

Matter and energy

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Matter consists of atoms held together by electromagnetic forces. How tight these bonds are determines which of the four states:



1. Solid-characteristics,

• they are arranged in a regular pattern • they are held together by strong forces called bonds • they can vibrate in a fixed position • they cannot move from place to place • cannot be compressed or squashed as the particles are close together and have no space to move into

2. Liquid- characteristics,

- are close together
- arranged in a random way

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• and can move around each other while remaining close • Examples include water, Pepsi etc.

3. Gas-characteristics

• far apart • arranged in a random way • move quickly in all directions • There are no bonds between the particles in a gas, so they are free to move in any direction.

4. Plasma- characteristics

• Plasma is created by adding energy to a gas so its nuclei and electrons separate (called ionization) into negatively charged electrons, and positively charged ions. • Unlike the other states of matter, the charged particles in a plasma will react strongly to electric and magnetic fields (i.e. electromagnetic fields). If a plasma gets cold, the ions will re-form into a gas. • Over 99% of the matter in the universe is believed to be plasma. When the atoms in a gas are broken up, the pieces are called electrons and ions. • Because these pieces have an electric charge, they are pulled together or pushed apart by electric fields and magnetic fields. • This makes a plasma act different from a gas. For example, magnetic fields can be used to hold a plasma, but not to hold a gas.

Energy

Definition- The property of matter and radiation which is manifest as a capacity to perform work (such as causing motion or the interaction of molecules).

Energy and its forms

• Kinetic • Potential, • Thermal • Chemical • Electric • Magnetic • Gravitational • Nuclear, These forms of energy are constantly shifting from one form to another to make the universe as we know it function. The law of conservation of energy states that energy may neither be created nor destroyed. Therefore the sum of all the energies in the system is a constant. As a result energy simply changes its form from one form to another. An example. Chemical energy in the form of gas in a power plant is burnt to provide electrical energy which is sent over cables to your home to power you bulbs which emit light energy.

Energy and its relation to matter

Energy in the form of heat or absence of heat causes matter to change its shape and state. How? - Thermal energy from a heat source e.g. the sun. Transfers its energy into the particles of water. This thermal energy is converted into kinetic energy which causes the particles of water to vibrate and move around more rapidly. This movement breaks the inter particle bonds between water particles creating the substance we know as steam.

References

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