cell wall (in leaves), itself ;
R cannot digest leaves **R** allows sloth to digest cellulose
able to, absorb / use, products / sugars, from, cellulose / cell wall, digestion ;
provide, vitamins / minerals ;
ref to, protein / nitrogen, recycling ;
idea of protection from gut, pathogens / parasites ; [1 max]
- (iii) predators are, secondary consumers / tertiary consumers / top carnivores ;
(population, size / number of) predators limited by numbers of prey / sloths / AW ;
energy loss, between trophic levels / along food chain / inefficient energy transfer ;
detail e.g. only 10% transfer / respiration / heat / movement / excretion / inedible parts / egestion / to decomposers ;
(prey numbers small so) competition for, food / prey ;
predators hunted by humans ;
habitats / areas, of predators destroyed ; [3 max]
- [Total: 9]

Q4.

- (a) (endoplasmic reticulum/RER) has ribosomes ;
(ribosomes/RER) site of protein synthesis ;
antibodies are proteins ;
RER for, modification/transport/transport vesicle formation ; [max 2]
- (b) 3000 ;; **A** 2933/3067 *if units given allow one mark only*
if incorrect allow one mark for correct length measured 44/45/46 mm and
knowledge of formula is correct (magnification = image length/actual length –
this can also be seen by workings e.g. 45 mm / 15 μ m) but incorrect conversion
factor used for final calculation [2]
- (c) Variola (virus) ; [1]
- (d) memory cells produced (along with plasma cells) ;
to max 2
idea of greater number of (specific immune system) cells ;
(memory cells are) long(er) lived/remain in circulation ;
memory T and B cells ;
ref. to/detail of, faster secondary response (to give immunity) ; [max 3]

- (e) *two relevant e.g.*
- 1 vaccine, thermostable/freeze-dried ; **A** *idea of* longer shelf-life/no wastage
 - 2 virus did not mutate ; **A** pathogen/strain
 - 3 same vaccine could be used everywhere ;
 - 4 cheap to produce (in large quantities) ;
 - 5 ease of production ;
 - 6 used a live virus/vaccine gave a strong immune response ;
 - 7 no need for boosters ;
 - 8 ease of administration ; e.g. ref. to enthusiastic volunteers
needles could be, sterilised/re-used
 - 9 high percentage cover/AW ;
 - 10 ref. to ring vaccination/described ;
 - 11 global effort/AW ;
- [2]

- (f) artificial active/active artificial ;
- [1]

[Total: 11]

alt

Q5.

(a) *this can be answered in the context of penicillinase*

- 1 complementary shape ;
- 2 substrate, fits into / enters / binds to / with, active site ;
A enzyme-substrate complex / ESC
- 3 ref. to specificity ;
- 4 lock and key / induced fit ; **A** description of induced fit
- 5 ref. to temporary bonds form with, active site / R groups (of amino acid residues) ;

[max 3]

(b) *shown to max 2*

secondary structure ;
 α / alpha, helix ; **R** 'helix' / helical structure unqualified by alpha
 β pleated sheet ;
tertiary structure / folding ; **ignore** 3D shape or structure
globular ;

not shown to max 2

amino acids / primary structure / sequence of amino acids ;
(types of) R groups ;
bonds / named bonds ; **A** peptide
quaternary structure ;
prosthetic group ;

[max 3]

(c) (i) one lower peak inside line than uncatalysed ;
start and finish at, dotted lines / same energy levels as uncatalysed ;

[2]

(ii) activation (energy) / (energy of) activation ;

[1]

- (d)
- 1 do not prescribe for viral diseases ;
 - 2 only use when necessary / do not overprescribe ;
 - 3 only available on prescription / not available 'over the counter' ;
 - 4 people must, complete the course / take as instructed ;
R take a long course
 - 5 test to find out which is most appropriate antibiotic to use ;
A use most, appropriate / effective, antibiotics
A use narrow-spectrum antibiotics
 - 6 details of sensitivity test ;
 - 7 rotate / AW, antibiotics / use in combination ; **R** use many antibiotics
 - 8 do not use same antibiotics for humans and animals ;

[max 2]

[Total: 11]

Q6.

- (a) 1 small size / 6-8 μm (diameter), to squeeze through capillaries (7 μm) ;
2 small size / 6-8 μm (diameter), so, haemoglobin (molecules) near to surface (of plasma membrane) / reduces distance for diffusion (in / out of rbc) ;
3 no nucleus / lack of organelles, so more room for haemoglobin (so more oxygen transported) ; **R** more room for oxygen
4 biconcave shape / diagram drawn, increases surface area for, diffusion / uptake / release (of oxygen) ;
5 flexible / AW (membrane), to squeeze through capillaries ; [max 3]
- (b) 1 enzymes are proteins, protein synthesis does not occur ;
2 no, nucleus / DNA / genes, so no, transcription / mRNA ; } *
3 no mRNA, so no, translation / protein synthesis ; } *
***A** no nucleus, so no protein synthesis *for one mark*
4 no, RER / ribosomes, site of protein synthesis / AW ;
5 no mitochondria, insufficient ATP (for synthesis) ;
6 no RER for modification (of protein) ; **A** Golgi apparatus [max 2]
- (c) (i) iron ; **A** Fe^{2+} / Fe^{3+} / ferrous / ferric [1]
(ii) amino acids / peptides ; [1]
- (d) carbonic anhydrase ; [1]
- (e) 1 diffusion of, carbon dioxide / CO_2 ;
2 into red blood cell from correct source ;
3 description of carbonic acid formation followed by H^+ production ;
4 ref. carbonic anhydrase) fast reaction; **A** ecf from (d)
5 haemoglobin has a higher affinity for hydrogen ions than oxygen ;
A haemoglobin releases oxygen more easily in acidic conditions
accept idea of H^+ binding to haemoglobin bringing out oxygen release
6 ref. to, allosteric effect / change in tertiary structure / AW, in (oxy)haemoglobin, causes, release / AW, of oxygen ;
7 formation of haemoglobinic acid ; *must refer to, H^+ binding / decreased pH*
8 ref. higher partial pressures / AW, CO_2 , linked to (oxy)haemoglobin releasing, more oxygen / oxygen more readily ; *Bohr shift*
9 formation of carbamino-haemoglobin ; **R** carboxyhaemoglobin
10 chloride shift, qualified ;
e.g. as hydrogen carbonate ions move out of cell, chloride ions move in e.g. to maintain, electroneutrality / a balance of charge / ions ; [max 5]

[Total: 13]