



2010

Biology GA 1: Written examination 1

GENERAL COMMENTS

This examination was the fifth 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 the 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. However, many students made errors by not carefully reading and interpreting diagrams and flow charts such as in Questions 1bi., 1cii., 6c. and 6d. Proper use of the reading time is critical so that students may start the necessary thought processes and to 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, there were no examples of this in the June examination. Students are reminded that suitable abbreviations are DNA, ATP, NADH and chemical symbols such as H₂O. If students wish to use another abbreviation and are not sure of its appropriateness, then they should define it; for example, photosynthesis (phs).

Teachers and students are reminded that the set of key skills (refer to page 12 of the study design) are examinable. Section B, Question 2b. 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> 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 | % No Answer | Comments |
|----------|-----|-----|-----|-----|-------------|---|
| 1 | 25 | 14 | 26 | 35 | 0 | The only cellular pathogens are bacteria. Prions and viruses are non-cellular pathogenic agents. |
| 2 | 19 | 25 | 10 | 46 | 0 | Option B (lymph drains back into the circulatory system) is correct for the lymphatic system but not correct for lymph nodes. |
| 3 | 11 | 9 | 75 | 5 | 0 | |
| 4 | 3 | 16 | 57 | 24 | 0 | |
| 5 | 72 | 5 | 9 | 13 | 0 | |
| 6 | 14 | 4 | 61 | 20 | 0 | |
| 7 | 6 | 81 | 11 | 2 | 0 | |
| 8 | 24 | 66 | 7 | 2 | 0 | |
| 9 | 17 | 19 | 62 | 2 | 0 | |
| 10 | 10 | 76 | 7 | 6 | 0 | |
| 11 | 7 | 8 | 68 | 16 | 0 | |
| 12 | 52 | 28 | 5 | 15 | 0 | |
| 13 | 87 | 4 | 4 | 5 | 0 | |
| 14 | 4 | 6 | 83 | 7 | 0 | |



| Question | % A | % B | % C | % D | % No Answer | Comments |
|----------|-----|-----|-----|-----|-------------|--|
| 15 | 5 | 34 | 44 | 16 | 0 | Catabolic reactions break down and release energy, and are therefore exergonic. Option B is a catabolic reaction. Options A, C and D were anabolic reactions requiring an input of energy, and are therefore endergonic. |
| 16 | 58 | 11 | 14 | 16 | 1 | |
| 17 | 23 | 44 | 18 | 14 | 0 | Plants absorb different wavelengths of light. Light which is not absorbed is reflected. Oxygen is a by-product of photosynthesis and is dependent on the light energy absorbed. The greatest amount of oxygen production occurs in red light, followed by blue, then yellow, while the green light is reflected. |
| 18 | 18 | 15 | 11 | 56 | 0 | |
| 19 | 48 | 30 | 11 | 10 | 1 | Hsp60 is found in both prokaryotes and eukaryotes, therefore it is manufactured in free ribosomes as prokaryotes do not have ribosomes on endoplasmic reticulum. |
| 20 | 2 | 17 | 53 | 27 | 0 | Lipids such as waxes which constitute the cuticle of leaves act to reduce water loss and dehydration. Structural support is provided to a plant cell by the cellulose (carbohydrate) cell wall. Lipids, which are part of the cell membrane, do not provide structural support. |
| 21 | 25 | 45 | 8 | 21 | 1 | |
| 22 | 5 | 70 | 7 | 17 | 0 | |
| 23 | 65 | 13 | 9 | 13 | 0 | |
| 24 | 61 | 17 | 19 | 3 | 1 | |
| 25 | 4 | 16 | 10 | 69 | 1 | |

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.
- 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 'glycogen' and 'glucagon' may be indistinguishable if spelt incorrectly (see Question 1bii.).

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

Question 1a.

| Marks | 0 | 1 | Average |
|-------|----|----|---------|
| % | 76 | 24 | 0.3 |

A hormone is a chemical messenger produced by a cell and (one of):

- triggers a specific response
- attaches to specific receptors.

Students were asked to give the general function of a hormone. Many students incorrectly described a hormone instead of outlining the general function of a hormone. Poorly worded responses such as 'a chemical messenger sent to a specific receptor' were incorrect as hormones generally can move throughout the whole organism.

Question 1b.

| Marks | 0 | 1 | 2 | 3 | Average |
|-------|----|----|----|----|---------|
| % | 23 | 35 | 29 | 12 | 1.3 |

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Question 1bi.

Name of female: Emily

Explanation: Emily's blood glucose level has a greater initial increase and takes longer/five hours to decrease.

