



Module 1

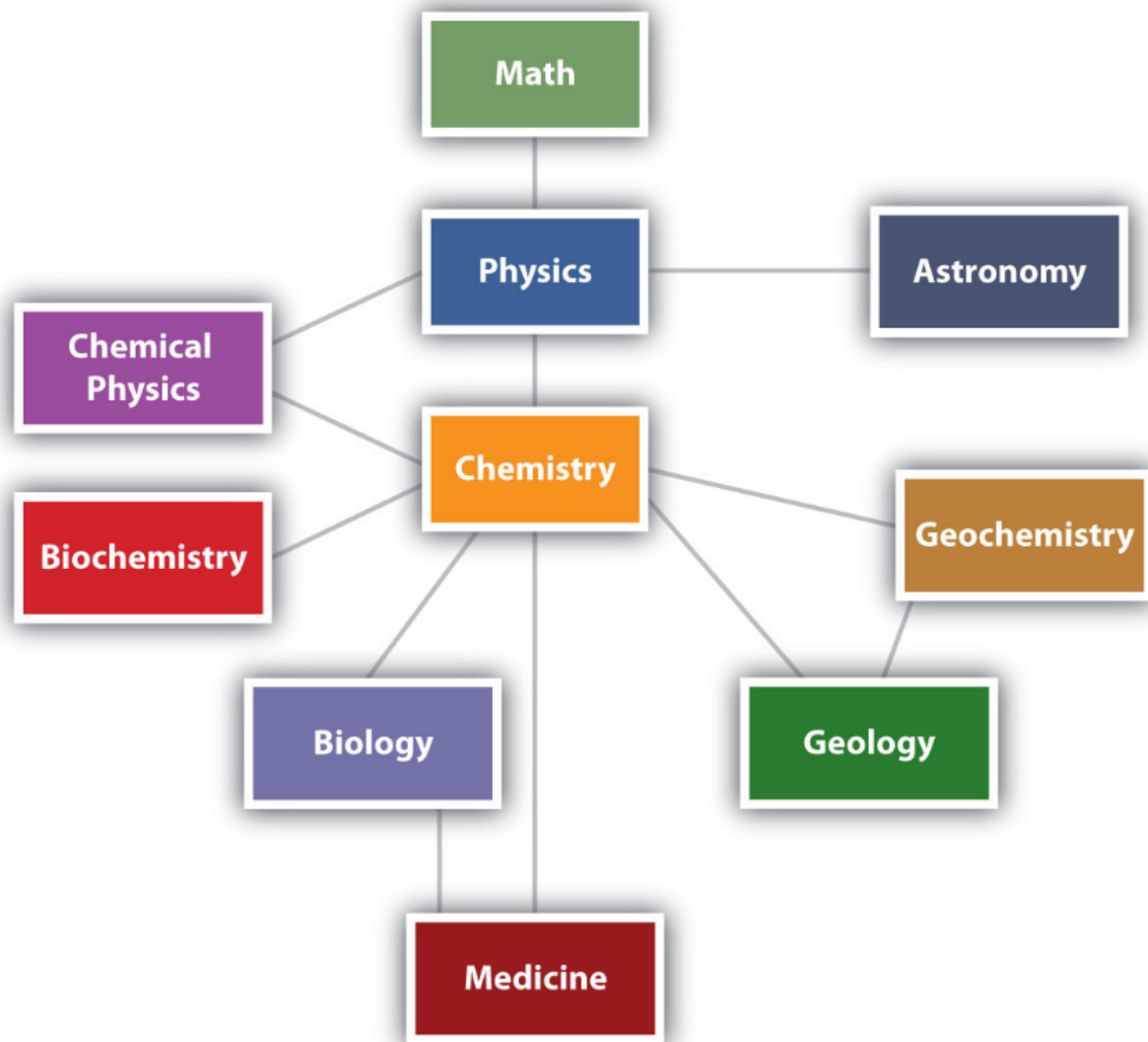
Brad Ashburn, PhD
BIOC 141

What is Chemistry? (Section 1.1)

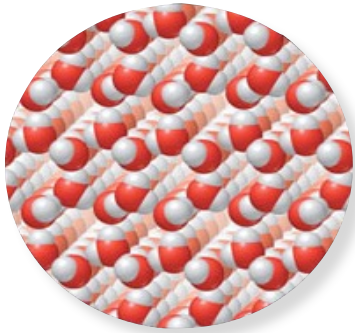


Chemistry is the study of the composition, properties and transformations of **matter**.

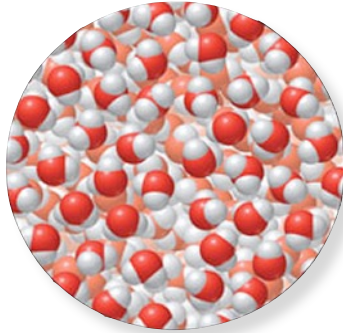
Chemistry is the Central Science



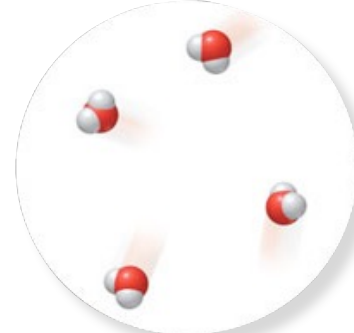
Classification of Matter (Section 1.2)



