



2003

Biology GA 1: Written examination 1

**SPECIFIC INFORMATION**

**Section A – Multiple choice**

This table indicates the approximate percentage of students choosing each distractor. The correct answer is the shaded alternative.

Question	A	B	C	D	Selected comments
1	5	52	10	33	Many students incorrectly thought that all plant cells contain chloroplasts. By considering the root system of a vascular plant students could identify many cells that do not have chloroplasts. Chloroplasts contain many folded membrane layers where the chlorophylls are located.
2	2	5	10	83	
3	39	20	25	16	Cellulose, glycogen and starch are all examples of carbohydrates. The basic structural unit of carbohydrates is glucose. The basic subunit of a protein is an amino acid.
4	8	8	68	16	
5	13	19	5	63	
6	3	87	3	7	
7	88	4	4	4	
8	3	25	60	12	
9	8	86	2	4	
10	17	25	56	2	
11	16	65	11	8	
12	47	6	37	10	
13	47	29	12	12	Students needed to recognise that when the yeast was respiring anaerobically alcohol was produced. Oxygen was not introduced until point P and after this time alcohol was broken down. Many students incorrectly chose point N as the point of highest alcohol concentration. The vertical axis is plotting the rate of production of carbon dioxide not the amount of carbon dioxide produced.
14	26	26	41	7	
15	6	75	7	12	
16	5	5	12	78	
17	4	6	42	48	Point X on the graph shows that as the substrate concentration increases the rate of the reaction remains constant. A limiting factor is one that prevents the rate of reaction from increasing. The substrate concentration is increasing and the amount of enzyme is constant so the limiting factor is the amount of enzyme.
18	3	10	3	84	
19	20	20	49	11	Fish living in freshwater are likely to take in water from their surroundings, as their body cells will have a higher ionic concentration to that of their surroundings. Water will move in passively down a concentration gradient. The fish will need to get rid of excess water and so produce large quantities of dilute urine.
20	2	77	2	19	
21	7	3	3	87	
22	79	15	5	1	
23	6	63	24	7	
24	20	5	69	6	
25	34	9	53	4	

**Section B – Short answer**

For each question a correct answer (or answers) is provided. In some cases the answer provided is not the only answer that could have been awarded marks.

## Question 1

1a

Marks	0	1	Average
%	55	45	0.45

The feature confirming that the section was from an animal tissue was the presence of a thin cell membrane as the outer covering **or** the absence of a cell wall.

A common incorrect response was the absence of chloroplasts. Chloroplasts are not found in all plants cells and their absence cannot be used to confirm that a tissue is from an animal.

1b

Marks	0	1	Average
%	18	82	0.82

Structure Y is a mitochondrion.

1ci–ii

Marks	0	1	2	Average
%	56	27	17	0.61

1ci

Structure X is involved in the absorption of material into the cell **or** in the exchange of materials/nutrients between the cell and its environment.

1cii

The presence of microvilli greatly increases surface area available for absorption.

Some students incorrectly described the microvilli as either cilia or flagella or hairs.

## Question 2

2ai–aii

Marks	0	1	2	Average
%	10	21	69	1.59

2ai

Bacteria are prokaryotic.

2aaii

Prokaryotic organisms have no membrane enclosed organelles.

Students could make a comparative statement in their response to 2aaii. An example of a correct response would be 'Prokaryotic organisms lack a distinct nucleus but cells of higher organisms (eukaryotic) each have a membrane bound nucleus'.

2b

Marks	0	1	Average
%	54	46	0.46

Many bacteria cannot survive in the stomach because of the very low pH (strongly acidic) of the environment **or** the presence of digestive enzymes in the environment.

Some students incorrectly equated highly acidic with high pH. A solution that is highly acidic will have a low pH. Responses that only included general terms, for example 'because of the digestive juices or pH level', were not awarded marks.

2c

Marks	0	1	Average
%	77	23	0.23

The bacteria may have an outer surface that is resistant to acid attack.

When answering this type of question students need to remind themselves of the structure of bacteria. Answers such as the presence of hooks or suckers suggest a lack of understanding of bacterial structure.

2di–iii

Marks	0	1	2	3	Average
%	26	21	23	30	1.57

**2di**

A vaccine is a solution of dead or attenuated bacteria, **or** a solution containing a particular kind of antigen **or** a solution containing a particular protein/glycoprotein from *Helicobacter pylori*.

Many students were not awarded marks for their answers because they described what a vaccine does and not what it is.

**2dii**

The vaccine would stimulate the production of specific antibodies and/or specific memory cells, giving protection against future infections.

