Unit 0: Review of Chemistry Concepts

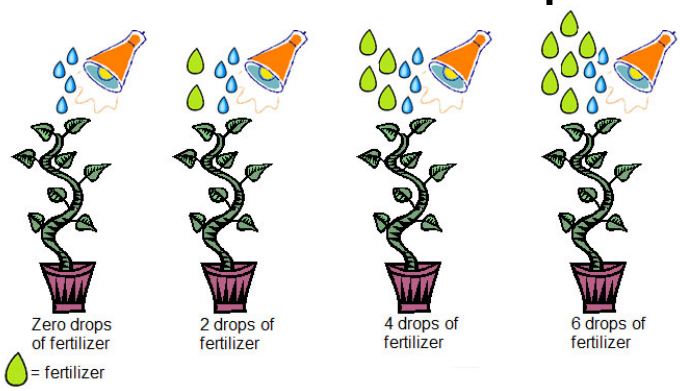
Topic 1: The Scientific Method

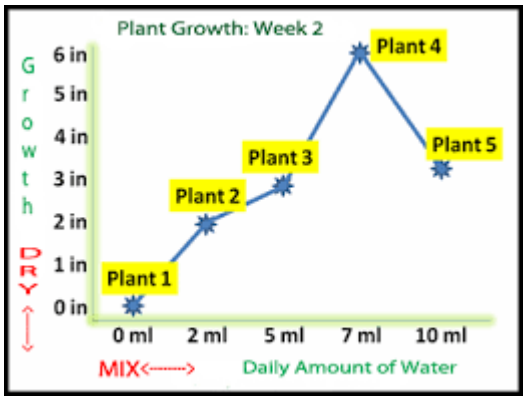
Scientific Method: a procedure that involves a series of steps that are used to investigate a natural occurrence.

1. Observation/Research: Make observations and research the topic of interest.
2. Problem/Question: Develop a question or problem that can be solved through experimentation.
3. Hypothesis: Predict a possible answer to the problem. It is typically written in an If...then.. statement.
4. Design an Experiment: Develop and follow a procedure, including a detailed materials list. The outcome must be measurable.
5. Collect and Analyze Results: Modify the procedures if needed. Confirm the results by retesting. Include tables, graphs, and photographs.
6. Conclusion: Include a statement that accepts or rejects your hypothesis. Make recommendations for future study and possible improvements.
7. Communicate the Results: Be prepared to present the project to an audience.

Parts of an Experiment

1. Control Group: This group is left alone and not experimented on.
2. Experimental Group: This group shows the effect of the variable being tested.
3. Dependent Variable: The variable that gets measured.
4. Independent Variable: The variable that is changed.
5. Constants: Variables that are kept constant throughout the experiment.





To graph your results remember:
D= Dependent Variable is the
R= Responding Variable and it goes on the
Y= Y-Axis

M= Manipulated Variable is the
I= Independent Variable and it goes on the
X= X-Axis

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Topic 1: The Scientific Method

Practice

Directions: Read the following scenarios below and identify the independent variable, dependent variable, constants, and control group.

Scenario 1: Mr. Smith wanted to see if the color of light shined on a plant had an effect on the number of leaves it had. He gathered two groups of the same species of plants, gave them the same amount of water, and did the test for the same amount of time. On one group of plants he used white light and on the second group he changed the light color to red.

Independent Variable: _____

Dependent Variable: _____

Constants: _____

Control Group: _____

Scenario 2: A shopping mall wanted to determine whether the more expensive "Tough Stuff" floor wax was better than the cheaper "Steel Seal" floor wax at protecting floor tiles against scratches. One liter of each brand of floor wax was applied to test sections of the main hall of the mall. The test sections were all the same size and were covered with the same kind of tiles. After 3 weeks the number of scratches in each of the test sections was counted to observe the wax's effectiveness.

Independent Variable: _____

Dependent Variable: _____

Constants: _____

Control Group: _____

Scenario 3: In an experiment, yeast cells were used to test the effectiveness of the enzyme catalase at various temperatures. Catalase is found within cells to break down hydrogen peroxide. The scientist wanted to determine the optimum temperature for the functioning of this enzyme. The yeasts were placed in hydrogen peroxide solutions that had been heated to varying temperatures. An experimental apparatus was used that detected the number of oxygen bubbles produced as the hydrogen peroxide decomposed.

