
BIOLOGY

9700/22

Paper 2 AS Level Structured Questions

March 2017

MARK SCHEME

Maximum Mark: 60

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge will not enter into discussions about these mark schemes.

Cambridge is publishing the mark schemes for the March 2017 series for most Cambridge IGCSE®, Cambridge International A and AS Level components and some Cambridge O Level components.

PUBLISHED

Question	Answer	Marks
1(a)	label line and letter G to one of the ends of the chromosome ;	1
1(b)	anaphase / telophase ;	1
1(c)	cytokinesis ;	1
1(d)	receptor(s) ; I description of receptor	1

Question	Answer	Marks
2(a)(i)	<i>Vibrio cholerae</i> ;	1
2(a)(ii)	A 1 <i>cell structure</i>: ribosome ; R RER 2 <i>difference</i>: 70S / smaller / 18 nm v 80S / larger / 25–30 nm ; B 3 <i>cell structure</i>: DNA / chromosome ; I RNA 4 <i>difference</i>: circular / (closed) loop v linear OR no histone proteins / naked v histone proteins OR not surrounded by nuclear envelope v surrounded by nuclear envelope ; A in a nucleus v not in a nucleus C 5 <i>cell structure</i>: cell wall ; 6 <i>difference</i>: murein / peptidoglycan v cellulose ; I lignin	6

PUBLISHED

Question	Answer	Marks
2(b)	<i>two from</i> 1 caused by, a pathogen / a bacterium / <i>V. cholerae</i> ; 2 transmissible / AW OR reference to faecal-oral route ; 3 reference to reduced effectiveness of functions / AW ;	2
2(c)	primary, secondary, tertiary ; A 1°, 2°, 3° quaternary ; A 4°	2
2(d)	<i>three from:</i> 1 cholera toxin, fits into / complementary to, receptor / GM1 ; A complementary shape 2 membrane pinches in / invaginates / AW ; A engulfs / envelops 3 membrane fusion ; 4 (endocytotic) vesicle / vacuole, formed ; 5 ATP / energy, required ; A points from an annotated diagram	3
2(e)(i)	<i>one from:</i> 1 portion that binds to cell ; 2 (antibodies produced) prevent binding to cell / prevent entry to cell ; 3 safer as not the toxic portion ; 4 A subunit, causes damage to cell / less safe / AW ; 5 AVP e.g. larger so more likely to provoke immune response / AW ;	1

PUBLISHED

Question	Answer	Marks
2(e)(ii)	<i>five from:</i> 1 vaccine contains (subunit B / bacterial) antigen(s) ; 2 primary immune response occurs ; 3 correct ref to B-lymphocytes / formation of plasma cells ; A B cells 4 secretion of, antibody / immunoglobulin (against cholera antigens) / antitoxins ; 5 T-helper lymphocytes secrete cytokine ; 6 (cytokine) increases humoral response / stimulates T-killer cells / stimulates macrophages ; 7 memory cell production ; 8 secondary (immune) response / response on further infection, is faster ; 9 higher levels of antibodies produced (during further infection) ; 10 active artificial immunity (against cholera) ; 11 AVP e.g. <i>idea</i> of specific antibody against each of the different vaccine antigens ;	5

PUBLISHED

Question	Answer	Marks
3(a)	all three correct ; with the non-competitive inhibitor Z with the competitive inhibitor Y without any inhibitor X	1
3(b)	four from: V_{max} 1 X and Y same V_{max} of 10 au ; 2 V_{max} of, X/Y , higher than Z /ORA ; A (V_{max} of), X/Y , 10 au v Z 5 au A (V_{max} of), X/Y , double the V_{max} of Z K_m 3 X and Z same K_m ; A K_m of both is 4 mmol dm ⁻³ 4 X/Z , lower K_m than Y /ORA ; A K_m of, X/Z , 4 mmol dm ⁻³ v Y 6.5 mmol dm ⁻³ 5 reference to affinity for substrate ;	4
3(c)	four from: 1 double helix ; 2 strands are held together by hydrogen bonds (between bases) ; 3 complementary base pairing / described as A-T and C-G ; A purine pairs with pyrimidine R thiamine 4 antiparallel stands / strands are 3' to 5' and 5' to 3' ; A strands run in opposite directions 5 (each strand has a sugar phosphate backbone with) phosphodiester bonds ; 6 (monomers / units / DNA) are (DNA) nucleotides / polynucleotide strands ; 7 (nucleotide =) <u>deoxyribose</u> sugar, phosphate, nitrogenous (organic) base ; A points from a diagram	4

