

**CAMBRIDGE**  
INTERNATIONAL EXAMINATIONS

**NOVEMBER 2002**

**GCE Advanced Level**

**MARK SCHEME**

**MAXIMUM MARK : 50**

**SYLLABUS/COMPONENT :9700 /4**

**BIOLOGY  
(STRUCTURED QUESTIONS (A2 CORE))**



UNIVERSITY of CAMBRIDGE  
Local Examinations Syndicate

|        |                                      |          |       |
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**Question 1**

- (a)
- (i)  
 increase ;  
 rapid/sharp/steep ;  
 then decrease ;  
 does not drop to original value ; 2 max
- (ii)  
 decreases to 0 / all used up ; 1
- (b)
- (i)  
 GP continues to be formed from RuBP;  
 (until) all RuBP used up ;  
 the GP falls as converted to hexose/glucose/TP ; 2 max
- (ii)  
 in dark RuBP not regenerated/converted to GP ; R used up  
 requires the products /ATP/reduced NADP from the light reaction / photophosphorylation ; 2
- (c)  
 ATP ;  
 reduced NADP ; 2
- Total : 9**
- 

**Question 2**

(a)

|   | name of structure                                 | stage of respiration                                     |
|---|---|--|
| A | matrix  | Krebs cycle ;  |
| B | cristae / inner membrane<br>A intermembrane space | oxidative phosphorylation/ETC ;<br>A build up of protons |

**Penalise once if rows A and B are correct but swapped  
 If both structure names are correct (but stages incorrect) allow one mark**

|        |                                      |          |       |
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(b)

membranes separate from rest of cytoplasm ;  
 allows different pH ;  
 inner membrane attachment of stalked particles / ATPase ;  
 allows linear / ordered arrangement of carriers/ETC/respiratory chain ;  
 ref. to large internal surface area/AW ;  
 matrix contains enzymes;

3 max

(c)

carries / transfers protons/hydrogen(atoms) ;  
 and electrons ;  
 in/to ETC /FAD/respiratory chain;  
 ref. to dehydrogenation/oxidising ;  
 energy used to form ATP;  
 ref. to coenzyme ;  
 ref. alternative pathways (named);

3 max

(d)

light involved ;  
 occurs in chloroplasts/chlorophyll ;  
 on thylakoid membranes ;  
 ref. to cyclic and non-cyclic ;  
 photolysis of water/produces oxygen;

***If oxidative phosphorylation stated***

light not involved;  
 oxygen final hydrogen acceptor/oxygen not evolved;

3max

Total:11

### Question 3

(a)

engulf / remove / breakdown red blood cells ;  
 haemoglobin broken down ;  
 into haem and globin ;  
 iron removed (from haem) ;  
 remainder passes to liver cells to form bile pigments ;  
 globin broken down into amino acids ;

4 max

(b)

forms lipoproteins ;  
 stores fats ;  
 synthesises cholesterol ;  
 forms bile salts from cholesterol ;  
 converts glucose to fats ;  
 converts fats to fatty acids and glycerol;  
 converts fats/glycerol to glucose;

3 max

|               |   |                 |              |
|---------------|---|-----------------|--------------|
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|  |  |                   |
|--|--|-------------------|
| (c)  |  |                   |
| diffuses into sinusoids;   |  |                   |
| dissolved/in solution ;  |  |                   |
| in blood/ plasma ;   |  |                   |
| via hepatic vein ;   |  |                   |
| via renal artery;  |  | <b>2 max</b>      |
| (d)  |  |                   |
| (i)  |  |                   |
| less glucose / amino acids / fatty acids and glycerol / nutrients/more urea; |  | <b>1</b>          |
| (ii)   |  |                   |
| less oxygen / more carbon dioxide;   |  | <b>1</b>          |
|  |  | <b>Total : 11</b> |

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#### Question 4

|  |                |              |
|--|----------------|--------------|
| (a)  |                |              |
| metaphase ;  |                | <b>1</b>     |
| (b)  |                |              |
| centromeres divide / splits;   | <b>R break</b> |              |
| chromatids separate ;  |                |              |
| idea movt. to opposite poles / centrioles ;                          |                |              |
| by microtubules / spindle fibres ;                                   |                |              |
| idea.mechanism of movement ;   |                | <b>3 max</b> |
| (c)  |                |              |
| (i)  |                |              |
| breaks down / disperses ;  |                | <b>1</b>     |
| (ii)   |                |              |
| centrioles divides/replicate;  |                |              |
| to form two pairs (of centrioles) ;                                  |                |              |
| move to (opposite) poles;  |                | <b>2 max</b> |
| (d)  |                |              |
| 1 random alignment / independent assortment / or description;        |                |              |
| different mix of maternal and paternal chromosomes/chromatids ;      |                |              |
| 2 crossing over / chiasmata formation/exchange of genetic material ; |                |              |
| between chromatids of homologous chromosomes ;                       |                |              |
| breaks up linkage groups / mixes maternal and paternal alleles ;     |                |              |
| In 1 or 2 ref. different gametes produced;                           |                | <b>4 max</b> |

**Total : 11**

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|        |                                      |          |       |
|--------|--------------------------------------|----------|-------|
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**Question 5**

(a)

Either

*If genetic diagram used*

Penalise once for incorrect symbols

orange dominant to black (or converse);

orange scallop

|           |           |           |           |           |   |
|-----------|-----------|-----------|-----------|-----------|---|
| parents   | $S^o S^b$ | X         | $S^o S^b$ | ;         |   |
| gametes   | $S^o$     | $S^b$     | $S^o$     | $S^b$     | ; |
| genotype  | $S^o S^o$ | $S^o S^b$ | $S^o S^b$ | $S^b S^b$ |   |
| phenotype |           | orange    |           | black     | ; |

black scallop

|           |           |           |           |   |   |
|-----------|-----------|-----------|-----------|---|---|
| parents   | $S^b S^b$ | X         | $S^b S^b$ | ; |   |
| gametes   | (         | $S^b$     | $S^b$     | ) |   |
| genotype  |           | $S^b S^b$ |           |   |   |
| phenotype |           | black     |           |   | ; |

Or

*If text explanation given*

orange dominant to black (or converse);  
orange are heterozygous;  
(because) ref. 3:1 ratio;  
link data to ratio;  
black are homozygous;  
because all offspring are black;

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(b)

separate orange scallops produced from first cross / test cross orange with black ;  
some will produce only orange offspring ;  
these will be homozygous for orange allele/pure breeding ;

2 max

**Total : 8**