Independent Variable: _____

Dependent Variable: _____

Constants: _____

Control Group: _____

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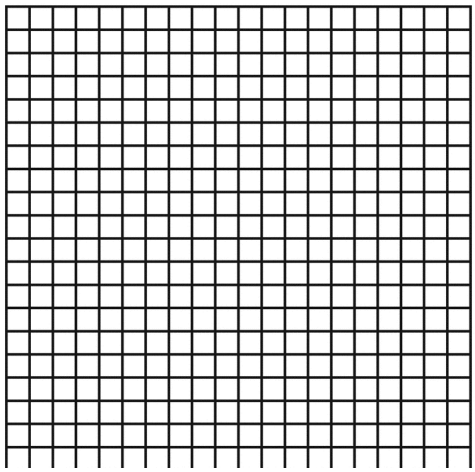
Topic 1: The Scientific Method
Practice

Directions: Use the provided data to create the correct type of graph. Make sure you place your independent and dependent variables correctly.

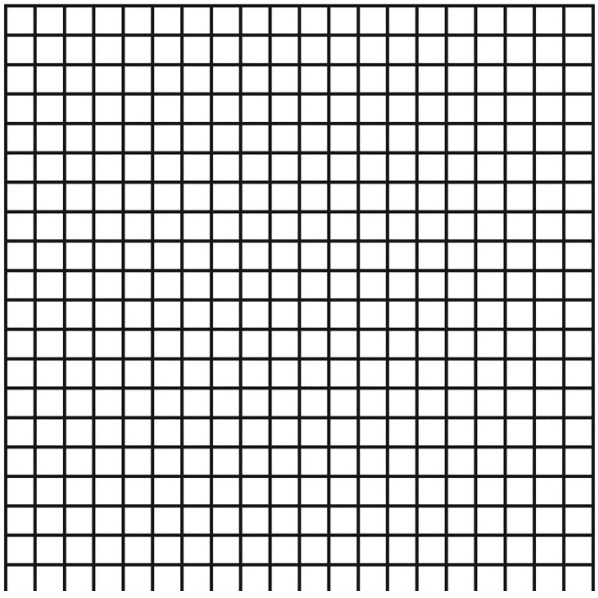
1. This is the data from scenario 3. Create a line graph using this data. Be sure to label your axes.

Temperature (°C)	Number of Bubbles
0	0
10	2
20	6
30	15
40	6
50	3
60	1
70	0



2. Use this data to create a triple line graph. Be sure to label your axes and provide a legend to represent each type of plant.

Plants Tested (Number of blossoms)	0% solution of fertilizer	5% solution of fertilizer	10% solution of fertilizer	20% solution of fertilizer	30% solution of fertilizer
Roses	5	8	16	28	20
Daisies	3	5	8	13	18
Gladiolas	8	29	26	15	3



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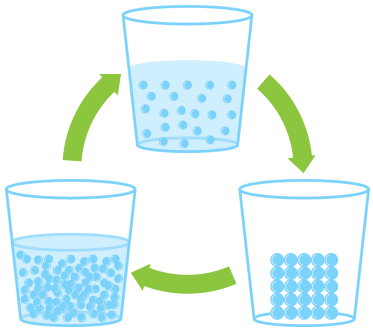
Topic 2: Classification and Properties of Matter