PUBLISHED

Question	Answer	Marks
3(d)	<i>two from:</i> 1 <i>idea that</i> , hydrogen peroxide, damage / breaks, DNA <u>and</u> repair errors (may) occur ; 2 (so leads to) incorrect, nucleotide / base, inserted (during replication) / change in, nucleotide / base, sequence (of DNA / RNA) ; 3 new allele (may be) formed ; 4 may result in an altered polypeptide / AW ;	2

Question	Answer	Marks
4(a)	(closed) double circulation ; capillary ; pulmonary vein ; right atrium ; A auricle septum ;	5
4(b)(i)	<i>two from:</i> 1 <i>idea</i> that (to be transported) many substances need to, dissolve / be in solution ; 2 ionic compounds / named, can, dissociate / dissolve ; 3 polar compounds / named, e.g. glucose / amino acids, can dissolve ; 4 globular proteins / named, e.g. antibodies, can dissolve ;	2
4(b)(ii)	<i>three from:</i> 1 water molecules attracted to each other ; A sticky / stickiness <i>cohesion:</i> 2 (hydrogen bonding provides) <u>cohesion</u> between water molecules ; A water is cohesive 3 reference to water leaving xylem (at top), pulling water (molecules below) ; A there is a transpiration pull <i>adhesion:</i> 4 <u>adhesion</u> to <u>cellulose</u> lining (of xylem) ; A <u>cellulose</u> wall 5 maintains / prevents falling of, column of water ; 6 AVP e.g. reference to cellulose hydrophilic / adhesion to hydrophilic parts of lignin ;	3

PUBLISHED

Question	Answer	Marks
5(a)	bronchus } ; trachea } bronchiole ; alveolus ; I same structure written on more than one line	3
5(b)	<i>two from:</i> 1 (tobacco) smoke contains, tar / carcinogens / named carcinogen ; 2 causes mutations / mutagenic / described mutation e.g. protooncogene to oncogene / oncogene forms / tumour suppressor gene switched off ; 3 uncontrolled mitosis / AW ;	2
5(c)	<i>three from:</i> 1 many layers v few(er) layers ; A one layer / thicker 2 cells all the same v more than one type of cell / goblet cells and (epithelial) cells ; A no goblet cells 3 cells, flatter / smaller / cubical / AW v columnar cells ; 4 reference absence of cilia ; 5 large / prominent, nuclei / ORA ;	3

PUBLISHED

Question	Answer	Marks									
6(a)(i)	surface area : volume = 1.67 : 1 ; ; A 1.7 : 1, 5 : 3 <i>if incorrect, allow one mark for working</i> surface area = 90 mm² <u>and</u> volume = 54 mm³ <i>calculations:</i> <table> <tr> <td>surface area</td><td>volume</td><td>ratio</td></tr> <tr> <td>6 × 3 × 4 (sides) = 72 mm²</td><td>6 × 3 × 3</td><td>90 : 54</td></tr> <tr> <td>3 × 3 × 2 (sides) = 18 mm²</td><td></td><td></td></tr> </table>	surface area	volume	ratio	6 × 3 × 4 (sides) = 72 mm ²	6 × 3 × 3	90 : 54	3 × 3 × 2 (sides) = 18 mm ²			2
surface area	volume	ratio									
6 × 3 × 4 (sides) = 72 mm ²	6 × 3 × 3	90 : 54									
3 × 3 × 2 (sides) = 18 mm ²											
6(a)(ii)	(block X) has higher, surface area to volume ratio / SA:V ; OR (block X) has more surface area proportionately per unit volume / AW ; reference to shorter distance for diffusion to centre ;	2									
6(a)(iii)	<i>two from:</i> 1 diffusion (rate) too slow ; A idea of cannot rely on diffusion 2 reference to distances too far to reach all, cells/tissues ; 3 time taken is too long / AW ;	2									
6(b)	Benedict's (reagent / solution) ;	1									