solid

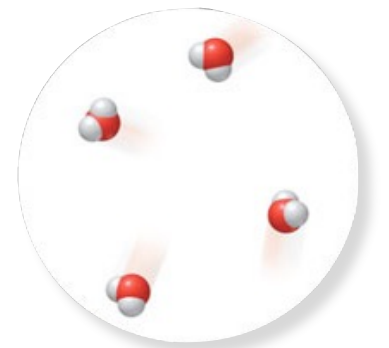
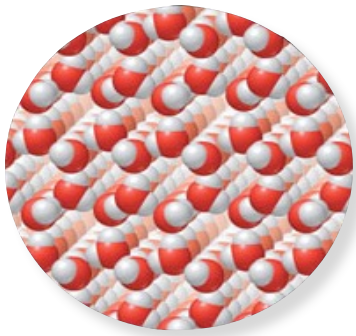
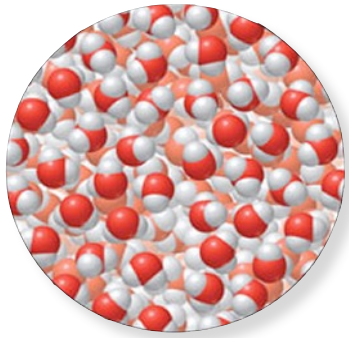


liquid



gas

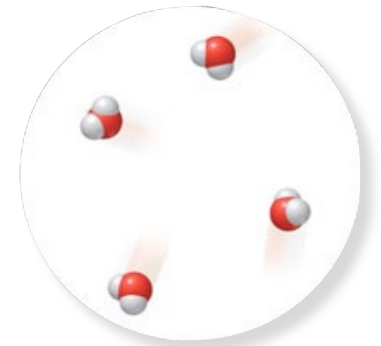
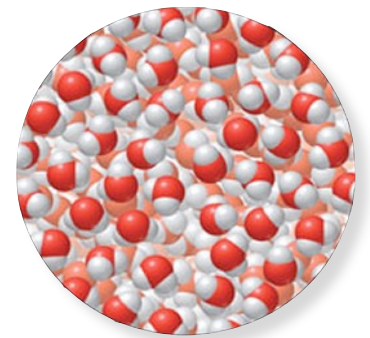
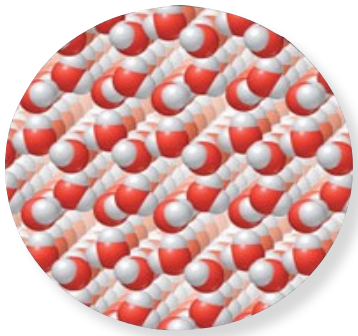
Volume



Definite

Indefinite

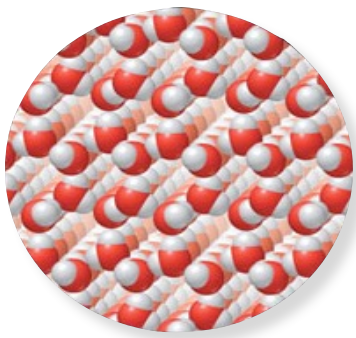
Shape



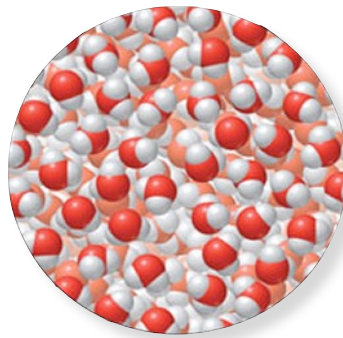
Definite

Indefinite

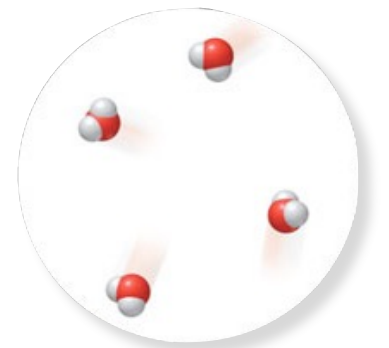
Particle Distance



Very Close

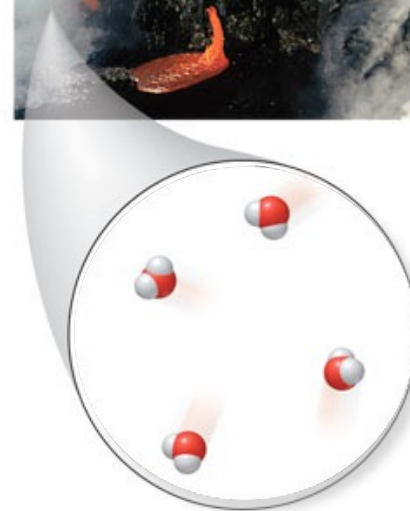
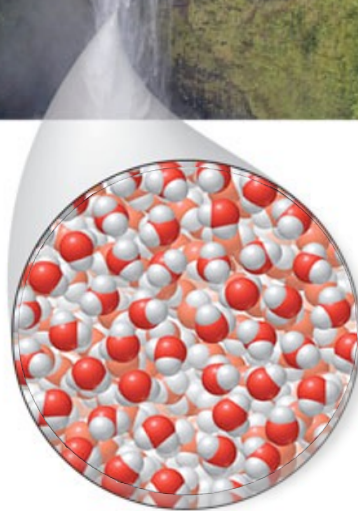
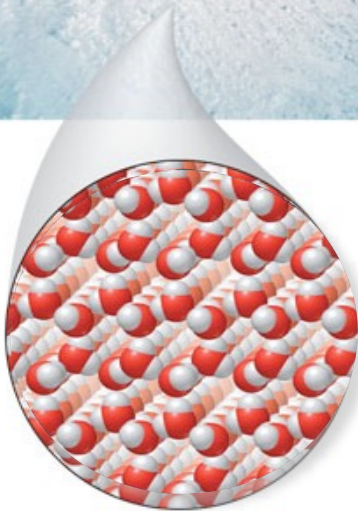
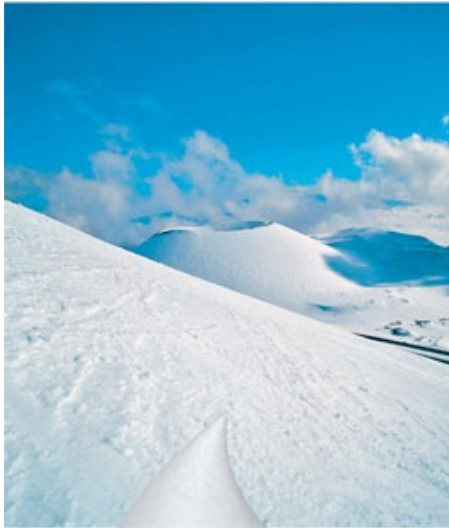


Close



Far Far Away

States of Matter



Physical properties can be observed or measured without changing the composition.