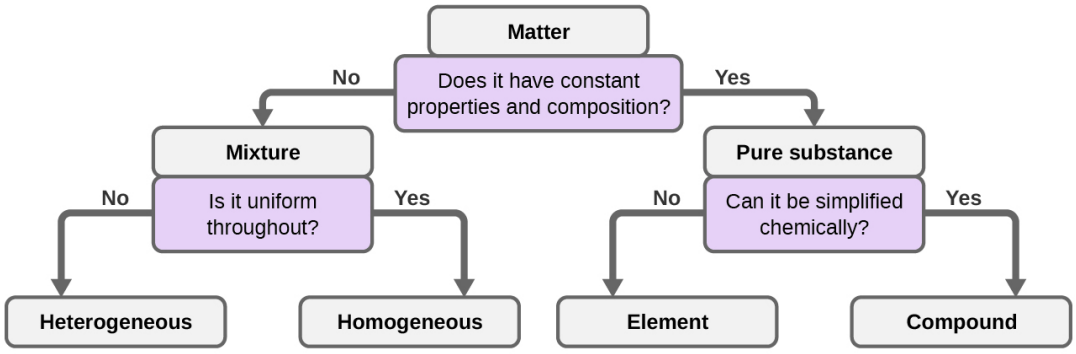
Vocabulary:

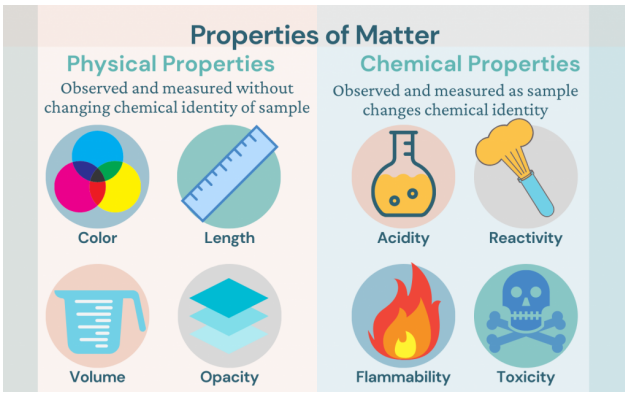
Solid: A substance with definite shape, definite volume, tightly packed particles that vibrate in fixed positions.

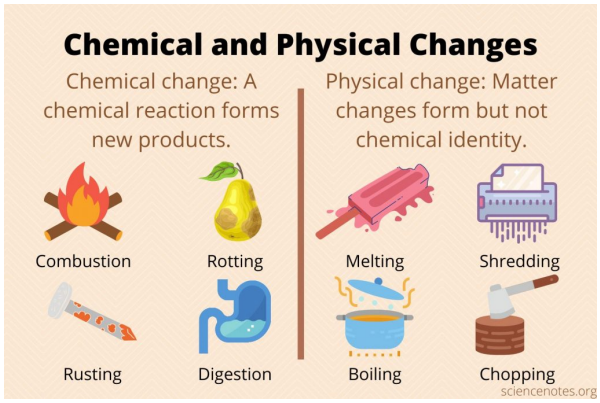
Liquid: A substance with indefinite shape (it takes the shape of the container it is put in), definite volume, and particles that slide around each other.

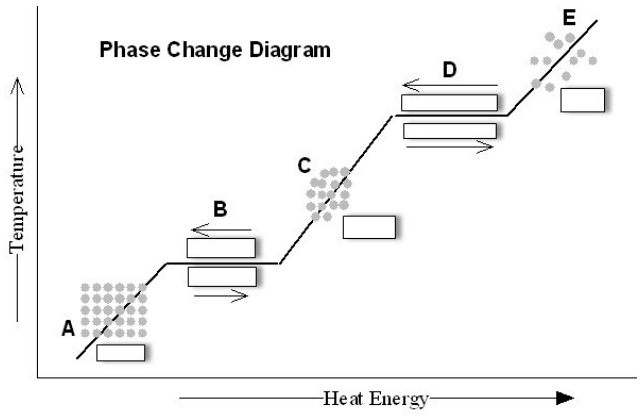
Gas: A substance with indefinite shape, indefinite volume (particles spread out to fill the space), and particles that freely move around the container they are in.











Evidence of a chemical change:

Country- Color Change

Girls- Gas production

Like- Light production

To- Temperature change

Party- Precipitate forms

Outside- Oxidation

IMPORTANT!

The bond that forms within a compound is an intramolecular force. The forces that exist between two separate compounds are intermolecular forces (IMFs). These IMFs are what is 'broken' during a phase change.

Unit 0: Review of Chemistry Concepts

Topic 2: Classification and Properties of Matter
Practice

Directions: Identify the following as either an **element**, **compound**, **homogenous**, or **heterogenous** mixture.

