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Cambridge International Advanced Subsidiary and Advanced Level

MARK SCHEME for the May/June 2015 series

9700 BIOLOGY

9700/23 Paper 2 (AS Structured Questions), maximum raw mark 60

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Mark scheme abbreviations:

;	separates marking points
/	alternative answers for the same point
R	reject
A	accept (for answers correctly cued by the question, or by extra 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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1 (a) phospholipid (and protein) molecules, move about / diffuse / AW **;**
protein (molecules), scattered / AW **;** **A** different proteins present [2]

(b) *similarity to max 1*
(contains) phospholipid (bilayer)**;** **A** detail of orientation of phospholipid
A lipid bilayer
(contains) protein **;**

difference (look for ora)
(Davson Danielli) layer(s) of protein / protein only on outside **;**
(fluid mosaic) ref. to proteins, in different locations discrete / different types / named or described **;**
(fluid mosaic) presence of cholesterol (molecules) **;** [max 2]

(c) **1** requirement for, energy / ATP **;** **R** ATP energy
2 uses, carrier / transport, protein **;** **A** pump
3 conformational change (of carrier protein) **;** AW
4 moving against a concentration gradient **;** **A** low to high concentration
5 specific, binding site **;** **A** ref. to specificity to substance moved across [max 3]

to max 2
(d) **1** loss of, tertiary structure / quaternary structure / secondary structure **;**
A loss of shape of active site *in correct context*
2 loss of globular, shape / structure / form **;**
3 breakage of, ionic / hydrogen / hydrophobic, bonds / interactions **;**

to max 2
4 loss of function of (membrane) proteins **;**
5/6 detail **; ;**
e.g. transport of, polar molecules / ions, impaired AW
loss of cell to cell adhesion
unable to receive cell signals
loss of enzyme function
7 ref. to membranes, become leaky / lose partially permeable nature **;**
A cannot regulate, entry / exit, substances
8 disrupt interaction between protein and phospholipid bilayer / described **;** [max 3]

[Total: 10]

2 (a) (late) interphase **/** phase / after G1 phase / before G2 phase **;**
A after first growth phas**e /** before prophase / before mitosis / after cytokinesis [max 1]

(b) **(i)** hydrogen / H, (bonds) **;** [1]

(ii) Y, single ring structure **;** **A** smaller molecule compared to **X** [1]

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(c) (i) change in, nucleotide / base, sequence of DNA ;
any one from
new allele fomed ;
deletion / substitution / addition / frame shift , (mutation) ;
change to / altered, mRNA ; **A** altered codon(s)
(causing) change in, primary structure / amino acid sequence, of, polypeptide / protein ;
A different protein / altered function of protein / non-functional protein [max 2]

(ii) cell cycle shorter / interphase shorter / division more frequent ;
(cell cycle) checkpoints not controlled ;
uncontrolled (growth / division) / AW ;
AVP ; e.g. no differentiation (into epithelial cell)
A no cell death / apoptosis [max 2]

[Total: 7]

3 (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 μm) 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]

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

[Total: 11]

4 (a) (i) ***A*** *bp for blood pressure throughout*

1 bp decreases with distance (from, heart / LV) **;**
A named vessels to indicate distance

2 difference between minimum and maximum bp decreases (with distance) **;**

3 maximum and minimum bp are the same, at the capilaries / after arterioles **;**

4 (BP) reaches zero kPa, at large veins / vena cava(e) **;** **A** after small veins
A no blood pressure

5 steepest decrease in bp between aterioles and capillaries **;**

6 correct data quotes **;**
e.g. mp 1 from 16 kPa to 0 kPa for maximum bp
mp 1 from 10.6–10.8 kPa to 0 kPa for minimum bp
mp 2 11.6 / 11.8 kPa, in aorta / nearest to left ventricle and 0 kPa at capillaries
mp 3 (same bp of) 5 kPa [max 3]

(ii) (presence of) valves **;** **R** bicuspid / tricuspid, valves
to stop backflow / allows one-way flow / flow only towards heart **;** [max 2]

