

Matter: Study Guide

In order to be prepared for the Matter summative assessment, you should review the following concepts using your Science Interactive Notebook and any other handouts provided by your teacher:

- Interpret/understand a sequence of models (diagrams) showing the activity of molecules in all three basic phases of matter, to include the properties, arrangement and movement of molecules
- construct and interpret models of atoms and molecules
- identify substances as being an element or a compound
- determine how a change in temperature affects the phases of matter (e.g., water)
- compare and contrast mixtures and solutions

CHARACTERISTICS OF GASES, LIQUIDS, AND SOLIDS

GAS	LIQUID	SOLID
Assumes the shape of its container	Assumes the shape of its container	Retains a fixed shape
Assumes the volume of its container—no definite volume	Has a definite volume	Has a definite volume
Compressible (lots of free space between particles)	Not easily compressible (lots of free space between particles)	Not easily compressible (little free space between particles)
Flows easily (particles can move past one another)	Flows easily (particles can move/slide past one another)	Does not flow easily (rigid-particles cannot move/slide past one another)

Important vocabulary

matter: anything that takes up space (has volume) and mass

physical property: a characteristic of matter that can be observed or measured

volume: how much space an object takes up

density: how much matter is in a certain size space

atom: the smallest unit of an element

element: matter made of only one type of atom

nucleus: the central portion of an atom made of protons and neutrons

protons: parts of an atom with a positive (+) charge that are part of the nucleus

electrons: parts of an atom with a negative (-) charge that swirl around the outside of the nucleus

neutrons: parts of an atom that have no charge and are part of the nucleus

molecule: a combination of atoms bonded together; the smallest unit of a compound

compound: a substance made of at least two different elements bonded together

mixture: a combination of two or more substances that are not bonded and can be separated by physical methods

solution: a mixture in which one substance dissolves in another

solid: molecules packed together so they hold their shape and do not flow

liquid: molecules that are loosely packed together and can flow past each other

gas: molecules that move freely past each other with a lot of space between them

temperature: how much heat energy an object has

boiling: liquid turning into a gas, forming bubbles inside the liquid

boiling point: the temperature at which an object boils

melting: changing state from solid to liquid

melting point: the temperature at which an object melts and freezes

Important Facts

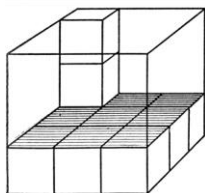
All living and nonliving things are made of **matter**. All matter has **mass**. All matter has **volume**.

You use your senses to describe the **physical properties** of matter. Physical properties tell how an object looks, feels, or acts. Some examples of physical properties are **size, color, shape, smell, texture, sound, and taste**.

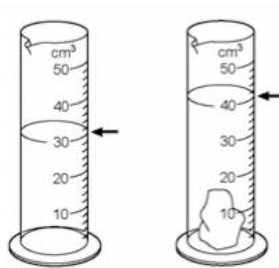
Different types of matter have different **physical properties**. You use a **balance** to find the

mass of an object. Mass is measured in **grams** or **kilograms**.

Volume is measured in **cubic centimeters**. To find the volume of rectangular objects, you can multiply the length times the width times the height. To find the volume of other objects, you use the **water displacement method** in a **graduated cylinder**.



$3 \times 3 \times 3 = 27$ so the volume is 27 cubic centimeters



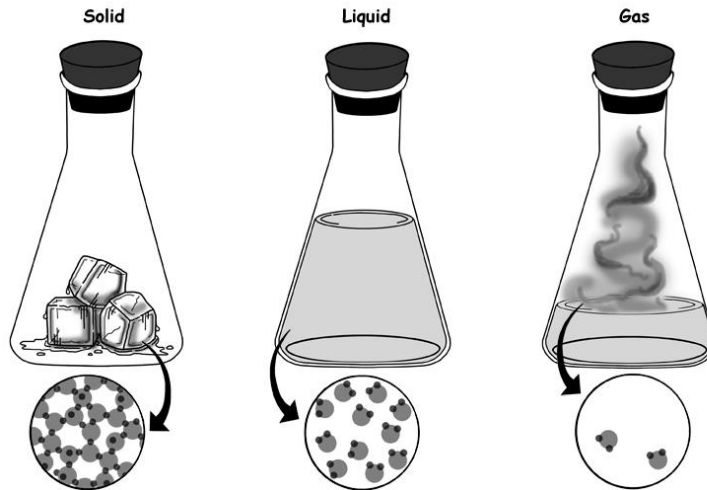
The water went from 30mL to 40mL. $30-40=10$, so the volume is 10 mL

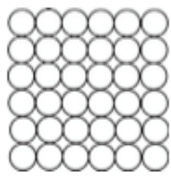
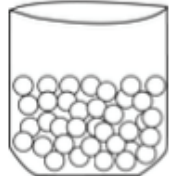
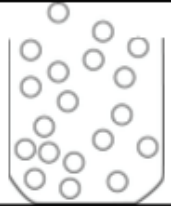
Objects that are heavy for their size have a **high density**. Objects that are light for their size have a **low density**. Objects that are the same size (volume) can have different densities.

