

Cambridge
International
AS & A Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary and Advanced Level

BIOLOGY

9700/02

Paper 2 AS Level Structured Questions

For Examination from 2016

SPECIMEN MARK SCHEME

1 hour 15 minutes

MAXIMUM MARK: 60

This document consists of **8** printed pages.



2**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)
<u>underline</u>	actual word given must be used by candidate (grammatical variants excepted)
max	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 as guidance)

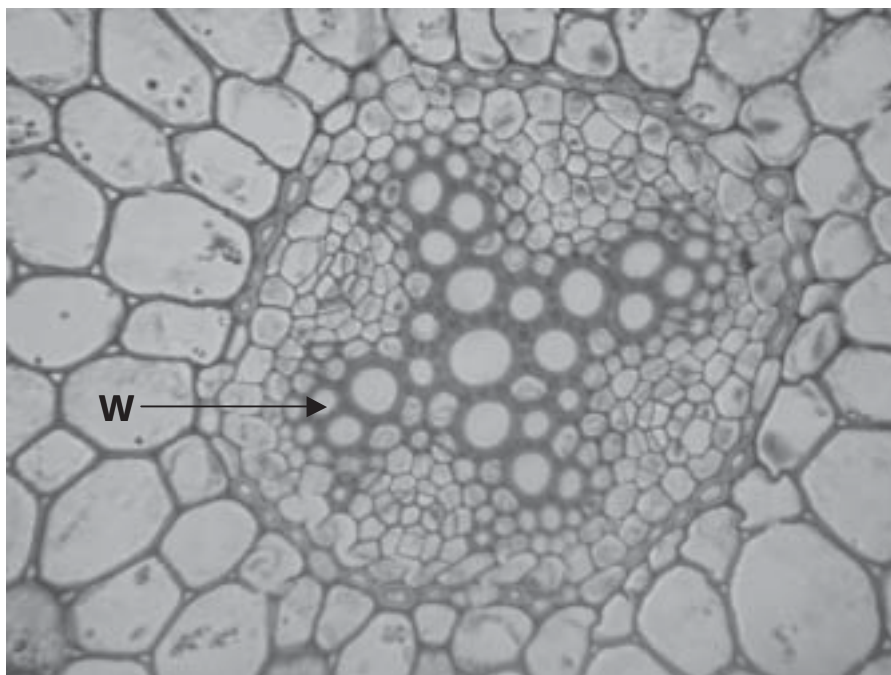
3

- 1 (a) 2,3,1,4 ; [1]
- (b) (i) nuclear envelope, disassembling / fragmenting / breaking down / forming vesicles;
A membrane *for envelope* R disappears [1]
- (ii) telomere ; [1]
- (c) (i) resolving power, not high enough / poor / low / 250 nm / 0.25 μm / half the wavelength of light (used) ; A resolution *for resolving power*
resolution limited by wavelength of light ;
microtubule (diameter) too small to interfere with light waves / AW ; [max 2]
- (ii) forms part of, spindle / spindle fibres ;
attachment to centromeres / chromosomes / chromatids ;
detail ; e.g. movement of, sister chromatids / (daughter) chromosomes, to (opposite) poles / spindle fibres shortening at anaphase [max 2]
- (iii) *monomer*
protein / tubulin, composed of / AW, amino acid, monomers / building blocks / sub-units;
A protein / tubulin, composed of / AW, amino acids joined, together / by peptide bonds
- macromolecule*
protein / tubulin, is a large molecule, composed of / AW, many / AW, amino acids / smaller molecules ; [2]

[Total: 9]

4

- 2 (a) arrow from **W** to any xylem vessel element ; e.g.



[1]

- (b) through cytoplasm / cytoplasmic pathway ;
 via plasmodesmata ; *in context of* parenchyma to endodermal cell *or*
 endodermal cell to pericycle cell through, endodermis / endodermal cells / passage cells ;
 water moves down water potential gradient ;
 parenchyma cell higher water potential than, adjacent cell / endodermal cell / xylem vessel
 element ; **A** *idea of* overall higher water potential in soil (solution) than in xylem / (external)
 atmosphere around leaf
 diffusion (through cytoplasm / plasmodesmata) *or* osmosis *in context of across vacuolar*
membranes ;
 ref. to cohesive nature of / hydrogen bonding between, water molecules ; [max 4]

- (c) (i) iodine in potassium iodide (solution) ; **A** iodine solution [1]

- (ii) amylose, spiral / spiralled / helix / helical ; **R** α -helix **R** coiled
 amylopectin branched ;
 compact / AW ;
 qualified ; e.g. for maximum storage
 (so) insoluble / osmotically inactive / inert ;
 amylopectin, many free ends (so easily supplies glucose) ;
 (amylose / amylopectin / starch) contain glucose for immediate use as respiratory
 substrate (on hydrolysis) ; [max 4]

[Total: 10]

