

The Scientific Method

1) The following is a list of steps performed during a scientific inquiry. Place them in the correct order in the diagram below.

- | | |
|-----------------------------|--|
| 7 Analyze data | 3 Gather information |
| 8 Communicate your results | 1 Make observations and ask a question |
| 6 Compile and organize data | 5 Perform an investigation |
| 10 Draw conclusions | 4 Plan an investigation |
| 2 Formulate a hypothesis | 9 Pose new questions |

1. Make observations + ask question
2. Gather Information
3. Formulate a hypothesis
4. Plan an Investigation
5. Perform an Investigation
6. Compile + organize data
7. Analyze data
8. Draw conclusions
9. Communicate results
10. pose new questions

2) Consider the following and determine the aim of each of the experiments.

- a) One tank of gold fish is feed the normal amount which is once day, a second tank is feed twice a day, and a third tank four times a day during a six week study. The fish's body fat recorded daily.

To determine if the amount of body fat in a fish increases if it is fed more.

- b) The number of flowers on different breeds of bushes in a greenhouse is recorded every week for two months. The first group is given 20ml of water each day (which is normal). The second group is given 20ml of water and 1 gram of miracle grow each day. And the third group is given 20 ml of water and 2 grams of miracle grow each day.

To determine if the number of flowers on bushes will be affected by miracle-grow plant food.

- c) Three redwood trees are kept at different humidity levels inside a greenhouse for 12 weeks. One tree is left outside in normal conditions. Height of the tree is measured once a week.

To determine if humidity affects tree growth.

3) Consider the following observations and give a hypothesis for each. Use either the word because or use the if/then method of writing a hypothesis.

- a) Leaves on maple trees turn red in the fall.

If the temperature decreases, then the leaves of maple trees turn red.

- b) William seems to become more hyper after he has eaten candy.

If William eats candy, then he becomes more hyper.

- c) Carrots grown in sandy soil grow longer than those grown in clay soil.

If carrots are grown in sandy soil, then they will become longer than if they are grown in clay soil.

4) Why is it important to include quantities and sizes in your list of materials?

→ more precise

→ reader can duplicate experiment

5) List 3 important items to look out for when writing out a procedure.

→ clear, logical steps

→ start with verb (present tense)

→ use diagrams when necessary

→ repeat experiment (↑ reliability)

6) Match the following terms with their definitions.

<u>Variable</u>	<u>Definition</u>
<u>c</u> Independent (experimental) variable	a) kept constant during experiment
<u>b</u> Dependent variable	b) affected by the changes/ what is Measured during experiment
<u>a</u> Control variables	c) changed during the experiment

7) Discuss the importance of conducting simple controlled experiments.

↑ validity of results
- 1 variable is changed only so any changes are due to that variable
- people will believe you!

8) Differentiate between qualitative and quantitative measurements. Give an example of each.

qualitative : observations using senses (ex. colour)
quantitative : observations using numbers (ex. mass)

9) Sec. 5 students in biology class conducted an experiment to determine the effects of

Wal-Mart brand plant food on houseplants. They hypothesised that plants that would be given plant food would grow better because they would have extra nutrients.

Six African violets located in the same class were used. They were divided into 2 groups: Group A and Group B. Each plant received 10 hours of light per day, 10mL of water per week, and were maintained at 20° C for a period of 30 days. Once every five days, Group A received 1 gram of Wal-Mart brand plant food dissolved in that day's water supply. Group B did not receive any plant food throughout the experiment.

a) What is the experimental variable?

plant food

b) What is the control group?

Group B (no plant food)

c) List 3 control variables.

type of plant
amount of water
temp. of air
amount of light
same class
same size pots

