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ADVANCED BIOLOGY Summer Assignment

Instructions. Please read the following outline detailing good scientific practices. This should be a review from middle school. If you have any questions, please utilize the internet or the library. You will also have the opportunity to see me for extra help during the 1st week of school. Review this outline first, then complete the following worksheets for practice.

SCIENTIFIC METHOD

1. Ask a **QUESTION** based on an **OBSERVATION**

- *Ms. Biology comes home from vacation and realizes that her plants are dead. She asks herself, “Why did my plants die?”*

2. Draw an **INFERENCE**

- *Ms. Biology looks around her apartment and sees that she closed the curtains of all of her windows. She infers that the lack of light had something to do with the death of her plants.*

3. Based on your inference, create a **TESTABLE HYPOTHESIS**

- *Amount of light affects plant height (which indicates the health of the plant)*

4. Make a **PREDICTION** based on your inference (If...then...because...)

- *If the amount of light is greater, **then** plant height will be greater **because** plants need light to grow.*
- *As the amount of light **increases**, plant height should also **increase** **because** plants need light to grow.*

5. Design an **EXPERIMENT** (could be done in a laboratory setting or in the field)

- Identify **variables**
 - **Independent Variables**
 - *Amount of light*
 - **Dependent Variables**
 - *Plant height*
 - **Constant Variables (make sure the experiment is **controlled**)**
 - *Amount of water*
 - *Amount of fertilizer*
 - *Location*
 - *Amount of soil*
 - *Type of soil*
 - *Type of planter*
 - *Size of planter*

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- Make sure the experiment is **viable**
 - **Experimental Group(s)**
 - *Plants with varying amounts of light*
 - **Control Group**
 - *Plant with NO light*

6. COLLECT DATA

- **Qualitative Data**
 - Expresses qualities
 - *E.g. colors, behaviors, feelings, etc. (These do not apply to Ms. Bawa's Plant Scenario)*
- **Quantitative Data** (always in **METRIC SYSTEM UNITS**)
 - Expresses quantities (numbers)
 - *E.g. 5 heartbeats, 20 centimeters, 45 occurrences*
 - *Ms. Biology will record Plant Height in centimeters for her experiment.*

7. REPRESENT AND ANALYZE DATA

- **Data Representation**
 - **Data Table**
 - Include a descriptive head title and proper subtitles with units in parentheses
 - **Graph**
 - Line graph (scatter plot with connected lines)*
 - For data where there are **varying degrees of the independent variable** (tends to be for **quantitative** data)
 - *E.g. time, amount of water, amount of fertilizer, etc.*
 - *In Ms. Biology's Plant Scenario, the independent variable is **light intensity**, so she would make a line graph.*
 - Bar or column graph
 - For data where the independent variable is split up into **categories**
 - *E.g. colors, feelings, behaviors, etc.* (tends to be for **qualitative** data)

Always include **BOTH** a data table **AND** a graph

- **Data Analysis**
 - Identify **trends** in data table or graph
 - Statistical Analyses
 - *E.g. mean, mode, median, range*

8. Draw **CONCLUSIONS** and **REPORT** findings in a research paper (lab report)

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IDENTIFYING VARIABLES

For the following problems, please identify the proper variables: Independent (IV), Dependent (DV), Control (CV), and Constants.

1. Different rose bushes are grown in a greenhouse for two months. The number of flowers on each bush is counted at the end of the experiment.
 - IV: _____
 - DV: _____
 - CV: _____
 - Constants: _____

2. You water three sunflower plants with salt water. Each plant receives a different concentration of salt solutions. A fourth plant receives pure water. After a 2-week period, the height is measured.
 - IV: _____
 - DV: _____
 - CV: _____
 - Constants: _____

3. 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.
 - IV: _____
 - DV: _____
 - CV: _____
 - Constants: _____

4. Pea plant clones are giving different amounts of water for a three-week period. The first pea plant receives 400 milliliters (mL) a day. The second pea plant receives 200 mL a day. The third pea plant receives 100 mL a day. The fourth pea plant does not receive any extra water; the plant only receives natural ways of receiving water. The height of pea plants is recorded daily.
 - IV: _____
 - DV: _____
 - CV: _____
 - Constants: _____

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5. One tank of gold fish is fed the normal amount of food once a day, a second tank is fed twice a day, and a third tank four times a day during a six week study. The fish's weight is recorded daily.

- IV: _____
- DV: _____
- CV: _____
- Constants: _____

6. You decide to clean the bathroom. You notice that the shower is covered in a strange green slime. You decide to try to get rid of this slime by adding lemon juice. You spray half of the shower with lemon juice and spray the other half of the shower with water. After 3 days of spraying equal amounts 3 times a day, there is no change in the appearance of the green slime on either side of the shower.

- IV: _____
- DV: _____
- CV: _____
- Constants: _____

7. Jason wanted to find out what fertilizer worked best for growing marigolds. He put Miracle Grow on one, Scott's fertilizer on one, and no fertilizer on another.

- IV: _____
- DV: _____
- CV: _____
- Constants: _____

8. You want to test which size of soccer (football) ball is easiest to juggle with your feet. You test a size 3, size 4 and a size 5 ball. You count the seconds the ball stays in the air for each of the trials. You allow yourself to use both of your feet, knees, and head to juggle the ball.

- IV: _____
- DV: _____
- CV: _____
- Constants: _____

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GRAPHING PRACTICE

Scenario: **Diabetes** is a disease affecting the insulin producing glands of the **pancreas**. If there is not enough insulin being produced by these cells, the amount of **glucose in the blood** will remain high. A blood glucose level **above 140** for an extended period of time is not considered normal. This disease, if not brought under control, can lead to severe complications and even death.