(b) hydrolysis **;** **A** breaking bond using water
(of / breaking of) peptide bond **;**
between Phe and His / Phe-His bond **;**
removal of, two amino acids / His and Leu / dipeptide **;** [max 3]

(c) 1 (ACE) inhibitor / drug, has similar shape as, substrate / polypeptide **;**

2 complementary (shape) to active site (shape) **;**

3 binds to / fits into / enters, active site (of ACE enzyme) **;**
A forms enzyme-substrate complex

4 substrate cannot, enter / bind **;**
A competes with substrate for active site
A no / few / prevents formation of, ES complexes

5 reduces rate of, reaction / formation of angiotensin / product formation **;** [max 3]

[Total: 11]

5 (a) (light microscope) observe living cells / cells would be killed (with EM) **;**
vacuum used in electron microscope **;**
(light microscope) can have water on slide (to allow cells to move) **;** ora
AVP **;** e.g. more readily available for use
organisms move in response to light [max 2]

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(b) (i) (part of / used in synthesis, of) chlorophyll (molecule) **;**
R gives chlorophyll green colour

in translation / joining of large and small subunits (of ribosomes) **;**

enzyme, cofactor / activator / described **;** *idea of role in enzyme catalysis*
A correctly named enzymes e.g. DNA polymerase

AVP **;** e.g. stabilizing, cell wall / proteins / nucleic acids / membranes
important in energy transfers / ATP synthesis
DNA, synthesis / replication
ref. to role in, light absorption / capture (for photosynthesis) [max 1]

(ii) *any two from*
1 good solvent / polar (for substances needed by the organism) **;** AW
2 transparent / allows light through, (for photosynthesis) **;**
3 liquid over wide range of temperatures **;**
4 high specific heat capacity **; A** description
5 high latent heat of vaporisation **;**
6 ref. to density **;** e.g. ice / solid, less dense than, water / liquid
circulation bringing nutrients to surface
7 ref. to low viscosity for locomotion **;** [max 2]

(c) *assume multicellular organisms unless stated, then accept ora*
1 small, surface area to volume ratio / SA:V **;**
A as organisms increase in size, SA:V decreases
2 ref. to (larger size means) long distances (to reach, cells / tissues) **;**
3 diffusion, too slow / insufficient / unable to satisfy needs **;**
4 transport system decreases time to supply cells **;**
5 require, bulk / mass, flow **;**
6 ref. to transport system means efficient supply (to cells) of nutrients / named / assimilates / water **; A** brings supplies close to cells (for transfer) [max 4]

(d) 1 mass flow **; A** pressure flow
2 sucrose / solutes / assimilates / sugars, decreases, water potential / Ψ**;**
A more negative / lowers, water potential
A for water potential **A** solute potential
3 water enters (sieve tubes) by osmosis **;**
4 (water enters) down water potential gradient **;**
5 (increased volume) increase in / high(er), hydrostatic pressure **;**
ref. to hydrostatic required once only in mp 5 or mp 7or mp 8
6 unloading / removal, of sucrose / AW, at the sink / named sink **;**
7 lowers hydrostatic pressure / low pressure at sink **;**
8 movement is, down pressure gradient / from high to low (hydrostatic) pressure **;** [max 5]

[Total: 14]

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6 (a) (i) nitrification **;** [1]

(ii) by bacteria **;**
denitrification / reduction**;**
ref. anaerobic conditions **;** **A** ref. to waterlogging [max 2]

(b) (i) *idea of* (unit made up of) biotic and abiotic, components **;** AW
further detail **;** interacting / functioning together **;**
A *idea of* self-sustaining unit [2]

(ii) carries out photosynthesis / converts light (energy) to chemical energy **;**
A (photo)autotrophic
synthesises (complex) organic compounds from inorganic, compounds**;**
(occupies) lowest / first trophic level **;** **A** acts as a producer [max 1]

(iii) place where an organism lives **;** **A** population / species / community [1]

[Total: 7]

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