



ASSESSMENT and
QUALIFICATIONS
ALLIANCE

General Certificate of Education

Human Biology 6413

Specification A

BYA9 Written Synoptic Paper

Mark Scheme

2007 examination - June series

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Question 1

- (a) Fall in environmental temperature detected by receptors in skin/
blood temperature detected by receptors in hypothalamus;
Increased secretion of hormones/adrenaline/thyroxine;
Shivering (or description);
Increased metabolic rate/ (rate of respiration);
Oxygen required for respiration;
(Respiration) produces heat; 3 max
- (b) (i) Higher temperature increases rate of reaction/enzyme action;
Heat release (by these reactions raises temperature further); 2
- (ii) Entry of sodium ions (into axon) decreases potential difference
across membrane/in axon/ makes potential difference
less negative/reaches threshold;
Causes more opening of sodium gates/ more sodium ions to enter; 2
- (c) Larger bat/flying fox has more cells/more tissue/more fat;
More respiration/metabolic activity generating more heat;
Smaller surface area to volume ratio;
So less heat lost; 2 max
- (d) During hibernation/ from flight to rest;
Slows rate of impulses from SAN/inhibits contraction of ventricles; 2
- (e) Two marks for correct answer of 0.07cm^3
One mark for incorrect answer where stroke volume has been correctly
calculated by dividing cardiac output by heart rate; 2
- (f) (i) Concentration of haemoglobin is the same;
But there are more rbc's in the bat (so must be smaller);
Or
Larger number (in the bat);
Per mm^3 ; 2
- (ii) Greater surface area : volume ratio/combined surface area;
For diffusion/ uptake/release of oxygen;
Shorter diffusion distance to centre;
To meet high respiratory needs of bat; 2 max
- (g) High P_{50} means dissociation curve to the right/ haemoglobin has lower
affinity for oxygen;
Haemoglobin unloads more oxygen at high partial pressures;
Helps to maintain high rate of respiration;
Aerobic respiration produces more ATP / releases more energy; 3 max

Question 2

- (a) Found inside (red blood cells/liver) cells; *Context must be right*
Antibodies /lymphocytes can only affect the when in plasma/unable to enter host cells; 2
- (b) Initial rise due to destruction of trypanosomes with one type of antigen;
Trypanosomes with different antigens survive;
Increase in number;
Another rise in temperature as these are destroyed;
Temperature falls while new antibodies being produced; 4 max
- (c) (i) Reverse transcriptase; 1
- (ii) mRNA coding for all proteins being produced; 1
- (iii) Find sequence of bases in DNA;
One triplet/ 3 bases/ codon codes for one amino acid;
Same for all organisms/ universal code; 2 max
- (d) Hydrolysis; 1
- (e) (i) All VSG molecules will have the same sugar;
Allowing it to fit into the binding site of the antibody/ complementary shape;
Reject antigen/VSG with binding site
In lab conditions, sugar is exposed/not embedded in membrane; 2 max
- (ii) Sugar is within membrane;
Cannot be reached by antibodies;
Variable regions tightly packed/prevent access; 2 max

Question 3**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 of a high standard reflecting 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 most of the 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 if not all 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.

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

The following symbols should be used in marking

- ✓ A valid point reflecting the level of knowledge expected of an A-level candidate
- x Incorrect biology
- Q Quality of written communication poor
- Material irrelevant

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 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 drawn 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 Carbon dioxide in organisms and ecosystems.

	Biology
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Biochemistry	
The biochemistry of photosynthesis	14.6
The biochemistry of respiration	14.8
C4 photosynthesis in maize	11.6
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Physiology	
Gas exchange surfaces	15.4
Changes in cardiac output and pulmonary ventilation with exercise	10.8
The transport of respiratory gases	15.5
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Ecology	
The effect of carbon dioxide on productivity;	11.6
Decomposition and recycling maintain the balance of nutrients in an ecosystem	14.9
The greenhouse effect is not specifically mentioned but should be credited here if discussed	
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Essay B Why the offspring produced by the same parents are different in appearance

Biology

Genes

Genes incorporate coded information which influences phenotype	11.3
Gene mutation	14.2

Environment

Environment variation	14.2
Dietary requirements of insects	15.7

Chromosomes and cells

Meiosis	11.2 and 14.1
Principles of Mendelian inheritance	14.1
Polygenetic inheritance	14.2
Gametes and gamete formation. Fertilisation	16.1