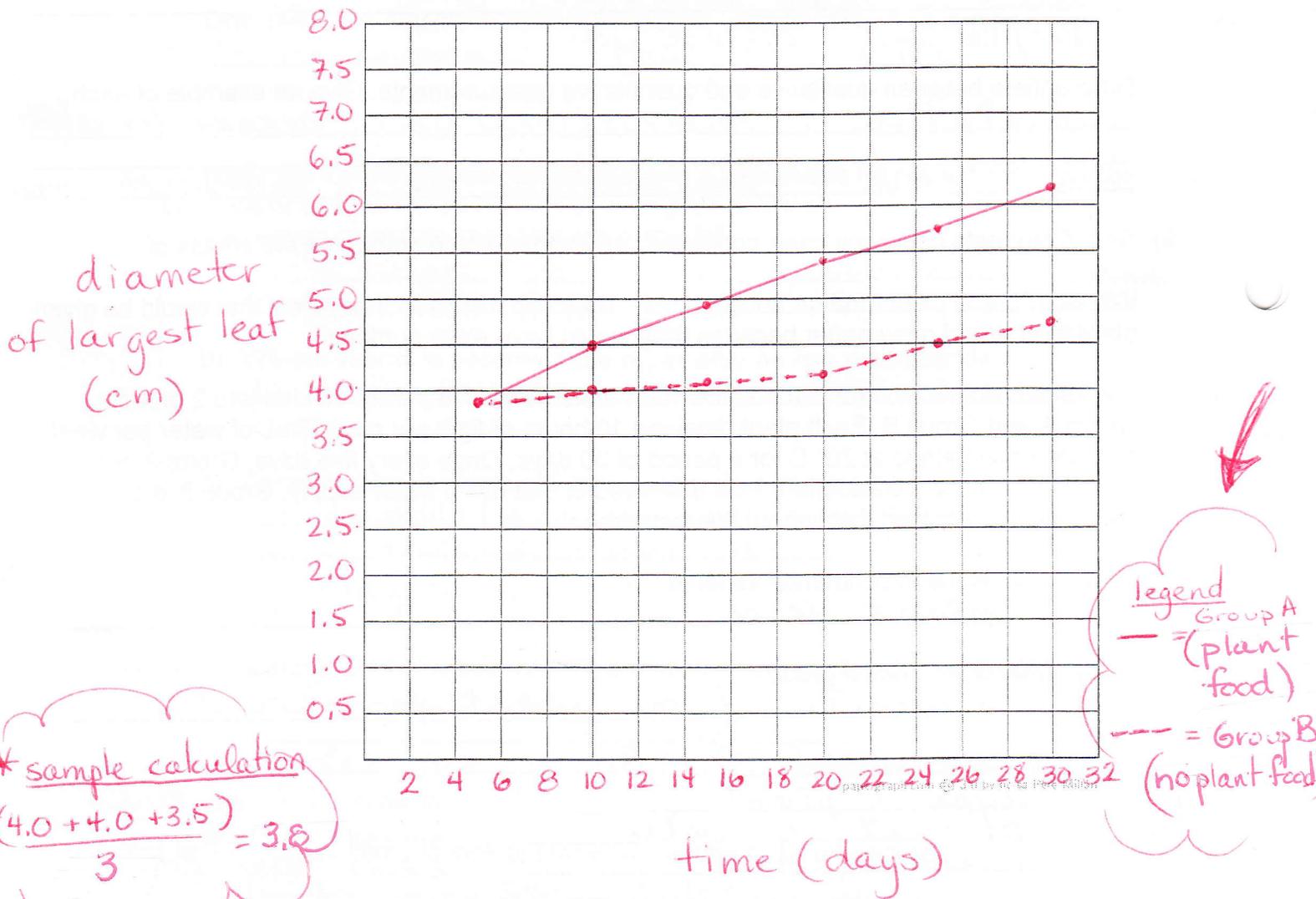
d) How could the experimental procedure have been improved? List 3 ways.

◦ ↑ # samples (6 vs 600)
◦ ↑ # conditions (ex vary amount of food 0g, 1g, 2g, 3g)
◦ # hours light (change to mimic nature/your house)
◦ try again with other types of plants

e) The table below represents the data collected during the experiment. Use this data to construct a graph.

plant	diameter of largest leaf (cm)					
	Day 5	Day 10	Day 15	Day 20	Day 25	Day 30
A- #1	4.0	4.5	5.0	5.5	5.7	6.2
A- #2	4.0	4.8	5.2	5.8	6.2	6.6
A- #3	3.5	4.1	4.4	4.8	5.3	5.8
B- #1	3.5	3.6	3.6	3.8	4.1	4.3
B- #2	4.0	4.2	4.3	4.4	4.6	4.8
B- #3	3.8	4.1	4.3	4.5	4.7	5.1

Growth of African Violet Leaves



f) Do the results support or refute their hypothesis? Justify your answer.

Support the leaves of plants fed the plant food are bigger than those that are not given plant food

ex. $3.8 \rightarrow 6.2 = 2.4\text{cm} \uparrow$
 vs. $3.8 \rightarrow 4.7 = 0.9\text{cm} \uparrow$