



## GENERAL COMMENTS

This examination was the fourth 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.

Student performance on this examination continues to improve. It was clear that students organised their time well and had the opportunity to convey their knowledge in the time available. Where students were asked to give their own examples, such as in Question 7d., they showed a great depth of knowledge and a pleasing ability to apply key knowledge. Overall, students performed well on questions related to the endocrine system and immune responses.

It was evident, however, that many students made errors by not carefully reading and interpreting diagrams. 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 responses. 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.

Teachers and students are reminded that the set of key skills (refer to page 12 of the study design) are examinable. Section B, Question 4 demonstrated how skills developed through completing activities such as experiments can be applied.

Teachers and students are also 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. These resources are updated regularly and include opportunities for teacher professional development, student workshops, articles and relevant links.

## 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	3	12	83	2	
2	4	13	8	75	
3	10	6	80	3	
4	23	9	34	34	The advantage of membrane bound organelles is to compartmentalise areas to facilitate reactions and processes. They do not provide support via structural networks.
5	23	17	41	18	The heaviest components are found in the lower layers of the tube. The faster speeds separate the smaller cellular components, in this case ribosomes.
6	79	8	9	4	
7	14	5	75	5	
8	18	2	39	41	The question stated that the amount of lactose (the substrate) in each test tube was the same. Therefore the amount of glucose (the product) produced would also be the same. As the amount of lactase (enzyme) present was half the amount in test tube four compared to the amount in test tube three, the rate (slope of the graph) is slower and the reaction takes twice as long.
9	9	49	20	21	
10	77	4	7	12	
11	4	11	64	20	
12	59	7	12	21	
13	3	82	13	3	



Question	% A	% B	% C	% D	Comments
14	24	43	15	18	
15	43	19	8	30	
16	5	10	83	2	
17	5	84	7	4	
18	41	4	7	49	The structure which best represents a component of the cell membrane is the phospholipid, an example of which would be a liposome. Protein, while a component of the cell membrane, does not form a suitable structure to enclose a drug.
19	13	13	2	71	
20	4	82	12	2	
21	9	11	69	10	
22	3	1	2	94	
23	14	24	6	56	
24	11	43	11	35	
25	34	26	3	37	Step R involves peptidases converting proteins (polypeptides) to peptides; hence options A and B were incorrect. Children with the same parents would have different proteins. The number of amino acids present does not change when the mixture is separated.

## Section B – Extended response 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 made careless mistakes when interpreting and labelling diagrams.
- Many answers contained words that were spelt incorrectly. Although 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 'glycogen' and 'glucagon' may be indistinguishable if spelt incorrectly.
- Many answers included inappropriate use of abbreviations. Abbreviations in common use were acceptable, for example, ATP, CO<sub>2</sub> and DNA. However, 'RER' for rough endoplasmic reticulum was **not** acceptable.

Students should be reminded that writing with a pen, using legible handwriting and correct spelling are all important.

### Question 1

Questions 1a. and 1b. were generally well answered.

#### Question 1a.

Marks	0	1	2	Average
%	37	31	33	1

Chain X alpha helix/coil

Chain Y beta pleated sheet

Both of these structures represent secondary structures. To gain the mark students needed to state that these structures are coiled or pleated. A simple response of 'beta sheet' was not precise enough to gain the mark.

#### Questions 1b.

Marks	0	1	2	Average
%	38	15	47	1.1

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Suitable examples included:

- glycogen; energy source
- chitin; exoskeleton.

Many students incorrectly gave starch and cellulose as their answers when the question asked for a polysaccharide found in animals. Students occasionally gave examples of monosaccharides and disaccharides, however these answers did not gain any marks.

## Question 1c.

Marks	0	1	Average
%	73	27	<b>0.3</b>

Cholesterol makes the cell membrane:

- more flexible
- more stable
- more fluid in colder temperatures
- decrease the permeability of the bilayer to create small water-soluble molecules.

Unfortunately, many students made contradictory statements and did not gain the mark.

## Question 2a.

Marks	0	1	Average
%	42	59	<b>0.6</b>

mRNA	G	A	A	U	G	U	A	A	U	G	A	G
------	---	---	---	---	---	---	---	---	---	---	---	---

Many students transcribed the DNA correctly, however omitted a base or made one mistake and did not gain the mark. Some students incorrectly transcribed the DNA and gave T (thymine) rather than U (uracil).

