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ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Education

Biology 6416

Specification B

BYB678/B Applying Biological Principles

Mark Scheme

2007 examination - June series

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.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of candidates' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

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Question 1

(a) (i) to the left (no mark),
Oxygen consumed;
Lower pressure inside/higher outside (makes drop move);
Equal volume of carbon dioxide absorbed (by substance); 2 max

(ii) Suitable measurements;;;
e.g.
Distance moved by drop;
Bore/(internal) diameter of tube;
Mass of animal;
(Accept weight)
Time interval; 3 max
(*Accept for 1 mark, measurement of named control variable);*

(iii) To move the drop (to the right/left)/ to refill the capilliary with air for further experiments/ reset apparatus; 1

(b) Muscles (associated with wings);
(So a lot of) respiration/ATP breakdown with heat produced; 2

(c) Mutation in the queen;
These (endothermic) colonies more likely to survive (winter);
These queens pass on allele/gene(s) (to next generation); 3 max

Total 11

Question 2

(a) Variable relating to preparing agar plate;
Explanation relating to enzyme activity; 2 max

e.g.;
Same starch concentration; (*Accept amount of starch)*
Constant substrate concentration;

OR

Same pH;
Optimum for enzyme;

OR

Same agar concentration; *(Accept volume/depth/amount of agar);*
Affects diffusion of enzyme;

OR

Same mass/size/amount of endosperm;
Affects amount of enzyme;

(b) Amylase/enzyme;
Diffuses out;
Breaks down/hydrolyses starch (so no reaction); 2 max

(c) Slender break down starch without gibberellic acid, normal don't;
Slender produce amylase/enzyme/enzyme functional without gibberellic acid present/normally;
Slender (endosperm) produces/normal doesn't produce gibberellic acid;
Normal only produce amylase/enzyme/functional enzyme when gibberellic acid present;
Slender produce more than enzyme than normal plants when gibberellic acid present; 2 max

(d) (i) There is no difference between the ratios; 1

(ii) No significant difference between them;
Because probability of 0.05 (or smaller) taken as significant (and 1.61 falls between 0.20 and 0.50); 2

Total 9

Question 3

(a) Reference to optimum pH (for);
Proteins/enzymes/named metabolic process; 2

(b) 1 Interspecific competition (in a community);
2 Sorrel competes well at optimum pH/ sorrel does not compete well/ out-competed at lower and higher pH;
3 Fescue competes best at lower and higher pH/ does not compete well at the optimum pH;
4 (Fescue) is better adapted than other species to low and high pH;
(Accept converse for sorrel); 3 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 14 12	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.
Average	10 8 6	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.
Poor	4 2 0	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.

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

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 are 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 grade C/D/E 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.

Question 4

(a) Movements inside cells

Topic areas for assessment of scientific content:

1	Plasma membranes and movement across	**(M)**
2	Protein synthesis	**(P)**
3	Movement through ER and Golgi	**(ER)**
4	Cell division and chromosome movement	**(C)**
5	Water movement in plants/xylem	**(W)**
6	Translocation	**(P)**
7	Neurones and synaptic vesicles	**(N)**
8	Actin and myosin	**(S)**
9	DNA replication and mutation	**(D)**
10	Electron transport chains	**(Etc)**
11	Molecular/atomic/ionic movement	**(K)**

Any other sensible example of movement inside cells should be credited.
In a good essay, the emphasis should be on movement.

Assessment of breadth of knowledge

3 marks	Coverage of 4 examples with sufficient detail to illustrate relation of content to movement.
2 marks	3 examples described in some detail.
1 mark	Reference to 2 examples but without clear links to movement.

(b) Transfers through ecosystems

Topic areas for assessment of scientific content:

1	Photosynthesis – energy transfer	**(P)**
2	Respiration – energy transfer	**(B)**
3	Carbon cycle	**(C)**
4	Nitrogen cycle	**(N)**
5	Food chains	**(F)**
6	Ecological pyramids	**(E)**
7	Pesticide toxicity/bioaccumulation	**(B)**
8	Eutrophication	**(Eu)**
9	Digestion and absorption	**(D)**
10	Transfer of genetic material	**(G)**
11	Water cycle	**(W)**

Any other sensible example of transfer through ecosystems should be credited.
In a good essay, the emphasis should be on transfers.

Assessment of breadth of knowledge

3 marks	Coverage of 4 examples with sufficient detail to illustrate relation of content to transfers.
2 marks	3 examples described in some detail.
1 mark	Reference to 2 examples but without clear links to transfers.