



## GENERAL COMMENTS

This examination was the third for the reaccredited *Biology VCE 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.

The performance of many students this year was most commendable. It was clear that the students had organised their time well and were therefore able to attempt all questions in the time available. Where students were asked to use their own examples, such as in Question 8b., responses showed a great depth of knowledge and a pleasing ability to apply key knowledge. Overall, the students performed well on questions related to cellular respiration and immune responses and, to a lesser extent, enzymes and plasma membranes. Homeostatic pathways were well understood, as shown by student responses to Section B, Question 8. Students performed less well on Question 5b., which was on the cell mediated response.

Teachers and students are reminded that the set of key skills (refer to page 12 of the study design) are examinable. Question 6c. from Section B 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.

## 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	15	4	79	2	
2	92	2	4	2	
3	7	72	9	12	
4	4	6	84	5	
5	11	18	4	67	
6	15	13	68	4	
7	71	18	8	3	
8	88	3	6	3	
9	9	7	8	77	
10	33	21	4	42	The internal environment of an organism is the extra cellular fluid (option D) which is regulated by homeostasis. Cytoplasm (option A) is the internal component of the cell.
11	4	84	9	3	
12	2	1	3	93	
13	53	27	14	6	
14	32	4	59	5	
15	8	14	70	8	
16	2	12	80	5	
17	5	10	5	80	
18	14	78	5	3	
19	10	3	85	2	
20	8	65	13	13	
21	2	6	1	90	
22	50	18	12	21	
23	11	45	18	26	This question is a feedback pathway. By carefully reading the stem and applying their knowledge, students should have deduced that option B was the correct response. All other responses were contradictory to the information given.



Question	% A	% B	% C	% D	Comments
24	71	19	4	6	
25	3	75	3	18	

## 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 wrote their responses to the short answer section in pencil, rather than in pen as instructed. Students should be aware that pencil can be very difficult for the assessors to read and may result in writing that is unclear.
- 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 biological terms that cause a lack of clarity in meaning could result in failure to gain credit for the answer. For example, the distinction between 'thymine' and 'thiamine' may not be clear if spelt incorrectly.

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

### Question 1

Marks	0	1	2	Average
%	29	61	10	0.9

#### 1i.

Chemical composition (any of):

- phospholipid
- phospholipid bilayer.

Appropriate explanations included:

- the hydrophilic head and the hydrophobic tail allow the passage of lipid soluble molecules
- it is flexible, to form vesicles
- it forms a waterproof barrier.

#### 1ii.

Chemical composition (any of):

- protein
- protein channel
- polypeptide.

Appropriate explanations included:

- changeable shape to transport large molecules
- specific shape to transport specific molecules

This question allowed students to draw on their own experience gained through the SAC 'Movement of substances through a membrane'. The chemical composition for both parts was well answered and many students could relate the chemical composition of the phospholipid to its function. Very few students could correctly relate the structure of the protein to its function. The explanations had to be consistent with the composition given.

### Question 2

This question mainly required students to recall information and, in part, apply the information given.

#### Question 2a.

Marks	0	1	2	Average
%	18	25	57	1.4

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	DNA	RNA
Differences	<ul style="list-style-type: none"> <li>• double stranded</li> <li>• contains thymine</li> <li>• contains deoxyribose sugar</li> </ul>	<ul style="list-style-type: none"> <li>• single stranded</li> <li>• contains uracil</li> <li>• contains ribose sugar</li> </ul>

## Question 2b.

Marks	0	1	Average
%	61	39	0.4

Any one of:

- mRNA: to carry information from the nucleus to the ribosome for protein synthesis
- tRNA: to carry specific amino acids to the ribosome for protein synthesis
- rRNA: a structural component of the ribosome.

The specific name of the RNA was not required; a letter was a suitable way to distinguish the type. Students should know that tRNA is transferRNA, **not** transportRNA. Students who used this incorrect term were not awarded a mark. Many students also incorrectly used the terms 'transcription' and 'translation'.