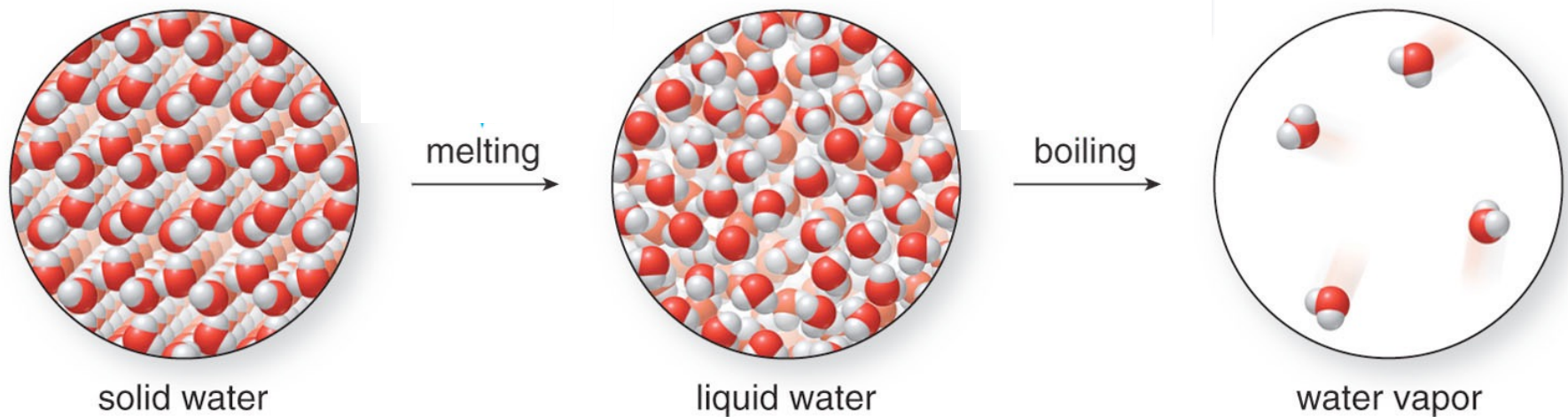
Physical Properties

The Element Copper

State at 25 °C	Solid
Color	Orange-red
Odor	Odorless
Melting Point	1083 °C
Boiling Point	2567 °C
Luster	Shiny
Conduction of Electricity	Excellent
Conduction of Heat	Excellent



Physical Change



Physical change alters material without changing its composition.

Physical Change



Water boils to form water vapor.

Sugar dissolves in water to form a solution.

Copper is drawn into thin copper wires.

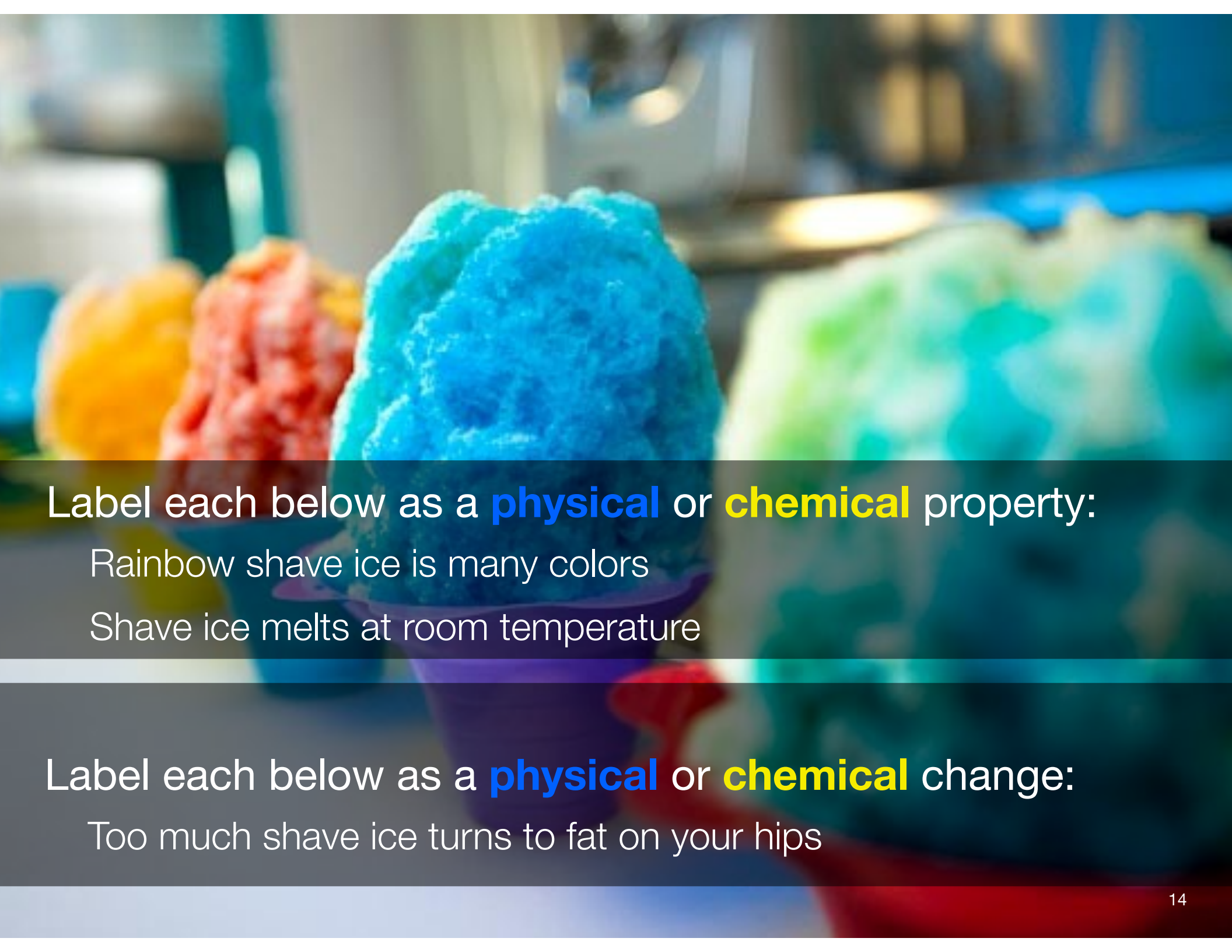
Paper is cut into tiny pieces of confetti.