5

- 3 (a) P = right, atrium / auricle ;
Q = aorta ; [2]
- (b) SAN to max 2
pacemaker / sets rate of heart beat / responsible for rhythmic contraction ;
sends out, impulses / waves of excitation ;
initiates / brings about / AW, heart beat / contraction of the heart / atrial contraction / atrial systole ;
Purkyne tissue to max 2
conducts, impulses / waves of excitation, down septum to, ventricles / apex of heart / base of heart ;
conducts, impulses / waves of excitation through ventricle walls ;
to cause, ventricular contraction / ventricular systole (from base upwards) ;
to an overall max 4 [max 4]
- (c) closed
blood, contained / AW, in, blood vessels / arteries, veins and capillaries ;
double
blood, travels through / AW, the heart twice during one, complete circuit / circulation ;
or
pulmonary and systemic, circulation /systems / circuits ; A description [2]
- (d) (i) oxygen in(to blood), carbon dioxide out (of blood) ;
diffusion / from a high(er) concentration to a low(er) concentration ;
through alveolar wall and capillary, endothelium / wall ;
oxygen enters red blood cells ;
oxygen taken up by haemoglobin ; AW [max 3]
- (ii) carbon monoxide (in inhaled smoke) binds to haemoglobin / carboxyhaemoglobin formed ;
carbon monoxide competes with oxygen for, haemoglobin binding sites / AW;
haemoglobin has a higher affinity for carbon monoxide than oxygen ; [max 2]

[Total: 13]

6

- 4 (a) (i) protein / peptide, hormones ;
too large to cross membrane ;
hydrophilic / water soluble ; **A** not, hydrophobic / lipid soluble
unable to pass through hydrophobic core / AW, of phospholipid bilayer ; [max 2]
- (ii) chemicals released are circulating hormones ;
hormones combine with cell surface receptors ;
on target cells / cells where transcription is triggered ;
action of kinases and phosphatases (within the cell) lead to (specific) response ;
specific response = transcription / production of mRNA ; [max 3]
- (b) (i) optimum is, pH 5 / between pH 4–5.5 ; **A** optimum pH value between 4–5.5
increasing activity as pH increases to, optimum / pH 5 ;
decreasing activity as pH increases above, optimum / pH 5 ;
active, over a wide pH range / between pH 1–9 ; [max 2]
- (ii) low pH equivalent to high, hydrogen ion / H^+ , concentration ;
hydrogen / ionic, bonds, disrupted / broken / AW ;
active site shape, changed / AW ; **A** active site no longer complementary to substrate
ref. to partial denaturation / some enzymes denatured ;
(active site change so) decreases effective collisions / fewer enzyme substrate complexes
formed ;
(only) some (phosphatase) enzymes active / all enzymes partly active ; [max 3]
- (c) (i) in (sodium) alginate (beads) / encapsulation ;
A other named methods, e.g.
entrapment / trapped in pores of silica gel
adsorption onto, clay / glass / resin
(within) polymer / partially permeable membrane, microspheres
covalent bonding to support, material / collagen [1]
- (ii) *any one acceptable suggestion, e.g.*
enzyme / phosphatase, can be reused ;
enzyme / phosphatase, easily recovered ;
enzyme / phosphatase, doesn't contaminate, DNA / product ;
less purification of product / DNA, required ; **A** less downstream processing required
enzyme / phosphatase, longer shelf life / AW ;
enzyme / phosphatase, more stable to, temperature / pH ; [max 1]
- (d) *similarities*
both have, pentose / 5C sugar ;
both have, organic / nitrogenous, base ; **A** both have purine (base)
both have phosphate ;
differences
(ATP) ribose not deoxyribose ;
(ATP) adenine not guanine ;
(ATP) three phosphates, not one ; [max 4]

[Total: 16]

5 (a) one mark each row

statement	measles	smallpox	malaria
caused by a virus	✓	✓	✗
caused by <i>Plasmodium</i>	✗	✗	✓
eradicated by vaccination	✗	✓	✗
transmitted by contaminated water	✗	✗	✗

[4]

- (b) *idea that* viruses have no, sites / targets, where antibiotics can work ;
viruses have no, cell walls / ribosomes / cell membranes ;

A have different enzymes

idea that even if antibiotics could affect viruses, they are within cells, antibiotics cannot reach them ;

[max 1]

[Total: 5]

8

- 6 (a) antigen-presenting cell ; A description e.g. macrophage that has phagocytosed pathogen and has antigens on surface
vaccine containing antigen ; [2]
- (b) transcription, translation, RER / rough endoplasmic reticulum / Golgi (body) ; [1]
- (c) (i) soluble in, blood / plasma / tissue fluid / lymph ;
tertiary / quaternary, structure allows formation of, variable site ; AW
idea of easier to transport (than fibrous proteins) ; [max 1]
- (ii) more than one, polypeptide ;
(antibodies have) two heavy and two light, polypeptides / chains ; [2]
- (d) hybridoma (cell) ; [1]
- [Total: 7]