Cambridge International AS & A Level

Cambridge Assessment International Education
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BIOLOGY **9700/22**

Paper 2 AS Level Structured Questions **March 2018**

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.

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Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

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GENERIC MARKING PRINCIPLE 5: Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).
GENERIC MARKING PRINCIPLE 6: Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

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Mark scheme abbreviations:

;	separates marking points
/	alternative answers for the same marking point
R	reject
A	accept (for answers correctly cued by the question, or by additional guidance)
AW	alternative wording (where responses vary more than usual)
underline	actual word given must be used by candidate (grammatical variants accepted)
max	indicates the maximum number of marks that can be given
ora	or reverse argument
mp	marking point (with relevant number)
ecf	error carried forward
I	ignore

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Question	Answer	Marks
1(a)	*assume in context of transmission electron micrograph unless otherwise stated* *any **one** from:* *idea that* can see internal structures **;** cannot see surface contours / AW **;** **A** not 3-D appearance AVP **;** e.g. ref. to small(er) depth of field **;**	**1**
1(b)	*any **two** from:* (flattened) sacs have layered appearance / no connection between membranes / AW / ora **;** not, connected to / contiguous with / continuous with, (outer membrane of) nuclear envelope / ora **;** swellings at end of sacs (for vesicle formation) / vesicles at ends of sacs **;** no ribosomes / ora **;**	**2**
1(c)	actual diameter = image length / magnification **;** *at 11 mm for X–Y:* 234 nm **;** **A** 213 nm (for 10 mm) **A** 255 nm (for 12 mm) **A** 223 nm (for 10.5 mm) **A** 245 nm (for 11.5 mm)	**2**

Question	Answer	Marks
1(d)(i)	**I** glycocalyx **I** glyco / carbohydrate chains **A** points from labelled diagram 1 phospholipid <u>bilayer</u> **;** *plus any **two** from:* 2 fatty acid core / fatty acid tails orientated inwards **;** 3 protein **;** 4 further detail of proteins **;** e.g. integral and peripheral / AW scattered (in phospholipid bilayer) 5 cholesterol **;**	**3**
1(d)(ii)	*any **one** relevant suggestion:* reduced gaps between membrane molecules **;** higher proportion of phospholipids with saturated fatty acids / ora **;** fewer unsaturated fatty acids so, fewer 'kinks' in tails / closer packing **;** higher proportion of cholesterol molecules **;** fewer, channel / carrier / transport, proteins **;** smaller diameter of channels in non-specific channel proteins **;** fewer types of (specific), transport / carrier, proteins **;** AVP **;** e.g. fewer, aquaporins / channels for water	**1**

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Question	Answer	Marks
2(a)(i)	bone marrow ;	**1**
2(a)(ii)	*accept points from a diagram* *max **three** from:* 1 detection / recognition ; e.g. detects (named type of) pathogen recognises, (foreign) antigens / antibodies complexed to antigens has receptors (for antigens) 2 engulfs / envelops, pathogen / bacterium / AW ; **A** phagocytosis occurs **A** endocytosis occurs **A** pseudopodia form 3 forms, vacuole / vesicle / phagosome ; 4 ref. to lysosome fusion ; 5 ref. to hydrolytic / digestive, enzymes ; **A** named examples **A** hydrolases 6 ref. to antigen presentation ; 7 AVP ; e.g. (response is) non-specific / innate	**3**
2(a)(iii)	*any **one** valid suggestion from:* produces inhibitors for / deactivates, lysosomal enzymes ; escapes out of phagosome ; forms resistant spore / is resistant to digestive enzymes ; AVP ; e.g. suggestion of macrophage malfunction	**1**

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Question	Answer	Marks
2(b)	*any **three** from:* 1 production of mucus by, mucous glands / goblet cells **;** 2 sticky / AW, mucus **or** mucus traps, pathogens / bacteria / microorganisms **;** 3 mucus acts as a barrier (to prevent entry) **;** 4 mucus increases distance to reach cells **;** 5 cilia on ciliated epithelial cells **;** **A** ciliated epithelium 6 cilia, waft / move, mucus / AW **;** 7 *idea that* (contaminated) mucus is moved, away from alveoli / away from lung tissue / towards back of mouth / AW **;**	**3**
2(c)	*any **one** suggestion from:* blood / plasma / circulatory system **;** lymph / lymph system **;** within, neutrophils / macrophages / phagocytes **;** **A** white blood cells / leucocytes	**1**
2(d)	*any **one** from:* from infected, cows / cattle **;** eating contaminated, meat / beef (from infected cattle) **;** drinking, raw / unpasteurised, milk (from infected cows) **;**	**1**
2(e)	*any **two** from:* increases chances of, killing / AW, all bacteria **;** **I** will kill all bacteria (unqualified) **A** will kill all bacteria if bacteria are, susceptible / not resistant if bacteria are resistant to one antibiotic, then still susceptible to other antibiotics / AW **;** reduces chance of mutations arising / (if bacteria susceptible) mutations unlikely to occur against all antibiotics **;** AVP **;** e.g. antibiotic can be stopped because of side effects idea that more effective because different antibiotics will work on different targets (in the bacteria)	**2**