To be awarded the marks for this question students were required to make a **comparative** statement as shown above or to compare Emily's result to Grace's. A common incorrect answer was 'Emily's blood sugar level initially was high and then returned to normal', since this was the same situation for Grace.

No marks were awarded for giving the name of the female.

Question 1bii.

Either of:

- the rise was due to her body converting glycogen to glucose
- there are corrections of small overshoots.

Answers which stated that Grace had eaten a snack or a meal were not awarded the mark. For this to be a valid method to indicate the failure of the blood-glucose homeostatic mechanism, both subjects needed to be in identical conditions.

Many students understood the homeostatic mechanisms of blood glucose and correctly identified the role of glucagon in this process; however, this was not required. Some students did not gain the mark for this question as their spelling of the words 'glycogen' and 'glucagon' was difficult to decipher.

Question 1c.

| Marks | 0 | 1 | 2 | 3 | Average |
|-------|---|----|----|----|---------|
| % | 8 | 30 | 28 | 34 | 1.9 |

Question 1ci.

Decreased fertility or decreased sperm production

Some careless errors occurred here and students are advised to answer the question rather than to give extra information that is not required.

Question 1cii.

Effect: Rise in production

Explanation: Less testosterone is produced and negative feedback does not occur, so GnRH continues to be produced.

There were many confused answers to this question. Many students did not understand that negative feedback of testosterone to the hypothalamus inhibits the production of GnRH, and incorrectly stated that a lack of negative feedback inhibits the production of GnRH.

Many students who incorrectly identified a fall in production could still gain the first mark for the explanation.

Question 2a.

| Marks | 0 | 1 | 2 | Average |
|-------|----|----|----|---------|
| % | 29 | 44 | 27 | 1 |

Cell membrane: To regulate the inputs/outputs of the cell

Porin: To allow large/water soluble/polar molecules to enter/leave the cell, or site of facilitated diffusion or active transport

The question asked for a function of each structure; therefore, 'The porin is a protein channel' was incorrect. Some students gave functions of each structure which, though correct for a multicellular eukaryotic cell, were not correct for a bacterium; for example, 'Porin, cell to cell communication'.

Question 2b.

| Marks | 0 | 1 | 2 | 3 | Average |
|-------|----|----|----|----|---------|
| % | 25 | 32 | 31 | 12 | 1.3 |

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The following is an example of a possible answer.

Hypothesis: Mice fed hard pellets will weigh more than mice that are fed soft pellets

Experimental procedure: Two groups of mice: one group fed hard pellets and the other soft, and all other variables controlled

Results: Mice fed hard pellets weighed more than mice fed soft pellets

Too many students wrote their hypothesis referring to energy expenditure. It was apparent that some students do not understand the difference between an aim and a hypothesis and would benefit from more practice writing hypotheses in class or for school-assessed coursework.

Students did not need to state the features of the mice as these were given in the stem of the question; however, they needed to identify a factor which should have been controlled, for example, water availability.

The results needed to relate directly to the hypothesis. Measuring weight was by far the most feasible method; however, measuring the activity of each group was also considered a suitable measure in this case.

Overall it was most pleasing to see the quality of answers to this question. Most students were able to gain some marks and show their understanding of scientific method. It was evident that some students did not read the stem of the question carefully.

Question 3a.

| Marks | 0 | 1 | Average |
|-------|----|----|---------|
| % | 26 | 74 | 0.8 |

Glucose or $C_6H_{12}O_6$

Question 3b.

| Marks | 0 | 1 | 2 | 3 | Average |
|-------|----|---|----|----|---------|
| % | 53 | 9 | 14 | 25 | 1.1 |

Suitable answers included:

- glycolysis: glucose is converted to pyruvate, 2 ATP produced
- Krebs (cycle): pyruvate is converted to carbon dioxide, 2 ATP produced
- electron transport chain: hydrogen combines with oxygen to produce water, 32–34 ATP produced.

The question required a brief description of three stages of cellular respiration. Answers could also include the inputs or outputs of each stage, where each stage occurred or the amount of ATP produced.

Many students, however, described different stages of photosynthesis and did not gain any marks. Some students wrote large amounts of information for each part; this was unnecessary and wasted valuable examination time. Some students gave contradictory information.

Errors included:

- O_2 being a part of glycolysis
- NADPH rather than NADH in the Krebs cycle
- CO_2 being an output of the electron transport chain and 36–38 ATP being produced.

Question 3c.

| Marks | 0 | 1 | Average |
|-------|----|----|---------|
| % | 88 | 12 | 0.1 |

The oxygen produced in photosynthesis can be used in cellular respiration.

