

CAMBRIDGE
INTERNATIONAL EXAMINATIONS

June 2003

GCE A LEVEL

MARK SCHEME

MAXIMUM MARK: 50

SYLLABUS/COMPONENT: 9700/04

BIOLOGY
Paper 4 (Theory 2 (A2 Core))



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1 (a) top half of leaf/just below (upper) epidermis;
packed (densely);
long axis in line with incident light/AW;

2 max

(b) contain large numbers of chloroplasts/large amount of chlorophyll;
large vacuole; (*only give if linked to next point*)
chloroplasts (in cytoplasm) close to cell wall/cell membrane;
short diffusion pathway;
(cell) elongated/arranged to intercept (maximum) light;
thin (cell) wall;
ref. movement of chloroplasts;

3 max

(c) contains photosystems/PS1 and PS2/chlorophyll and accessory pigments/
reaction centres;
maintain carriers/receptors in position;
site of photophosphorylation/light reaction;
site of ETC;
ref. proton pumping/proton gradient;
large surface area;
produce ATP/ref. ATP synthase;
produce reduced NADP;

4 max

(d) ref. to Rubisco;
carbon dioxide combines with RuBP;
driven/powered by ATP;
and reduced NADP;
forms PGA;

2 max

Total: 11

2 (a) provides energy;
suitable examples;
e.g. muscle contraction, protein synthesis, DNA replication, cell movement, active transport

3

(b) *substrate level phosphorylation* cytoplasm (in glycolysis);
matrix of mitochondria (in Krebs cycle);
oxidative phosphorylation inner membrane of mitochondria/cristae;

2 max

(c) oxidative phosphorylation more than substrate level phosphorylation;
ref. to quantity, e.g. 32/34 vs. 4/6 per glucose;

2

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- (d) requires proton gradient produced by ETC;
with no oxygen ETC does not occur/no electron flow;
NAD cannot be reformed/NADH cannot be oxidised;
oxygen combines with electron/proton/oxygen final acceptor in ETC;
- 3 max**

Total: 10

- 3 (a) **A** vesicles containing transmitter/acetylcholine/synaptic vesicle;
B presynaptic membrane;
C synaptic cleft/gap;
D post synaptic membrane;
E receptor/protein/Na⁺ gate;
- 5**

- (b) arrow pointing down;
- 1**

- (c) ref. low Ca²⁺ in synaptic knob/high Ca²⁺ outside knob;
action potential/depolarization causes opening of Ca²⁺ channels;
Ca²⁺ into synaptic knob;
causes vesicles to move towards presynaptic membrane;
causes vesicles to fuse with presynaptic membrane;
vesicle contents/transmitter/exocytosis into synaptic cleft/gap;
- 3 max**

Total: 9

- 4 (a) metaphase;
II; (*allow one mark for telophase and two marks for telophase 1*)
- 2**

- (b) ref. spindles/microtubules shorten contract/pull/breakdown;
centromeres divide;
chromatids (pulled) apart;
to opposite poles;
chromosomes unwind/AW;
nuclear membrane reforms;
ref. cytokinesis/cleavage;
- 4 max**

- (c) independent/random assortment;
of homologous chromosomes;
different combinations of parental chromosomes;
crossing over/chiasmata;
between chromatids of homologous chromosomes/non-sister chromatids;
breaks up linkage groups/mixes alleles from parents; **R** genes
ref. to non-identical/genetically different gametes;
- 4 max**

Total: 10

Page 3	Mark Scheme	Syllabus	Paper
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- 5 (a)** phenotype is the feature/characteristic;
 results from interaction of genotype and environment on organism/
 environment may alter the appearance of an organism;
 genotype unaffected by environment;
 genetic characteristics inherited/passed on to offspring/ora/represents alleles
 possessed;
- 2 max**
- (b)** artificial selection carried out by humans;
 choose organisms with useful characteristics/benefit to humans;
 natural selection carried out by environment;
 ref. survival (to breed);
 ref. evolution;
- 3 max**
- (c) (i)** length of DNA/sequence of bases/locus on a chromosome;
 coding for a characteristic/protein/polypeptide/enzyme;
- 2**
- (ii)** alternative form of a gene;
 determining contrasting characters/controls one form of a character;
 occupies same locus;
 ref. sequence of bases;
 ref. dominance;
- 3 max**
- Total: 10**