

Matter and Measurement Activities: Chemistry is the science that deals with the study of matter, its properties and the changes that matter undergoes. The following series of activities will help ensure that you understand the general concepts of matter and measurement. Please do each activity. *Show all of your work in your composition book,* and be sure to show proper units and significant digits.

Activity 1: *Classifying Matter*

Classify at least 12 of the following substances to the best of your ability. Or give an example of each substance in the appropriate section of your flowchart (provided) and tape this into your composition book.

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Activity 2: *Intensive and Extensive Properties*

Intensive Properties: do *not* depend on (vary with) the amount of the matter present.

Extensive Properties: do depend on (vary with) the amount of matter present.

Classify the following properties of matter as **intensive** or **extensive**. Make a Table in your composition book, where 1 column lists the intensive properties and the other lists extensive properties.

- a. Color (i. depth and ii. tone)
- b. Mass - A measurement of the amount of matter in a object (grams).
- c. Odor
- d. Length
- e. Density - The mass of a substance divided by its volume.
- f. Luster - How shiny a substance is.
- g. Weight - A measurement of the gravitational force acting on an object.
- h. Malleability - The ability of a substance to be beaten into thin sheets.
- i. Ductility - The ability of a substance to be drawn into thin wires.
- j. Conductivity
- k. Volume
- l. Hardness
- m. Melting/Freezing Point
- n. Boiling Point

Activity 3: Physical and Chemical Changes

Physical Changes: Changes in matter that *do not* alter the identity of the matter itself.

Chemical Changes: Changes in matter that *do* alter the identity of the matter itself.

Classify the following changes of matter as **Physical** or **Chemical**. *Make a Table in your composition book, where 1 column lists the physical changes and the other lists chemical changes. Write the phrases or keywords, not just the letters!*

- a. You cut your hair
- b. Mixing sugar and water
- c. Making a peanut, pretzel and cereal mixture
- d. Baking soda reacts with vinegar and forms a gas
- e. A piece of metal is bent in half
- f. Methanol is burned and leaves a residue
- g. An aspirin is crushed into fine powder
- h. Copper turns green when exposed to the environment
- i. Two clear liquids are mixed and a yellow color forms
- j. Baking cookies
- k. Diamonds are used to scratch glass
- l. A tree burns to form ashes
- m. A piece of paper is crumpled up
- n. Water freezes to form ice
- o. A candle burns
- p. A candle melts
- q. Leaves change colors in the fall
- s. A car rusts
- t. A pencil is sharpened
- u. A cup of water evaporates

Activity 4: Measurement and Significant Digits

Use the given glassware, balance or ruler to measure the following:

- a. The width of a computer (keyboard) key (in mm): _____
- b. The mass of a (new) #2 pencil (in g) _____

- c. The volume of a #2 rubber stopper (in mL)_____

Activity 5: Calculations and Conversions Involving Significant Digits

- a. Determine the density of a piece of copper metal (Cu) (in g/cm³).
- Convert this density into lbs/ft³, showing your calculations and units (**1 in = 2.54 cm, 1 lb = 454 g**)
 - Calculate a **%-error** by comparing your experimental density value to the accepted value on your periodic table.

$$\% \text{ error} = \frac{|\text{your result} - \text{accepted value}|}{\text{accepted value}} * 100 \%$$

- b. Determine the area (in cm²) of the yellow triangle, the red rectangle and the green square. Convert this area into in², showing your calculations and units (**1 in = 2.54 cm**)

Activity 6: Separation Techniques

Determine the separation technique that would most effectively separate the following mixtures. Match the technique (**I through IV**) to the letter(s) that describe each mixture (**a through f**).

I Chromatography

II (Vacuum) Filtration

III Distillation

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- a) sugar dissolved in water
b) crude oil into different fuels
c) sand/silt from water
d) iron powder from carbon powder

IV Magnetism

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e) inks used in a black dye

f) caffeine from coffee

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