



## GENERAL COMMENTS

This examination was the sixth for the reaccredited *VCE Biology Study Design*. The emphasis throughout the study design is on developing knowledge and understanding of the principles and concepts of biology and their application to a range of contexts.

This year's examination provided students with the opportunity to apply their knowledge and the majority of students made a good attempt at all questions. Students approached the examination with confidence, indicating good use of examination time and attention paid to advice given in previous Assessment Reports. It was clear that students had organised their time well and were able to convey their knowledge in the time available. Proper use of reading time is critical so that students may start the necessary thought processes and closely analyse the questions **prior** to writing an answer.

Many students presented carefully written and clearly expressed answers. It was most pleasing to see that the majority of students answered Section B in pen as instructed. This greatly improves the clarity of the answer and assists the assessors to read and assess the paper.

The inappropriate use of abbreviations has been a problem in the past; however, it is most pleasing to report that there were no examples of this in the June paper. It is important to again state that suitable abbreviations include DNA, ATP, NADH and chemical symbols such as H<sub>2</sub>O. If students wish to use another abbreviation and are not sure of its appropriateness, then they should define it. In Question 3b., 'species 1' could have been used rather than the complete species name, and in Question 6b., students could have used the abbreviations given in the question. Students should avoid using exclamation marks and question marks in their answers.

Teachers and students are reminded that the set of key skills (refer to page 12 of the study design) are examinable.

Teachers and students are encouraged to visit the VCAA website <[www.vcaa.vic.edu.au](http://www.vcaa.vic.edu.au)> to access resources provided to support VCE Biology.

## SPECIFIC INFORMATION

### Section A – Multiple-choice questions

The table below indicates the percentage of students who chose each alternative. The correct answer is indicated by shading.

Question	% A	% B	% C	% D	Comments
1	7	7	84	1	
2	8	68	12	12	
3	2	2	21	75	
4	9	82	3	6	
5	60	17	10	12	
6	46	13	6	35	The presence of histamines does not indicate an infection. Their release is due to damage to or activation of mast cells by allergens. Pathogens cause infection.
7	5	5	85	5	
8	8	72	16	4	
9	80	11	7	2	
10	8	6	2	83	
11	26	35	7	32	The pathogen under consideration was a fungus. These are eukaryotic cells which, unlike bacteria, are unaffected by antibodies. They usually grow in moist, warm environments and gain their nutrition via hyphae.
12	73	9	8	10	
13	1	72	25	2	
14	3	2	3	92	
15	71	3	14	11	
16	4	7	6	83	



17	29	39	28	4	The manufacture of glucose requires an input of energy; hence it is an endergonic reaction. When amino acids are broken down, energy is released and this is an exergonic reaction. Catabolic reactions, such as the breakdown of glycogen, are exergonic reactions. In these reactions, energy is liberated and this in part is in the form of heat.
18	63	13	16	8	
19	34	55	8	4	
20	6	20	33	41	ATP is produced in aerobic and anaerobic respiration, such as fermentation in yeast cells. The reaction is reversible and is catalysed by enzymes.
21	4	36	52	7	
22	7	7	11	74	
23	12	12	48	28	When reading the graphs it was important for students to identify the energy levels of the reactants and the products. In reaction M, energy has been required for the reaction to proceed and is endothermic. In reaction P, the energy level of the products is lower, so energy has been released and it is therefore exothermic.
24	3	2	93	1	
25	31	66	1	1	

Students should ensure they read each multiple-choice alternative carefully before making their choice.

## Section B – Short-answer questions

For each question, an outline answer (or answers) is provided. In some cases the answer given is not the only answer that could have been awarded marks.

The following areas caused some concern.

- Many students did not make comparative statements when required; for example, in Questions 6a. and 7b.
- Many answers contained words that were spelt incorrectly. While students' spelling and grammar are not assessed, students need to be aware that errors in spelling that cause a lack of clarity in meaning could result in failure to gain credit for the answer. For example, words such as cellulose and cellulase may be indistinguishable if spelt incorrectly (see Question 1c.).

### Question 1a.

Marks	0	1	2	Average
%	28	45	27	1

Both of:

- the majority of amino acids on the outside of the molecule are hydrophilic
- the groups that are hydrophobic are on the inside.

Some students thought the diagram was of a cell and the cell membrane was hydrophilic, which was incorrect in this situation. Other students incorrectly thought a greater number of hydrophilic parts would make the protein highly soluble, when it is the position that is important.