Pepper is ground into flakes.



Chemical properties describe reactivity.

Chemical change converts one substance into another.

A close-up photograph of a cup of rainbow shave ice. The ice is shaved into fine, fluffy particles and is topped with various colored syrups, including blue, red, orange, and green. The background is blurred, showing what appears to be a food stand or stall.

Label each below as a **physical** or **chemical** property:

Rainbow shave ice is many colors

Shave ice melts at room temperature

Label each below as a **physical** or **chemical** change:

Too much shave ice turns to fat on your hips

Classification of Matter

Pure substance

Composed of a single component

Constant composition

Mixture

Composed of multiple components

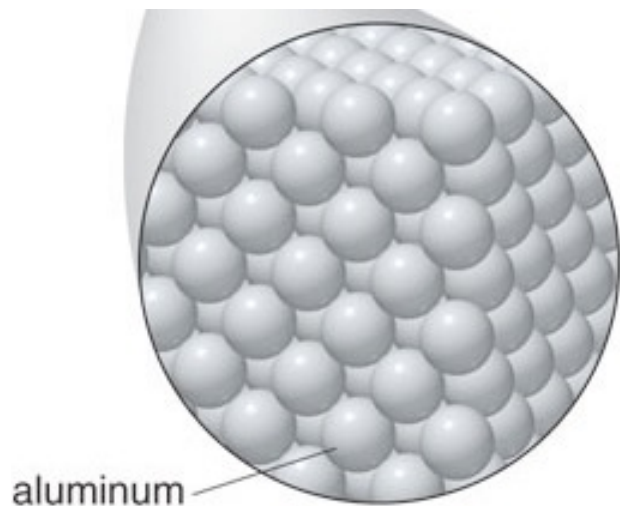
Variable composition



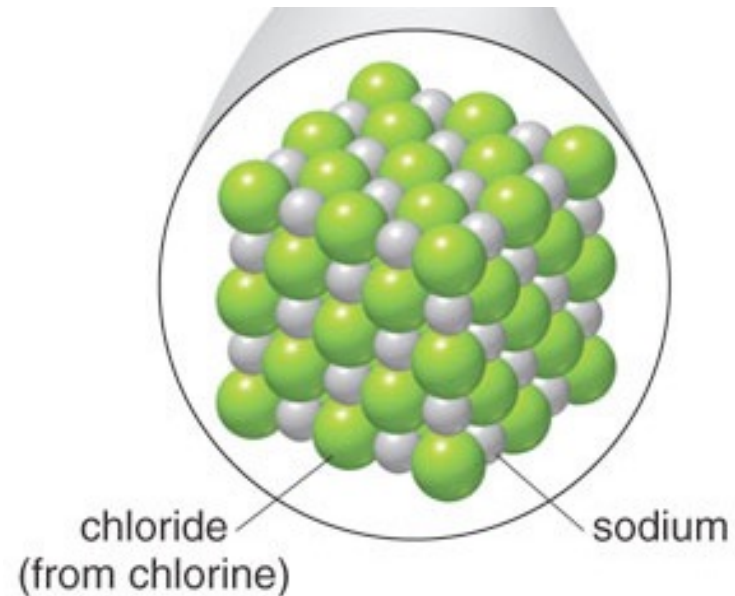
Pure Substances (two types)

An **element** is the most basic building block of matter.

A **compound** is a pure substance containing different elements.



