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## BIOLOGY VCE UNITS 3&4 DIAGNOSTIC TOPIC TESTS 2017

### TEST 10: SCIENTIFIC METHOD

TOTAL 40 MARKS (45 MINUTES)

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Student's Name: \_\_\_\_\_ Teacher's Name: \_\_\_\_\_

#### Directions to students

Write your name and your teacher's name in the spaces provided above.  
Answer all questions in the spaces provided.

#### SECTION A – MULTIPLE-CHOICE QUESTIONS

##### Instructions for Section A

Choose the response that is **correct** or that **best answers** the question.

A correct answer scores 1; an incorrect answer scores 0.

Marks will **not** be deducted for incorrect answers.

No marks will be given if more than one answer is completed for any question.

Unless otherwise indicated, the diagrams in this booklet are **not** drawn to scale.

#### Question 1

In an experiment, the factor that is changed is the

- A. dependent variable.
- B. independent variable.
- C. controlled variable.
- D. extraneous variable.

#### Question 2

What is the correct order of the steps to follow in the scientific method?

- A. formulate a hypothesis, test the hypothesis, analyse the results, ask a question, draw conclusions, communicate results
- B. ask a question, analyse results, formulate a hypothesis, test the hypothesis, draw conclusions, communicate results
- C. ask a question, formulate a hypothesis, test the hypothesis, analyse results, draw conclusions, communicate results
- D. ask a question, formulate a hypothesis, test the hypothesis, draw conclusions, analyse results, communicate results

**Question 3**

All the things in an experiment that must be kept the same are called

- A. controlled variables or factors.
- B. independent variables.
- C. dependent variables.
- D. controlled experiments.

**Question 4**

An experiment that tests only one factor at a time by comparing the experimental group to the control group is a/an

- A. controlled experiment.
- B. non-controlled experiment.
- C. dependent variable.
- D. independent variable.

*Use the following information to answer Questions 5–7.*

A scientist hypothesises the temperature at which a turtle's egg is incubated will determine whether the turtle will be male or female.

**Question 5**

The independent variable is the

- A. incubator.
- B. gender of the turtle.
- C. male turtles.
- D. temperature.

**Question 6**

The dependent variable is the

- A. size of the baby turtles.
- B. temperature.
- C. gender of the baby turtles.
- D. incubator.

**Question 7**

A suitable hypothesis for the scientist experimenting with turtle egg incubation, temperature and the resultant gender of offspring, would be: 'If the temperature of incubation is

- A. below 25°C, then all offspring will be male'.
- B. below 25°C, then offspring will be dead'.
- C. above 25°C, then all offspring will be no sex'.
- D. above 25°C, then all offspring will be sterile'.

**Question 8**

When you are deciding if the data supports the original hypothesis or does not support the hypothesis, you are

- A. making observations.
- B. drawing conclusions.
- C. asking questions.
- D. formulating a hypothesis.

**Question 9**

When you are sharing your results with the rest of the class, you are

- A. communicating results.
- B. analysing the data.
- C. carrying out the experiment.
- D. formulating a hypothesis.

**Question 10**

Your experiment involves measuring the mass of beetles.

The unit of measure you should use is

- A. grams.
- B. kilograms.
- C. metres.
- D. tonnes.

**Question 11**

Your experiment involves measuring the volume of liquid in a beaker.

The unit of measure you should use is

- A. millilitres.
- B. kilolitres.
- C. grams.
- D. litres.

**Question 12**

Scientific reports often include graphs.

In which part of the scientific method are graphs used?

- A. formulating a hypothesis
- B. analysis of data
- C. asking questions
- D. communicating the results

**Question 13**

The final part of a scientific report includes a summary of reasonable inferences about the experiment.

This is a

- A. conclusion.
- B. controlled experiment.
- C. question.
- D. hypothesis.

**Question 14**

Students carried out an experiment to investigate the effects of 'Charlie Carp' fertiliser on plant growth. The students set up an experiment. Plants in group A get no fertiliser, plants in group B get 5 milligrams of Charlie Carp fertiliser each day, and plants in group C get 10 milligrams of Charlie Carp fertiliser each day.

Which plant group is the control group?

- A. all of them
- B. group C
- C. group B
- D. group A

**Question 15**

When making observations for an experiment, the data collected can be

- A. qualitative and quadrilateral.
- B. quantitative and qualitative.
- C. quantitative and quadrennial.
- D. quantitative and quadraphonic.

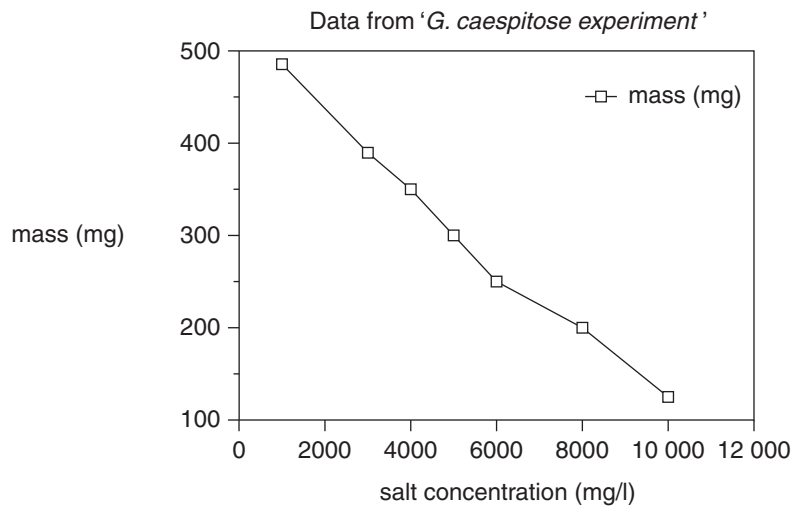
**SECTION B – SHORT-ANSWER QUESTIONS**

**Instructions for Section B**

Answer **all** questions in the spaces provided. Write using blue or black pen.  
Unless otherwise indicated, the diagrams in this booklet are **not** drawn to scale.

