State of Matter and Properties of Matter

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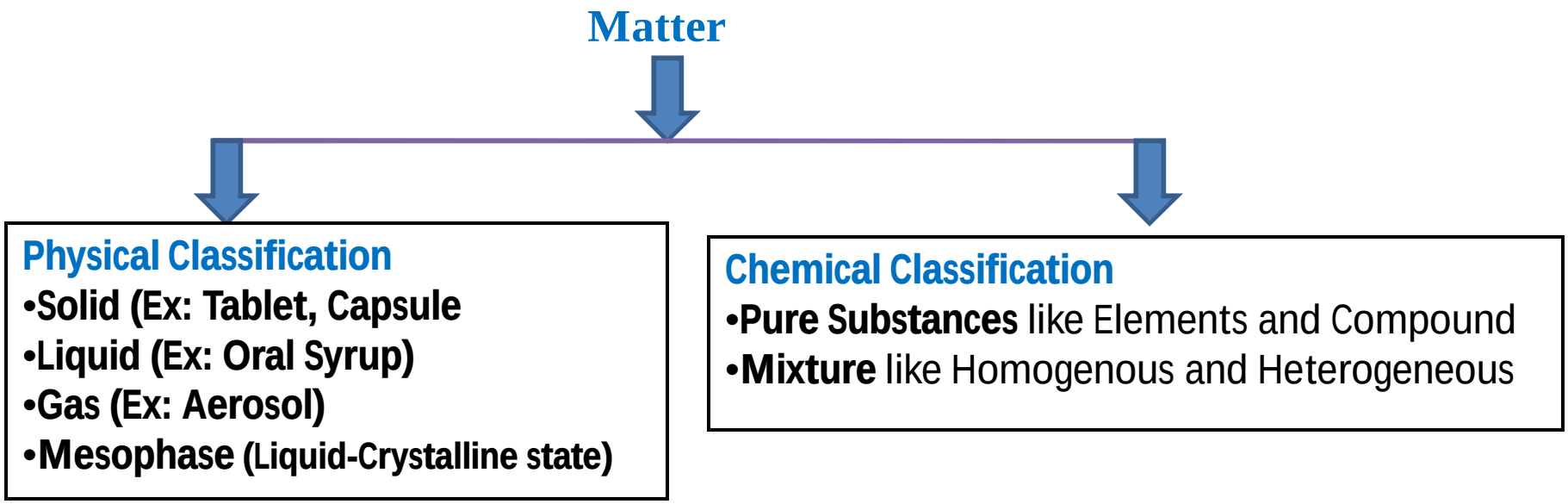
Outline of the Chapter

S. No.	Topics
1	State of matter
2	Changes in the state of matter
3	Latent heats
4	Vapour pressure
5	Sublimation critical point
6	Eutectic mixtures
7	Gases
8	Aerosols
9	Inhalers
10	Relative Humidity
11	Liquid complexes Liquid crystals Glassy states
12	Solid Crystalline Amorphous Polymorphism.

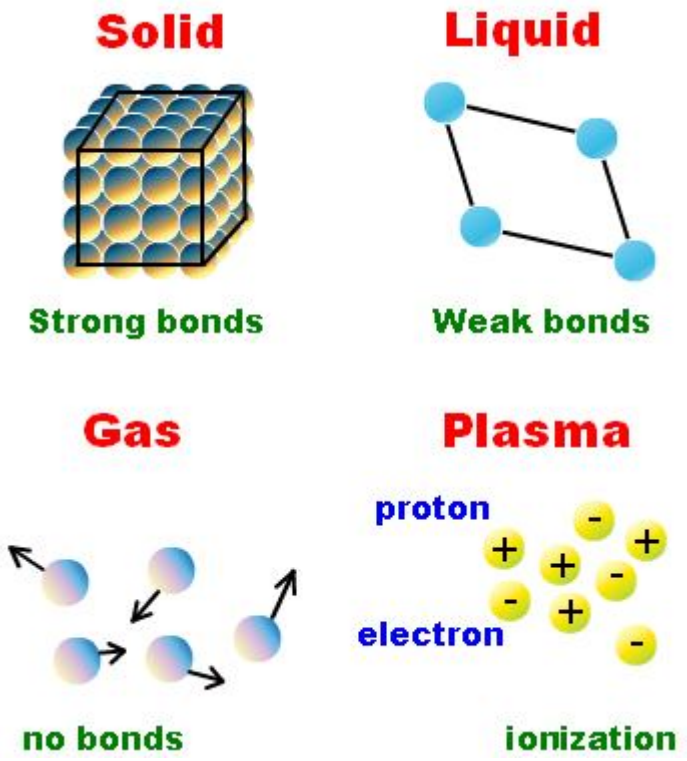
State of matter:

Matter is a substance which occupies space and possesses rest mass, especially as distinct from energy. Matters can be classify various ways like Physical Classification, Chemical Classification and General Classification.



