

GCE



Edexcel GCE

Biology / Biology (Human) (6104/03)

January 2006

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Mark Scheme (Results)

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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

(a) (i) Oxidative phosphorylation / electron transport chain / eq ;

1 mark

(ii) 1. Oxidoreductase / dehydrogenase / oxidase ;

2. Transfers {hydrogen / electrons} (from one carrier to another) ;

2 marks

(b) 1. {Reduces / combines with} oxygen ;

2. Combines with H^+ (and e^-) ;

3. To form water ;

2 marks

Total 5 marks

Question 2**Maximum mark**

- (a) (i) Arrow correctly positioned ; 1 mark
- (ii) 1. {Axon / nerve fibre} has a (myelin) sheath around it ;
2. Made of {many layers of membrane / phospholipids/lipid} ;
3. Reference to Schwann cells ;
4. Reference to electrical insulation ;
5. Reference to nodes of Ranvier /eq ; 2 marks
- (iii) Increases (speed of conduction) /eq; 1 mark
- (b) 1. Clear resting potential drawn at -60 mV peaking at +35 mV ;
2. Correct shape including hyperpolarisation and return to resting potential ; 2 marks
- Total 6 marks**

Question 3**Maximum mark**

- (a)
1. Can be {steroids / peptides / amides / eq} ;
 2. (Released in) minute quantities eq ;
 3. From endocrine glands / eq ;
 4. Idea that it {goes into / travels} in the bloodstream eq ;
 5. Affect target organs / eq ;
 6. By binding to protein receptors sites on {cells / membrane}

3 marks

- (b) (i)
- (Hormone A is) FSH / follicle stimulating hormone ;
- (Hormone B is) LH / luteinising hormone ;

2 marks

(ii) *Description*

1. In first 3/4 days there is a rise in both FSH and oestrogen ;
2. FSH stimulates oestrogen production ;
3. Between 3/4 and 10/11 the level of oestrogen rises and FSH falls ;
4. Oestrogen inhibits FSH production ;
5. This is an example of negative feedback ;
6. At day 12/13 oestrogen levels {reach a peak / start to fall} and FSH levels rise / ref. to oestrogen peaking at day 12/13 before FSH peaking at day 14 ;
7. High levels of oestrogen stimulates FSH production ;
8. This is an example of positive feedback ;

4 marks**Total 9 marks**

Question 4**Maximum mark**

- (a)
1. Active transport of {Na⁺ / Cl⁻} out from ascending limb ;
 2. Idea of low water potential in medulla ;
 3. Reference to counter current flow mechanism /eq ;
 4. Water passes out of {collecting duct / descending limb} ;
 5. By osmosis ;
 6. Reference to ascending limb (of Loop of Henlé) being impermeable to water ;

3 marks

- (b)
1. Hopping mouse ;
 2. Has highest urine : plasma concentration ratio / eq ;
 3. Indicating {more water retained in body / less water lost / very efficient water conservation / eq} (essential for survival in very dry habitat) ;
 4. Long(er) loops of Henlé ;

3 marks

- (c)
1. Excess amino acids ;
 2. Deaminated / eq;
 3. Ammonia to urea / reference to ornithine cycle ;
 4. {Transported / dissolves in (blood) plasma ;
 5. Reference to (ultrafiltration) in glomerulus /eq ;
 6. Credit detail of ultrafiltration / eq ;

4 marks**Total 10 marks**

Question 5

Maximum mark

- (a)
1. White matter surrounds grey matter / eq ;
 2. White matter contains myelin / grey matter has no myelin ;
 3. Grey matter contains {cell bodies of effector neurones/ connector neurones / eq / synapses} ;
 4. White matter contains {sensory neurones / ref. to ascending and descending neurones };
 5. Reference to central canal ;
 6. (Central canal) contains fluid ;
 7. (Spinal cord) surrounded by meninges ;
- [Accept from suitably labelled diagram]

4 marks

- (b)
1. Arrival of action potential /eq ;
 2. Calcium channels open in (pre-synaptic membrane) ;
 3. Calcium ions enter (the pre-synaptic bulb) ;
 4. Vesicles migrate/eq to membrane ;
 5. Vesicles fuse with (pre-synaptic) membrane ;
 6. Releasing {transmitter substance / e.g. acetylcholine/ eq} ;
 7. By exocytosis ;
 8. Transmitter substance diffuses across synaptic cleft ;
 9. Binds to receptors on post-synaptic membrane ;
 10. Reference to a generation of a post-synaptic potential /eq ;

6 marks

Total 10 marks

Question 6

Maximum mark

Molecule	Precise location in the body	Importance during exercise
		Provides oxygen / oxygen store (when levels are low) ;
Creatine phosphate / phosphocreatine ;	Muscle cells ;	
	Muscle cells / liver cells ;	

Total 4 marks

Question 7

Maximum mark

- (a)
1. Valves ;
 2. Prevent back flow ;
 3. (Lymphatic vessels) embedded /eq between muscles ;
 4. idea of muscle contraction squeezing vessels ;

3 marks

- (b)
1. Reference to macrophages ;
 2. Engulf and digest pathogens ;
 3. Ref. to antigen presenting cells ;
 4. Lymphocytes ;
 5. (Blymphocytes / plasma cells) secrete antibodies ;
 6. Ref. to {oponization /eq / immobilisation / eq (of pathogen)}

3 marks

Total 6 marks

Question 8**Maximum mark**

- (a) (i) 1. Medium to high intensity / eq ;
2. Swimming / jogging / eq ;
3. Minimum duration of 20 minutes ;
4. 3-5 times per week ;
5. Idea of building up training programme with time ;
- 3 marks**
- (ii) For comparison with (resting pulse) final rate / eq ;
- 1 mark**
- (iii) 1. Decreases ;
2. Because heart rate falls ;
3. Due to larger stroke volume ;
4. {stronger / more} cardiac muscle
5. Idea of more {capillaries / oxygen uptake} in {lungs / muscle} ;
- 2 marks**
- (b) Lots of mitochondria lots of aerobic respiration ;
(Red brown colour) high in myoglobin to store more oxygen ;
Lots of capillaries to {bring more oxygen /remove more carbon dioxide / for faster gas exchange} ;
- 3 marks**
- Total 9 marks**

Question 9

Maximum mark

(a) Volume of air inspired (or expired) in one minute ;

1 mark

- (b) (i) 1. 30 (% increase above normal) ;
2. $100 + 30 (=130\%)$;
3. $130 \div 100 \times 8 (=10.4 \text{ dm}^3 \text{ min}^{-1})$;

Or

1. 30 (% increase above normal) ;
2. $\frac{30 \times 8}{100} (= 2.4 \text{ dm}^3 \text{ min}^{-1})$;
3. $+8 (= 10.4 \text{ dm}^3 \text{ min}^{-1})$;

3 marks

- (ii) 1. {Increased levels of carbon dioxide / fall in pH} (in blood) ;
2. Detected by chemoreceptors ;
3. In {aorta / carotid artery / medulla} ;
4. Nerve impulses to intercostals and diaphragm muscles ;
5. Rate of contraction increases ;

4 marks

- (c) 1. Detects degree of stretch during inhalation ;
2. Prevents over inflation of the lungs ;
3. Impulses along {sensory neurones / vagus nerve} to {medulla / respiratory centre} ;
4. Reflex action initiated / impulses along motor neurone (in response) ;
5. Internal intercostal muscles contract / inhibition of respiratory centre / external intercostal muscles no longer stimulated (to contract) ;

3 marks

Total 11 marks