



Biology

Written examination 1 – June

Introduction

The examination criteria and description were published in the *VCAA Biology Assessment Handbook 2006*.

There will be two Biology examinations. Unit 3 will be assessed in Examination 1 (midyear) and Unit 4 will be assessed in Examination 2 (end of year).

The duration of each examination will be 90 minutes plus 15 minutes reading time.

The examination paper will require students to respond to a series of items related to Outcomes 1 and 2 in Unit 3 and the key skills outlined on page 12 of the Study Design.

Each outcome will be weighted approximately equally on the examination.

Area of study	Marks allocated %
Molecules of life	45–55
Detecting and responding	45–55

The examinations will assess a representative sample of the key knowledge and skills that underpin the outcomes of each unit. While students will not be required to complete practical exercises within the examination, they may be asked to draw on their practical experiences when answering questions.

Structure and format

The structure and format of the examination for the revised Biology study (2006–2009) will be the same as in 2005.

The examination paper will be presented in a question and answer book and will have two sections.

Section A will consist of 20–25 multiple-choice questions. Each question will be worth 1 mark. Students will be required to mark their responses on a multiple-choice answer sheet.

Section B will consist of short-answer questions and will be worth 50 marks.

Teachers may refer to past examination papers for examples of questions. Some relevant examples are provided on pages 8–9.

Other relevant references

Teachers should refer to the Examination section of the *VCE and VCAL Administrative Handbook 2006*, *VCAA Biology Assessment Handbook*, the VCE Biology Study page on the VCAA website: www.vcaa.vic.edu.au/vce/studies/biology/biologyindex.html and to the *VCAA Bulletin* for further advice during the year. Assessment Reports on the written examinations may also contain helpful advice.

Sample questions

The following sample questions indicate the type and range of questions teachers and students can expect on the new key knowledge and skills in the revised Biology Examination 1 in June 2006. They are not intended to form the basis of a sample examination paper.

Sample questions – examination 1

Please note

There may be some overlap in content in the following sample questions. Overlap that gives significant clues to other questions is avoided on examination papers.

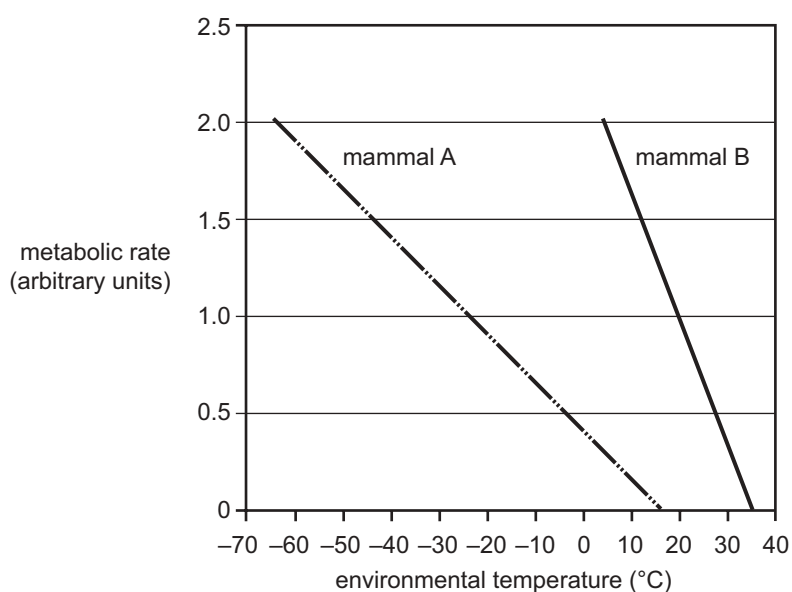
Section A – Multiple-choice questions

Question 1*

Key knowledge: Stability and change in the internal environment

Key skill: Investigate and inquire scientifically, analyse and synthesise data

The graph below shows the effect of environmental temperature on the metabolic rate of two mammals. The zero rate of metabolism represents the basal metabolic rate for each mammal.



