

GCE 2004
June Series



Mark Scheme

Biology B BYB678/B

Mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation meeting attended by all examiners and is the scheme which was used by them in this examination. The standardisation meeting ensures that the mark scheme covers the candidates' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for the standardisation meeting each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed at the meeting and legislated for. If, after this meeting, examiners encounter unusual answers which have not been discussed at the meeting they are required to refer these to the Principal Examiner.

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BYB678/B**Question 1**

- (a) adding CO₂ decreases pH / makes more acid
 OR removing CO₂ increases pH / makes more alkaline;
(credit anywhere but do not credit this mark if stated that oxygen is an alkaline gas)
 rate of photosynthesis > rate of respiration in **A**;
 respiration only in **B**;
 rate of photosynthesis = rate of respiration in **C**; 4
- (b) (i) shows that indicator alone does not change colour in light; 1
- (ii) so that all tubes receive same amount of heat; 1
- (c) *(N.B. feature + advantage both needed for 1 mark)*
stomata on upper surface allow gas exchange;
 air spaces near upper surface facilitate diffusion of gases (from upper stomata);
 chloroplasts concentrated in cells near surface give maximum light absorption;
 no cuticle allows gas exchange over all of upper surface / since no need for water conservation;
 large air spaces keep leaf buoyant; 2 max
- Total 8
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Question 2

- (a) (i) 11g sucrose dissolved in water (and made up to) 50 cm³ / 50g; 1
- (ii) make a series of volumes of 22% sucrose solutions;
 measure how far each travels up the chromatography paper; 2
- (b) (i) both (volume) of nectar and (mass) of sucrose / sugar increased by regular removal;
 (proportionately) greater effect on nectar than sucrose; 2
- (ii) nectar from flower B has greater concentration of sugar;
(accept references to figures (A has 6.2 - 6.6 μg mm⁻³, B has 12 - 12.4 μg mm⁻³)) 1
- (iii) nectar always available for insects; 1

(c)	(adding sucrose solution) decreases nectar secretion / less nectar produced than control; (<i>allow correct processed figures</i>)	1
	adding sucrose solution results in reabsorption of sugar (<i>gains 2 marks</i>);; (<i>BUT adding sucrose solution reduces secretion of sugar in nectar / sugar moved out gains 1 mark</i>);	2
(d)	via (intrinsic) proteins; (<i>reject channel proteins</i>) using ATP / active transport / energy;	2
Total		12

Question 3

(a)	47 213;	1
(b)	(i) there is no difference in the proportion / number of influenza cases between the 5 vaccines; (<i>reject vaccinated versus no vaccinated</i>)	1
	(ii) significant difference in proportion / number of cases of influenza between the vaccines / the null hypothesis should be rejected;	1
(c)	sample size small; possible differences in exposure to infection; exposure to different strains / mutants; possible differences in existing immunity; possible differences in sex / age; possible differences in socio-economic status;	2 max
Total		5

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
Good	16	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.
	14	
	12	
Average	10	Some 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.
	8	
	6	
Poor	4	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.
	2	
	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

Guidelines for marking the essay**Introduction**

The essay is intended for the assessment of AO4 (Synthesis of knowledge, understanding and skills) and Quality of Written Communication (Sections 6.4 and 6.5 in the specification). Examiners are looking for

- evidence of knowledge and understanding at a depth appropriate to A level
- selection of relevant knowledge and understanding from different areas of the specification
- coverage of the main concepts and principles that might be reasonably be expected in relation to the essay title
- connection of concepts, principles and other information from different areas in response to the essay title
- construction of an account that forms a coherent response
- clear and logical expression, using accurate specialist vocabulary appropriate to A level

Assessing Scientific Content

Maximum 16 marks.

Descriptors are divided into 3 categories: Good (16, 14, 12), Average (10, 8, 6) and Poor (4, 2, 0). Only even scores can be awarded, i.e. not 15, 13, etc.

Examiners need first to decide into which category an essay comes.

A good essay

- includes a level of detail that could be expected from a comprehensive knowledge and understanding of relevant parts of the specification
- maintains appropriate depth and accuracy throughout
- avoids fundamental errors
- covers a majority of the main areas that might be expected from the essay title (These areas will be indicated in the mark scheme). (Occasionally a candidate may tackle an essay in an original or unconventional way. Such essays may be biased in a particular way, but where a high level of understanding is shown a high mark may be justified.)
- demonstrates clearly the links between principles and concepts from different areas.

Note that it is not expected that an essay must be 'perfect' or exceptionally long in order to gain maximum marks, bearing in mind the limitations on time and the pressure arising from exam conditions.

An average essay

- should include material that might be expected of C/D/E grade candidates
- is likely to have less detail and be more patchy in the depth to which areas are covered, and to omit several relevant areas
- is likely to include some errors and misunderstandings, but should have few fundamental errors
- is likely to include mainly more superficial and less explicit connections

A poor essay

- is largely below the standard expected of a grade E candidate
- shows limited knowledge and understanding of the topic
- is likely to cover only a limited number of relevant areas and may be relatively short
- is likely to provide superficial treatment of connections
- includes several errors, including some major ones

Having decided on the basic category, examiners may award the median mark, or the ones above or below the median according to whether the candidate exceeds the requirements or does not quite meet them.

Marking the essay

In marking scientific content, letters in the margin show each key area covered; these are used to assess the breadth of criteria. A single tick is used to indicate accurate coverage of each significant area, and a double tick to emphasise ‘good depth of content.’ Errors are indicated with a cross. A squiggly line in the margin is used to highlight irrelevance and ‘Q’ to highlight poor use of terminology, unclear grammar and inappropriate style.

Specific guidance for assessing Scientific Content and Breadth of Knowledge in Essays

The following provides guidance about topics which might be included in the essays. It is not an exclusive list; the assessment of scientific content does not place restrictions on topics that candidates might refer to, provided they are

- relevant;
- at an appropriate depth for A level and
- accurate.

It is not expected that candidates would refer to all, or even most, of the topics to gain a top mark; the list represents the variety of approaches commonly encountered in the assessment to the essays. In both essays, topics either from the option modules or beyond the scope of the specification should also given credit where appropriate.

(a) The process of osmosis and its importance to living organisms

(1) definition (D)

(2) effects on cells (C)

turgity and support
 plasmolysis (idea)
 lysis
 cystic fibrosis

(3) importance in animals (A)

role in relationship between plasma and tissue fluid
 role in medulla of kidney
 reabsorption in gut
sweat production neutral

(4) importance in plants (P)

role in movement of water from soil to leaves in plants
 role in mass flow hypothesis for movement in plants

Breadth of knowledge

3 marks	reference to all 4 areas
2 marks	definition + 2 other areas
1 mark	any 2 areas

(b) Energy transfers which take place in living organisms**(1) ATP (A)**

synthesis from ADP and P
role as an energy source

(2) photosynthesis (P)

excitation of electrons
generation of ATP and reduced NADP
photolysis
reduction of glycerate phosphate to carbohydrate
structure of chloroplast in relation to energy transfers

(3) respiration (R)

net gain of ATP in glycolysis
production of ATP in Krebs cycle
synthesis of ATP associated with electron transfer chain
ATP production in anaerobic respiration
structure of mitochondrion in relation to energy transfers

(4) uses of energy in biological processes (B)

active transport
muscle contraction
nerve transmission
synthesis
translocation
kidney function
nitrogen fixation
receptors

Breadth of knowledge

3 marks	reference to all 4 areas
2 marks	ATP + 2 other areas
1 mark	any 2 areas