CAMBRIDGE INTERNATIONAL EXAMINATIONS

Cambridge International Advanced Subsidiary and Advanced Level

MARK SCHEME for the October/November 2014 series

9700 BIOLOGY

9700/21 Paper 2 (AS Structured Questions), maximum raw mark 60

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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International Examinations

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
AVP	alternative valid point (examples given)

1 (a) microvilli **;** **R** villi

increase the surface area for absorption/movement across membrane/AW **;**
A excretion/secretion [2]

(b) (mitochondria) synthesis/AW, ATP **;** **R** energy **A** provide, energy/ATP
for active, uptake/transport **;** **A** any other active method such as pinocytosis/secretion [2]

(c) 4.7/4.8/5.0/5.2 **;;** **A** 5

$\frac{29\,\text{mm}/29\,000}{6000}$

or

$\frac{30\,\text{mm}/30\,000}{6000}$

Award one mark if answer incorrect or length incorrectly converted but correct formula used
i.e. image length divided by magnification of 6000 [2]

(d) secrete/make/produce/release mucus **;**
pathogens/bacteria/viruses/microorganism/dust/AW stick to mucus **;** **A** trapped by mucus
idea that pathogens/AW do not reach
the cells lining the trachea
or the cells lining the bronchi
or the alveoli **;**
prevents pathogens/AW entering the circulatory system **;**
reduces chances of infection **;** [max 3]

(e) thin(ner)/flat(ter) **;** **A** squamous not columnar **;**
(far) fewer mitochondria **;**
no microvilli **;** [max 2]

[Total: 11]

2 **(a)** abnormal condition**/**abnormal state/disorder/ill-health/AW, qualified
e.g. having an adverse effect (on an organism)
reduces the effectiveness of functions
produces (specific) signs/symptoms
infectious and non-infectious causes **;** [1]

(b) natural active **;** artificial active **;** natural passive **;** artificial passive **;**

Allow one mark for active and passive correct [4]

(c) number of cases fluctuates **;** **A** description of increases and decreases over time

(overall trend) number of cases decreases (over time) **;**
overall decrease, data quote to support **;**
e.g. (India) 155 000/160 000 cases in 1950 to 0 in 1980
(all countries) 330 000 cases in 1950 to 0 in 1980
(India) 250 000/160 000 cases in 1951 to 0 in 1980
(all countries) 485 000 cases in 1951 to 0 in 1980

India/all countries, three major peaks **;**
data quote to support **;** e.g. 1951, 1958, 1974

eradication, no cases from 1975/1976, for India or 1978 for world **;**
A (almost zero) from 1976 for world [max 3]

(d) 1 smallpox virus was stable/did not mutate **;**
2 same vaccine was used for whole programme/vaccine did not need to be changed **;**
3 vaccine was live/gave a strong immune response **;** **A** effective
4 one dose was enough to give life-long immunity/no boosters required **;**
5 heat stable/freeze dried vaccine **;**
6 suitable for hot countries/isolated areas/rural areas **;**
7 bifurcated/steel, needle, could be re-used/easier delivery/AW **;**
8 herd/mass, vaccination/immunity **;** **A** (many countries) mandatory vaccination
9 ring vaccination/ref. to contact tracing **;**
10 few/no symptomless carriers **;**
11 no animal reservoir/only in humans **;**
12 infected people easy to identify **;**
13 isolation of cases to prevent spread **;**
14 AVP **;** e.g. comparatively low cost, qualified; many volunteers became vaccinators/AW **;**
[max 4]

[Total: 12]

3 **(a)** condensation **;** **A** dehydration [1]

(b) accept glycine-valine or valine-glycine

peptide bond drawn correctly **;**
amino and carboxylic acid ends shown **;**
correct R-groups **;**
water eliminated **;** [4]

(c) **(i)** GAU GUU AAG **;** [1]

(ii) messenger **;** [1]

(d) during systole semi-lunar valve is open **;**
during diastole semi-lunar valve is closed **;**
proximity/AW pulmonary artery to (right) ventricle (so no pressure lost) **;**
elastic recoil of pulmonary artery maintains blood pressure/AW **;**
no/little blood in (right) ventricle, after contraction/during diastole **;**
fills with blood at low pressure **;** [max 3]

(e) increase in power of contraction **;** AW
increase in (systolic) blood pressure **;**
strain on right ventricle/right ventricle does not function efficiently **;**
growth of muscle in/right ventricle increases in thickness **;**
insufficient oxygen to, heart/cardiac, muscle **;**
heart failure/heart attack **;** [max 2]

(f) persistent/AW, cough **;**
cough produces much mucus **;**
wheezing **;**
rapid breathing/difficulty breathing/breathlessness **;**
bluish colour to the skin **;**
recurrent chest infections/frequent colds *or* 'flu/AW **;**
barrel-shaped chest **;**
chest pains **;** **R** heart pains
fatigue/weakness, (with exercise) **;** [max 2]

[Total: 14]

4 **(a)** one mark for correct cells in column 2 ;

name of stage	cell in Fig. 4.1	behaviour of chromosomes	nuclear envelope
interphase ;	**B**	chromosomes uncoiled, may be replicating	intact
prophase	**D**	chromosomes, coiling/condensing/seen as two sister chromatids/AW ;	intact, but then breaks down
metaphase	**A**	chromosomes on equator/AW ;	not present
anaphase	**C**	chromosomes/chromatids, moving to opposite poles	not present ;
telophase	**E**	chromosomes uncoiling	reforming/present/intact ;

[max 5]

(b) *mitosis*
needs number of chromosomes to remain constant/diploid ;
needs all daughter cells to be genetically identical/have no genetic variation ; **A** clones
needs genetic stability ;

meiosis
halves the number of chromosomes/diploid → haploid ; **A** undergoes a reduction division
daughter cells are all genetically different ; *accept once only*
produces genetic variation ; *accept once only*
involved in sexual reproduction (in flowering plants) not growth ; **A** production of gametes
idea that cells that are genetically different will not function together in tissues ; ora [max 3]

(c) asexual reproduction/vegetative propagation ;
(tissue) repair ; **R** cell repair
(cell/tissue) replacement ;
AVP ; e.g. clonal expansion/part of gametogenesis/spores in fungi [max 2]

[Total: 10]

5 (a) *autotroph to max 3*
carries out photosynthesis/photosynthetic **;** **A** acts as a producer
synthesises (complex) organic compounds from inorganic, compounds **;**
uses light energy **;**

heterotroph
obtains energy from, complex/organic, compounds **;** **A** insects/animals
ref. digestion/absorption soluble products **;** AW
acts as a consumer/feeds on other organisms **;** [max 4]

(b) less nitrification/ammonia to nitrite/ammonia to nitrate/nitrite to nitrate **;**
limits/AW uptake of ammonia/nitrate, by producers/(aquatic) plants/phytoplankton **;**
N becomes/is limiting factor for growth of producers **;** **A** decreased growth
less N for synthesis of amino acids/proteins/other named nitrogenous compound(s) **;**

less food available for consumers/higher trophic levels **;**
reduces production/productivity in these ecosystems **;** [max 3]

[Total: 7]

6 (a) ref.to <u>cell wall</u> freely permeable **;**
(through) cell surface membrane/vacuolar membrane or tonoplast **;**
A partially permeable, membranes
(by) osmosis **;**
movement from high water potential to low water potential **;** **A** down water potential gradient
ref. aquaporins **;** [max 3]

(b) (i) **K** – plasmodesma **;**
L – vacuolar membrane/tonoplast **;** **A** vacuole [2]

(ii) apoplast **;** [1]

[Total: 6]