

**CAMBRIDGE INTERNATIONAL EXAMINATIONS**

Cambridge International Advanced Subsidiary and Advanced Level

**MARK SCHEME for the March 2016 series**

**9700 BIOLOGY**

**9700/22**

Paper 2 (AS Level 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.

Cambridge will not enter into discussions about these mark schemes.

Cambridge is publishing the mark schemes for the March 2016 series for most Cambridge IGCSE<sup>®</sup> and Cambridge International A and AS Level components.

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Mark scheme abbreviations:

<b>;</b>	separates marking points
<b>/</b>	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 as guidance)



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- 3 (a) (i) a gene codes for a protein / gene coding for EPO ;  
 ref. transcription ;     **A** gene 'switched on'  
                                   **A** increase gene expression  
  
 mRNA (required) for, EPO / protein, synthesis  
                                   **or**  
 mRNA involved in translation ;
- [max 2]
- (ii) vesicles move to, cell (surface) / plasma, membrane (via cytoskeleton) ;  
 (vesicles) fuse / merge, with cell (surface) membrane ;  
  
 exocytosis (occurs) ;  
  
 (movement of vesicle / exocytosis) requires, energy / ATP ;  
       **A** active (process)  
       **R** active transport
- [max 2]
- (b) (i) EPO, binds to / combines with / AW, receptors ;  
 receptors, complementary to / specific shape for, EPO ;  
       **A** EPO fits into receptors  
  
 cell signalling / EPO binding leads to (specific) responses within the (target)  
 cells / AW ;  
       **I** cells respond to EPO  
  
only, target / bone marrow, cells, have receptors, for EPO / specific to EPO ;  
       **or**  
       **A** binding triggers responses only within, target / bone marrow, cells
- [max 3]
- (ii) too large ;  
  
 ref. to shape, cannot pass through ;  
  
 (protein) is, hydrophilic / water soluble, and cannot cross hydrophobic core (of  
 phospholipid bilayer) / AW ;  
  
 no specific membrane transport protein ;
- [max 1]
- (c) stem cell ;     **A** haematopoietic stem cell  
                           *treat as neutral* adult / non-embryonic / multipotent / stromal
- [max 1]

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(d) **max 3** if all description (D) or all explanation (E)

**A** Hb for haemoglobin and Hb concentration for mean Hb concentration

**A** g per kg /  $g\ kg^{-1}$ , for g per kg body mass

*constant*

**D** Hb concentration, remains constant / of  $12.6\ g\ kg^{-1}$ , for first two weeks (of investigation) / up to start of injections ;

**E** idea of regulation ;

e.g. sufficient oxygen so no requirement for increased EPO

*increase then decrease description*

**D** (then) increase in Hb concentration (from week 2) for 5 weeks / AW, then decrease (for last three weeks / to week 10) ;

**D** data quote / manipulated data, to support ;

e.g. increase from  $12.6\ g\ kg^{-1}$  (week 2) to  $15.3\ g\ kg^{-1}$  (week 7)

increases by  $2.7\ g\ kg^{-1}$  (to week 7)

decrease from  $15.3\ g\ kg^{-1}$  (week 7) to  $13.7\ g\ kg^{-1}$  (week 10)

decreases by  $1.6\ g\ kg^{-1}$  (to week 10)

*increase explanation*

**E** EPO increases production of red blood cells that contain Hb / AW ;

*decrease explanation*

**E** red blood cells, short life span / die ;

**E** cell signalling stops / (target / bone marrow) cells no longer stimulated / AW ;

**A** EPO, degraded / AW

*increase after injections stop*

**D** Hb concentration increases for 1 week after injections have finished ;

**E** *idea of*, time delay for red blood cell production to stop / time for immature red blood cells to mature and be released into blood stream ;

AVP ; e.g. steady increase as time required for, mitosis / cell

proliferation / differentiation into red blood cells / production of haemoglobin

contributory factor for increase may be, accumulation / increased concentration, of EPO with injections

[max 4]

(e) *high altitudes and low oxygen partial pressure so*

less oxygen in inhaled air / less oxygen (would be) transported to tissue / AW ;

lower oxygen saturation of haemoglobin / haemoglobin has lower oxygen affinity ;

body requires more red blood cells that contain haemoglobin / AW ;

**A** more red blood cells produced so more haemoglobin (to bind oxygen)

idea of compensation ; **R** *idea of* body getting more oxygen

[max 3]

[Total: 16]

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4 (a) *Morbillivirus*

aerosol / droplet, infection ;

**A** described, e.g. (from infected person) in, exhaled / airborne, droplets, and inhaled

*idea of spread by touching an infected surface and putting fingers into mouth / nose ;*

**R** contact *without qualification*

*HIV*

sexual intercourse / passed via semen / passed via vaginal fluids / AW ;

blood transmission ; **A** described, e.g. blood transfusion

sharing (contaminated), needles / syringes

*accept transmitted in body fluids for one mark if above two points not gained*

mother to, foetus / baby, transmission ;

**A** described, e.g. across placenta / during birth / breastfeeding

AVP ; e.g. ref. to measles mode of transmission leading to faster spread of disease / ora

[max 4]

(b) antibiotics (only) used against bacteria (and some fungi) ; **I** used in malaria

*idea that antibiotics act at a cell structure not possessed by virus ;*

e.g. viruses, do not have, a cell wall / a cell surface membrane / ribosomes

suggestion that viruses are, inside host cells / not within reach ;

antibiotics act only on, living / growing, cells (viruses do not grow) ;

antibiotics do not act on, protein coat / capsid / capsomeres / viral envelope ;

[max 2]

(c) (i) phospholipid bilayer ;  
proteins / glycoproteins / named ; **I** cholesterol

[2]

(ii) SLAM acts as a receptor ;  
haemagglutinin / H / (viral) glycoprotein, binds to / fits into / complementary to,  
SLAM / receptor ;

fusion protein / F / (viral) glycoprotein, causes fusion (of envelope) to cell surface membrane ;

**A** (viral) envelope fuses with cell surface membrane

fusion releases nucleoprotein (and viral polymerase) ;

[max 3]



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- (ii) hydrogen/ionic, bonds, break/disrupted ; **A** electrovalent for ionic  
**R** if other bonds named  
charges at the active site may be affected ;  
changes, shape/(tertiary) structure, of active site ;  
**A** changes, shape/tertiary structure, of enzyme

[max 2]

- (iii) substrate enters the active site ;  
active site, (partially) flexible/changes shape slightly ;  
ref. provides a better fit/moulds around ;  
allows interaction of R groups (of active site) with substrate ;

[max 2]

**[Total: 12]**

- 6 (a) trachea/windpipe  
bronchus/bronchi  
bronchiole/bronchioles  
alveolus/alveoli
- } *all correct two marks ; ;*

*one mark for:*

*one structure, incorrect/missing, but others in correct order*

**or**

*trachea and alveolus correct but bronchus and bronchiole wrong way round*

[2]

- (b) emphysema ;  
chronic bronchitis ;

[2]

**[Total: 4]**