

GCE 2004
June Series



Mark Scheme

Biology/Human Biology A *BYA9/W*

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BYA9/W**Question 1**

- (a) (i) Increase in rate faster and faster as gets nearer hatching / exponential increase in rate = 2marks
(Rate) increases = 1 mark
[Note. Must describe an exponential increase to gain 2nd mark]
- (ii) More respiration because more cells/tissues / larger/growing embryo;
[Credit idea of exponential growth under part (ii) if not awarded for part (i)] 3
- (b) (i) 39; 1
- (ii) Correct calculation of RQ from volume of carbon dioxide divided by volume of oxygen/4.5 divided by 6/0.75 = 2 marks
RQ calculated, but single mistake such as volume of oxygen divided by volume of carbon dioxide / masses divided = 1 mark
- Interpretation appropriate to figure obtained and referring to specific substrate;
[If RQ > 1, must refer to anaerobic conditions] 3
- (c) Shows variation/range / differences/deviation from mean;
Greater in smaller birds; 2
- (d) Larger birds will produce larger young;
Contain more cells (at hatching);
Resulting from more cell divisions/cell cycles;
Cell cycle will take more or less the same time; max 3
- (e) (i) 1.5/1.6 and 300g 2 marks for both answers correct
1 mark for one correct answer 2
[Do not penalise for incorrect answers stemming from minor inaccuracies in reading the graph as grid is not present.]
- (ii) Larger food store required for respiration/longer period of growth; 1
- (f) (i) Relationship between rate of diffusion, surface area and thickness of exchange surface as defined by Fick's law;
Link between diameter/area of pore and surface area;
Link between length of pore and thickness of exchange surface; 3
- (ii) Higher concentration inside the egg;
Water molecule small enough to pass through pore; 2
[Reject last point if qualified by reference to osmosis]

Total 20 marks

Question 2

- (a) (i) Fibrin; 1
- (ii) Reaction requires thrombin;
Produced from prothrombin in presence of thromboplastin/substances released/produced from damaged blood vessels;
[Ignore Ca²⁺ ; Ignore platelets; Reject anything from blood itself] 2
- (b) Activates plasminogens / stimulates production of plasmins;
Break down fibrin causing breakdown of blood clots / are able to break down protein fibres and dissolve blood clots;
Which might block coronary (cardiac) arteries/blood vessels; 3
- (c) Plasminogens from different animals have different primary structure/
sequence of amino acids;
Plasminogens have different shapes/3° structure;
Specific shape fitting active site of enzyme / desmokinase/enzyme has specific shaped active site to fit plasminogens / desmokinase can form E-S complex with these plasminogens; 3
- (d) (i) Absence of fat linked to heat loss/poor insulation /
large surface area to volume ratio so high rate of heat loss /
rate of enzyme-controlled reactions falls / fewer enzyme-substrate collisions; 1
- (ii) Heat generated by (metabolic) reactions;
Which further increases metabolic rate / rate of reaction of enzymes /
positive feedback;
Lower temperature gradient with environment so less able to lose heat;
Specific adverse effect of high core/internal/body temperature on proteins; max 2
- (e) Antigens (on virus) recognised/presented / stimulate;
B-cells/B-lymphocytes divide/clone/multiply;
Plasma cells produce/secrete antibodies (against virus);
Some may be produced at start from memory cells / some as a result of earlier infection / idea of this taking time; max 3

Total 15 marks

General Principles for marking the Essay:

Four skill areas will be marked: scientific content, breadth of knowledge, relevance and quality of language. The following descriptors will form a basis for marking.

Scientific Content (maximum 16 marks)

| Category | Mark | Descriptor |
|----------------|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | 16 | |
| Good | 14 | Most of the material reflects a comprehensive understanding of the principles involved and a knowledge of factual detail fully in keeping with a programme of A-level study. Some material, however, may be a little superficial. Material is accurate and free from fundamental errors but there may be minor errors which detract from the overall accuracy. |
| | 12 | |
| | 10 | |
| Average | 8 | A significant amount of the content is of an appropriate depth, reflecting the depth of treatment expected from a programme of A-level study. Generally accurate with few, if any, fundamental errors. Shows a sound understanding of the key principles involved. |
| | 6 | |
| | 4 | |
| Poor | 2 | Material presented is largely superficial and fails to reflect the depth of treatment expected from a programme of A-level study. If greater depth of knowledge is demonstrated, then there are many fundamental errors. |
| | 0 | |