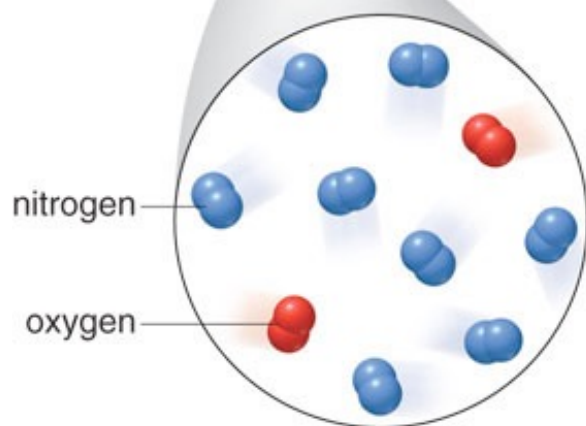
element



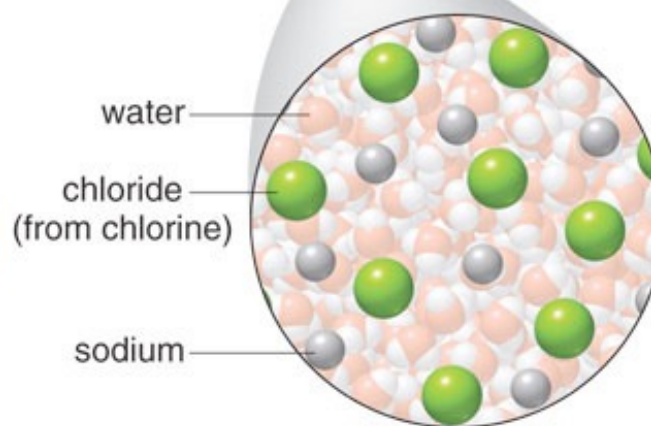
compound

Mixtures

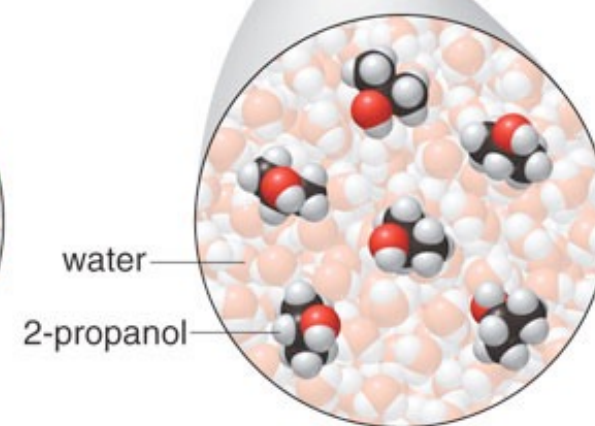
a. Two gases



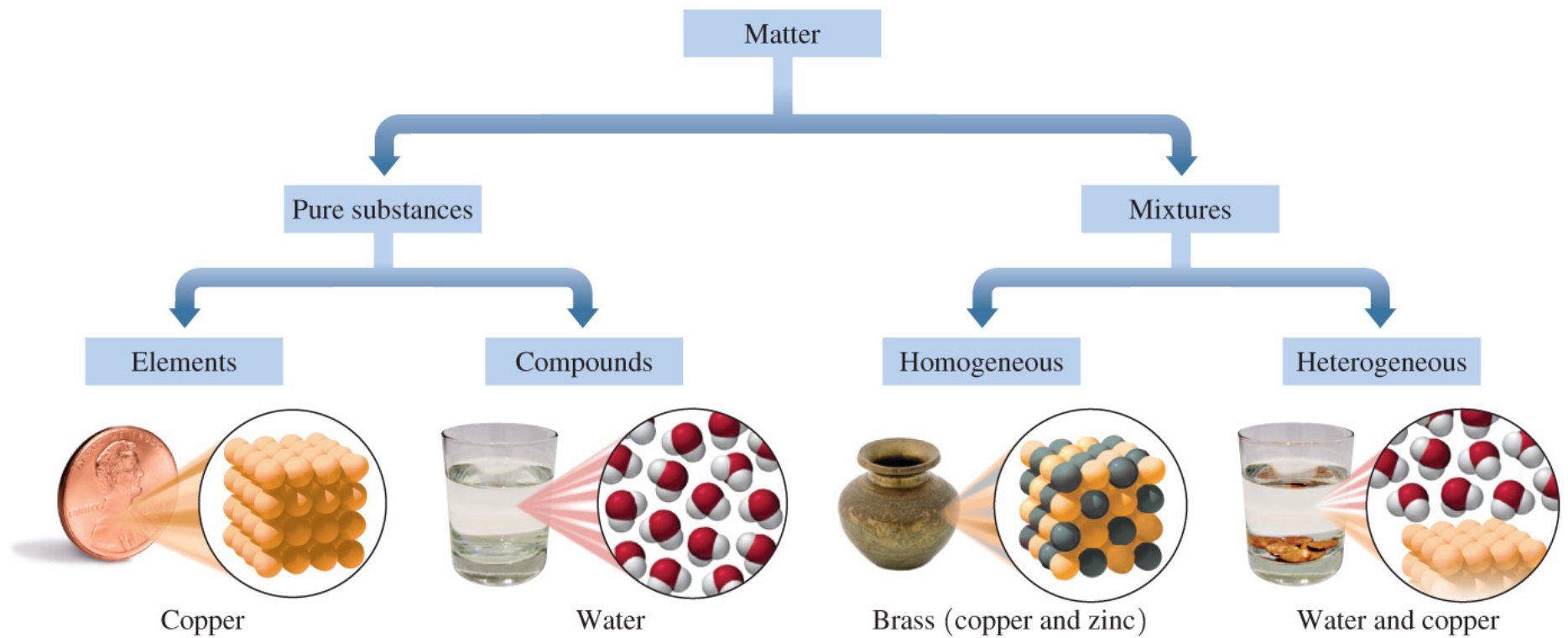
b. A solid and a liquid



c. Two liquids



Classification of Matter



Concept Check

Classify each as either a homogenous mixture, heterogenous mixture, element, or compound.

