

The background features a color gradient from red at the top to blue at the bottom. Overlaid on this are various scientific diagrams, including circular gauges with numerical scales (e.g., 40, 150, 160, 170, 180, 190, 200, 210, 220, 240, 250, 260) and arrows, and circular patterns with dashed lines and arrows, suggesting a technical or scientific theme.

IS JEWELRY BEING TARNISHED A PHYSICAL OR CHEMICAL CHANGE?

PLEASE ANSWER THIS QUESTION ON A SCRAP PIECE OF PAPER TO THE BEST OF YOUR KNOWLEDGE. PLEASE PUT YOUR NAME ON THIS PAPER AND TURN IT INTO THE BASKET.

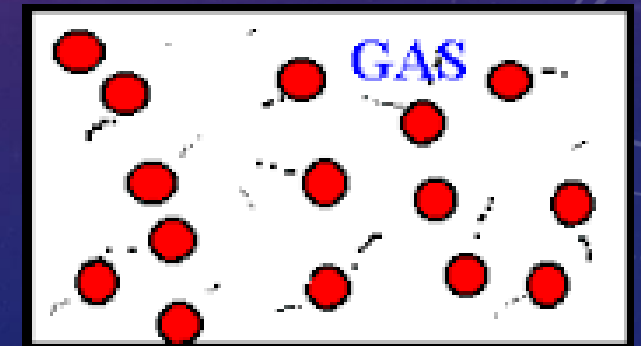
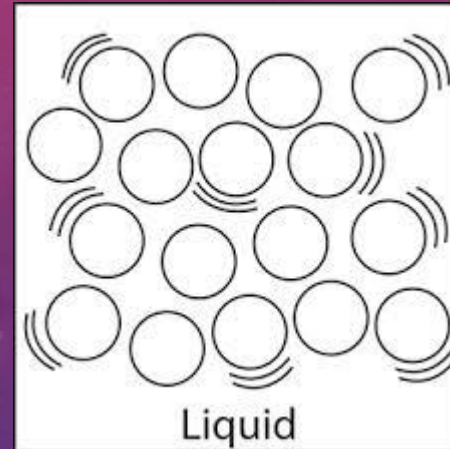
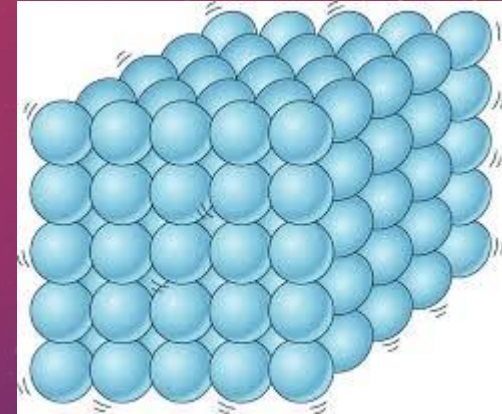
PROPERTIES OF MATTER

REFERENCE CHAPTERS: 1.3, 2.1, 2.3

- States of Matter
- Physical Properties and Changes
- Chemical Properties and Changes
- Break for pre-assessment
- The Scientific Method
 - Independent, Dependent and Control Variables
 - Qualitative and Quantitative Observations

STATES OF MATTER

- Solid
 - Definite shape and volume
 - The particles are packed closely together in a rigid arrangement.
- Liquid
 - Indefinite shape and definite volume
 - The particles are close together, but they are free to flow past one another.
- Gas
 - Indefinite shape and indefinite volume
 - The particles are relatively far apart and can move freely.



PHYSICAL PROPERTY

- When you discuss properties of a substance that define a quality or condition of a substance that can be observed or measured without changing the substance's composition it is called a Physical Property.

More examples of physical properties



Thermal conductivity- the rate at which a substance transfers heat.



State- is the physical form in which a substance exists such as solid, liquid, gas.

