GCE

Edexcel GCE

Biology / Biology (Human) (6104/01)

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**

Type of food or drink	Microorganism used	Metabolite produced	Role of metabolite in food or drink production
	Yeast /saccharomyces/ S carlsbergensis / S cerevisiae ;		
			Causes the {dough /bread} to rise / gives the bread its texture /eq ;
	Bacteria / correctly named bacteria /Lactobacillus bugaricous / Streptococcus thermophilus;	Lactic acid /lactate + H^+;	

Total 4 marks

Question 7 **Maximum mark**

(a) Pipette / loop /syringe ;

Pipette / syringe ;

2 marks

(b)
1. {(Agar) {powder / tablets} dissolved (in appropriate volume of) distilled water / eq} / Ref. to agar being melted prior to pouring ;
2. Agar autoclaved / heated to more than 121 ˚C eq ;
3. Reference to cooling of agar prior to pouring (to reduce condensation) ;
4. Agar poured into Petri dish ;
5. Reference to swirling of dish (to ensure even / complete coverage) ;
6. Reference to aseptic techniques ;

3 marks

(c) (i)
1. Reference to use of (inoculating) loop ;
2. (Loop) needs to be {sterilised / eq} before inoculation ;
3. (Loop) streaks bacteria out across surface of agar ;
4. Reference to {sterilising / eq} (loop) between each set of streaks ;
5. Reference to need to cool loop before use ;
6. Keep lid as close to plate during steaking as possible ;

3 marks

(ii) At least 3 lines per streak set
Must overlap between sets
No overlap between 1st and last streak set ;

1 mark

Total 9 marks

Question 8 **Maximum mark**

(a)

	Bacterial cell	**Patient's cell**
1.	{70S / smaller} ribosome	{80S / larger} ribosome ;
2.	No membrane bound organelles / mesosomes	Membrane bound organelles / named example / no mesosomes;
3.	No nucleus / nuclear envelope	Nucleus / nuclear envelope ;
4.	Circular DNA	Linear DNA ;
5.	(Peptidoglycan) cell wall	No cell wall ;
6.	Prokayotic	Eukayotic ;

2 marks

(b) (i) 1. Bacteria type B is sensitive to antibiotics p and q whereas type A is {resistant / not sensitive} ;

2. Bacteria type B are more sensitive than type A to antibiotic R ;

3. Neither types of bacteria are sensitive to antibiotic S ;

2 marks

(ii) 1. Antibiotic S ;

2. Because it is ineffective on both type A & B / eq ;

3. (Because penicillin) only works on gram positive bacteria / converse;

4. Interferes with synthesis of cell wall ;

3 marks

Total 7 marks

Question 9 **Maximum mark**

(a)
1. During {first 2 hours /eq} {both stay the same / no change in glucose concentration whilst bacterial cell number stays the same / eq } ;
2. Between 2 and {7/8} the bacterial cells increase in number as the glucose concentration falls /eq ;
3. Between 7 and 8 hours the bacterial cells increase in number {slower /eq} but glucose concentrations continue to decrease at the same rate / eq ;
4. After 8 hours glucose concentration continues to fall but cell number remains constant ;

2 marks

(b)
1. Between 0 and {8 /10} hours the pH falls ;
2. Bacteria produce {carbon dioxide / lactic acid / organic acids ;
3. (Which) enter in the culture medium ;
4. Resulting in {an increase in hydrogen ions / formation of carbonic acid / eq} ;
5. {By 8/10 }hours the pH levels off / pH the same from 10 to 12 hours } / PH {fairly /eq} stable between 8 and 12 hours ;
6. Bacteria have died /eq ;

3 marks

(c)
1. Correct readings : 5.2 – {2.1/2.05} ;
2. Correct substitution into formula / correct subtraction divided by 0.301 ;
3. Answer {as whole generations / rounded down / given as a whole number} ;

   10 ;

   [allow consequential error for correct readings]

3 marks

Question 9 continued **Maximum mark**

(d) 1. Add more glucose / renew carbon source /add suitable C-source ;

2. For respiration / respiratory substrate ;

OR

1. Adjust the pH / eq ;

2. So {enzymes/ proteins} can function ;

2 marks

Total 10 marks