Oxygen (O_2)

Saltwater

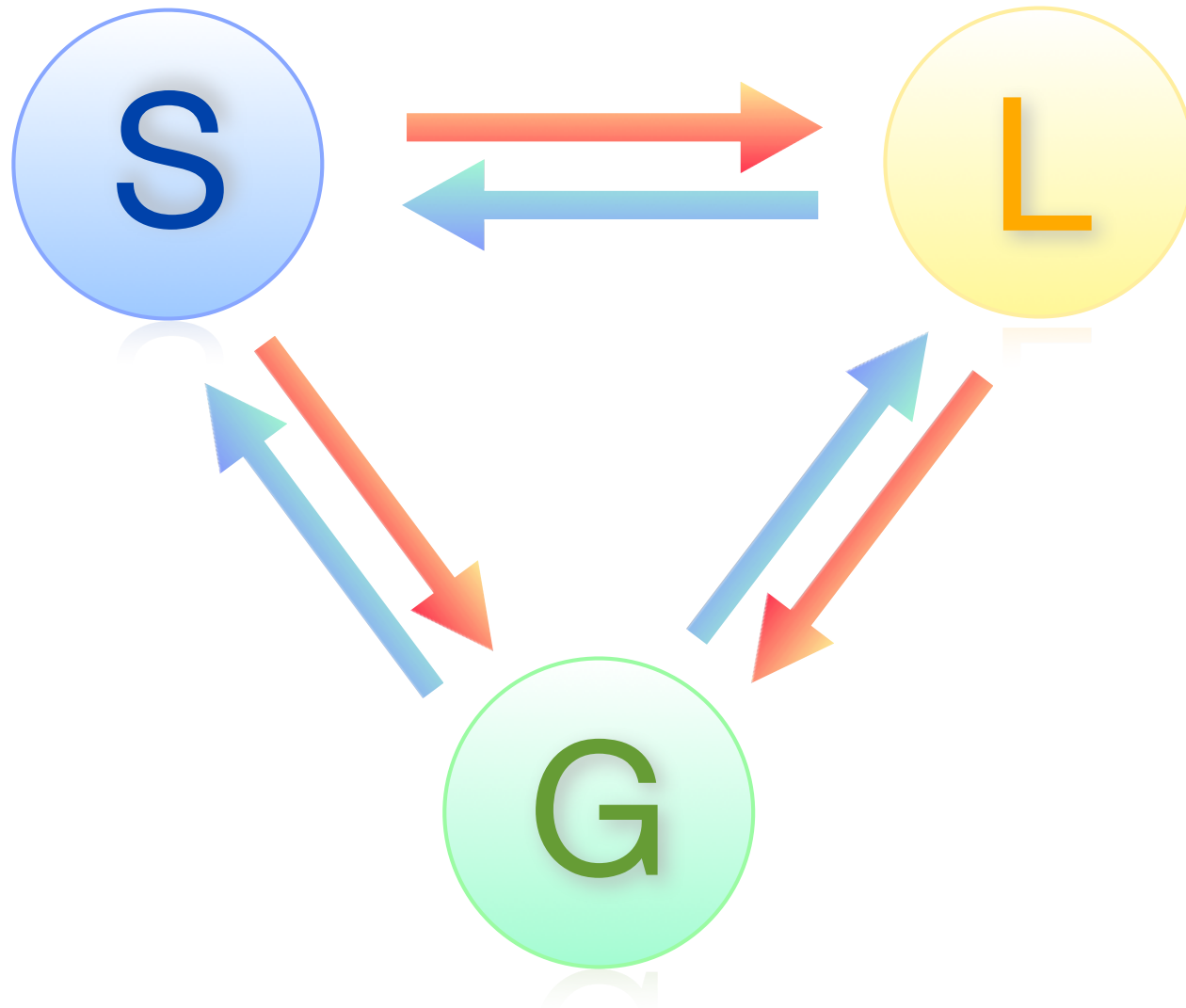
Chalk ($CaCO_3$)

Phosphorus

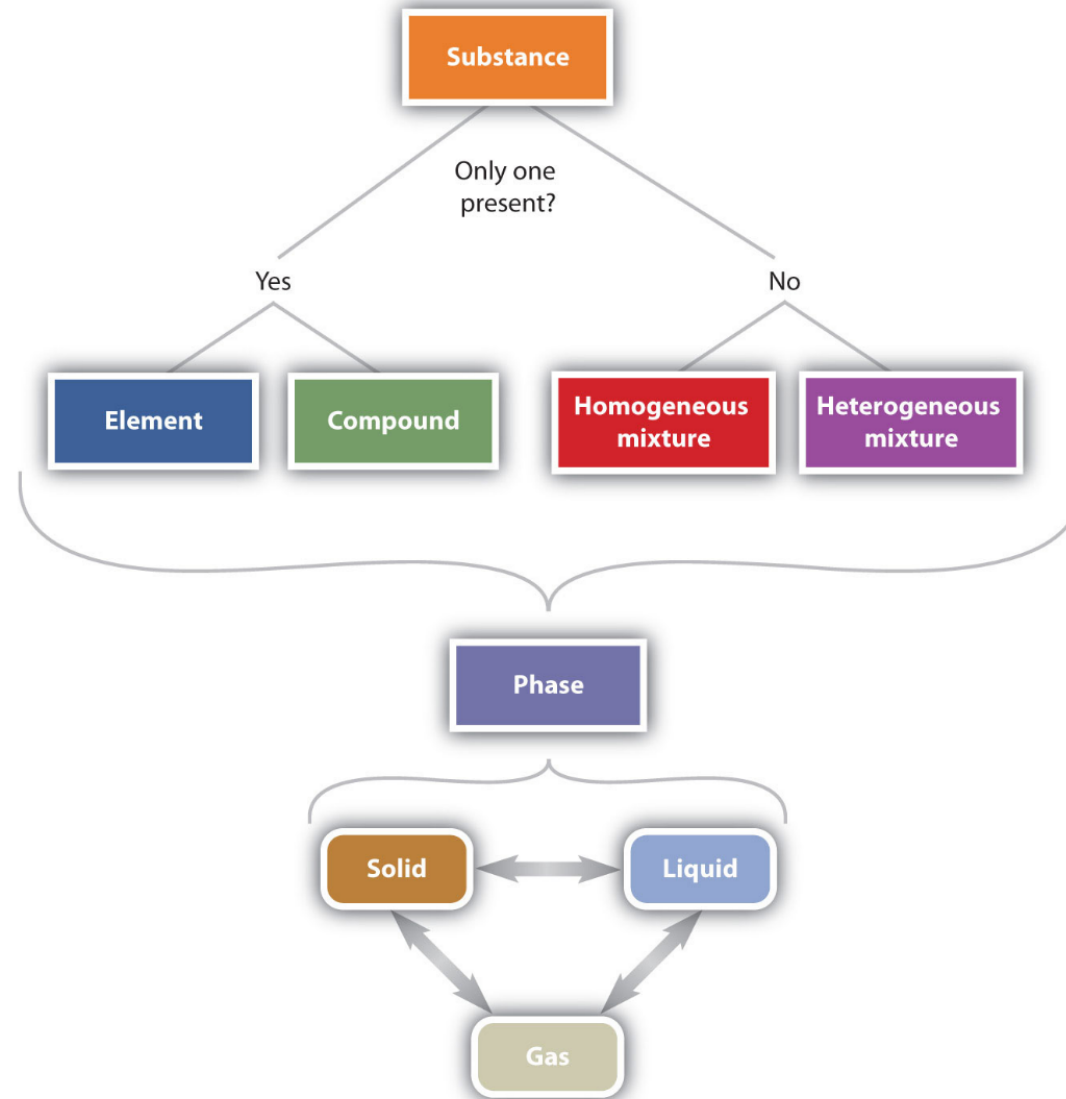
Battery acid (H_2SO_4)

