

Mark Scheme (Results)

Summer 2007

GCE

GCE Biology (6104/02)

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 mark

Stage	Part of cell in which it occurs	Two Products
	cytoplasm / cytosol ;	pyruvate / pyruvic acid, NADH / eq and ATP / H ⁺ ;
		ATP, CO ₂ , NADH / eq and FADH ₂ / eq /H ⁺ ;
	cristae / inner membrane of mitochondrion;	

Total 4 marks

Question 2

Maximum mark

- (a) (i) liver ;
(ii) ovary / testis;

2 marks

- (b) 1. ref to glucagons binding to receptor activating adenylyl cyclase ;
2. (therefore) {several / many} ATP molecules are converted to cAMP / eq ;
3. cAMP activates an enzyme ;
4. (each activated) enzyme (molecule) {hydrolyses / eq} many glycogen (molecules) ;
5. idea that glycogen is made up of many glucose (molecules) ;
6. ref to cascade effect / eq ;

3 marks

Total 5 marks

Question 3

Maximum mark

- (a) 1. idea that anabolism builds up molecules and catabolism breaks them down ;
2. correct example of anabolism e.g. glucose by photosynthesis, proteins from amino acids ;
3. correct example of catabolism e.g. carbon dioxide from respiration, glucose from glycogen breakdown ;

3 marks

- (b) (i) 1. {hydrogen / electrons} transferred from malate to NAD^+ ;
2. ref to reduction of NAD^+ ;
3. ref to oxidation of malate ;

2 marks

- (ii) (enzyme) 1 ;

1 mark

- (iii) 1. less fumarate produced ;
2. (therefore) less malate produced ;
3. (therefore) concentration of oxaloacetate decreases /eq ;
4. (so) {inhibition stops/eq} / enzyme 2 becomes active again ;
5. ref to negative feedback ;
6. idea that succinate levels may rise ;
7. ref to more 2-oxoglutarate / hydroxyglutarate formed ;
8. ref to decreased {levels / production } of { NADH / FADH_2 / H_2O } eq ;

4 marks

Total 10 marks

Question 4

Maximum mark

- (a) 1. increases ;
2. (because hydrostatic) pressure increases in {glomerulus / capillaries} ;
3. idea that volume of blood arriving is greater than that leaving ;

2 marks

- (b) 1. deamination / correct description ;
2. of excess amino acids ;
3. ref to production of ammonia ;
4. (followed by) ornithine cycle ;
5. in the liver ;

3 marks

- (c)(i) 1. correct difference i.e. $15-8 (= 7)$;
2. correct division (by 15) ;
3. conversion to percentage ;
[correct answer = 46.7]

3 marks

- (c)(i) 1. correct difference i.e. $15-8 (= 7)$;
2. correct division (by 15) ;
3. conversion to percentage ;
[correct answer = 46.7]

3 marks

- (ii)
1. less protein in diet / eq (on day 2) ;
 2. therefore fewer excess amino acids;

 3. more water in diet (on day 2);
 4. therefore more water in the urine ;

 5. idea of dehydration (on day 1) ;
 6. therefore less water in the urine ;

 7. idea of greater demand for amino acids due to {training / growth / repair / pregnancy} (on day 2) ;
 8. therefore {less / no} excess amino acids ;

 9. ref to liver malfunction / eq (on day 2) ;
 10. less urea formed ;

 11. urea loss through sweating (on day 2) ;
 12. less urea in urine ;

3 marks

Total 11 marks

Question 5

Maximum mark

1. idea of resting potential {at start / returned to at end} (of post-synaptic membrane) ;
2. more Na^+ outside axon and more K^+ inside / eq ;
3. (imbalance maintained by) Na^+ / K^+ pump ;
4. ref to acetylcholine ;
5. diffuses across synaptic cleft ;
6. binds to receptors ;
7. on post-synaptic membrane ;
8. membrane becomes permeable to Na^+ / Na^+ gates open ;
9. Na^+ enter (by diffusion) ;
10. causes more { Na^+ channels / voltage gated channels} to open ;
11. result in depolarization (of membrane) / figures quoted;
12. idea of depolarization reaching threshold level;
- 13 (resulting in an) action potential / excitatory post-synaptic potential ;
14. propagation by local currents / eq ;
15. ref to {wave of depolarization / saltatory conduction / eq} ;

Total 10 marks

Question 6

Maximum mark

- (a)
1. (results from a) lack of vitamin C ;
 2. idea that it cannot be {synthesised / stored} in our bodies ;
 3. needed for synthesis of {collagen / tissue proteins / connective tissue} ;
 4. credit details of biochemistry ;
 5. credit details of symptoms of scurvy ;

3 marks

- (b)
1. fibre decreases transit time of stools / eq (through the colon) ;
 2. decreasing time that {dangerous/carcinogenic} chemicals present ;
 3. softens the stools / increases the bulk of faeces ;
 4. reducing friction / trauma / eq;

3 marks

Total 6 marks

Question 7**Maximum mark**

- (a) (skinfold) calliper ; 1 mark
- (b) 1. pinch skin (between finger and thumb) ;
2. pull lever to open arms of calliper / eq ;
3. close calliper over skinfold / eq ;
4. read measurement from the scale ; 3 marks
- (c) **ANY TWO FROM:**
waist
back / below shoulder blade
hip
front of upper arm
back of upper arm ; 1 mark
- (d) (i) average skinfold calculated ;
percentage body fat: 17.4 - 18.4 ; 2 marks
- (ii) measurements from one part of body only;
only three readings; 1 mark

Total 8 marks

Question 8

Maximum mark

- (a)
1. ethene released / produced ;
 2. enzymes stimulated / ref to synthesis of enzymes ;
 3. pectinase breaks down pectin ;
 4. middle lamella / cell wall breaks down ;
 5. starch broken down to sugar / eq ;
 6. Chlorophyll broken down / lycopene produced ;

4 marks

- (b) (i)
1. raise carbon dioxide level/lower oxygen content ;
 2. store at low temperatures ;
 3. use ethene inhibitor ;

1 mark

- (ii)
1. reduce bruising / damage ;
 2. ref to customer preference ;
 3. less risk of microbial decay ;
 4. adjusting time of sale / eq ;
 5. increase shelf life / time of storage ;

2 marks

Total 7 marks

Question 9

Maximum mark

- (a) 1. fermentation of glucose/fructose/sucrose ;
2. in anaerobic conditions ;
3. (results in) the production of ethanol ;
2 marks
- (b) (i) 1. up to 12 - 12.4 days both produce alcohol at similar rate / similar volume ;
2. alcohol production by type B yeast stops before type A / eq ;
3. type A produces more alcohol overall / after day 12 than type B ;
4. correct manipulation of figures ;
3 marks
- (ii) 1. alcohol toxic /eq ;
2. yeast died ;
3. sugar used up ;
2 marks
- (c) 1. carbon dioxide is produced ;
2. by (either aerobic or anaerobic) respiration ;
3. alcohol levels will not become high enough to kill yeast / eq ;
2 marks

Total 9 marks