

**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

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Mark scheme abbreviations:

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

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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]**

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- 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]

Page 5	Mark Scheme	Syllabus	Paper
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- 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]

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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>B</b>	chromosomes uncoiled, may be replicating	intact
prophase	<b>D</b>	chromosomes, coiling/condensing/seen as two sister chromatids/AW ;	intact, but then breaks down
metaphase	<b>A</b>	chromosomes on equator/AW ;	not present
anaphase	<b>C</b>	chromosomes/chromatids, moving to opposite poles	not present ;
telophase	<b>E</b>	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]

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- 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 cell wall 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]