Density- the mass per unit volume of a substance



Solubility- the ability of a substance to dissolve in another substance



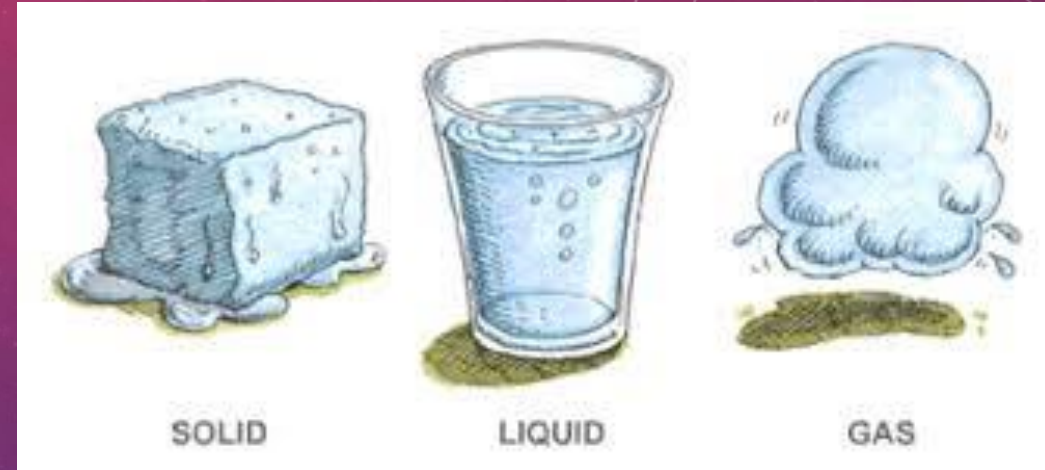
Ductility- the ability of a substance to be pulled into a wire



Malleability- ability of a substance to be rolled or pounded into thin sheets

PHYSICAL CHANGE

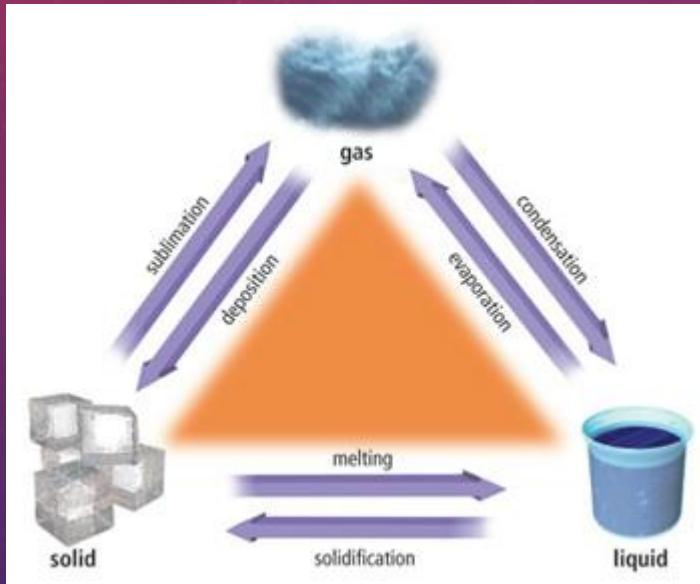
- Matter can change.
- What changes can you observe about the water in the picture to the right?
- When a change occurs to matter that does not change the composition of the matter it is called a Physical Change.



PHYSICAL CHANGE

PHYSICAL CHANGES CAN BE CLASSIFIED AS REVERSIBLE OR IRREVERSIBLE.

Reversible



Irreversible



CHEMICAL PROPERTY



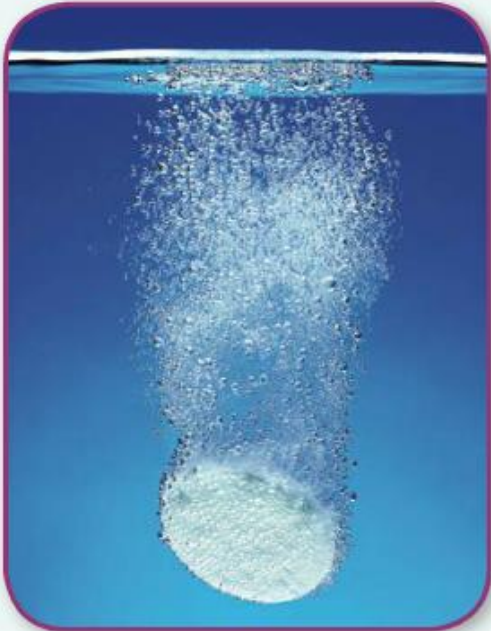
- The ability of a substance to undergo a chemical change is called a chemical property.
- Words such as burn, rot, rust, decompose, ferment, explode and corrode usually signify a chemical change.
- During a chemical change, the composition of the matter **always** changes.