Buckyball (C_{60})

Phase Changes of Matter



Summary of Matter



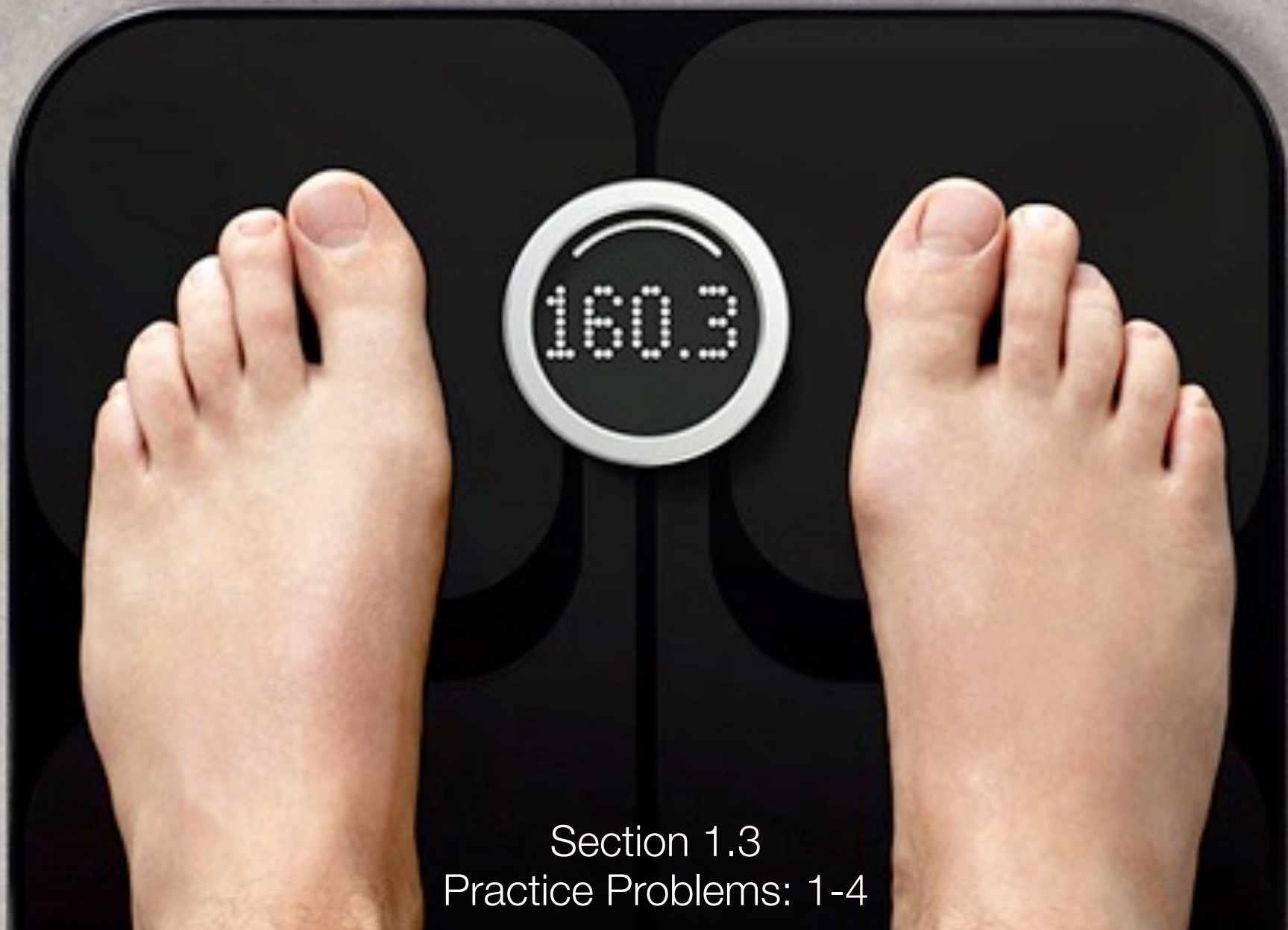
Concept Review (Section 1.2)

