
BIOLOGY

9700/21

Paper 2 AS Level Structured Questions

May/June 2016

MARK SCHEME

Maximum Mark: 60

Published

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Mark scheme abbreviations:

;	separates marking points
/	alternatives answers for the same point
R	reject
A	accept (for answers correctly cued by the question, or extra guidance)
AW	alternative wording (where responses vary more than usual)
<u>underline</u>	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
ecf	error carried forward
I	ignore
mp	marking point (with relevant number)

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1 *must have correct spellings of Plasmodium and Vibrio cholera*

feature	malaria	tuberculosis	cholera
name of pathogen	<i>Plasmodium</i> ;	<i>Mycobacterium tuberculosis</i>	<i>Vibrio cholerae</i> ;
type of organism	protocist / protoctistan ; A protist / protozoan / sporozoan	bacterium	bacterium ; A bacteria
mode of transmission	by, a vector or (feeding or biting by) <i>Anopheles</i> / mosquito ;	via, (airborne) droplets / aerosol(s) (infection) ;	drinking water and food contaminated with human faeces

[6]

[Total: 6]

2 (a) (i) phagocytosis / endocytosis ; **R** pinocytosis **I** engulfing

[1]

(ii) **E** transcription ;

F translation ; **A** post translation(al) modification

[2]

(iii) **B** (phagocytic / endocytic) vacuole / phagosome ; **A** vesicle

R incorrectly qualified vacuole or vesicle (e.g. permanent / large / secretory / Golgi / excretory)

I food / pathogenic

G (80S) ribosome ; **A** rough endoplasmic reticulum **R** RER / rough ER

I 70S or any other type of incorrect S as a qualification

H Golgi (body / apparatus / complex) ;

J mitochondrion ; **A** mitochondria

[4]

(b) **I** fusion of lysosomes with phagosome and diffusion of products of digestion

1 bacteria are, killed / destroyed / broken down / digested ; **A** hydrolysed

A cell wall broken down

R bacteria are cut up

2 (by hydrolytic) enzymes ;

3 any example, e.g. carbohydrase / lysozyme / protease / nuclease ;

4 killed by, hydrogen peroxide / H₂O₂ / free radicals / AW ;

5 AVP ; e.g. correctly named substrate for enzyme

murein / peptidoglycan, polysaccharide(s), polypeptides, nucleic acids, lipids

e.g. correctly named bonds broken

glycosidic, peptide, ester, phosphodiester

[max 3]

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- (c) 1 *idea that only, a few / some / small number / AW, with correct specificity ;*
 2 (different) T-lymphocytes are specific to different antigens ;
 3 (T cell) receptor is, complementary (in shape to antigen) ;
 4 AVP ;
 e.g. this may be during a primary immune response so no memory cells
 e.g. disease state (HIV/AIDS and leukaemia) or treatment where few
 T-lymphocytes in the body [max 2]

[Total: 12]

- 3 (a) (i) **N** ciliated ; **A** pseudostratified **I** columnar / cuboidal **R** cilia [1]
 (ii) **O** mucous glands ; **A** mucus glands / serous glands [1]
 (iii) **P** cartilage ; [1]

- (b) **I** more air can enter unqualified
 1 more air / oxygen, reaches the, alveoli / gas exchange surface ;
 2 more gas exchange / greater absorption of oxygen / excretes more carbon
 dioxide ; AW
A maximises oxygen obtained
 3 satisfies increased demand for oxygen / AW ;
 4 trachea / bronchi / airways, widen / AW ;
 e.g. dilate / expand / enlarge **A** diameter of lumen increases
 5 reduces resistance to air flow ; **R** rate of air flow increases [max 2]

- (c) *collagen has*
 three polypeptides / a quaternary structure ;
I more than one polypeptide unqualified
 glycine is every third amino acid ; **I** at regular intervals **R** roughly / approximately
 (triple) helix / helical (shape) ; **I** regular coils **R** alpha helix [max 2]

[Total: 7]

- 4 (a) *transpiration is an inevitable consequence because*
 1 stomata open ;
 2 for diffusion in of carbon dioxide / carbon dioxide required for photosynthesis ;
 3 water vapour, diffuses out / moves out down the water potential gradient ;
A description of water potential gradient / high to low water potential
A vapour pressure gradient / water vapour gradient
allow water vapour if it is clear that evaporation has occurred
A water evaporates and diffuses out
R water evaporates out
I water (vapour) concentration gradient [3]

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- (b) 1 adhesion of water to, cellulose/lining/walls (of xylem vessels) ;
A adhesive force
 2 ref to, hydrophilic/polar, property of cellulose (fibres) ;
A hydrophilic/polar, parts of lignin
 3 cohesion between water molecules ; cohesive force
 4 maintains column of water/prevents water column breaking/AW ;
 5 *ref. to* transpiration pull/AW ; **I** transpiration *unqualified* [max 3]

(c) *mp3 – units for rates of transpiration must appear once correctly in the whole answer to award this point*

- 1 rate (of transpiration) of all trees is 0 at, 06.00/start ; **A** no transpiration
 2 rates (of transpiration) increase and decrease (in all three) ; **A** peaks
 3 highest rates:
 emergent trees at 14.30 at 8.5 kg h^{-1}
 canopy trees at 14.30 at 3.5 kg h^{-1}
 suppressed trees at 13.00 at $1.6\text{--}1.7 \text{ kg h}^{-1}$;
must have units at least once
accept kg/h or kg per hour
 4 emergent trees (always) have highest rate **or** suppressed trees have lowest rate ;
A emergent trees have higher rate than, canopy and suppressed, trees
 5 rate of emergent trees is, much/AW, higher than rates for canopy and suppressed trees ;
 6 emergent trees have, steeper/steepest, increase in (transpiration) rate ;
A emergent trees have, steeper/steepest, decrease in (transpiration) rate [max 4]

