GCE

Edexcel GCE

Biology / Biology (Human) (6104/01)

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**

	Endotoxin	Exotoxin
1.	Released once {bacteria have died / cell wall damaged}	Released from living bacteria ;
2.	Delay between infection and {release / symptoms}	{Released soon after infection / symptoms appear quickly} ;
3.	Part of the bacterial cell wall / lipoplysaccharide	Protein / enzyme ;
4.	Needed in high concentrations to have an effect	Effective in very small concentrations ;
5.	Example: salmonella / Gram negative only	Example: staphylococcus / Gram negative and positive;

3 marks

	λ phage	HIV
1.	DNA	RNA ;
2.	No reverse transcriptase	Reverse transcriptase ;
3.	Complex	Polyhedral / icosahedral ;
4.	No {envelope / membrane}	Enveloped / with membrane;
5.	Tail pins/no GP proteins	No tail pins / GP proteins;

3 marks

Total 6 marks

Question 7 **Maximum mark**

(a) Fungus / Ascomycetes / Ascomycota/ mould ;

1 mark

(b) (i) 1. All nutrients added at beginning of culture / none added during ;

2. Waste products not removed ;

3. Product harvested at end/ eq;

4. pH not adjusted ;

2 marks

(ii) 1. (Penicillin is) a secondary metabolite ;

2. Produced {at end of growth phase / during stationary phase} ;

3. Microorganisms {stop growing / enter stationary phase} when {nutrients are depleted / waste products build up / pH falls / anaerobic} ;

2 marks

(c) Culture fluid / fraction 2;

Because penicillin is secreted /eq ;

2 marks

Total 7 marks

Question 8 **Maximum mark**

(a) 12×10^6 (cells added in the 2 cm^3) ;

Total volume (22cm^3) ; [CE]

$\div 22 = 5.45 \times 10^5$ (cells cm^{-3}) ; [CE]

3 marks

(b) (i) 1. Neither species of bacteria survive at pH 9 ;

2. The optimum pH for growth of *E. coli* is pH 8 and for pH 6 for *L. bulgaricus* ;

3. *E. coli* cannot survive/eq pH 4, 5(& 9), *L. bulgaricus* cannot survive 8 (& 9) ;

4. *E. coli* can survive pH 6 & but *L. bulgaricus* can survive pH4 ;

5. *E. coli* can grow at pH 7(& 8), *L. bulgaricus* can grow at pH 5;(6) & 7 ;

6. *L. bulgaricus* can tolerate a wider range of pH values than *E. coli* ;

7. *E.coli* {grows better/eq} in alkaline conditions but *L Bulgaricus* {grows better/eq} in acidic conditions ;

3 marks

(ii) 1. pH affects enzyme (activity)/protein ;

2. They have different enzymes/proteins ;

3. Reference to *L. bulgaricus* {needing to tolerate {low pH / acidic conditions} / are acidophilic};

4. Because of lactic acid fermentation ;

5. Enzymes needed for {DNA replication / protein synthesis / cell wall synthesis} / proteins needed for cell transport/eq;

3 marks

Total 9 marks

Question 9 **Maximum mark**

(a) (i) Dilution plating / use of a counting chamber with an exclusions dye (e.g. methylene blue);

1 mark

(ii) Mix bacteria / sterile technique/eq ;

1 mark

(b) (i) 1. Lag phase shown ;

2. Exponential phase shown;

3. Line for exponential phase steeper than that given for glucose ;

3 marks

(ii) 1. (Second lag phase / delay before new growth) due to {synthesis/secretion} of {enzymes/sucrase} ;

2. Time taken to {break down/absorb}{sucrose/products};

3. More growth due to addition of carbon source / eq ;

4. Growth rate is faster than for glucose because sucrose is a disaccharide / eq ;

5. (Stationary phase results) when sucrose all used up/eq ;

6. Reference to diauxic growth ;

3 marks

Total 8 marks