CONCEPT REVIEW EXERCISES

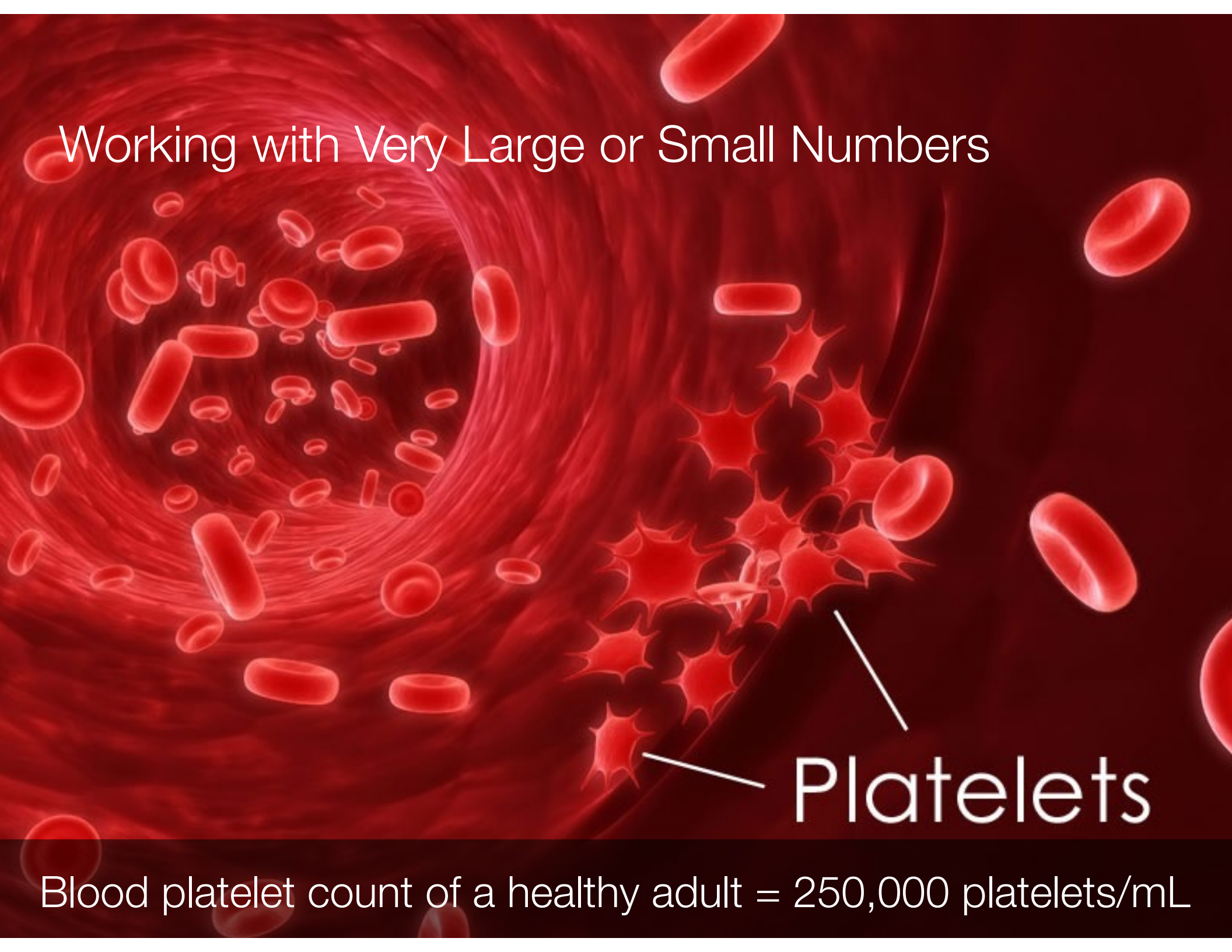
1. Explain the differences between the physical properties of matter and the chemical properties of matter.
2. What is the difference between a heterogeneous mixture and a homogeneous mixture? Give an example of each.
3. Give at least two examples of a phase change and state the phases involved in each.

Practice Problems: 1-12

Components of a Measurement



Section 1.3
Practice Problems: 1-4

A 3D illustration of a blood vessel. The vessel is shown as a red, textured tube. Inside, numerous red blood cells are depicted as red, biconcave discs. On the right side of the vessel, a cluster of platelets is shown. These platelets are small, red, and have a star-like or spiky appearance. Two white lines point from the word 'Platelets' to this cluster.

Working with Very Large or Small Numbers

Platelets

Blood platelet count of a healthy adult = 250,000 platelets/mL

[illegible][illegible]

Scientific Notation (Section 1.4)

$$A \times 10^B$$



Coefficient

Any number from 1 through 9



Exponent

Any positive or negative
whole number

Count sig figs in coefficient only

Standard to Scientific Notation

Step 1: Move the decimal point to give a coefficient of 1 through 9

Step 2: Multiply the result by 10^B , where B = # of decimal places moved

- Decimal moved to the left = B is positive
- Decimal moved to the right = B is negative

Scientific Notation to Standard

Exponent is **positive** = BIG number = move the decimal point to the **right**

Exponent is **negative** = small number = move the decimal point to the **left**

Human Hair



Concept Check

Convert into **scientific notation**:

800,291 ft =

0.00000200 km =

Convert into **standard numbers**:

7.92×10^5 mm =

4.1×10^{-3} in =

Concept Review (Section 1.4)

CONCEPT REVIEW EXERCISES

1. Why it is easier to use scientific notation to express very large or very small numbers?
2. What is the relationship between how many places a decimal point moves and the power of 10 used in changing a conventional number into scientific notation?

Practice Problems: 1-8