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.



CAMBRIDGE International Examinations

**[Turn over**

**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 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) |

**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]

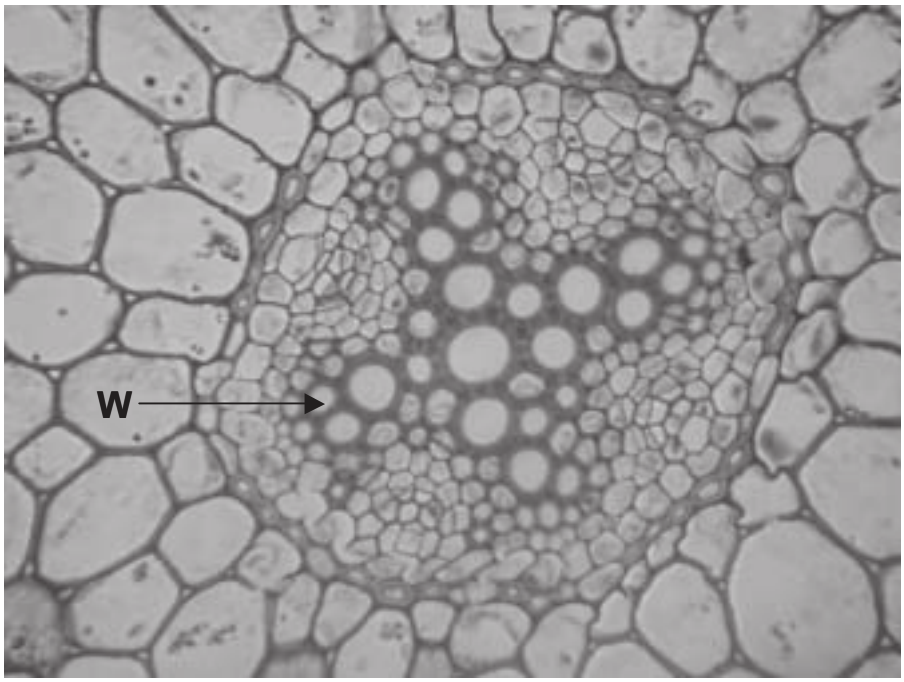
**(ii)** forms part of, spindle / spindle fibres **;**
attachment to centromeres / chromosomes / chromatids **;**
detail **;** e.g. movement of, sister chromatids / (daughter) chromosomes, to (opposite) poles / spindle fibres shortening at anaphase [max 2]

**(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]

**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]

**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]

**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 *Plasmodium* | × | × | ✓ | ; |
| 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]

**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]