GROUP DISCUSSION

- What are the four major indicators of a chemical change?
 - Change in color
 - Production of a gas
 - Formation of a precipitate
 - Transfer of energy

INDICATORS OF CHEMICAL CHANGE



Production of a Gas

Bubbles of carbon dioxide gas form when an antacid tablet is dropped into a glass of water.



Color Change

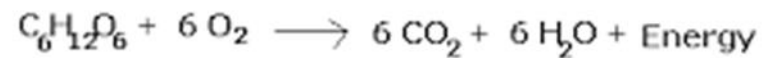
When a test strip is dipped in a solution, the color change is used to determine the pH of the solution.



Formation of a Precipitate

One step in the production of cheese is a reaction that causes milk to separate into solid curds and liquid whey.

Cellular Respiration



DESIGN YOUR OWN EXPERIMENT

PROMPT: You are investigating the effects of increasing numbers of sodium chloride (NaCl) particles on the boiling point of dihydrogen monoxide (H₂O).

THINGS TO DO:

- Write a research question
- Write a hypothesis
- Determine the independent and dependent variables and levels
- State the control variable and constants in the experiment
- Determine whether you are making quantitative or qualitative observations
- Design a step-by-step procedure which explains how to do the experiment

THE SCIENTIFIC METHOD

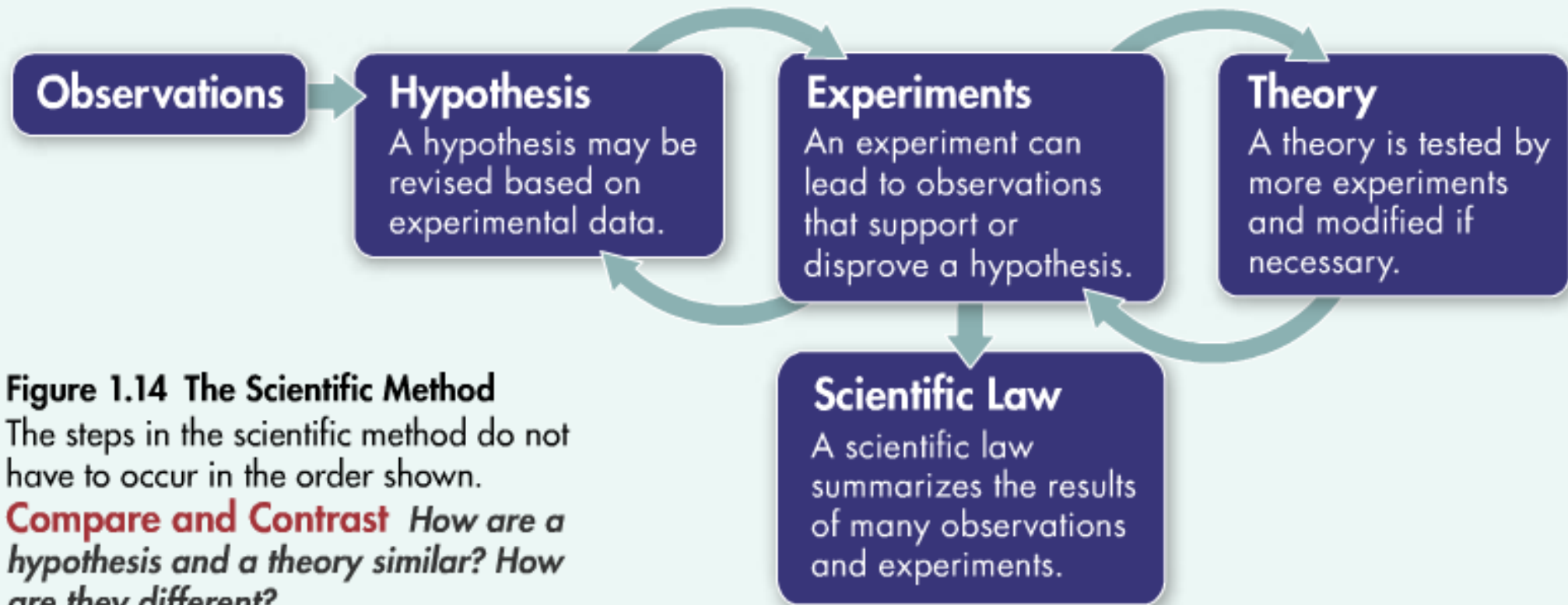


Figure 1.14 The Scientific Method

The steps in the scientific method do not have to occur in the order shown.

