GCE

Edexcel GCE

Biology / Biology (Human) (6104/03)

Summer 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) Leaves / seeds/ roots/ stems/ petioles/ flowers/ fruits/ shoots/ coleoptiles / buds ;

1 mark

(b) (in dark) slow conversion in darkness (P_{FR}) to P_R ;

(Infar red light) fast conversion (P_{FR}) to P_R ;

2 marks

(c) Exposure to {red light / 660 to 700nm / daylight / white light} ;

1 mark

Total 4 marks

Question 2 **Maximum mark**

(a) (i) Type: Effector / motor / multipolar ;

Role: {Transmit / eq} impulses to {effectors / muscles / glands / named eg.} ;

2 marks

(ii) Arrow drawn points down from cell body to synaptic knob;

1 mark

(b) Where: Grey matter ;

Importance: {link/eq} with {sensory / relay} neurone / reference to summation ;

2 marks

(c)
1. Gap in the myelin sheath /eq ;
2. Enables {depolarisation/action potential/eq} (of axon) ;
3. Causes impulse to jump from node to node / saltatory conduction ;
4. Speeds up (transmission of)impulse ;

3 marks

Total 8 marks

Question 3 **Maximum mark**

(a)
1. Both rise in first half hour ;
2. {Greater/ faster} increase in diabetic men (in first half hour) / converse ;
3. (between 30 to 60 minutes) decreases in non-diabetic men and increases in diabetic men ;
4. {After one hour/eq} the non-diabetic bgl is lower than the original and diabetic is higher;
5. Manipulation of comparative figures to support any of above ;

3 marks

(b) (i) Insulin causes fall in blood glucose levels ;

Blood glucose does not decrease in diabetic men / decrease only seen in non-diabetic men / allow converse;

2 marks

(ii)
1. Correct reference to effect on respiration ;
2. Osmotic effect of glucose / eq ;
3. Reference to oedema/dehydration of {cells / tissues} / eq ;
4. Reference to change in blood {pressure / pH} ;
5. Coma / death /fainting / nausea / kidney damage ;

2 marks

(c)
1. Low level detected by pancreas / islets of Langerhans / α cells ;
2. Glucagon secreted / eq;
3. By α cells ;
4. {Glycogenolysis / gluconeogenesis / eq} stimulated ;
5. (Results in) the release of glucose {into blood / from liver} ;

3 marks

Total 10 marks

Question 4 **Maximum mark**

Maximum 3 marks if no reference to "at these sites"

(a)
1. electrons lose energy
2. H^+ pumped into intermembrane space ;
3. H+ accumulate / reference to concentration gradient ;
4. Reference to {ATPase / H^+ channel /stalked particle} (inner membrane) ;
5. H^+ flow (through ATPase) back into matrix ;
6. {Phosphorylation of ADP / ADP + Pi } to ATP ;

4 marks

(b)
1. 1 x reduced FAD and 1 x reduced NAD produced / eq ;
2. (1 x) reduced NAD gives 3 ATP molecules ;
3. (1 x) reduced FAD gives 2 ATP molecules ;
4. Because reduced FAD donates {H^+ / electrons} after site 1 / eq ;

3 marks

(c)
Cytoplasm ;

Matrix of mitochondria ;

Matrix of mitochondria ;

3 marks

Total 10 marks

Question 5 **Maximum mark**

Gross structure:

1. Reference to renal artery and renal vein ;
2. Reference to ureter qualified ;
3. Reference to outer cortex and inner medulla ;
4. Reference to pelvis as a cavity /eq ;

Nephron structure:

5. Reference to nephron;
6. Consisting of Bowman's capsule, proximal convoluted tubule, loop of Henle and distal convoluted tubule in correct sequence;
7. Reference to glomerulus located inside Bowman's capsule ;
8. Details of Bowman's capsule e.g. basement membrane / podocytes ;
9. Reference to wide afferent and narrow efferent arterioles ;
10. Cells of PCT have {microvilli / brush borders / lots of mitochondria;
11. Details given for loop of Henle eg location, relative width of limbs ;
12. Reference to vasa recta ;
13. Details of collecting ducts eg connect to lots of nephrons, location ;

