

CAMBRIDGE
INTERNATIONAL EXAMINATIONS

June 2003

GCE A AND AS LEVEL

MARK SCHEME

MAXIMUM MARK: 50

SYLLABUS/COMPONENT: 9700/02

BIOLOGY
Paper 2 (Theory 1)



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KEY

a semi colon ;	indicates a separation of marking points
an oblique line /	indicates alternative wording or acceptable alternative
R	means reject
A	means accept
AW	means 'alternative wording'
underlined with a <u>straight line</u>	accept this word only, no alternative word is acceptable
D	represents quality mark(s) awarded for diagrams, as indicated on the Mark Scheme
L	represents mark(s) awarded for labels on diagrams, as indicated on the Mark Scheme
Q	represents quality of expression and is used for marks awarded on free-response questions

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Question	Expected Answers	Marks
1 (a)	C, E, D, B;	1
(b)	centromeres have divided/duplicated; R. split R. replicated (sister) chromatids/(daughter) chromosomes pulled/moved/separate/migrate to (opposite) <u>poles</u> ; ref. to the spindle/microtubules/spindle fibres; R. fibres	max 2
(c)	replication/DNA synthesis; assembly of nucleotides/polynucleotide (chain) formed; (alongside) old/original/both strands, act as <u>template</u> ; by base/complementary pairing/ A-T <u>and</u> G-C; quantity of DNA doubles/two new double helices formed;	max 3
(d)	production of <u>genetically</u> identical cells/ <u>genetically</u> uniform cells/ identical DNA/maintains <u>genetic</u> stability/same number <u>and</u> kind of c-somes/no <u>genetic</u> variation;	1

[Total 7]

2 (a)

*Award one mark per column. No penalisation for complete lack of **all** crosses (or **all** ticks) unless mixture of x and ✓ missing as agreed*

statement	emphysema	tuberculosis	obesity	rickets	smallpox
eliminated by vaccination	x	x	x	x	✓
a worldwide infectious disease	x	✓	x	x	✓ or x
a form of malnutrition	x	x	✓	✓	x
a deficiency disease	x	x	x	✓	x
involves degeneration of lung tissue	✓	✓ or x	x	x	x

[Total 5]

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- 3 (a)** Correct letter order **on** Question Paper:
- A - nucleus;
 C - mitochondria; B - RER;
 D - Golgi apparatus;
 E - cell surface membrane;
- max 4**
- R. process statements instead of letters*
- (b)** secrete/release/produce/make antibodies; **1**
 A. immunoglobulins
 R. memory cells unless linked to antibody production
- (c)** nucleus/nuclear envelope/nuclear membranes/nucleolus;
 no cell wall;
 have organelles/named visible organelles; (golgi/mitochondrion/
 RER) R. more organelles
 larger (cell);
 fixed ribosomes/ribosomes attached to E.R./no free
 ribosomes;
- max 2**
- [Total 7]**
-
- 4 (a)**
- (i)** shade in xylem; (complete xylem star must be shaded) **1**
- (ii)** shade in phloem; (A. shading of just one phloem group) **1**
- (b)** ref to bending/provide support/strength; R. lignin unqualified **1**
 R. prevents collapsing
- (c)** osmosis/diffusion;
down water potential gradient/from high/less negative to low/more
 negative water potential/AW; (R. osmotic potential/conc. gradients/
 less or more) through partially/selectively/differentially permeable
 membrane; R. semi-permeable **max 2**
- (d)** transpiration pull/cohesion-tension/cohesion-adhesion/
 mass flow in xylem;
 into spongy mesophyll (cells);
many cell walls/surfaces/large surface area; evaporation of water
 (from damp walls); into (substomatal/intercellular) air spaces; diffusion
 of water vapour/water as a gas/described; (e.g. movement of water
vapour from high to low conc.) through stomata/cuticle (to air/
 atmosphere); **max 4**
- (ignore ref. to apoplast, symplast, vacuolar pathways)
- [Total 9]**

Page 4	Mark Scheme	Syllabus	Paper
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- 5 (a) (i) haem; R. incorrect spelling
combines/binds with/carries/holds/takes up/transport oxygen; **2**
- (ii) soluble/polar/hydrophilic (on outside)/compact/spherical/curled/
coiled/folded (into a ball)/metabolically active;
4 polypeptides; **2**
- (b) iron needed for haem/haem contains iron;
less haemoglobin (made); R. less RBCs
less oxygen transported/supplied/delivered (to cells/tissues);
less respiration/respiration rate decreased;
R.respiration less efficient/effective **max 3**
- (c) muscle; A. cardiac/skeletal/involuntary muscle **1**
R. named muscle, e.g. biceps muscle
- (d) (i) 90%;
25%; A. within range 23-25% R. 23-26%, 22-25%
(N.B. Both % need to be correct for one mark) **1**
- (ii) haemoglobin unloads/releases oxygen/dissociates,
easily/readily/at higher ppO₂ (in tissues/cells);
(whilst) myoglobin holds on to oxygen/is very stable/does
not dissociate easily/has a higher affinity for oxygen;
(so) providing a store/reservoir/reserve of oxygen;
(so will not) release oxygen until the pp/conc./tension of oxygen
is low/during strenuous exercise;
so delaying anaerobic respiration; **max 3**
- (e) S-shaped curve to the right of **H**;
(N.B. curve should be S-shaped, start at 0, plateau out at
between 90-98% saturation, show 50% plus saturation at pp
of 6kpa) **1**

[Total 13]

- 6 (a) *Two correct letters required for a mark for each column if list given;
mark first 2 letters.*

Alcohol	Caffeine	Nicotine	Heroin
U	S	S	U
V	T	T	Y
Y	Z	W	W
Z		X	
		Z	

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(b) decrease in response to drug/effect of drug becomes less (intense);
 decrease in sensitivity of receptors/more receptors are made;
 drug is metabolised/becomes part of body's metabolism; more drug necessary to achieve the same effect/sensation/euphoria; **max 2**

(c) *award marks from any annotated diagrams*
Either
 inhibitor fits site other than active site/allosteric site; tertiary/3D structure or shape changes/any two bonds mentioned break; (ionic, van der Waals, hydrophobic, hydrogen, disulphide, covalent)
 active site changes shape;
 substrate no longer fits/binds/active site no longer complementary to substrate/E.S. complex not formed;

or
 inhibitor fits permanently/irreversibly into active site;
 substrate can no longer bind/substrate blocked/no E.S. complex formed;
 increasing substrate has no effect; **max 3**

Either mark scheme as appropriate – do not mix marking points from both mark schemes

[Total 9]

Total mark for paper = 50