**2diii**

The vaccine is unlikely to protect against infection by other bacteria because antigen/antibody reactions are highly specific – different bacteria are unlikely to have the same antigens as *Helicobacter pylori*.

**Question 3****3a**

<b>Marks</b>	<b>0</b>	<b>1</b>	<b>Average</b>
<b>%</b>	56	44	<b>0.44</b>

Neuron M is a connecting neuron or interneuron.

**3b**

<b>Marks</b>	<b>0</b>	<b>1</b>	<b>2</b>	<b>Average</b>
<b>%</b>	46	33	21	<b>0.75</b>

A reflex arc is an automatic response that occurs without involvement of the brain. The importance of such a response is that it brings about immediate or fast response to protect the body from tissue damage.

Students were not required to reiterate what was in the diagram. The diagram was provided as a starting point for the question.

**3c**

<b>Marks</b>	<b>0</b>	<b>1</b>	<b>Average</b>
<b>%</b>	51	49	<b>0.49</b>

The myelin sheath increases the rate of conduction of a nerve impulse along the axon.

**3di–iii**

<b>Marks</b>	<b>0</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>Average</b>
<b>%</b>	12	31	30	27	<b>1.71</b>

**3di****Area X****3dii**

**Structure P:** is a storage site for the neurotransmitter substance **or** it releases neurotransmitter substance **or** it contains a chemical that diffuses across neuromuscular gap **or** it secretes chemicals such as acetylcholine across the synaptic gap.

**Structure Q:** carries out aerobic cellular respiration for production of ATP **or** provides energy for the cell.

Note that the question did not require students to identify the organelles. Structure P is a vesicle and Structure Q is a mitochondrion. Students had to give specific answers to the question and were not awarded marks for general statements such as Q is the powerhouse of the cell or P stores substances.

**Question 4****4a**

<b>Marks</b>	<b>0</b>	<b>1</b>	<b>2</b>	<b>Average</b>
<b>%</b>	13	34	53	<b>1.40</b>

Evidence from the table that suggests that mammal species A is suited to a dry environment included any two of:

- 0% water gain by drinking
- major source of water is metabolic water
- high proportion of water loss by evaporation means little lost in other ways
- produces very little urine.

Student responses that gave a characteristic not mentioned in the table could not be awarded a mark. One such common incorrect response was to refer to metabolic rate.

**4bi–iii**

<b>Marks</b>	<b>0</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>Average</b>
<b>%</b>	13	35	34	18	<b>1.56</b>

**4bi****The mammal may:**

- spend the day in burrow
- restrict activities during the day
- display nocturnal behaviour
- move into shade.

Any one of the above was accepted as a correct response.

**4bii**

The third avenue of water loss to account for 4% of losses would be water lost in the faeces.

**4biii**

A structural adaptation that accounts for the variation in water lost in the urine would be differences in the length of the loop of Henle in the nephron of the kidney– the longer the length, the more reabsorption and hence reduced loss of water.

**Question 5****5a**

<b>Marks</b>	<b>0</b>	<b>1</b>	<b>Average</b>
<b>%</b>	25	75	<b>0.75</b>

A control group is to be used as a comparison with experimental group **or** to use as a point against which experimental group may be judged.

**5b**

<b>Marks</b>	<b>0</b>	<b>1</b>	<b>2</b>	<b>Average</b>
<b>%</b>	62	25	13	<b>0.50</b>

**Group X** included the people with diabetes. Reasons based on the data were:

- glucose levels after 60 minutes were much higher in X than in Y because insulin present was not sufficient to trigger a homeostatic feedback
- insulin levels remained relatively constant in group X indicating inability to produce insulin in response to presence of sugar.

Marks were awarded for the correct reasons and not for identifying group X as the group with people who were diabetic.

**5c**

<b>Marks</b>	<b>0</b>	<b>1</b>	<b>Average</b>
<b>%</b>	77	23	<b>0.23</b>

In the control group, the production of insulin promotes uptake of glucose by body cells and so reduces the level of blood glucose.

Some students answered by stating that the pancreas continued to make insulin but gave no indication of how the insulin lowered the blood glucose level. The mark was only awarded where students mentioned the increase in uptake of glucose by the cells.

**5di–ii**

<b>Marks</b>	<b>0</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>Average</b>
<b>%</b>	24	26	19	31	<b>1.58</b>

**5di**

Glucagon is secreted by the pancreas.

**5dii**

The level of plasma glucose would increase as glucagon increases breakdown of glycogen stored in liver (and muscle) to glucose.

