Name: _____
Date: _____ Class Period: _____

THE SCIENTIFIC METHOD:
NOT JUST FOR SCIENTISTS!

What Is Science?

- A _____ through which _____ is _____, _____, and _____.
- All areas of _____ involve posing _____ (questions) about _____.

Processes of Science

- _____
- _____
- _____
- _____
- _____
- _____
- _____
- _____

Terms and Definitions

- _____ -- The most probable _____ based on the best available _____.
  - Example:
- _____ -- _____ or _____ that can be _____ repeatedly
  - Example:
- _____ -- A _____ drawn on the basis of _____
  - Example:
- _____ -- An _____ guess – a _____ statement
  - Example:
- _____ -- A general statement that _____ or explains a wide variety of _____
  - Example:
- _____ -- A _____ that is _____ based on _____
  - Example:

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Scientific Method

1. _____ - something is considered a _____ if its _____ is not _____. Some crucial information is missing. Solving the problem involves finding this _____.
2. _____-- the more you know about the problem the more _____ you can state the problem and the less time you will waste looking for _____.
3. _____ :
    a. Use what you know about the problem to predict a _____ and try it.
    b. Look for _____ that will help you make predictions about the problem.
    c. Make a _____, or a representation, of what you're working with.
    d. Break the _____ down into smaller, simpler problems.
4. _____ -- design an _____ that will provide a means for you to make a solid conclusion about your _____
5. _____ -- a solid conclusion is related to the hypothesis and based on the results of a well designed experiment.

Experimental Design Concepts

- A science experiment is designed so that only ___ variable is being tested at a time.
- A _____ is something that is changed to study how this change effects the thing being studied.
- By changing only one variable, when you make your _____ you can be assured that it is only that one variable that is causing the _____.
- _____ (IV) - the variable that is purposely _____ by the experimenter.
- _____ (DV) - the variable that responds and is the variable _____.
- _____ (C) - all factors that are kept the _____ during the experiment.
- _____ - the standard to compare the experimental effect against.
- _____ - the _____ of objects/organisms undergoing treatment for each value of the independent variable, or the number of _____ the experiment is repeated.

Name: _____
Date: _____ Class Period: _____

Independent Variable: The thing that you are testing (ex: different amounts of fertilizer)
Treatment: The individual things you are testing listed out (ex: 5 mg fertilizer, 10 mg fertilizer, 15 mg fertilizer, none)
Dependent Variable: What you are measuring as a response (ex: plant height)
Constants: Things that are the same throughout the whole experiment (ex: light exposure, water received, type of seed, soil, containers, growing environment, etc.)
Control: The variable that is not being altered so that you can compare the results against it (ex: One tray does not receive any fertilizer so you can compare what naturally happened to how adding fertilizer makes it different.
Trials: How many times you ran each test (ex: 30 seeds)

The following scenarios will give you practice in identifying the experimental design components:

SCENARIO ONE: The effect of fertilizer on plants.

DESCRIPTION: John's biology class was studying various ways to recycle materials, including the use of compost as fertilizer. Members of John's class are investigating the effectiveness of various recycled materials in promoting plant growth. John and three members of his lab group decided to compare the effect of compost and commercial fertilizer on plant growth. Three flats of bean plants (25 plants per flat) were grown for five days. The plants were then fertilized as follows: Flat A received 10g of commercial fertilizer; Flat B received 10g of aged compost; and Flat C received no fertilizer. The plants received the same amount of sunlight and water each day. At the end of 20 days, the students recorded the height of the plants in centimeters.

IV:				
Treatment:				
Trials:				
DV:				
Constants:				

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SCENARIO TWO: The effectiveness of various metals in preventing rust of iron.

DESCRIPTION: Several weeks after Allen conducted a classroom experiment on the effectiveness of various metals in releasing hydrochloric acid, he read that the gas company was burying sheets of magnesium next to iron pipelines in order to prevent rusting. Allen wondered if other active metals would also be effective in preventing rust. To investigate, he placed each of the following into separate test tubes containing water: one iron nail; one iron nail wrapped with an aluminum strip; one iron nail wrapped with a magnesium strip; and one iron nail wrapped with a lead strip. He used the same amounts of water from the same source, equal amounts (mass) of the metal wraps, and the same type of iron nails. At the end of five days, he described the amount of rusting as small, moderate, or large. He also recorded the color of the water.

IV:				
Treatment:				
Trials:				
DV:				
Constants:				

SCENARIO THREE: The effect of perfume on the behavior of bees.

DESCRIPTION: JoAnna read that certain perfume esters would cause bees to leave the hive and act in an agitated fashion. She decided to investigate the response of bees to four different perfumes-designated A, B, C, and D. She placed a saucer containing 25mL of perfume "A" 10m from a beehive. She then recorded the total number of bees that emerged from the hive during a 15-minute interval and made observations on their behavior. Using a 30-minute interval between tests to allow recovery time for the bees, she then repeated the procedure to test the remaining three samples. Each test was conducted on the same day with similar weather conditions (humidity, temperature, and wind were the same).

IV:				
Treatment:				
Trials:				
DV:				
Constants:				