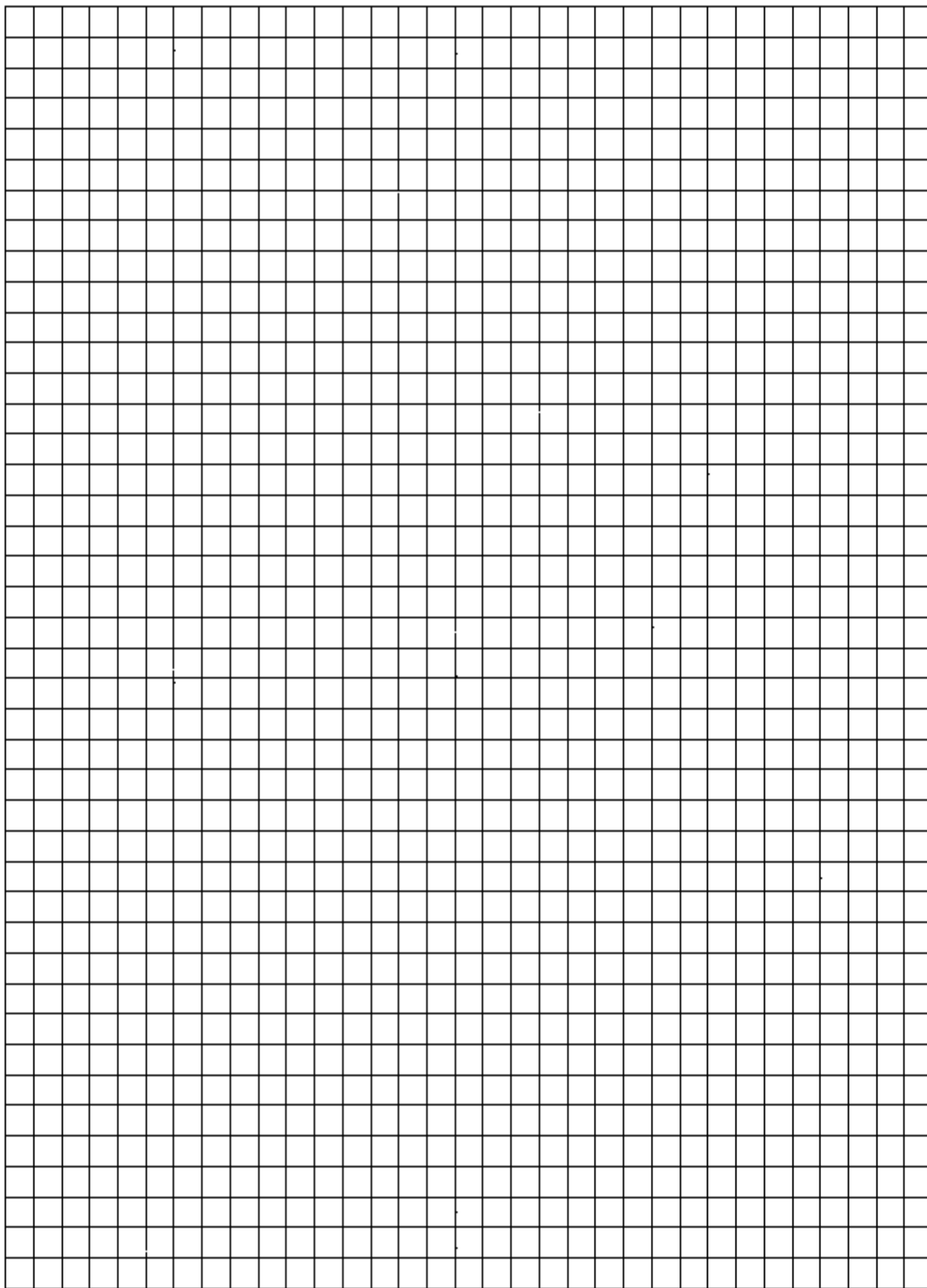
Answer the following questions concerning the data below and then graph it.

Time After Eating hours	Glucose mg /dL of Blood Person A	Glucose mg /dL of Blood Person B
0.5	170	180
1	155	195
1.5	140	230
2	135	245
2.5	140	235
3	135	225
4	130	200

1. What is the dependent variable and why?
2. What is the independent variable and why?
3. What title would you give the graph?
4. Which, if any, of the above individuals (A or B) has diabetes?
5. What data do you have to support your hypothesis?
6. If the time period were extended to 6 hours, what would the expected blood glucose level for Person B?

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GRAPHING PRACTICE

Scenario: Forest rangers from a small community in Maine have reported seeing strange patterns in fox and rabbit populations, and they are very worried that these two populations will disappear from this area. The rangers have been tagging, counting, and recording the fox and rabbit populations for the last 2 years. The data is represented in the table below.

Answer the following questions concerning the data below and then graph it. You may even want to use your graph to answer some of the questions.

Time (months)	Rabbit Population	Fox Population
0	143	12
3	98	43
6	17	35
9	11	24
12	35	9
15	101	29
18	136	39
21	84	44
24	33	27

1. Of the two types of data that can be collected, which type is represented in the data table and why?
2. What is the dependent variable and why?
3. What is the independent variable and why?
4. What seems to be happening to the two populations? Write an appropriate hypothesis.
5. What data do you have to support your hypothesis? Be specific.
6. Do the rangers need to be worried about the populations of the rabbits and foxes? Explain why or why not. Be as specific as possible and justify your answer.

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