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BIOLOGY**9700/22**

Paper 2 AS Level Structured Questions

March 2017

MARK SCHEME

Maximum Mark: 60

Published

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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

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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

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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

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

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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

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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

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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

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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
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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									