Compare and Contrast *How are a hypothesis and a theory similar? How are they different?*

RESEARCH QUESTIONS

- Qualities:
 - Asks a question worth asking
 - The question is not trivial
 - Sharply focused
 - Arguments can be supported with obtainable evidence

GOOD OR BAD?

- 1. How do different salts affect the freezing point of water?
 - Not particularly focused
- 2. How does the concentration of caffeine affect the rate of decomposition of hydrogen peroxide in liver in the presence of paracetamol?
 - Good example
- 3. Investigating an aspect of the rate of the reaction between magnesium and hydrochloric acid.
 - Not a question, not specific
- 4. How effective is boric acid as a flame retardant for the brush fences commonly used around houses in Victoria, Australia?
 - Good example

INDEPENDENT, DEPENDENT AND CONTROL VARIABLES

- Independent variable is the variable that you change during an experiment
 - Also called the manipulated variable
- Dependent variable is the variable that is observed during the experiment
 - Also called the responding variable
- Control variable is the variable that remains constant and unchanged during the experiment

EXAMPLE

- The time it takes to run a mile depends on the person's running speed.
 - Independent variable
 - Person's running speed
 - Dependent variable
 - Time it takes to complete the mile

EXAMPLE

- Does the number of times you dip a wand into bubbles affect the number of bubbles made?
 - Independent Variable
 - Number of times the wand is dipped into the bubbles
 - Dependent Variable
 - How many bubbles are made

EXAMPLE



Homer notices that his shower is covered in a strange green slime. His friend Barney tells him that coconut juice will get rid of the green slime. Homer decides to check this out by spraying half of the shower with coconut juice. He sprays the other half of the shower with water. After 3 days of “treatment” there is no change in the appearance of the green slime on either side of the shower.

Identify the:

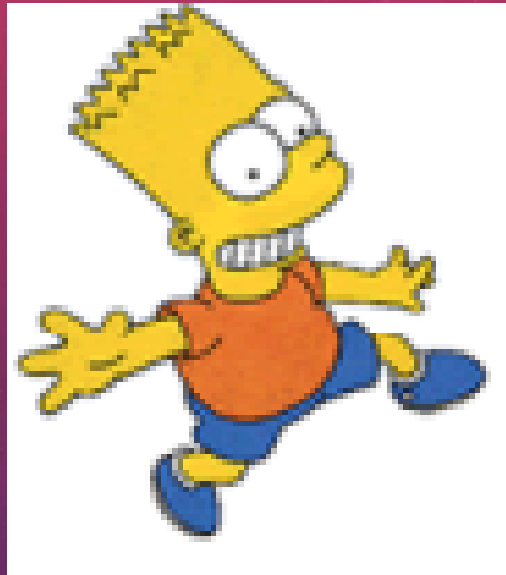
Control Group –

Independent Variable –

Dependent Variable –

What should Homer’s conclusion be? –

EXAMPLE



Bart believes that mice exposed to microwaves will become extra strong. He decides to perform this experiment by placing 10 mice in a microwave for 10 seconds. He compared these 10 mice to another 10 mice that had not been exposed. His test consisted of a heavy block of wood that blocked the mouse food. He found that 8 out of 10 of the microwaved mice were able to push the block away and 7 out of 10 of the non-microwaved mice were able to do the same.

Identify the:

Control Group –

Independent Variable –

Dependent Variable –

What should Bart's conclusion be? –

How could Bart's experiment be improved? –

QUALITATIVE VS. QUANTITATIVE OBSERVATIONS

- Quantitative Observations:
 - Observations describing results that are measurable
 - Examples: weight, length, temperature
- Qualitative Observations:
 - Observations describing the quality of a thing without expressing numerical values
 - Examples: shape, color, physical appearance

BOILING POINT LAB NEXT CLASS!!

- In order to participate in lab...
 - Turn in your signed safety contract
 - Be dressed appropriately for lab
 - Have your completed pre-lab at the start of class