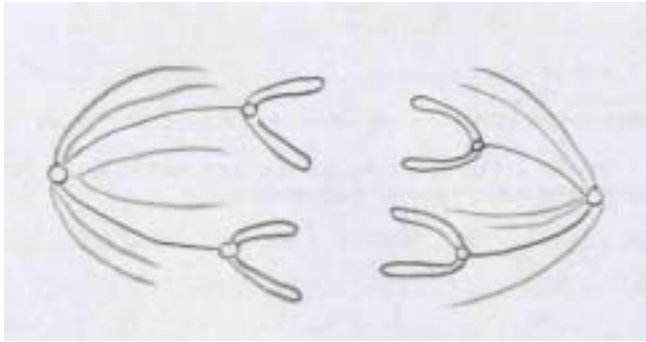
(d) *following factors may be given in answers, any three of these factors = 1 mark*

- light, intensity/wavelength **I** 'more light'
 humidity
 temperature
 wind speed/air movement
 size of tree/height/area of leaves
 water availability/depth or length of roots
*transpiration rate for emergent trees is higher because ... accept **ora** for suppressed trees*
accept vapour pressure gradient/water vapour pressure gradient/water vapour diffusion gradient for water potential gradient
 1 high(er) light intensity for emergent trees increase in stomatal aperture ; *ora*
A more sunlight
A stomata open more
I more stomata open
 2 lower humidity for emergent trees so steeper water potential gradient ; *ora*
A description of water potential gradient
 3 higher temperature/AW, for emergent trees so higher rate of, evaporation/diffusion ; *ora*
 4 higher wind speed for emergent trees so, steeper water potential gradient/lower humidity ; *ora*
A *ref. to* diffusion shells/descriptions of water potential gradient
 5 emergent trees have longer roots so take up more water ;
 6 emergent trees have more leaves so, greater surface area/more stomata per unit area (of leaf) ; [max 4]

[Total: 14]

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5 (a) (i) if draw other stages mark first one only – either left to right or top to bottom



four chromatids/daughter chromosomes, drawn as single structures between equator and poles ;
V shaped, chromatids/daughter chromosomes, in correct orientation ;
spindle (fibres) attached to all four, centromeres/kinetochores/apex, and centrioles ; **R** if these extend between chromatids

[max 3]

- (ii) 1 attach to the, centromeres (at prophase) ; **A** kinetochores
I if attach at metaphase
2 attach to, centrioles ; **A** centrosome/MTOC
3 arrange the chromosomes on the, equator/metaphase plate ;
4 pull/move, (daughter) chromosomes, apart/to the poles ;
A separates for moves apart **A** (sister/identical) chromatids
I ends **R** homologous chromosomes

[max 2]

- (b) (i) 1 produces/makes/synthesises, haemoglobin ; **I** fills up
2 produces/makes/synthesises, carbonic anhydrase ; **I** fills up
3 loss/AW, of the nucleus ;
4 loss/AW, of (named) organelles ;
e.g. ribosomes/(R)ER/mitochondria
5 becomes biconcave/described ;
6 AVP ; e.g. cell surface/antigens/named antigens
ref. to cytoskeleton

[max 3]

- (ii) *cell Y*
1 remains/stays as a, stem cell ;
2 divides/undergoes mitosis ;
I *ref. to becoming a type of blood cell/platelet*
R if it becomes a cell other than a blood cell/platelet

[max 1]

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(c) (i) 13.5 ; [max 1]

- (ii) 1 low(er) partial pressure of oxygen (at high altitude) ;
A pO_2/ppO_2
 2 less oxygen in, inhaled air/lungs/alveoli ;
 3 so haemoglobin, is not fully saturated/has lower saturation (with oxygen) (than at sea level)/lower affinity for oxygen ;
 4 *idea that* more red blood cells so, higher concentration of/more haemoglobin ;
 5 allows, same/similar/enough, volume of oxygen to be transported in the blood as at sea level ;
 6 volume of oxygen transported in the blood is less ;
 7 less oxygen for (aerobic) respiration/lack leads to anaerobic respiration ;
 8 any consequence, e.g. fatigue, altitude sickness ;

[max 4]

[Total: 14]

6 (a) *fluid*
 phospholipids (and proteins), move / AW ;

mosaic

proteins/glycoproteins, scattered / AW (in the phospholipid bilayer) ;

A different types of proteins

I pattern unqualified

[2]

(b) 7 nm ; **A** any size or range within 6 nm and 10 nm
A 7 nanometres

[1]

(c) cholesterol ;
 unsaturated fatty acids ; **A** phospholipid tails
 carbohydrate chains added to protein(s)/glycoproteins ;
A oligosaccharides *for carbohydrate chains*
 carbohydrate chains added to lipids/glycolipids ;
 glycocalyx ;
 channel protein(s) / AW ; **A** aquaporin(s) ;
 carrier proteins / AW ;
 peripheral/extrinsic, proteins ;
 attachment to, cytoskeleton/microfilaments ;
 receptor(s) ;
 antigen(s) ;
 AVP ;

[max 4]

[Total: 7]