**Question 1** (6 marks)

*Galeolaria caespitose* is a marine worm commonly found in the littoral zones of rocky shores and is subsequently well-adapted to survival with the changing tide. A number of *G. caespitose* which had an average mass of 300 mg were placed in a variety of salt concentrations for 12 hours. They were weighed, the results averaged, then plotted on the graph shown below.



a. What was the hypothesis in this experiment? 1 mark

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b. What is the independent variable in this experiment? 1 mark

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c. What factors would have been controlled in this experiment? 1 mark

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d. Is there a control setup? If so, which one? 1 mark

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e. How was the experiment replicated? 1 mark

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f. To further check the consistency and accuracy of the results, what should the biologists do? 1 mark

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**Question 2** (8 marks)

Four identical portions of a pure starch solution are put into different test tubes. Saliva is added to each tube, then a small sample of each solution is taken immediately and tested for starch and maltose (a disaccharide). The four test tubes are then placed in water baths, each at a different temperature. The first bath is at 0°C, the second at 20°C, the third is at 40°C and the fourth is at 100°C. Two drops of each mixture are removed every four minutes to test for the presence of starch and maltose. The results are shown in the table below.

| Temperature<br>(°C) | Maltose |   |   |    |    |    |    |    |    | Starch  |   |   |    |    |    |    |    |    |
|---------------------|---------|---|---|----|----|----|----|----|----|---------|---|---|----|----|----|----|----|----|
|                     | Minutes |   |   |    |    |    |    |    |    | Minutes |   |   |    |    |    |    |    |    |
|                     | 0       | 4 | 8 | 12 | 16 | 20 | 24 | 28 | 32 | 0       | 4 | 8 | 12 | 16 | 20 | 24 | 28 | 32 |
| 0                   | -       | - | - | +  | +  | +  | +  | +  | +  | +       | + | + | +  | +  | +  | +  | +  | +  |
| 20                  | -       | - | + | +  | +  | +  | +  | +  | +  | +       | + | + | +  | +  | -  | -  | -  | -  |
| 40                  | -       | + | + | +  | +  | +  | +  | +  | +  | +       | + | + | -  | -  | -  | -  | -  | -  |
| 100                 | -       | - | - | -  | -  | -  | -  | -  | -  | +       | + | + | +  | +  | +  | +  | +  | +  |

+ indicates the test is positive (that is, the substance is present)

- indicates the test is negative (that is, the substance is absent)

- a. Identify the controlled variables/factors. 1 mark

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- b. Identify the independent variable. 1 mark

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- c. Identify the dependent variable. 1 mark

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- d. How is the dependent variable being measured? 1 mark

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- e. At what temperature does the saliva contain no maltose? Explain your answer. 2 marks

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- f. What conclusions can you infer from the results? 1 mark

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- g. What pattern/trend can be identified in the results for the test tubes kept at 0°C–40°C? 1 mark

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**Question 3** (5 marks)

A group of school students came up with an idea that mice exposed to electromagnetic radiation will become 'super mice' with bigger muscles. They decide to carry out this experiment by exposing groups of mice to electromagnetic radiation from electricity transmission lines. One group of 10 mice was exposed for 10 minutes. These mice were compared to another group of 10 mice that had not been exposed. The students' test consisted of blocking the mice from access to food using a heavy piece of wood that blocked the mouse food. They found that 8 out of 10 of the mice exposed to electromagnetic radiation could push the wood away. 7 out of 10 of the non-exposed mice could do the same.

- a. Identify the control group in the students' experiment. 1 mark

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- b. Identify the independent variable. 1 mark

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- c. Identify the dependent variable. 1 mark

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- d. What should the students conclude about their experiment? 1 mark

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- e. How could the students improve their experiment? 1 mark

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**Question 4** (2 marks)

An investigation was carried out to determine which antibacterial soap was the most effective against common skin surface bacteria *Staphylococcus albus*. Four agar Petri dishes were labelled A–D. Each dish was swabbed with the same amount of the *Staphylococcus albus* bacteria. 2 millilitres of water was added to dish A. 2 millilitres of different brands of antibacterial soap were added to dishes B–D respectively. The Petri dishes were incubated for 24 hours at 37°C. The number of bacterial colonies and the amount of growth of bacteria in each Petri dish was determined. It was found that dish D had the least amount of bacterial growth.

- a. Write a suitable conclusion for this investigation. 1 mark

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- b. How can this experiment be improved? 1 mark

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**Question 5** (4 marks)

One student put forward the idea that exposure to sunlight affects the growth of tomato fruit.

- a.** Restate this idea as a hypothesis. 1 mark

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- b.** Design an experiment to test your hypothesis. 2 marks

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- c.** Give results for the experiment you designed in part **b.** that support your hypothesis from part **a.** 1 mark

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