States of Matter

Unit: Matter

MA Curriculum Frameworks (2016): HS-PS1-11(MA)

Mastery Objective(s): (Students will be able to…)

- Define & describe states of matter and transitions between states.
- Classify matter according to its physical state.

Success Criteria:

- States of matter and transitions are described using correct vocabulary.
- States of matter are correctly identified based on observable properties.

Tier 2 Vocabulary: state, matter

Language Objectives:

- Explain the three common states of matter (solid, liquid and gas) and the properties of each.
- Explain the difference between a physical and chemical change.

Notes:

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

Examples of matter: anything you can touch or feel—solids, liquids, and gases.

Examples of things that are *not* matter: forms of energy such as light, microwaves, radio waves, etc.

state of matter: the physical form the matter is in (solid, liquid, gas, or plasma)

solid: a state of matter in which the molecules are bonded (attached) to each other. Molecules in a solid move back and forth, but cannot break free from the other molecules. Solids have a definite shape and a definite volume.

liquid: a state of matter in which bonds between the molecules are continuously breaking and forming. Molecules in a liquid are free to move, but are attracted to nearby liquid molecules. Liquids have a definite volume, but not a definite shape. (Liquids take on the shape of their containers.)

gas: a state of matter in which the molecules are not bonded to one another. Molecules in a gas are free to move anywhere within the confines of their container. Gases have neither a definite shape nor a definite volume. (Gases expand to fill their containers.)

Use this space for summary and/or additional notes:

plasma: a state in which the molecules have so much energy that they cannot hold onto all of their electrons. Charge is continuously flowing through the plasma and can often be seen as blue streaks (such as in a plasma globe).

Note that the distinctions between the phases can be subtle. For example, ketchup has a definite shape unless you wait for a long time, but it eventually takes on the shape of its container. As it turns out, ketchup is a liquid with a high viscosity (meaning that it resists flowing). Glass flows very slowly (windows that are centuries old are thicker at the bottom than at the top), but this is because of the movement of solid particles. (This is analogous to small pebbles settling to the bottom of a bucket of rocks.) Glass is therefore an amorphous (irregularly-shaped) solid, not a viscous liquid.

melting: the transition from a solid to a liquid.

freezing: the transition from a liquid to a solid.

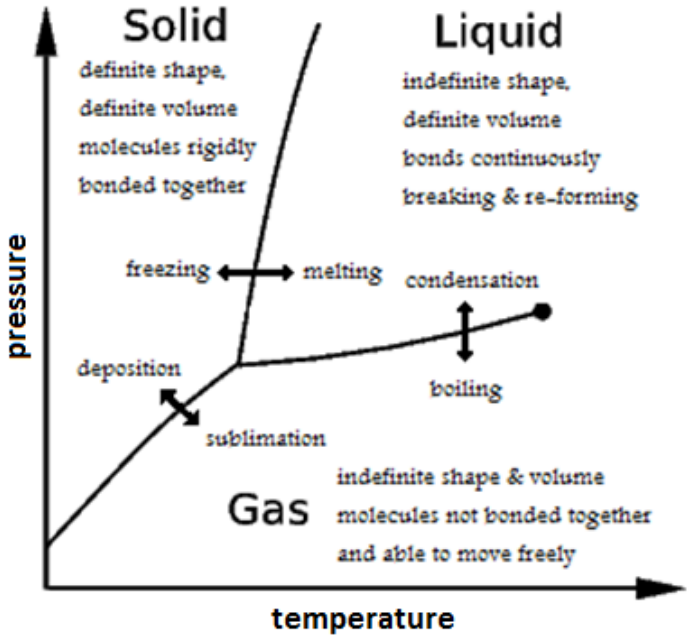
boiling: the transition from a liquid to a gas.

condensation (or condensing): the transition from a gas to a liquid.

sublimation (or subliming): the transition from a solid directly to a gas.

deposition (or depositing): the transition from a gas directly to a solid.

Some properties of solids, liquids and gases and the processes of converting between them are summarized in the phase diagram below:



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