Cambridge International AS & A Level

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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)	*Vibrio cholerae* **;**	**1**
2(a)(ii)	**A** 1 *cell structure:* ribosome **; R** RER 2 *difference:* 70S / smaller / 18 nm v 80S / larger / 25–30 nm **;** **B** 3 *cell structure:* DNA / chromosome **; I** RNA 4 *difference:* 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 *cell structure:* cell wall **;** 6 *difference:* murein / peptidoglycan v cellulose **; I** lignin	**6**

Question	Answer	Marks
2(b)	*two from* 1 caused by, a pathogen / a bacterium / *V. cholerae* **;** 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)	*three from:* 1 choleragen, 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)	*one from:* 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**

Question	Answer	Marks
2(e)(ii)	*five from:* 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. *idea* 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>deoxy</u>ribose sugar, phosphate, nitrogenous (organic) base **;** ***A** points from a diagram*	**4**

Question	Answer	Marks
3(d)	*two from:* 1 *idea that,* hydrogen peroxide, damage / breaks, DNA and 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)	*two from:* 1 *idea* 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)	*three from:* 1 water molecules attracted to each other **; A** sticky / stickiness *cohesion:* 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 *adhesion:* 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**

Question	Answer	Marks
5(a)	bronchus / trachea ; bronchiole ; alveolus ; **I** same structure written on more than one line	**3**
5(b)	*two from:* 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)	*three from:* 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**

Question	Answer	Marks
6(a)(i)	surface area : volume = 1.67 : 1 **; ; A** 1.7 : 1, 5 : 3 *if incorrect,* ***allow*** *one mark for working* surface area = 90 mm^2 and volume = 54 mm^3 *calculations:* surface area — volume — ratio 6 × 3 × 4 (sides) = 72 mm^2 — 6 × 3 × 3 — 90 : 54 3 × 3 × 2 (sides) = 18 mm^2	**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)	*two from:* 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**