**Planning an Investigation**

**For a test to accurately prove something, it must be a fair test! As in it must only have one thing you are looking at and everything else must be controlled and the same. Eg what soil makes plants grow better. Must control sunlight exposure and watering.**

**Identifying Variables**

A variable is any characteristic or factor which can take any one of a range of values. Scientific investigations often look at the effect of changing one variable on another. It is therefore important to identify all the variables in an investigation. These may be independent, dependent or controlled. In all fair tests, only one variable is changed by the investigator.

**Dependent variable**

Dependent variable

Independent variable

* Measured during the investigation.
* Recorded on the y axis of the graph

**Controlled variables**

* Factors that are kept the same or controlled.
* List these in method, as appropriate

 to your investigation.

**Independent variable**

* Set by the person carrying out the investigation (the variable which is changed).
* Recorded on the x axis of the graph.

**Case Study: Catalase Activity**

Catalase is an enzyme that converts hydrogen peroxide (H2O2) to oxygen and water. An experiment was set up to investigate the effect of temperature on the rate of the catalase reaction. Small (10 cm3) test tubes were used for the reactions, each containing 0.5 ml of enzyme and 4 ml of hydrogen. Reaction rates were assessed at four temperatures (10oC, 20oC, 30oC, and 60oC). For each temperature, there were two reaction tubes. The height of oxygen bubbles present after one minute of reaction was used as a measure of the reaction rate; a faster reaction rate produced more bubbles. The entire experiment, involving eight tubes, was repeated on two separate days.

*Draw the experimental design*

1. Write a suitable purpose/aim for this experiment: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. (a) Identify the independent variable: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(b) State the range of values for the independent variable: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(c) Name the unit for the independent variable: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(d) List the equipment needed to set the independent variable: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. (a) Identify the dependent variable: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(b) Name the unit for the dependent variable: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(c) List the equipment needed to measure the dependent variable: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Explain why it would have been desirable to have included an extra tube containing no enzyme: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. Identify three variables that might have been controlled in this experiment, and how they could have been monitored:
3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
5. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
6. What may have been the hypothesis for this experiment?

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1. If you were to complete this experiment, what general results would you expect?

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