## Question 2c.

Marks	0	1	Average
%	35	65	0.7

Amino acid

## Question 2d.

Marks	0	1	Average
%	78	22	0.3

Any one of:

- collagen, to provide strength to skin
- fibrin, required for blood clotting
- myosin, to facilitate muscle contraction.

This question needed to be answered at the cellular level and students who named gross body structures, such as hair, did not gain the mark. A suitable name **and** function were required to gain the mark. 'Chitin' was an incorrect response given by some students.

## Question 2e.

Marks	0	1	Average
%	71	29	0.3

Property

- strength
- flexibility

Explanation

- due to the arrangement of the polypeptides which enabled them to be stretched and return to the original shape
- parallel arrangement of protein fibres for support

## Question 3

Many answers to this question demonstrated students' knowledge and understanding of photosynthesis and cellular respiration.

## Question 3a.

Marks	0	1	Average
%	51	49	0.5

Light is necessary for photosynthesis, and where light absorption was high so was the rate of photosynthesis.

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It was important for students to make a comparative statement between the two graphs. Some students incorrectly stated that the chlorophyll was absorbed, not the light. Other students **described** the graphs rather than giving an explanation as requested by the question.

## Question 3b.

Marks	0	1	2	Average
%	24	35	40	1.2

### 3bi.

Any one of:

- water
- NADP
- ADP and Pi.

### 3bii.

Any one of:

- oxygen
- NADPH
- ATP.

## Question 3c.

Marks	0	1	Average
%	40	60	0.6

36 ATP

Responses between 34 and 38 ATP were accepted due to the variation in yield in different tissues.

## Question 3d.

Marks	0	1	2	3	Average
%	34	26	21	19	1.3

### 3di.

Cristae (of the mitochondria)

### 3dii.

Product (either of):

- water
- ATP.

Description

- Electrons are passed along electron acceptors/a series of cytochromes.
- Oxygen captures electrons, which are combined with hydrogen.
- Carrier molecules give up hydrogen as it is passed along.

Many students correctly identified the site of the reaction and the product, though very few stated that 'product Z is...'. This was satisfactory, as long as students indicated in some other way what was formed. Students' descriptions of the events which occurred in the electron transport stage ranged from complete, highly advanced descriptions to many which demonstrated no knowledge of this process.

## Question 4

### Question 4a.

Marks	0	1	Average
%	20	80	0.8

Either of:

- enzymes increase the rate of chemical reactions which would otherwise occur too slowly to sustain life
- enzymes lower the activation energy required for a reaction to proceed.

This question was well answered.

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## Question 4b.

Marks	0	1	2	Average
%	36	29	35	1.0

The active site is a particular position/specific site on an enzyme which attaches to a specific substrate.

Many vague statements were given which did not indicate the specificity of the active site with respect to its role.

## Question 4c.

Marks	0	1	2	Average
%	65	20	15	0.5

Either of:

- rational drug design involves the analysis of a disease to determine a structure/aspect of the disease. A drug is then designed to mimic/block the action of the disease causing agent
- a drug is developed to act specifically on an infective agent/enzyme. This then binds and removes the capacity to cause disease.

Even though rational drug design has been part of the VCE Biology course for three years, this type of question is still poorly answered. Many vague comments were made. Students who gained full marks for this question often used a suitable example to explain their answer.

## Question 4d.

Marks	0	1	2	3	4	Average
%	3	12	26	22	38	2.9

### 4di.

Designed drug two

### 4dii.

This drug has the most points which are complementary to the active site of the ACE.

### 4diii.

The use of the drug would block/inhibit the active site of ACE **or** compete with Angiotensin I. Angiotensin II would not be produced **or** would be produced in lesser amounts and lead to a reduced blood pressure.

This question was well answered as most students correctly identified that designed drug two would be most effective and many made a comparative statement as to why this was the best choice. It was pleasing to see the number of students who correctly applied their knowledge to part iii. and provided a well-reasoned response.