From the information given you could conclude that

- A. mammal A would be shivering when the air temperature is -50°C .
- B. mammal B would be sweating when the air temperature is 20°C .
- C. mammal B would have a thicker insulating layer of fat than mammal A.
- D. vasodilation of skin blood vessels of mammal A would occur when air temperature is -10°C .

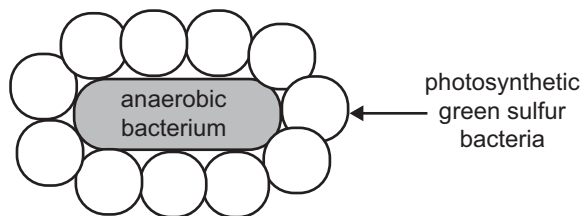
* Aspects of this question, such as the term 'basal metabolic rate', would be explained if this question appeared in an examination.

Question 2

Key knowledge: Energy transformations

Key skill: Apply biological understandings

Photosynthetic green sulfur bacteria live together as a colony of cells. They group together in a ring about a single anaerobic bacterium as shown in the diagram below.



It is reasonable to assume that

- A. the photosynthetic green sulfur bacteria trap light at the grana in their chloroplasts and form organic material.
- B. oxygen produced by the green sulfur bacteria during photosynthesis would be used by the central bacterium.
- C. the central bacterium relies on the green sulfur bacteria for organic material for respiration and it supplies the green sulfur bacteria with carbon dioxide.
- D. the central bacterium would supply energy to the green sulfur bacteria.

Question 3

Key knowledge: Signalling molecules and signal transduction

Key skill: Apply biological understandings

Steroid hormones and amino acid hormones both stimulate their target cells. The two kinds of hormone have different mechanisms to initiate responses within their target cells.

Steroid hormones

- A. attach to protein receptors on the membranes of their target cells.
- B. form a hormone-receptor complex that binds to a site on a DNA molecule.
- C. use a G protein to stimulate an effector within a target cell membrane.
- D. bring about an initial response of carbohydrate molecule production.

Section B – Short-answer questions

Question 1

Key knowledge: Chemical nature of the cell

Key skills: Aspects of all three areas

- Investigate and inquire scientifically
- Apply biological understanding and
- Communicate biological information and understanding

A scientific analysis was conducted on three samples of biomacromolecules. The samples are known to be protein, polysaccharide or nucleic acid. The analysis yielded the following results.

Sample	% Carbon	% Hydrogen	% Oxygen	% Nitrogen	% Sulfur	% Phosphorus
A	27	49	24	0	0	0
B	29	49	13	8	1	0
C	35	21	26	14	0	4

- a. Identify which one of the samples is most likely to be a protein. Give one reason for your choice.
2 marks
- b. The nucleic acid involved is known to be DNA. List the three structural components of a DNA nucleotide.
1 mark
- c. The samples were prepared from living cells. Describe one precaution that should be observed when handling live material in the laboratory.
1 mark

Total 4 marks

Question 2

Key knowledge: Chemical nature of the cell

Key skills: Aspects of all three areas

- Investigate and inquire scientifically
- Apply biological understanding and
- Communicate biological information and understanding

Biomacromolecules are made of many numbers of individual subunits. For example, proteins are made of large numbers of amino acids linked together.

- a. i. Name one other kind of biomacromolecule found in living cells.
ii. Where in a cell would you find the biomacromolecule named in part i. of this question?
iii. Name the subunits that combine to form the biomacromolecule named in part i. of this question.

1 + 1 + 1 = 3 marks

Haemoglobin, a biomacromolecule found in red blood cells, contains four polypeptide chains. Two of these chains are called alpha chains and two are called beta chains. Different forms of alpha and beta chains exist.

Four different forms of the beta chain are Hb – A, Hb – S, Hb – C and Hb – G. The differences in the chains arise because of differences in amino acid composition at positions 6 and 7 of the chains.

