

Mark Scheme (Results)

January 2007

GCE

GCE Biology (8040/9040)

General Principles

Symbols used in the mark scheme

Symbol	Meaning of symbol
; semi colon	Indicates the end of a marking point.
eq	Indicates that credit should be given for other correct alternatives to a word or statement, as discussed in the Standardisation meeting. It is used because it is not always possible to list every alternative answer that a candidate may write that is worthy of credit.
/ oblique	Words or phrases separated by an oblique are alternatives to each other.
{ } curly brackets	Indicate the beginning and end of a list of alternatives (separated by obliques) where necessary to avoid confusion.
() round brackets	Words inside round brackets are to aid understanding of the marking point but are not required to award the point.
[] square brackets	Words inside square brackets are instructions or guidance for examiners.

Crossed out work

If a candidate has crossed out an answer and written new text, the crossed out work can be ignored. If the candidate has crossed out work but written no new text, the crossed out work for that question or part question should be marked, as far as it is possible to do so.

Spelling and clarity

In general, an error made in an early part of a question is penalised when it occurs but not subsequently. The candidate is penalised once only and can gain credit in later parts of the question by correct reasoning from the earlier incorrect answer.

No marks are awarded specifically for quality of language in the written papers, except for the essays in the synoptic paper. Use of English is however taken into account as follows:

- the spelling of technical terms must be sufficiently correct for the answer to be unambiguous
e.g. for amylase, 'ammalase' is acceptable whereas 'amylose' is not
e.g. for glycogen, 'glicojen' is acceptable whereas 'glucagen' is not
e.g. for ileum, 'illeum' is acceptable whereas 'ilium' is not
e.g. for mitosis, 'mytosis' is acceptable whereas 'meitosis' is not
- candidates must make their meaning clear to the examiner to gain the mark.
- a correct statement that is contradicted by an incorrect statement in the same part of an answer gains no mark - irrelevant material should be ignored.

Question 1

Maximum Marks

- 1 auxin / named example of an auxin such as IAA ;
- 2 extension of {internode / stem} / cell elongation / breaking dormancy in {seeds /buds}
/ development of side shoots / causing leaf growth / reversal of dwarfism / bolting;
- 3 cell division / cell differentiation / cell expansion in leaves / combat aging in leaves
/eq ;
- 4 abscisic acid / ABA;
- 5 ripening fruit / inducing flowering ;

Total 5 marks

Question 2

Maximum Marks

(a) (i) prophase 1 ; 1 mark

(ii) A = chromatid B = centromere C = chiasma / chiasmata ;;
[3 correct = 2 marks, 2 correct = 1 mark] 2 marks

(b) (i) (all) BbRr with black, rough fur ; 1 mark

(ii) 9 3 3 1 ; 1 mark

(iii) 1 ref. to expected numbers would be 27 black, rough : 9 black, smooth : 9 white, rough : 3 white, smooth ;
2 the actual results differ from {expected ones / 9:3:3:1 ratio} ;
3 genes for fur colour and texture are {on same chromosome / linked} ;
4 tend to be inherited together ;
5 only separated if {chiasma(ta) forms between them / crossing over takes place} ;
6 ref. to recombinants ;
7 recombinants are black with smooth fur and/or white with rough fur ;

4 marks

Total 9 marks

Question 3

Maximum Marks

- (a) (i) labeling: 3 correct = 2 ;;
2 correct = 1
1 correct = 0

drawing plan with no cells;
vein / midrib / upper epidermis shown in whole leaf;
all features shown in whole leaf;

5 marks

- (a) (ii) palisade - {packed with chloroplasts / chloroplasts can move in the cytoplasm to intercept light / lies under epidermis} to maximise the amount of light trapped ;
spongy - some chloroplasts so can absorb light / ref. to air spaces to assist {diffusion of gases / gas exchange} ;
lower epidermis - presence of stomata to allow {the entry of carbon dioxide / exit of oxygen} ;

3 marks

- (b) {large surface area / eq} to {maximise amount of light trapped / eq} ;

more {chlorophyll/chloroplasts} to {maximise photosynthesis / trap as much light as possible} ;

{more layers of palisade mesophyll cells / longer palisade cells / eq} to trap more light ;

any other valid comment ;

2 marks

Total 10 marks

Question 4

Maximum Marks

(a) (i) A = protein
B = phospholipid (bilayer);

1 mark

(ii) C = glycoprotein / glycocalyx ;
Role: recognition / antigen / receptor site / binds cells together / eq ;