## Question 2b.

Marks	0	1	Average
%	42	58	<b>0.6</b>

20 per cent

## Question 2ci-ii.

Marks	0	1	2	Average
%	67	27	6	<b>0.4</b>

## Question 2ci.

Cytosol or cytoplasm

Many students could not correctly identify where tRNA is found. A common incorrect answer was the nucleus.

## Question 2cii.

tRNA (transfer RNA) carries the correct amino acid to the ribosomes.

Answers to this question were not precise enough to gain the mark.

## Question 2d.

Marks	0	1	Average
%	22	78	<b>0.8</b>

Glutamic acid, cysteine, asparagine, glutamic acid

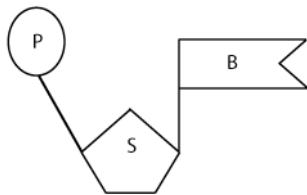
Students should be aware that if they choose not to write the complete answer and give abbreviations, these abbreviations must be recognisable. For example, 'asp' could represent aspartic acid **or** asparagine, and as a consequence these answers could not gain the mark.

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## Question 2e.

Marks	0	1	Average
%	59	41	<b>0.4</b>



To gain the mark, students needed to join the other two components on either side of the sugar. Most students demonstrated a pleasing level of understanding of the structure, function and role of nucleic acids.

## Question 3a.

Marks	0	1	Average
%	49	51	<b>0.5</b>

ATP or NADPH

## Question 3b.

Marks	0	1	Average
%	19	81	<b>0.8</b>

Any of:

- carbon dioxide
- temperature
- water.

## Question 3c.

Marks	0	1	Average
%	58	42	<b>0.4</b>

To **absorb** different wavelengths of light

A common incorrect answer was 'to absorb **more** light'.

## Question 3d.

Marks	0	1	2	Average
%	36	59	6	<b>0.7</b>

Both of:

- X sheds its leaves
- the leaves change colour as the pigments are broken down or moved out of the leaves.

This question was not well answered. Often students incorrectly stated that the decrease in pigments was due to the loss of leaves, yet the data given was for the amount of pigments per leaf.

## Question 3e.

Marks	0	1	2	Average
%	33	50	17	<b>0.9</b>

Both of:

- the higher the light intensity, the more light can be absorbed and the rate of photosynthesis is greater
- at higher temperatures, enzymes are denatured.

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It is important for students to understand that enzymes, **not** plants, are denatured by extremes of temperature.

This question asked students to **account** for the differences. Often students **described** the graphs and did not provide an explanation. Marks were given for interpreting the graph and providing further information that was not given in the question.

This question highlighted the problems some students have with reading and interpreting data. Students would benefit from more practice answering this style of question.

## Question 4ai-ii.

Marks	0	1	2	3	4	Average
%	17	13	24	29	16	2.2

## Question 4ai.

Following is an example of a suitable set up.

- Take two groups of tomato plants that are the same age type and state of health. One group is affected with beet caterpillars, the other is unaffected.
- Both groups are kept in the same environment (for example, the same temperature and water availability).
- Wasps are released and their activity is observed.
- Large numbers of plants are used or the experiment is repeated many times.

To answer this type of question effectively students should:

- plan their answer before they begin writing
- use only the hypothesis given in the question stem
- use only the information given in the question.

## Question 4aii.

If more wasps visited the plants eaten by caterpillars than the unaffected group then the hypothesis would be supported.

This question was well answered as most students made a **comparative** statement.

## Question 4b.

Marks	0	1	Average
%	49	51	0.5

The jasmonic acid would attract the wasps, which kill/eat the beet caterpillars.

Students with a sound understanding of scientific method were able to readily apply this knowledge to different situations presented.

Incorrect responses included the wasps scaring the caterpillar or the wasps pollinating the plant. The term 'insect' could have referred to either beet caterpillars or wasps so responses that used this term could not be awarded a mark.

Many students gave multiple reasons when only one reason was required. Students would benefit from giving their best answer first.

## Question 5

Question 5 was generally well answered.

