ST.LAWRENCE HIGH SCHOOL

JESUIT MINORITY INSTITUTION

CLASS 5 **SUB: GENERAL SCIENCE**

STUDY MATERIALS **DATE: 07.05.2020**

MATTER:

Matter is the "stuff" that makes up the universe — everything that takes up space and has mass is matter.

All matter is made up of atoms, which are in turn made up of protons, neutrons and electrons.
Atoms come together to form molecules, which are the building blocks for all types of matter. Both atoms and molecules are held together by a form of potential energy called chemical energy. Unlike kinetic energy, which is the energy of an object in motion, potential energy is the energy stored in an object.

THE FIVE PHASES OF MATTER:

There are four natural states of matter: Solids, liquids, gases and plasma. The fifth state is the man-made Bose-Einstein condensates.

SOLIDS

In a solid, particles are packed tightly together so they don't move much. The electrons of each atom are constantly in motion, so the atoms have a small vibration, but they are fixed in their position. Because of this, particles in a solid have very low kinetic energy.
Solids have a definite shape, as well as mass and volume, and do not conform to the shape of the container in which they are placed. Solids also have a high density, meaning that the particles are tightly packed together.

LIQUIDS:

In a liquid, the particles are more loosely packed than in a solid and are able to flow around each other, giving the liquid an indefinite shape. Therefore, the liquid will conform to the shape of its container.
Much like solids, liquids (most of which have a lower density than solids) are incredibly difficult to compress.

GASES:

In a gas, the particles have a great deal of space between them and have high kinetic energy. A gas has no definite shape or volume. If unconfined, the particles of a gas will

spread out indefinitely; if confined, the gas will expand to fill its container. When a gas is put under pressure by reducing the volume of the container, the space between particles is reduced and the gas is compressed.

PLASMA:
Plasma is not a common state of matter here on Earth, but it may be the most common state of matter in the universe. Stars are essentially superheated balls of plasma. Plasma consists of highly charged particles with extremely high kinetic energy. The noble gases (helium, neon, argon, krypton, xenon and radon) are often used to make glowing signs by using electricity to ionize them to the plasma state.

BOSE-EINSTEIN CONDENSATE:
The Bose-Einstein condensate (BEC) was created by scientists in 1995. Using a combination of lasers and magnets, Eric Cornell and Carl Weiman, scientists at the Joint Institute for Lab Astrophysics (JILA) in Boulder, Colorado, cooled a sample of rubidium to within a few degrees of absolute zero. At this extremely low temperature, molecular motion comes very close to stopping. Since there is almost no kinetic energy being transferred from one atom to another, the atoms begin to clump together. There are no longer thousands of separate atoms, just one "super atom."
A BEC is used to study quantum mechanics on a macroscopic level. Light appears to slow down as it passes through a BEC, allowing scientists to study the particle/wave paradox. A BEC also has many of the properties of a superfluid, or a fluid that flows without friction. BECs are also used to simulate conditions that might exist in black holes.

GOING THROUGH A PHASE

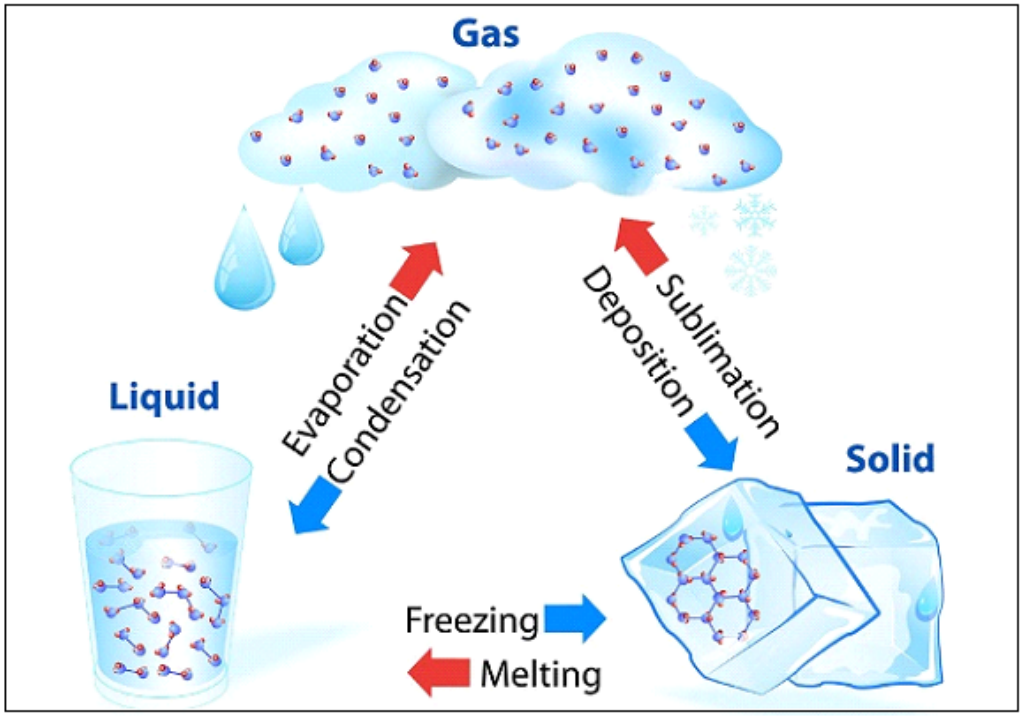
Adding or removing energy from matter causes a physical change as matter moves from one state to another. For example, adding thermal energy (heat) to liquid water causes it to become steam or vapor (a gas). And removing energy from liquid water causes it to become ice (a solid). Physical changes can also be caused by motion and pressure.

EVAPORATION:

Evaporation is the process by which water changes from a liquid to a gas or vapor. **Evaporation** is the primary pathway that water moves from the liquid state back into the water cycle as atmospheric water vapor.

CONDENSATION:

Condensation is the change of the physical state of matter from the gas phase into the liquid phase, and is the reverse of vaporization.



SUBLIMATION:

Sublimation is the transition of a substance directly from the solid to the gas state, without passing through the liquid state.

DEPOSITION:

Deposition is a thermodynamic process. ... One example of **deposition** is the process by which, in sub-freezing air, water vapor changes directly to ice without first becoming a liquid. This is how frost and hoar frost form on the ground or other surfaces.

FREEZING:

Freezing is a phase transition where a liquid turns into a solid when its temperature is lowered below its **freezing** point.

MELTING:

Melting, or fusion, is a physical process that results in the phase transition of a substance from a solid to a liquid.

Ms. Beline Jermy Peter