Breadth of Knowledge (maximum 3 marks)

| Mark | Descriptor |
|-------------|-------------------------------------------------------------------------------------------------------------------------|
| 3 | A balanced account making reference to most areas that might realistically be covered on an A-level course of study. |
| 2 | A number of aspects covered but a lack of balance. Some topics essential to an understanding at this level not covered. |
| 1 | Unbalanced account with all or almost all material based on a single aspect. |
| 0 | Material entirely irrelevant or too limited in quantity to judge. |

Relevance (maximum 3 marks)

| Mark | Descriptor |
|-------------|-------------------------------------------------------------------------------------------------------------------------------|
| 3 | All material presented is clearly relevant to the title. Allowance should be made for judicious use of introductory material. |
| 2 | Material generally selected in support of title but some of the main content of the essay is of only marginal relevance. |
| 1 | Some attempt made to relate material to the title but considerable amounts largely irrelevant. |
| 0 | Material entirely irrelevant or too limited in quantity to judge. |

Quality of language (maximum 3 marks)

| Mark | Descriptor |
|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| 3 | Material is logically presented in clear, scientific English. Technical terminology has been used effectively and accurately throughout. |
| 2 | Account is logical and generally presented in clear, scientific English. Technical terminology has been used effectively and is usually accurate. |
| 1 | The essay is generally poorly constructed and often fails to use an appropriate scientific style and terminology to express ideas. |
| 0 | Material entirely irrelevant or too limited in quantity to judge. |

Total 25 marks

Additional notes on marking Question 3

Care must be taken in using these notes. It is important to appreciate that the only criteria to be used in awarding marks to a particular essay are those corresponding to the appropriate descriptors. Candidates may gain credit for any information providing that it is biologically accurate, relevant and of a depth in keeping with an A-level course of study. Material used in the essay does not have to be taken from the specification, although it is likely that it will. These notes must therefore be seen merely as guidelines providing an indication of areas of the specification from which suitable factual material might be drawn.

In determining the mark awarded for breadth, content should ideally be from each of the areas specified if maximum credit is to be awarded. Where the content is drawn from two areas, two marks should be awarded and where it is taken only from a single area, one mark should be awarded. However, this should only serve as a guide. This list is not exhaustive and examiners should be prepared to offer credit for the incorporation of relevant material from other areas of study.

Essay A The transfer of energy between different organisms and between these organisms and their environment.

| Biology | Human Biology |
|------------------------------------------------------------------------------------------------------------------------------|----------------------|
| 14.6 Photosynthesis Photosynthesis uses energy from sunlight to synthesis organic molecules from inorganic sources | 14.6 |
| 14.7 Ecology Energy is transferred through food chains and food webs in a community | 14.7 |
| 14.8 Energy loss Respiration produces ATP which is the immediate form of energy for many cell activities | 14.8 |
| 15.2 Temperature control | 16.11 |
| 15.9 Receptors convert stimuli into electrical impulses in nerve cells | 16.8 |
| Dietary demands of pregnancy | 16.5 |

Essay B Ways in which different species of organisms differ from each other

| Biology | Human Biology |
|--------------------------------------------------------------------------------------------------------------------|----------------------|
| Molecular differences | |
| 10.4 Large molecules are important in the structure and functioning of Cells (proteins) | 10.4 |
| Genetic differences | |
| 11.3 Genes incorporate coded information which determines the metabolism of organisms | 12.5 |
| 14.2 Genes and environmental factors influence variation between individuals | 14.2 |
| 14.3 Selection can influence the frequency of alleles in a population | 14.3 |
| 14.4 Evolution has resulted in different species of organisms | 14.4 |
| Other aspects of biology | |
| 10.1 The cell is the basic unit of structure in prokaryotic and eukaryotic organisms | |
| 14.5 The concept of ecosystem (niches) | 14.5 |
| 15.5 Different organisms possess different types of haemoglobin with different oxygen transporting properties | |
| 15.4 Limitation of water loss in xerophytic plants | |
| 15.6 Digestion of cellulose | |
| Bacteria as examples of pathogenic microorganisms | 12.1/12.9 |
| Principles of immunology | 12.3 |