**Question 6****6a**

<b>Marks</b>	<b>0</b>	<b>1</b>	<b>2</b>	<b>Average</b>
<b>%</b>	34	19	47	<b>1.12</b>

The correct sequence of 1 3 5 4 2 6 was awarded 2 marks.

Students could be awarded one mark if the sequence they gave only contained one error and all other steps had a logical order.

**6b**

<b>Marks</b>	<b>0</b>	<b>1</b>	<b>2</b>	<b>Average</b>
<b>%</b>	19	39	42	<b>1.22</b>

An enzyme is a protein molecule **and** is an organic catalyst **or** it speeds up a chemical reaction **or** it is not used in the reaction.

**6c**

<b>Marks</b>	<b>0</b>	<b>1</b>	<b>Average</b>
<b>%</b>	24	76	<b>0.76</b>

10 µg/kg

(Note: responses that did not have the correct units were not awarded marks.)

**6d**

<b>Marks</b>	<b>0</b>	<b>1</b>	<b>Average</b>
<b>%</b>	76	24	<b>0.23</b>

Photosynthesis is not used to produce sugar during the early stages of germination because the plants have no (or insufficient) chlorophyll pigment to absorb light for photosynthesis **or** have no chloroplasts to absorb light for photosynthesis **or** have no photosynthetic tissue to absorb light for photosynthesis.

Common incorrect responses included the plants are underground or have no access to light.

**6e**

<b>Marks</b>	<b>0</b>	<b>1</b>	<b>Average</b>
<b>%</b>	46	54	<b>0.54</b>

**Gibberellin could have any one of the following actions:**

- stimulate cell elongation
- stimulate cell reproduction
- promotes the growth of juvenile leaves in some species
- stimulates growth in young leaves and young apical tissue (roots and shoots)
- can promote the development of fruit without fertilisation of the ovule (seedless fruit)
- stimulates flowering in response to long days
- breaks seed dormancy in some plants.

**6f**

<b>Marks</b>	<b>0</b>	<b>1</b>	<b>2</b>	<b>Average</b>
<b>%</b>	45	28	27	<b>0.81</b>

The lower concentration of phosphate ions on outside means the phosphate ions must be transported into cell against concentration gradient – such transport requires energy. Hence, transport will be active.

**6g**

<b>Marks</b>	<b>0</b>	<b>1</b>	<b>2</b>	<b>Average</b>
<b>%</b>	50	38	12	<b>0.61</b>

Photosynthesis provides oxygen for cellular respiration **and** glucose as an energy source **or** glucose is used as a structural component.

To be awarded full marks it was not sufficient to state that oxygen and glucose are both needed for cellular respiration.

**6h**

<b>Marks</b>	<b>0</b>	<b>1</b>	<b>Average</b>
<b>%</b>	40	60	<b>0.60</b>

These coral shapes increase the surface area which enables a greater absorption of light for photosynthesis **or** increase in the surface area means a greater absorption of carbon dioxide for photosynthesis.

Responses that stated an increase in surface area without mentioning how this would assist photosynthesis were not awarded marks.

## Question 7

7a

Marks	0	1	2	3	4	Average
%	9	55	10	14	12	1.66

Prior **structure 1**  
One day after **1 and 2**  
One month after **1 and 3 OR 1, 2 and 3**  
One year after **1 and 3**

7b

Marks	0	1	2	Average
%	40	39	21	0.81

Note that there is more than one correct response.

### If the answer stated 1 and 3

The man has made antibodies in response to foreign RBC and these continue to be made (structure 3)  
**and**

The antibodies the man has made have destroyed the Rhesus positive cells (structure 2)

**or**

The man continues to make his own cells (structure 1).

### If the answer stated 1, 2 and 3

The man has made antibodies in response to foreign RBC and these continue to be made (structure 3)  
**and**

Although most Rhesus positive cells (structure 2) have been destroyed by antibodies, some still exist

**or**

The man continues to make his own cells (structure 1).

This question required careful analysis by the student and a well thought out answer was required.

7c

Marks	0	1	2	Average
%	47	24	29	0.81

Agree, the man should not be given Rhesus positive blood.

The man would still be making antibodies and have memory cells to Rhesus factor five years later **and** if given Rhesus positive blood the antibodies in the man's blood would react immediately with the Rhesus on the donor red blood cells causing them to agglutinate and possibly cause the death of the man.

Many students treated this question as a 'typical' antigen – antibody reaction and did not recognise that the second transfusion may cause the death of the man. Students were not penalised as long as they presented a logical consequence of the second transfusion. The question was marked according to the level of knowledge expected of a Year 12 Biology student.

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