### Question 1b.

Marks	0	1	2	3	4	Average
%	26	16	21	18	19	1.9

	Type of nucleic acid found in structure	Specific function of the nucleic acid
Structure N	Either of: <ul style="list-style-type: none"> <li>• (Chloroplast) DNA</li> <li>• RNA.</li> </ul> Or one of: <ul style="list-style-type: none"> <li>• rRNA</li> <li>• tRNA</li> <li>• mRNA</li> </ul>	<ul style="list-style-type: none"> <li>• controls production of proteins for photosynthesis OR involved in replication of chloroplasts</li> <li>• involved in protein synthesis</li> <li>• part of ribosomes</li> <li>• carries specific amino acid to ribosomes</li> <li>• a copy of DNA carried to ribosomes</li> </ul>

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<b>Structure Q</b>	RNA or mRNA	a copy of DNA carried to ribosomes
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Students were required to name a **type of nucleic acid** found in the structure, **not** the name of the structure. Some students could not identify the chloroplast or misidentified it as a mitochondrion. For structure N, many students correctly gave a nucleic acid for Structure N, but could not gain the second mark as the function given referred to a cell, not the chloroplast.

### Question 1c.

Marks	0	1	2	Average
%	51	18	31	<b>0.8</b>

Sally is correct because (both of):

- the subunits are glucose/monosaccharide or nitrogen is not present
- it is therefore a carbohydrate or it is therefore not a protein.

Many students could identify the structure as a carbohydrate and recognise the chemical subunit.

An explanation such as ‘the macromolecule contains CH and O’ was incorrect and was not awarded a mark as lipids also contain these elements. Students could gain a mark when they stated ‘the proportion of elements  $C_x(H_2O)_x$  is for a carbohydrate’.

### Question 2a.

Marks	0	1	2	Average
%	57	26	17	<b>0.6</b>

Both of:

- there will be fewer T cells produced
- a reduced immune response.

This question was poorly answered. Some students discussed the thyroid gland or thought that B cells also matured in the thymus. It is important to note that the decrease in the weight of the thymus does not indicate that adults have ‘less need’ for their immune system.

### Question 2b.

Marks	0	1	2	3	Average
%	29	24	26	21	<b>1.4</b>

Students needed to make points such as:

- (a part of) the poison ivy was identified as foreign/an allergen/an antigen/non-self
- mast cells are activated by the binding of the allergen
- histamines are released or accumulation of fluid causes blisters to form

Students who answered this question in a logical and sequential manner were more likely to do well compared with those who wrote disjointed and often contradictory answers.

### Question 2c.

Marks	0	1	Average
%	35	65	<b>0.7</b>

These instructions were given to Paul so that all traces of the poison ivy material could be removed from his body.

An incorrect answer was ‘to improve hygiene or reduce infection’.

### Question 2d.

Marks	0	1	2	Average
%	12	72	16	<b>1.1</b>

Both of:

- to prevent further attack
- to avoid a hypersensitivity reaction/greater response.

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### Question 3a.

Marks	0	1	Average
%	32	68	0.7

Either of:

- abscisic acid
- ethylene.

The named hormone had to be identifiable and unambiguous.

### Question 3b.

Marks	0	1	2	Average
%	14	33	53	1.4

### Question 3bi.

*Physalis pubescens* or Species 1

### Question 3bii.

The plant's leaves are lower to the ground, making it easier for larvae to reach other leaves.

### Question 3c.

Marks	0	1	2	Average
%	26	43	32	1.1

### 3ci.

A pheromone is a signalling molecule that affects the behaviour of another member of the same species.

### Question 3cii.

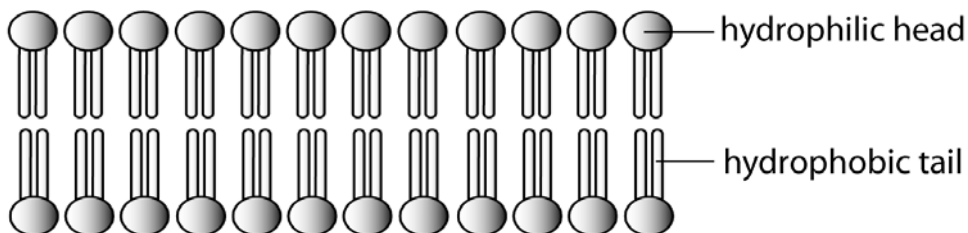
Moths would be attracted to the trap, where they would be caught and would therefore not attack the crop.

This question illustrated students' misconceptions, such as:

- plants produce pheromones
- pheromones kill animals
- pheromones work on many different species.

### Question 4a.

Marks	0	1	2	Average
%	11	25	64	1.6



For full marks, students needed to provide a suitable and correctly labelled drawing. Most students drew the diagram correctly; however, many added a lot of extra information. It was important that two fatty acid chains were illustrated. Some students' labels were incorrect, some students confused hydrophilic and hydrophobic, and others labelled a glycerol head rather than a phosphate head.

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## Question 4b.

Marks	0	1	Average
%	30	70	<b>0.7</b>

Alpha helix/ $\alpha$  helix

Secondary structures also include 'random coil and beta-pleated sheet'. Some students confused these terms and wrote imprecise descriptions.

## Question 4c.

Marks	0	1	Average
%	53	47	<b>0.5</b>

A placebo lacks the factor (probiotic) being tested and is used as a control to show the effects of the treatment.