## Question 5a.

Marks	0	1	Average
%	31	69	0.7

Via the bloodstream

## Question 5b.

Marks	0	1	Average
%	56	44	0.5

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A system where the response to a particular stimulus reverses the direction of that stimulus – the mechanism of homeostasis

## Question 5ci-ii.

Marks	0	1	2	Average
%	27	34	39	<b>1.1</b>

## Question 5ci.

T

## Question 5cii.

TSH is a protein-based hormone which is unable to pass directly through the plasma membrane and as a consequence requires a membrane receptor.

To adequately answer this question students were required to provide information that was not already given in the stem of the question.

## Question 5d.

Marks	0	1	Average
%	52	48	<b>0.5</b>

The cells in these organs lack the **appropriate** receptors for thyroxine.

A common mistake made by students was to refer to TSH rather than thyroxine.

## Question 5e

Marks	0	1	Average
%	23	77	<b>0.8</b>

Rough endoplasmic reticulum

Abbreviations were not acceptable.

## Question 5f.

Marks	0	1	Average
%	14	86	<b>0.9</b>

Golgi (body, apparatus, complex)

## Question 5g.

Marks	0	1	Average
%	49	51	<b>0.5</b>

Endocytosis

## Question 6

More careful reading of diagrams would have benefited many students, particularly in Questions 6a. and 6b.

## Question 6a.

Marks	0	1	2	Average
%	53	31	16	<b>0.7</b>

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Part 1: effector

Part 2: afferent (sensory) neuron

Most students recognised the information as an example of a stimulus response pathway and, without synthesising the material presented, incorrectly labelled part 1 as a receptor and part 2 as a connecting neuron. Students who followed the pathway illustrated were able to correctly label the parts.

## Question 6b.

Marks	0	1	Average
%	33	67	0.7

Neurotransmitter

## Question 6c.

Marks	0	1	Average
%	67	33	0.4

The neurotransmitter is being broken down by an enzyme.

## Question 6di-ii.

Marks	0	1	2	Average
%	74	20	6	0.3

## Question 6di.

This is an example of positive feedback, where the initial impulse passes through a series of neurons and refires the original neuron.

## Question 6dii.

This system is important to rhythmic breathing as continual reinforcement ensures continual breathing.

This question was poorly answered as many students failed to fully explain the impulse being continually sent and also incorrectly stated that breathing would be constant, rather than continual.

## Question 7a.

Marks	0	1	Average
%	49	51	0.5

B lymphocyte

## Question 7bi-ii.

Marks	0	1	2	Average
%	45	40	15	0.7

## Question 7bi.

B plasma cell

## Question 7bii.

To produce **specific** antibodies

## Question 7ci-ii.

Marks	0	1	2	Average
%	41	29	30	0.9

## Question 7ci.

B memory cell

## Question 7cii.

To **rapidly** produce antibodies if the infection recurs at a later date

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## Question 7d.

Marks	0	1	Average
%	52	48	0.5

Students could accurately name any autoimmune disease, including (but not limited to):

- type 1 diabetes (not simply 'diabetes')
- rheumatoid arthritis (not simply 'arthritis')
- multiple sclerosis.

Some students gave AIDS as their answer, however this is **not** an autoimmune disease.

## Question 7e.

Marks	0	1	2	Average
%	32	14	54	1.2

Both of:

- self cells are detected as foreign by the person's own immune system
- the immune system attacks misidentified cells.

This question was generally well answered, however some students described the effects of an autoimmune disease in Question 7d. rather than Question 7e. Some students stated 'The body could not distinguish between self and non self cells'; this is incorrect as the key point is that the body detects self **as** non self cells.

## Question 8a.

Marks	0	1	2	Average
%	21	35	44	1.3

Both of:

- bone marrow produces blood cells (or a specific example)
- a consequence of a lack of a particular type of cell, such as less oxygen carried due to fewer red blood cells or fewer antibodies due to fewer B cells.

## Question 8bi-ii.

Marks	0	1	2	Average
%	3	39	58	1.6

## Question 8bi.

Chemical 2

## Question 8bii.

Either of:

- chemical 2 has a shape which will combine exactly with bcl-2
- chemical 2 has the best shape to combine with bcl-2.

To gain the mark a **comparative** statement had to be made.

## Question 8c.

Marks	0	1	Average
%	74	26	0.3

One of:

- fewer adverse side effects of this drug
- provides an extra binding site for, for example, another drug or enzyme
- the drug passes more readily into cancer cells.

This question required students to read, analyse and interpret the data given. More careful reading would have assisted this process.