Few students were able to answer this question correctly.

Question 4a.

| Marks | 0 | 1 | 2 | Average |
|-------|----|----|----|---------|
| % | 37 | 31 | 32 | 1 |

Strain Z has the most plasma cells; therefore, more antibodies can be produced against the influenza virus.

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A comparative statement was required when referring to strain Z. Its introduction of more plasma cells needed to be compared with the production of plasma cells by cells X and Y.

Question 4b.

| Marks | 0 | 1 | 2 | Average |
|-------|----|----|----|---------|
| % | 48 | 37 | 15 | 0.7 |

Both of:

- blocking the receptors has the same effect as having no receptors, as is the situation with cell Y
- the most memory cells are produced by cell Y.

Many students restated the stem of the question saying that blocking the action of EB12 receptors could result in the production of a more efficient vaccine, and did not provide an explanation.

Question 5a.

| Marks | 0 | 1 | 2 | 3 | 4 | Average |
|-------|---|---|----|----|----|---------|
| % | 6 | 7 | 13 | 23 | 51 | 3.1 |

Question 5ai.

Organelle M: golgi (complex)

Function: packages protein/material for export from the cell

Question 5aii.

Organelle N: mitochondria

Function: site of aerobic respiration

These questions were very well answered. Students generally have a sound understanding of cellular respiration; however, it was disappointing that vague statements such as 'mitochondria: site of energy production' were given. Answers which stated that mitochondria is the 'powerhouse' of the cell were not awarded the mark for the function.

Question 5b.

| Marks | 0 | 1 | Average |
|-------|----|----|---------|
| % | 24 | 76 | 0.8 |

Q was the most obvious answer; however, M was also accepted as there was no information that the material would not have reached M in 3 minutes.

Students were required to give the appropriate letter and not give the name of the organelle.

Question 5c.

| Marks | 0 | 1 | 2 | Average |
|-------|----|----|----|---------|
| % | 55 | 21 | 24 | 0.7 |

Both of:

- if the hormone is lipid soluble it will pass through the cell membrane and bind to a receptor in the cytosol
- if the hormone is protein based it will bind to a membrane receptor.

Many students gave good descriptions but stated that the receptor for the steroid hormone was within the cell.

Question 6a.

| Marks | 0 | 1 | Average |
|-------|----|----|---------|
| % | 63 | 37 | 0.4 |

All of:

- deoxyribose (sugar)
- nitrogen base
- phosphate (group).

Sugar and pentose were not acceptable as these can also refer to ribose in RNA. Phosphorus was also incorrect; however, phosphorus group was acceptable.

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Question 6b.

| Marks | 0 | 1 | 2 | 3 | Average |
|-------|----|----|----|----|---------|
| % | 12 | 41 | 29 | 18 | 1.6 |

Amino acid sequence: glu-his-phe

Explanation: The changed primary structure or different bonding leads to a different shape.

Many students did not make the link that the shape would be changed and restated the stem of the question; for example, 'that this would affect the function'.

Question 6c.

| Marks | 0 | 1 | 2 | Average |
|-------|----|----|----|---------|
| % | 65 | 23 | 12 | 0.5 |

Hex A-glycolipid fails to form as the substrate can't bind to the enzyme.

Question 6d.

| Marks | 0 | 1 | 2 | Average |
|-------|----|----|---|---------|
| % | 59 | 39 | 3 | 0.5 |

Both of:

- the enzyme is blocked and therefore reduces the formation of glycolipid
- there is an alternative pathway/via compound R.

Very few students could identify the alternative pathway. The analysis of pathways would be valuable preparation for this type of question.

Question 7a.

| Marks | 0 | 1 | Average |
|-------|----|----|---------|
| % | 26 | 74 | 0.8 |

Autoimmune (disease)

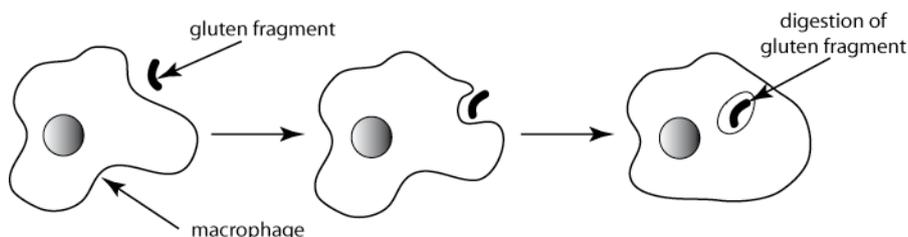
Autoimmune deficiency disease is incorrect. AIDS is an example of this type of disease and it is **not** an autoimmune disease.