## Question 4d.

Marks	0	1	2	Average
%	58	30	11	<b>0.6</b>

Both of:

- the baby would receive passive (natural) immunity from the mother as antibodies would be passed via the placenta/breast milk
- after birth, the baby's immune system has TLRs stimulated and would therefore not attack self-cells.

Students found the concepts in this question difficult to analyse and interpret. Students who gained full marks demonstrated an excellent understanding of the situation. Some students incorrectly identified the immunity from the mother as 'active'.

## Question 4e.

Marks	0	1	2	Average
%	32	31	38	<b>1.1</b>

Examples of factors that would need to be controlled are (two of):

- food/water availability
- enclosure/housing conditions
- health/age of mice.

Many students incorrectly stated the probiotic versus the placebo; this is the independent variable. Some students gave more than two answers.

It is important to reinforce that when the question specifically asks for an experiment on mice, this must be used. Rats are a different species.

## Question 5a.

Marks	0	1	Average
%	26	74	<b>0.8</b>

Endocytosis/phagocytosis

## Question 5b.

Marks	0	1	2	Average
%	22	34	44	<b>1.2</b>

Either of:

- antibodies bind to bacteria and cause agglutination, macrophages then engulf and destroy them
- macrophages display foreign antigens of the bacteria; the cells stimulate the production of antibodies.

This question essentially required students to give definitions of macrophages and antibodies. General answers such as 'Macrophages and antibodies identify and destroy bacteria' were too vague to gain full marks.

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## Question 5c.

<b>Marks</b>	<b>0</b>	<b>1</b>	<b>Average</b>
<b>%</b>	48	52	

The enzyme breaks down protein.

This question caused issues for many students. Some answers indicated that protease enzymes were **made** of proteins, which is correct but not relevant in this case.

## Question 5d.

<b>Marks</b>	<b>0</b>	<b>1</b>	<b>Average</b>
<b>%</b>	55	45	

The drug needs to be complementary to the active site and, by binding, prevent the enzyme from breaking down the antibodies.

## Question 6a.

<b>Marks</b>	<b>0</b>	<b>1</b>	<b>2</b>	<b>Average</b>
<b>%</b>	53	34	13	

Either of:

- passage along nerves is electrical/faster than this type of transport
- this transport of hormones is chemical/slower than electrical transmission along a neuron.

## Question 6b.

<b>Marks</b>	<b>0</b>	<b>1</b>	<b>2</b>	<b>Average</b>
<b>%</b>	33	20	46	

- **receptor** detects CRH or cortisol
- **effector** secretes ACTH

A vague answer such as ‘detects hormones’ and contradictory answers such as ‘the effector receives CRH and releases ACTH’ did not gain any marks.

## Question 6c.

<b>Marks</b>	<b>0</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>Average</b>
<b>%</b>	45	31	15	9	

All of:

- cortisol stimulates the liver to release glucose into the blood
- a high level of cortisol leads to negative feedback
- lower levels of cortisol lead to decreased release of glucose.

## Question 7a.

<b>Marks</b>	<b>0</b>	<b>1</b>	<b>Average</b>
<b>%</b>	44	56	

Either of:

- glucose + oxygen → carbon dioxide + water
- $C_6H_{12}O_6 + 6O_2 \rightarrow 6H_2O + 6CO_2$

Energy/ATP was not required to gain the mark. Some students did not have the correct products and reactants.

## Question 7b.

<b>Marks</b>	<b>0</b>	<b>1</b>	<b>2</b>	<b>Average</b>
<b>%</b>	44	25	31	

Both of:

- the electron transport chain would be unable to provide larger amounts of ATP
- there would be insufficient energy available to maintain life.

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An answer such as ‘There would be no energy available to the cell’ was incorrect as glycolysis, anaerobic respiration and the Krebs cycle would produce some ATP. Writing ‘this would result in death of the cell’ was simply repeating the stem of the question.

### Question 7c.

Marks	0	1	2	Average
%	50	14	36	<b>0.9</b>

Two of:

- water is split to form oxygen gas
- water is split to form  $H^+$  or NADPH is formed
- ATP is formed (from ADP and  $P_i$ ).

Students who did not describe chemical changes were not awarded any marks.

### Question 7d.

Marks	0	1	2	Average
%	69	23	8	<b>0.4</b>

### Question 7di.

The amount of carbon dioxide being released in cellular respiration equals the amount of carbon dioxide used in photosynthesis.

The question asked ‘in terms of chemical reactions’, therefore students were required to make statements about photosynthesis, cellular respiration and there being no  $CO_2$  used as indicated by the graph. While the term ‘compensation point’ suitably described Point M, it did not answer the question.

### Question 7dii.

There is a limiting factor (other than light) such as:

- lack of  $CO_2$
- lack of water
- lack of enzymes
- inability of chlorophyll to absorb any more light.

### Question 7e.

Marks	0	1	2	Average
%	45	30	25	<b>0.8</b>

Either of:

- Increase the rate of photosynthesis and therefore greater production of glucose/growth
- Reduce the production of hydrogen peroxide and ammonia and these are toxic and could harm the plant.