## Question 5

This question was one of the most challenging questions on the examination. It highlighted students' confusion between the cell mediated and humoral immune responses.

### Question 5a.

Marks	0	1	2	Average
%	38	44	18	0.8

#### 5ai.

Any one of:

- T-helper cells
- macrophages/phagocytes
- antigen presenting cells.

#### 5aai.

The cells mentioned in part i. have receptors that are capable of detecting self markers and/or non-self antigens.

### Question 5b.

Marks	0	1	2	Average
%	71	19	10	0.4

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Both of:

- in the cell mediated immune response, T-cell mediated rejection response occurs and T-helper cells activate cytotoxic T-cells and/or NK (natural killer) cells
- cytotoxic chemicals are produced which destroy foreign cells **or** macrophages engulf and destroy foreign material.

Most students incorrectly treated this question as a humoral immune response, while others mentioned all possible types of cells involved in immune responses and therefore did not score any marks. Students should use the correct terms for T-cells; either cytotoxic, helper or NK (natural killer) cells, not, for example, 'killer T-cells'.

### Question 5c.

Marks	0	1	Average
%	61	39	<b>0.4</b>

The tumour cells lack antigens/have the same markers as the previously uninfected Tasmanian devil and are therefore not recognised as non-self.

A common incorrect answer was simply stating that 'the tumours were accepted as the Tasmanian devils were related'.

### Question 5d.

Marks	0	1	Average
%	45	55	<b>0.6</b>

Either of:

- yes, the tumour is contagious and brings about a diseased state
- no, the tumour is not an organism but cells originating from rogue self cells.

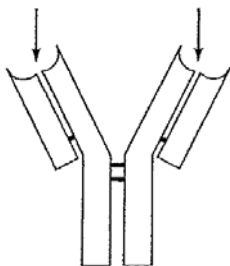
The explanation was the key part required in the answer.

### Question 6

This question provided the opportunity for students to apply their scientific knowledge, but with varying success.

### Question 6a.

Marks	0	1	2	Average
%	28	22	50	<b>1.3</b>



### Question 6b.

Marks	0	1	Average
%	40	60	<b>0.6</b>

An autoimmune disease is one in which the body identifies some self cells as non-self and attacks them.

This question was reasonably well answered; however, a common incorrect answer was that an autoimmune disease is a disease of the immune system, such as AIDS.

### Question 6c.

Marks	0	1	Average
%	79	21	<b>0.2</b>

A hormone is a chemical compound produced in a cell. It either acts within the cell or diffuses or is transported to other cells where it brings about a specific response.

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This part was not well answered. Students needed to expand at least in part on the definition provided, taking into account other examples of hormones they had studied. Too often, the new definition was even shorter than that given or was made more specific and hence more incorrect; for example, 'produced by endocrine glands'.

## Question 6d.

Marks	0	1	2	3	4	5	Average
%	12	12	19	26	19	12	2.7

Hypothesis

- That treatment with Vitamin D reduces the chance of mice developing rheumatoid arthritis

Experimental Design

- Use two large groups (for example, 20) of similar mice which normally develop rheumatoid arthritis.
- Treat the experimental group with Vitamin D. The other group, the Control group, are given a placebo and do not receive Vitamin D.
- Keep all other factors constant, such as diet, space, water and temperature.

Results

- For the hypothesis to be supported, fewer mice that are given Vitamin D should develop rheumatoid arthritis than those in the Control group.

The improvement in answers to this question compared to similar questions in the past was pleasing. Students who scored full marks gave a well set out and reasoned response that clearly answered each part of the question and were a pleasure to read.

Experimental design is integral to science and this question exposed many deficiencies in students' knowledge and understanding of the process, in particular the writing of a hypothesis. Too often, students gave an 'aim' rather than a clear hypothesis statement which could be tested. Students would benefit from more practical experience with appropriate examples.

## Question 7

Although this question was generally well answered, it required less application of knowledge than some other questions.