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Question	Answer	Marks
2(f)	*any **two** from:* overall trend for both is increase **;** rate of increase in cases of MDR-TB greater than rate of increase in cases of TB / AW / ora **;** ref. to fluctuations / detail of fluctuations / periods of decrease **;**	**2**
2(g)	*any **three** from:* *overall increase in TB cases:* 1 ref. to problems with people living in, poorly ventilated accommodation / close proximity to each other / AW **;** 2 vaccination programmes not able to prevent increase / herd immunity insufficient / AW **;** *decrease / numbers fairly constant:* 3 ref. to (some) success of, prevention / treatment programme **;** **A** described examples *increase in MDR-TB:* 4 people fail to finish course of treatment for normal TB / AW **;** 5 ref. to ease of transmission of TB means easy to transmit *MDR-TB **;*** *decrease in 2014 for MDR-TB:* 6 suggestion for decrease **;** e.g. better, surveillance / cooperation, in completion of drug therapy more successful antibiotics used people better educated about preventing spread *for either increase in TB cases or increase in MDR-TB:* 7 qualified ref. to link between, HIV / HIV/AIDS, and TB **;** 8 less money available for, longer drug treatment / vaccination, by, health authorities / governments **;** 9 AVP **;** e.g. balance between new cases and successfully treated cases means problem still exists in prevention ref. to changes in population size ref. to improvements in data collection ref. to immigration	**3**

Question	Answer	Marks
3(a)	*any **four** from:* 1 disaccharide to monosaccharides ; 2 **R** is water / water required ; 3 hydrolysis reaction ; 4 glycosidic bond broken ; 5 **S** is α-glucose ; 6 detail of enzyme action ; e.g. induced fit or lock and key hypothesis described 7 AVP ; e.g. (β-)1,4(-glycosidic) bond broken	**4**
3(b)(i)	*intracellular advantage:* *idea of* control / maintaining balance / efficient metabolism ; e.g. if, (enough) glucose / galactose / monosaccharides, present then no need for, uptake / breakdown, of lactose avoids osmotic problems as no build-up of monosaccharides high quantities of product means no requirement for use in respiration by cell *disadvantage:* loss of product / reduced productivity / product required continuously / slows rate of reaction / ref. to enzyme needing to remain active ;	**2**
3(b)(ii)	*any **one** from:* products and enzyme kept separated / AW ; product removed immediately ;	**1**
3(b)(iii)	*any **one** from:* inert / unreactive / cannot be digested by lactase / AW ; non-toxic ; insoluble ; long shelf-life ; AVP ; e.g. can create small mesh size suggestion of enzyme attachment to fibres	**1**

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Question	Answer	Marks
3(c)	*any **three** from:* 1 ref. to controlled variables **;** e.g. constant, pH / temperature 2 take samples at timed intervals **;** **A** regular intervals 3 determine, substrate concentration / product concentration **;** 4 plot graph of, dependent variable (*y*-axis) against time (*x*-axis) **;** 5 ref. to rate of disappearance of substrate **or** ref. to rate of appearance of product **;** 6 determine initial rate **;**	**3**

Question	Answer	Marks
4(a)	**I** any part of the pathway beyond cortical cells **I** incorrect mechanisms *any **four** from:* 1 correct ref. to, apoplastic pathway and symplastic pathway / apoplast and symplast **;** 2 cell wall route **;** 3 further detail **;** e.g. between, cellulose fibres / spaces between cells does not cross (cell) membranes 4 entry into, root hair cell by, crossing (partially permeable) cell surface membrane / osmosis **;** 5 (then) cytoplasmic route / within cytoplasm **;** 6 from cell to cell via plasmodesmata **;** 7 vacuolar route **;** **A** crosses, tonoplast / vacuolar membrane	**4**
4(b)	*any **one** from:* for active transport of mineral ions **;** **A** for mineral ion uptake against a concentration gradient for, ATP / energy, for active transport **;**	**1**

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Question	Answer	Marks
5(a)	*any **three** across both sections:* SAN (max **two**)*:* 1 pacemaker / sets rate of heart beat / responsible for rhythmic contraction **;** 2 sends out, impulses / waves of excitation / waves of depolarisation **;** 3 initiates / brings about / AW, heart beat / contraction of the heart / atrial contraction / atrial systole **;** *AVN (max **two**)*: 4 acts to relay impulses / described **;** 5 introduces delay to ventricular, systole / contraction(s) / prevents simultaneous contraction of atria and ventricles / AW **;** **A** allows time for, atria to empty / ventricles to fill 6 conducts, waves of excitation / impulses, to, bundle of His / Purkyne fibres **;**	**3**
5(b)(i)	**D** = vein / veins **E** = artery / arteries **F** = capillary / capillaries } **;**	**1**
5(b)(ii)	*any **two** from:* single layer / one cell thick **;** flattened / thin, cells **;** **A** squamous / pavement, cells / epithelia smooth surface (facing lumen) **;**	**2**

Question	Answer	Marks
6(a)	**1** adenine, thymine, cytosine, guanine **;** **2** DNA polymerase **;** **3** nucleotides **;** **4** complementary base pairing **;** **5** (DNA) ligase **;** **6** semi-conservative (replication) **;**	**6**

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Question	Answer	Marks
6(b)(i)	**J** metaphase **;** **K** prophase **;** **L** telophase **;** **A** anaphase	**3**
6(b)(ii)	large size / same size as cells in mitosis / ora **;**	**1**
6(b)(iii)	1 chromosomes, orientated / arranged / AW, at, (spindle) equator / metaphase plate **;** *plus any **one** from:* 2 chromosomes attached to, spindle / spindle fibres, at centromere / kinetochore **;** 3 spindle fully formed **;** 4 nucleolus has disappeared **;** 5 nuclear envelope, has disassembled / broken down / AW **;**	**2**

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