



BIOLOGY VCE UNITS 3&4 DIAGNOSTIC TOPIC TESTS 2017

TEST 10: SCIENTIFIC METHOD

SUGGESTED SOLUTIONS AND MARKING SCHEME

SECTION A – MULTIPLE-CHOICE QUESTIONS

Question 1 B

The independent variable is changed. The dependent variable is measured.

Question 2 C

The scientific method follows the logical sequence of: ask questions, formulate a hypothesis, test the hypothesis, analyse results, draw conclusions, communicate results.

Question 3 A

The independent variable is the factor that is changed. The dependent variable is the factor that is measured. A controlled experiment is one that has a control group to ensure any changes in results is due to the independent variable.

Question 4 A

A controlled experiment is one that has a control group to ensure any changes in results is due to the independent variable.

Question 5 D

The independent variable is the factor which is being tested, in this case the temperature of incubation.

Question 6 C

The dependent variable is the factor being measured, in this case the gender of the baby turtles.

Question 7 A

Option A is the only answer that gives a gender of the offspring per temperature.

Question 8 B

Conclusions sum up the findings of an experiment and refer to the hypothesis.

Question 9 A

Any time you are sharing results, you are communicating your results to others.

Question 10 A

Beetles are very small organisms; as such the appropriate unit of measurement is grams.

Question 11 A

Although some beakers may be able to hold more than one litre, the appropriate measurement is millilitres. Grams are used to measure mass not volume.

Question 12 B

Graphs are used to compare data.

Question 13 A

A conclusion sums up the findings of the experiment and refers to the hypothesis.

Question 14 D

Plant group A did not receive any Charlie Carp fertiliser and so is the group the experimental groups B and C are compared with to see if the independent variable caused any change in the plant growth.

Question 15 B

Quadrilateral is a shape with four sides. Quadrennial is a period of four years. Quadrophonic is a 4-channel sound system.

Quantitative is to measure the quantity of something. Qualitative is to describe qualities.

SECTION B – SHORT-ANSWER QUESTIONS

Question 1 (6 marks)

- | | | |
|-----------|---|--------|
| a. | If the water has a higher concentration of salt, then the average mass of the marine worms will be reduced. | 1 mark |
| b. | concentration of salt in the salt water | 1 mark |
| c. | time of experiment of 12 hours
initial average mass of the worms at 300 mg | 1 mark |
| d. | no control setup | 1 mark |
| e. | The experiment used multiple worms in each salt water concentration. | 1 mark |
| f. | repeat the experiment and repeat using more concentrations of salt water | 1 mark |

Question 2 (8 marks)

- | | | |
|-----------|--|--------|
| a. | Identical portions of pure starch were used, measurements occurred every four minutes. | 1 mark |
| b. | temperature of incubation | 1 mark |

- c. enzyme activity 1 mark
- d. presence of starch and maltose at each time interval 1 mark
- e. 100°C 1 mark
- At this temperature, the enzyme has denatured changing the shape of its active site so it can no longer bind to the substrate to catalyse the reaction. 1 mark
- f. 40°C is the optimum temperature for the enzyme to be active. The further from this optimum temperature there is less enzyme activity. 1 mark
- g. The enzyme steadily increases the rate of reaction from 0°C to 40°C. 1 mark
- At 0°C the enzyme is showing some activity; this activity increases at 20°C and is further increased at 40°C.
- OR**
- Between 0°C and 40°C for each increase in temperature by 20°C, there is an increase in enzyme activity by four minutes. 1 mark

Question 3 (5 marks)

- a. the group of mice not exposed to the electromagnetic radiation 1 mark
- b. exposure to the electromagnetic radiation 1 mark
- c. mice that could push the piece of wood away 1 mark
- d. Electromagnetic radiation did not cause the mice to become 'super mice'. The hypothesis was not supported. 1 mark
- e. *Any one of:*
- repeat using far more mice in each group
 - repeat using more mice and greater exposure time with electromagnetic radiation
 - repeat using a better method of exposing mice to electromagnetic radiation
- 1 mark

Question 4 (2 marks)

- a. As Petri dish D had the least amount of bacterial growth it can be concluded the antibacterial soap used in this dish was the most effective in reducing the growth of *Staphylococcus albus*. 1 mark
- b. increase sample size by testing multiple agar plates of bacteria with the different antibacterial soaps 1 mark

Question 5 (4 marks)

- a. If tomatoes are exposed to more hours of sunlight, then more fruit will be produced. 1 mark

b. Experiment must identify:

independent variable: amount of hours of sunlight exposure

dependent variable: the amount of tomato fruit on the tomato plants

how the dependent variable is to be measured: counting how many fruit are present

control group: no exposure to sunlight

large sample size: at least 50 plants in each group

controlled factors:

- same species of tomato plants
- same growth media
- same size pots
- same amount of water

2 marks

c. results that support the hypothesis:

The tomato plants exposed to the most hours of sunlight had more fruit than tomato plants exposed to less hours of sunlight or no sunlight at all.

1 mark