Most **thermometers** show two different temperature scales. The **Fahrenheit scale** is used in the United States. Most other countries use the **Celsius scale**.

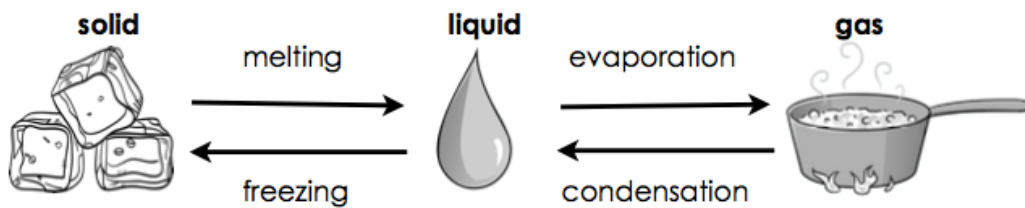
	Fahrenheit Scale	Celsius Scale
Water boils	212°F	100°C
Normal human body temperature	98.6°F	37°C
Room temperature	68°F	20°C
Water freezes	32°F	0°C

Three States (Phases) of Matter

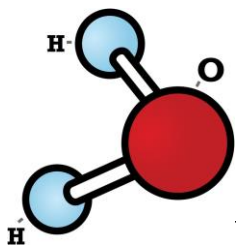


	Solid	Liquid	Gas
shape	has its own shape	takes shape of the container	fills the container
size	stays the same	stays the same	changes
particles			
water	ice	water	water vapor

Matter can change from one state to another depending on the temperature.

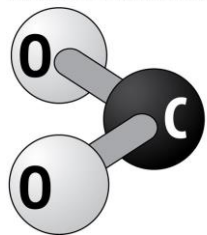


Diagrams of Atoms



Water molecule: has two elements (water & oxygen); has 3 atoms

Carbon Dioxide Molecule



Has two elements (carbon & oxygen); 3 atoms

Important Facts

- An atom is the smallest unit of an element.
- Atoms are made of very tiny bits called subatomic particles: protons, neutrons, and electrons
- All of an atom's protons and neutrons are packed tightly together in its center (nucleus)
- Protons have a positive electrical charge
- Neutrons have no electrical charge
- An atom's electrons swirl around the outside of the nucleus – always moving
- Electrons have a negative electrical charge

The following is an example from the periodic table of elements. Be familiar with what each of the labels represents. For example, gold has an atomic number 79. The atomic number tells you how many protons and electrons an element contains.

Gold	← Element Name
Au 79	← Atomic Number
Au	← Symbol
Atomic Weight = 196.87	← Atomic Weight (estimate)
*	← Element Phase (solid, liquid, gas)

Mixtures and Solutions

Name:

Mixtures

What is a mixture?

A mixture is a combination of 2 or more substances in which the substances do not chemically blend with each other.

Write down as many mixtures as you can think of.

Fruit salad

Vegetable salad

sand + water + marbles

oil and water

Sand + iron filings

Solutions

What is a solution?

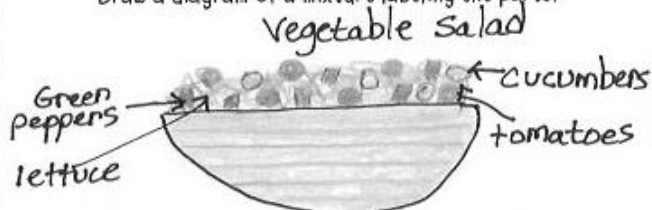
A mixture in which the substances are spread out evenly between one another and cannot be told apart; a homogenous mixture.

Write down as many solutions as you can think of.

Solute	+	Solvent	=	Solution
lemonade mix	+	water	=	lemonade
salt	+	water	=	salt water
carbon dioxide	+	water	=	soda water
zinc (30%)	+	copper (70%)	=	brass
chocolate syrup	+	milk	=	chocolate milk
hot chocolate mix	+	water	=	hot chocolate

Mixtures Diagram

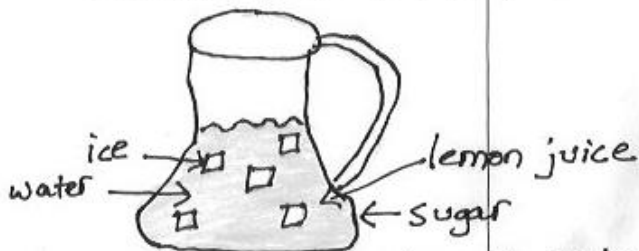
Draw a diagram of a mixture labeling the parts.



This vegetable salad is a mixture since the substances did not blend together and there was NOT a reaction.

Solutions Diagram

Draw a diagram of a solution labeling the parts.



This is a solution since the water, sugar and lemon juice combined to form a substance.