1. Mint chocolate chip ice-cream: _____
2. Oxygen: _____
3. Pepperoni Pizza: _____
4. Milk: _____
5. Salt (NaCl): _____
6. Water (H_2O): _____
7. Hydrogen: _____
8. Pile of leaves: _____
9. Lemonade: _____
10. Sodium bicarbonate (baking soda): _____

Directions: Identify the following as either a **physical property** or **chemical property.**

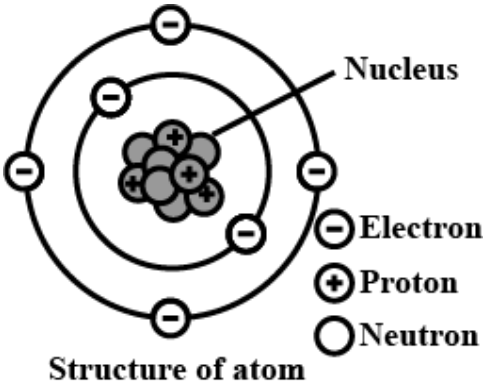
1. A substance boils at 100°C: _____
2. When introduced to a spark, a substance burst into flames: _____
3. Zinc reacts with acid to produce hydrogen gas: _____
4. Diamond will scratch glass, chalk, and most metals: _____
5. Iron rusts in the presence of oxygen: _____
6. Metals have a high luster (shininess): _____
7. Gold has a density of 19.3 g/mL: _____
8. Paper is combustible: _____
9. The copper wire was 1.22 m long: _____
10. Hydrogen peroxide decomposes when exposed to light: _____

Directions: Identify the following as either a **physical change or chemical change.**

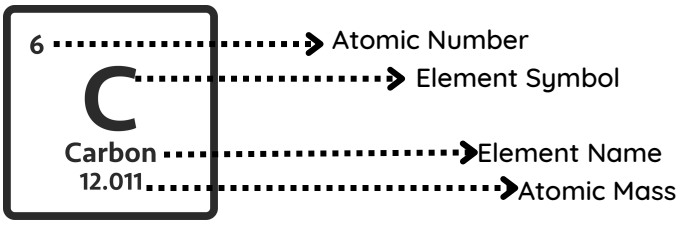
1. Water is absorbed by a paper towel: _____
2. Potassium chlorate decomposes and forms oxygen gas: _____
3. Water is heated and changed to steam: _____
4. A pellet of sodium is sliced in two: _____
5. Iron rusts: _____
6. Water condenses on the side of a cold glass: _____
7. Milk sours and goes bad: _____
8. A cake is baked for a birthday party: _____
9. Food is digested in the stomach: _____
10. A piece of glass shatters: _____

Unit 0: Review of Chemistry Concepts

Topic 3: Structure of the Atom and the Periodic Table



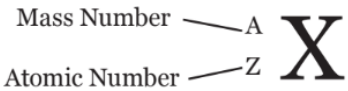
Structure of atom



Nuclear Symbol of an Element:

Mass Number= # of Protons + # of Neutrons in one atom of an element.

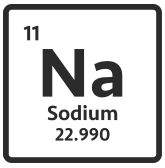
Atomic Number= # of Protons (also equal to # of electrons in a neutral atom)



How to calculate the number of subatomic particles:

Practice

Atomic Number =
Protons =
Electrons



Mass Number -
Atomic Number =
Neutrons

P= _____ N= _____ E= _____

P= _____ N= _____ E= _____

P= _____ N= _____ E= _____

IONS and ISOTOPES

Ions are elements that have a charge due to gaining or losing electrons.

- Cations: Positively charged ion from losing electrons.
- Anions: Negatively charged ion from gaining electrons.

Isotopes are elements that have a different atomic mass due to gaining or losing neutrons. This does not change the type of element or give it a charge.