2 marks

(b) (i) 1 active transport and diffusion both involved ;
2 ref. to {some / little / low rate of} diffusion / mainly active transport ;
3 hardly any ions transported without ATP, with ATP rate of transport is higher ;
4 diffusion only when no ATP present ;
5 active transport requires energy / ATP {supplies energy / is energy source / eq} ;
6 allows ions to {accumulate / build up / move against concentration gradient} ;

4 marks

(ii) 1 sodium ions {actively transported / pumped} out of ascending limb ;
2 together with chloride ions ;
3 into {medulla / medullary tissue} ;
4 ions accumulate in {medulla / medullary tissue} ;
5 ref. to lower water potential in {medulla / medullary tissue} / eq ;
6 water moves out of {descending limb / collecting ducts} by {osmosis / diffusion} ;
7 ref. to {increases concentration of urine / countercurrent multiplier} ;

4 marks

Total 11 marks

Question 5

Maximum Marks

- (a) (i) (overall trend) as conc. of caffeine decreases, heart rate decreases OR
converse as caffeine conc. increases, heart rate increases ;
largest decrease between 1000 and 100 ppm / allow converse ;
very low concentrations (0.0001 and lower) have no effect on heart rate ;
increase linear between 0.0001 and 1.0, then increase greater;

3 marks

- (ii) $((5.6 - 3.7) \div 3.7) \times 100$;
51.4 / 51.35 ;

2 marks

- (b) to observe the effect of no caffeine on the heart rate / to obtain a base reading ;

1 mark

- (c) 1 to eliminate a source of error ;
2 *Daphnia* are {ectothermic / eq} animals ;
3 {metabolic rate / eq} depends on temperature ;
4 if temperature changes, heart rate changes ;
5 this could have masked the effect of caffeine on heart rate / ref. to
temperature affects concentration of oxygen in water ;

3 marks

- (d) 1 nicotine is {a mimic of / chemically similar to} acetyl choline ;
2 nicotine binds to the receptors on the post synaptic membrane ;
3 results in {action potentials being generated / depolarisation} ;
4 then blocks the synapse / not broken down ;

2 marks

Total 11 marks

Question 6

Maximum Marks

- (a) maltose ;
ref. to hydrolysis ;
of glycosidic bond ;
by maltase ;

[max = 2 if maltose not identified]

3 marks

- (b) 1 villi increase surface area ;
2 microvilli increase surface area of (epithelial) cell (surface) membrane ;
3 ref. to capillary networks in villi (remove glucose to) maintain {concentration / diffusion} gradient ;
4 {thin / single cell} epithelium reduces distance between {lumen / eq} and the blood ;
5 ref. to {carrier proteins / sodium ion mechanism / co-transport of glucose} in cell (surface) membrane of epithelium ;

3 marks

- (c) (i) 1 ref. to negative feedback ;
2 increase in blood glucose detected by β -cells (in pancreas) ;
3 insulin released ;
4 from { β -cells / Islets of Langerhans} (in pancreas) ;
5 glucose to glycogen and fat / ref. to glycogenesis ;
6 in liver ;
7 increase permeability of cell membrane to glucose ;
8 ref. to conversion of glucose to fatty acids / fats ;
9 glucose levels turn to {normal / set point} ;

6 marks

Total 12 marks

Question 7

Maximum Marks

(a) succession ;

1 mark

- (b)
- 1 Increased number of species as succession progresses / number of species increases from grassland to woodland ;
 - 2 any suitable manipulation of data ;
 - 3 grassland is open habitat but trees provide more cover ;
 - 4 birds easily spotted by predators in grass / converse for trees and shrubs ;
 - 5 trees provide {roosting / nesting} sites;
 - 6 mixed woodland provides greater variety of food to support more species ;
 - 7 trees provide more niches for species than smaller shrubs ;

5 marks

- (c)
- 1 pine trees have less food available for birds / eq ;
 - 2 needles on the woodland floor do not support as many invertebrates / eq (which birds eat) ;
 - 3 reduction in the variety of {microhabitats / niches} ;
 - 4 idea that mixed woodland {has many layers / is more varied} that shelters birds / provide nesting sites;

2 marks

Question 7 (continued)

Maximum Marks

- (d)
- 1 deforestation / eq ;
 - 2 leaves soil exposed to erosion / loss of habitats / change in biodiversity ;

 - 3 acid rain / eq;
 - 4 damages leaves / needles of trees / eq;

 - 5 global warming / increase in greenhouse gases / eq ;
 - 6 summer drought reduces tree growth / eq;

 - 7 physical disturbance by recreational activities ;
 - 8 trampling destroys {vegetation / habitats} ;
[two pairs only]

4 marks

Total 12 marks