[Allow marks from well-labelled diagram]

Total 8 marks

Question 6 **Maximum mark**

	Cardiac	Striated
1.	In heart	Attached to {bones / skeleton} ;
2.	Intercalated discs / gap junctions / sacromeres irregularly arranged	No intercalated discs / no gap junctions sacromeres regularly arranged ;
3.	Branched	Not branched ;
4.	One nucleus per cell / individual cells	Multinucleate / fibres /eq ;
5.	Myogenic / involuntary / eq	Neurogenic / voluntary/eq ;
6.	Does not fatigue /eq	Does fatigue /eq ;

3 marks

	Myoglobin	Haemoglobin
1.	Muscle	Red blood cells/eq ;
2.	Stores oxygen	{Transports/eq} oxygen ;
3.	Higher affinity / eq	Lower affinity / eq ;
4.	One sub-unit/eq	Four sub-units/eq ;
5.	One {oxygen molecule/ haem}	Four {oxygen molecules/haem groups} ;
6.	Cannot {carry /eq} CO_2	Can {carry/eq} CO_2 ;

3 marks

Total 6 marks

Question 7 **Maximum mark**

(a) (i) B ;

1 mark

(ii) Mitosis ;

1 mark

(iii) (Plasma cells) {secrete / produce} antibodies ;

(Memory cells) respond to a second {exposure/eq} (to the same antigen) /faster response to infection / eq ;

2 marks

(b)
1. Receptors on cell surface bind to {antigen / cell / opsin/ particle / named example} ;
2. Cells engulf {pathogen / eq} / pseudopodia extend around the {pathogen / eq} / reference to endocytosis ;
3. {Phagosome / (phagocytic) vesicle} is formed (inside the cell) ;
4. Lysosomes fuse with vesicle membrane /eq ;
5. {Secrete/ release} (hydrolytic) enzymes into vesicle ;
6. {Pathogen / antigen} is {digested / destroyed} ;

3 marks

Total 7 marks

Question 8 **Maximum mark**

(a) (i) 1. (oxygen uptake) increases up to 60dm^3 min^{-1} and then levels off;

2. linear relationship up to 30 dm^3 min^{-1} / fastest up to {20/30} dm^3 min^{-1} ;

3. 30 – 60 dm^3 min^{-1} the increase is less ;

4. credit manipulation of figures ;

3 marks

(ii) 2.5 – 0.40 / 2.10 ;

÷ 0.40 ;

x 100 = 525(%) ;

answer : 525 %

3 marks

(b) 1. Increased numbers of capillaries {around alveoli / in lungs} / increased cardia muscle / increase stroke volume ;

2. Greater blood flow through the lungs ;

3. Increased numbers of red blood cells ;

4. Increased haemoglobin ;

5. Steeper diffusion gradient / eq ;

3 marks

Total 9 marks

Question 9 **Maximum mark**

(a) 1. Both increase up to the age of 30 and then decrease ;

2. After 30 years of age decrease variable for women but linear decrease in men ;

3. Fastest decrease is between the ages 45 and 55 years for women ;

4. Credit use of comparative figures ;

3 marks

(b) (i) Osteoporosis ;

1 mark

(ii) 1. Mean bone density is lower in women ;

2. Bone density decreases below {fracture level / (4 a. u.)} ;

3. Faster decline in bone density / lose calcium faster ;

4. Reference to {menopause / less oestrogen} ;

3 marks

(iii) Increased {calcium intake / weight bearing exercise} / HRT / regular exercise when younger/ glucosamine / chondrotinsulphate / bisphosphonates;

1 mark

Total 8 marks