Question 7b.

| Marks | 0 | 1 | 2 | Average |
|-------|----|----|----|---------|
| % | 25 | 50 | 24 | 1 |

Both of:

- macrophages engulf the gluten fragment (or a diagram showing this)
- the fragment is digested by enzymes/lysosomes.



This question was generally well answered and students who chose to draw a diagram provided a suitable one.

Question 7c.

| Marks | 0 | 1 | 2 | Average |
|-------|----|----|----|---------|
| % | 43 | 23 | 34 | 0.9 |

One of:

- cytotoxic T cell: kills infected epithelial cells

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- B cells: these cells differentiate into memory and plasma cells to produce antibodies against epithelial cells
- interleukins/cytokines: these stimulate specific immune response against epithelial cells.

Many answers given were unsuitable, such as NK cells, histamines or mast cells.

Question 7d.

| Marks | 0 | 1 | 2 | Average |
|-------|----|----|----|---------|
| % | 10 | 17 | 73 | 1.7 |

Examples of correct answers included:

- are there any known side effects?
- should it be taken with food?
- will I be paid for this?
- will I be compensated if things go wrong?
- is it subsidised by the government?

The responses provided varied greatly. In general, students did really well. Unsuitable responses included 'Is it safe for humans?', a repetition of the question stem, or both responses being variations of each other.

Question 8a.

| Marks | 0 | 1 | Average |
|-------|----|----|---------|
| % | 74 | 26 | 0.3 |

Two years – this was from peak to peak

Question 8b.

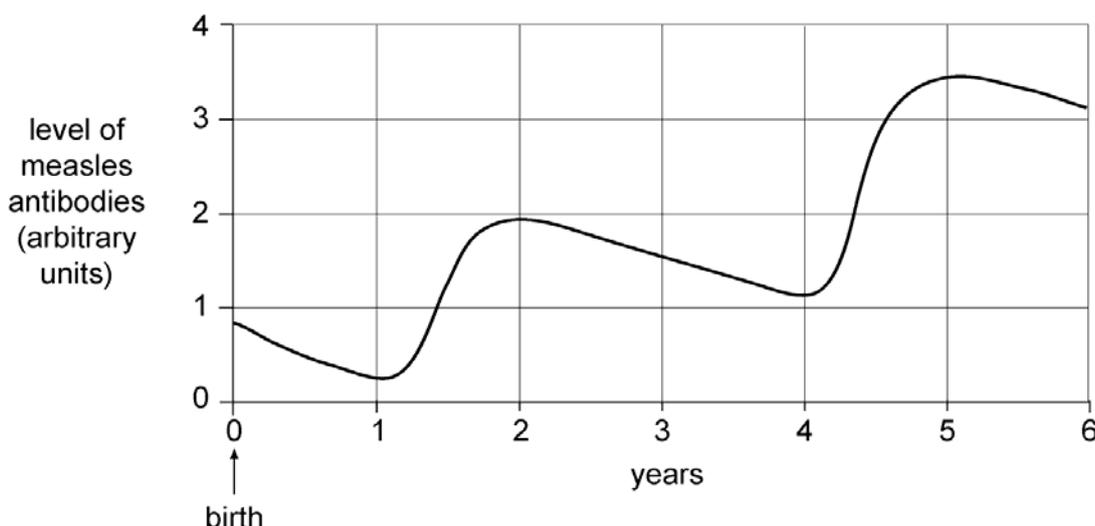
| Marks | 0 | 1 | 2 | Average |
|-------|----|----|----|---------|
| % | 33 | 39 | 28 | 1 |

Both of:

- the child has measles
- the child should be isolated from other family members or they should be vaccinated.

Question 8c.

| Marks | 0 | 1 | 2 | Average |
|-------|----|----|----|---------|
| % | 40 | 36 | 24 | 0.9 |



The graph needed to originate above 0 on the Y axis. There needed to be two distinct peaks, the first after 1 year and the second being greater after 4 years. The rise had to start after 1 and 4 years, not the peak at these times.

This would have been a suitable question to answer in pencil. Many graphs were confusing with multiple lines.

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Question 8d.

| Marks | 0 | 1 | 2 | Average |
|-------|----|----|----|---------|
| % | 25 | 35 | 41 | 1.2 |

Both of:

- Mrs Smith's embryo is at greater risk as it is at a critical stage of development
- abnormalities occur in one or more of the nervous system/eyes/ears/heart.