Isotopes

Protons: 3
Neutrons: 3

Protons: 3
Neutrons: 4

Protons: 3
Neutrons: 5

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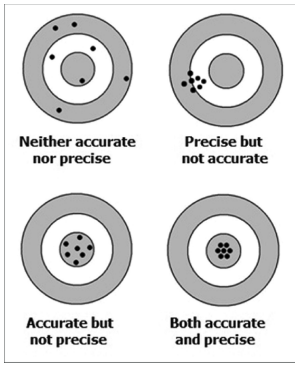
Topic 4: Accuracy, Precision, and Significant Figures



Vocabulary:

Accuracy: a measure of how close a measurement comes to the actual or true value of what is measured.

Precision: a measure of how close a series of measurements are to one another (repeated same value)

Percent Error formula: useful tool that used to determine the precision of your data or calculations.

$$\% \text{ error} = \left| \frac{\#\text{experimental} - \#\text{actual}}{\#\text{actual}} \right| \times 100$$

SIGNIFICANT FIGURES

Definition: each of the digits of a number that are used to express it to the required degree of accuracy.

- For Example: A scale that measures to one decimal place (ex: 9.2 g) cannot be read as 9.1889 because it is limited to the number of sig figs it can determine.

Rules for determining sig figs

1. All numbers 1-9 are significant. These are referred to as non-zero digits.
2. **Leading zeros** are never significant. Ex.: **0.000**125 only has 3 sig figs
3. **Captive zeros** are always significant. Ex.: 2,1**0**5 has 4 sig figs
4. **Trailing zeros** are only significant if there is a decimal present.
   Ex.: 12,5**00** has 3 sig figs 12.5**00** has 5 sig figs 0.02**00** has 3 sig figs

Rules for calculating with significant figures

When **multiplying or dividing**, the answer has the same number of sig figs as the value with the fewest sig figs.

Ex.: 1,205 x 1.6 = 1,928 Fewest sig figs = 2 Round answer to 2 sig figs = 1,900

When **adding or subtracting** the decimal places should be rounded to the same number of decimal places as the measurement with the fewest number of decimal places.

Ex.: 22.457 + 1.23 + 2.5671 = 26.2541 Number with fewest decimal places = 1.23

Round answer to 2 decimal places= 26.25

0.750 = _____ 18.2 X 1.998 = _____

1000.01 = _____ 34.66 + 333.0 = _____

0.0080050 = _____ 10.2/1.34 = _____

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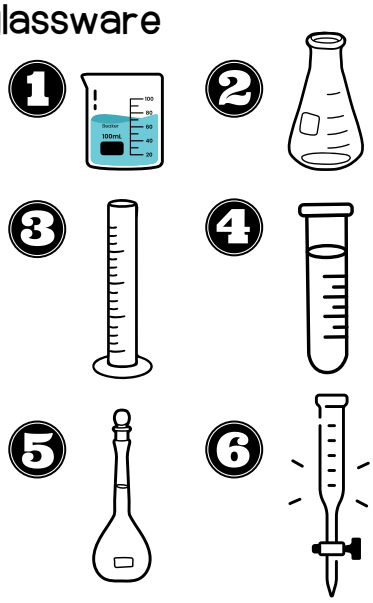
Topic 5: Reading and understanding science glassware

1. Beaker: Can be glass or plastic; common sizes are 50 mL, 100 mL, 250 mL, and 400 mL; glass beakers may be heated. Not to be used to measure out specific volumes of solution.
2. Erlenmeyer flask: glass; common sizes are 100 mL, 250 mL, and 500 mL; may be heated and used in titrations.
3. Graduated Cylinder: glass or plastic; common sizes are 10 mL, 50 mL, and 100 mL; used to measure approximate volumes; must not be heated.
4. Test Tube: can be glass or plastic; come in small, medium and large sizes; glass test tubes may be heated.
5. Volumetric Flask: glass; common sizes are 25 mL, 50 mL, 100 mL, and 250 mL; carefully calibrated to a specific volume and marked with a graduation.
6. Buret: glass; common sizes are 25 mL and 50 mL; used to measure volumes of solutions in titrations



Reading glassware:

When reading glassware or thermometer make sure you read from eye level. Read from the bottom of the meniscus (the curve of the liquid). The degree of accuracy is unique to each piece of graduated glassware. You may read the direct measurement using the markings, and then estimate one additional significant figure. The estimate is typically a 0 or 5.