The four amino acids in positions 6 and 7 in each of these chains is listed in the following table.

Amino acid position in chains	Hb – A	Hb – S	Hb – C	Hb – G
6	glu'	val	lys	glu
7	glu	glu	glu	gly

The DNA code for the amino acids in positions 6 and 7 are shown in the following table.

Amino acid	DNA triplets that code for the amino acids
glu	CTT or CTC
val	CAA or CAG or CAT or CAC
lys	AAA or AAG
gly	GGT or GGC or GGA or GGG

- b. Explain what makes a DNA code distinctive from an RNA code.

1 mark

- c. i. Considering positions 6 and 7 only, how many different DNA sequences could result in the formation of beta chain Hb – C?
ii. Explain how you arrived at your answer for part i.
iii. All DNA molecules have the same basic structure: a double-stranded helix. How many different kinds of RNA are there?

1 + 1 + 1 = 3 marks

Different sequences in DNA lead to the production of proteins containing different sequences of amino acids. This is called the primary structure of a protein.

- d. i. Explain the difference between the primary and tertiary structure of a protein.
ii. Give one example of a structural protein.

1 + 1 = 2 marks

Total 9 marks

Question 3

Key knowledge: Nature of biochemical processes

Key skills: Aspects of all three areas

- Investigate and inquire scientifically
- Apply biological understanding and
- Communicate biological information and understanding

The breakdown of sucrose into glucose and fructose is catalysed by the enzyme, sucrase. In an experiment a series of eight test tubes was set up and the same concentration of the sucrase was added to each tube. Each tube differed from the next in the concentration of sucrose that was added. All other variables were kept constant. The rate at which sucrose was converted to glucose and fructose was recorded.

- a. Construct one hypothesis that could be tested by this experiment.

1 mark

The results of the experiment are shown in the following table.

Concentration of sucrose (molarity)	Rate of reaction (arbitrary units)
0.0	0.0
0.05	2.1
0.1	2.6
0.15	3.0
0.2	3.3
0.25	3.4
0.3	3.4
0.35	3.4

- b. Draw a graph to display the results of the experiment. Plot the concentration of sucrose on the horizontal axis and the rate of reaction on the vertical axis.

2 marks

- c.** Explain whether the results of the experiment support the hypothesis that you made in part **a.** of this question.

1 mark

In the experiment above, glucose and fructose can be flushed down a sink with water. This treatment is not possible in all biological experiments.

- d.**
- i.** Name one chemical used in a biological experiment that could not be disposed of in this manner.
 - ii.** Explain your answer to part **i.**

2 marks

Total 6 marks

Questions from past exam papers

Many of the questions on past papers have relevance to the revised Biology Study Design (2006–2009) and can continue to be used by teachers. Because of the introduction of new key knowledge, for example details about signalling molecules and how they operate, some questions could be extended by the addition of parts that specifically address these new areas.

A few examples of appropriate questions are given below.

1997 Written examination 1

Question 3

Key knowledge: Immune response – passive and active immunity

Key skills: Aspects of all three areas

- Investigate and enquire scientifically
 - Apply biological understandings
 - Communicate biological information and understandings
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2003 Written examination 1

Multiple-choice Questions 24 and 25

Key knowledge: Specific immune response

Key skills: Aspects of two areas

- Investigate and enquire scientifically
 - Apply biological understandings
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2004 Written examination 1

Multiple-choice Questions 1 and 2

Key knowledge: Coordination and regulation

Key skills: Aspects of two areas

- Investigate and enquire scientifically
 - Apply biological understandings
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2004 Written examination 1

Multiple-choice Questions 17 and 18

Key knowledge: Coordination and regulation

Key skills: Aspects of two areas

- Investigate and enquire scientifically
 - Apply biological understandings
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2004 Written examination 1

Extended-response Question 2

Key knowledge: Coordination and regulation

Key skills: Aspects of all three areas

- **Investigate and enquire scientifically**
 - **Apply biological understandings**
 - **Communicate biological information and understandings**
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