### Question 7a.

Marks	0	1	Average
%	75	25	0.3

Positive phototropism

### Question 7b.

Marks	0	1	2	Average
%	20	29	51	1.4

7bi.

Any of:

- temperature
- number of seeds
- nutrients.

Some students incorrectly stated the type of seeds/plant. The stem of the question states 'a sample of seeds from the same plant', so this was not correct. More careful reading of the question would have prevented this error.

7bii.

The amount of light

### Question 7c.

Marks	0	1	Average
%	18	82	0.9

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## Question 7d.

Marks	0	1	Average
%	53	47	

Reflex arc

## Question 7e.

Marks	0	1	Average
%	62	38	

The rate of transmission of the nerve impulse would slow down, which could lead to a slower reaction and the person being burnt.

Many students failed to answer both parts of this question which clearly asked for a description of the damage **and** the effect on the person.

## Question 8

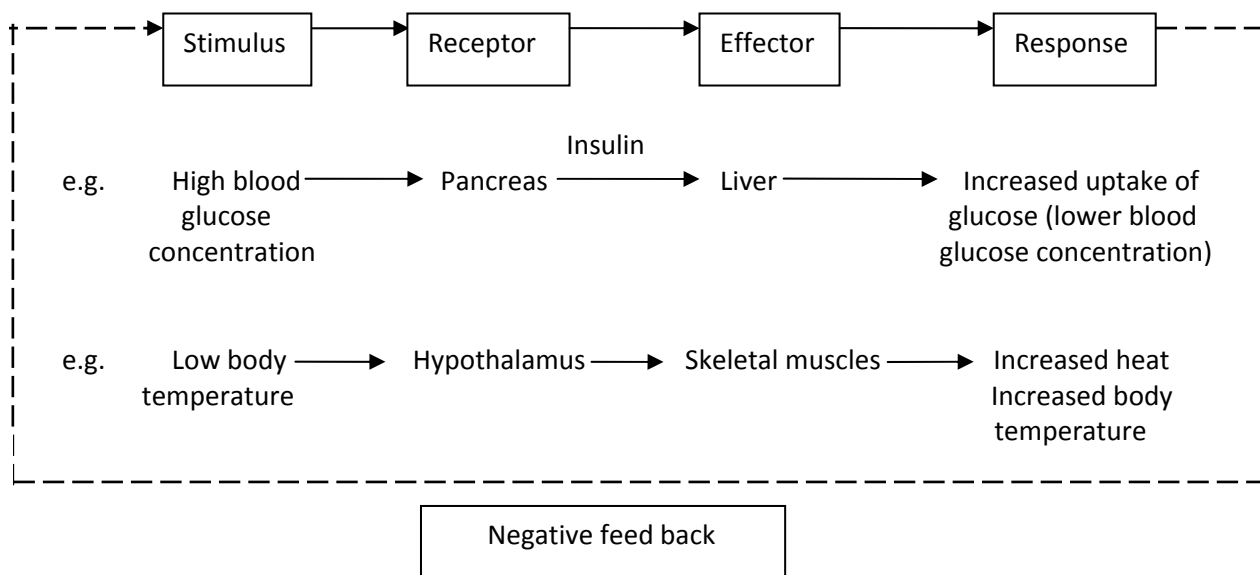
### Question 8a.

Marks	0	1	2	3	Average
%	38	20	21	21	

Students needed to name a suitable homeostatic system, such as regulation of blood glucose concentration, ion concentration in the blood or body temperature.

One mark was awarded for the name of the stimulus and an appropriate example, one mark for the name of a suitable effector and response, and one mark for an indication of negative feedback.

Below are some examples of appropriate responses.



### Question 8b.

Marks	0	1	Average
%	50	50	

High or low copper concentrations in the cell

### Question 8c.

Marks	0	1	Average
%	80	20	

Either of:

- too much copper may be toxic to the cell



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- copper is a co-factor required by enzymes.

Most students wrote general comments such 'copper is needed by the cells' or 'too much copper would damage/harm a cell'. These responses did not gain a mark.