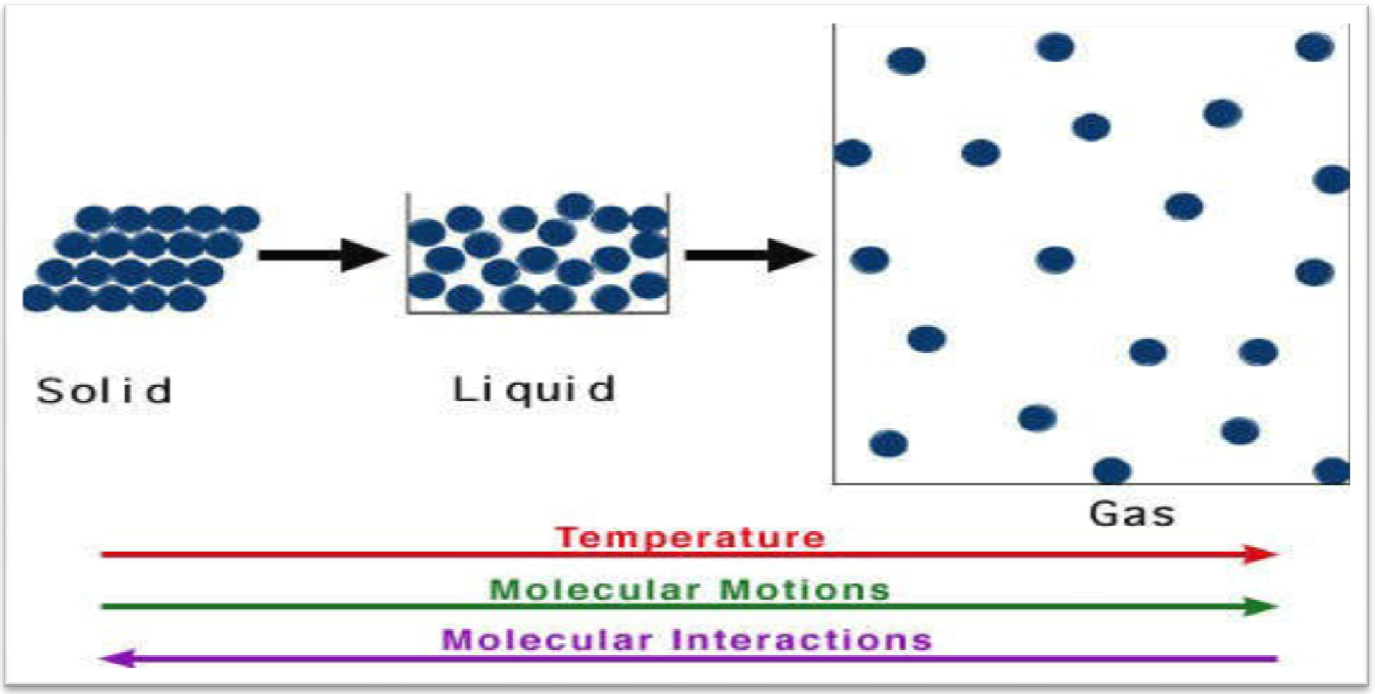
Gases, liquids, and crystalline solids are the three primary states of matter or phases. The molecules, atoms, and ions in the solid state are held in close proximity by intermolecular, interatomic, or ionic forces. The atoms in the solid can oscillate only about fixed positions. As the temperature of a solid substance is raised, the atoms acquire sufficient energy to disrupt the ordered arrangement of the lattice and pass into the liquid form. Finally, when sufficient energy is supplied, the atoms or molecules pass into the gaseous state. Solids with high vapor pressures, such as iodine and camphor, can pass directly from the solid to the gaseous state without melting at room temperature. This process is known as *sublimation*, and the reverse process, that is, condensation to the solid state, may be referred to as *deposition*.

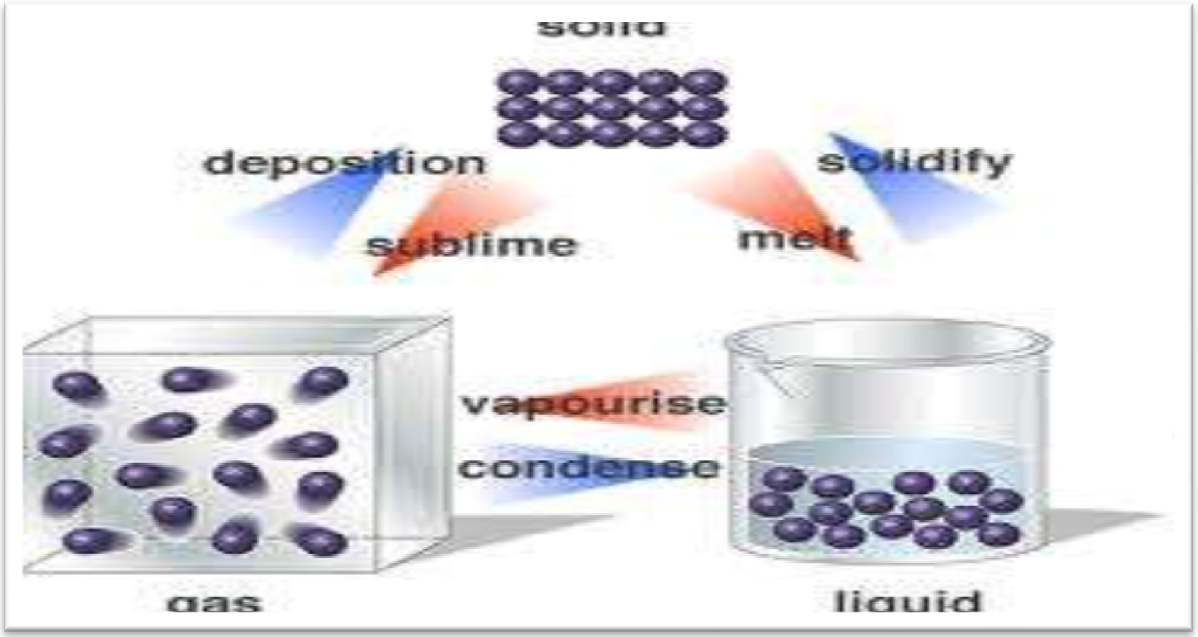
Certain molecules frequently exhibit a fourth phase, more properly termed a *mesophase* (Greek *mesos*, middle), which lies between the liquid and crystalline states. This so-called *liquid crystalline* state is discussed later. Supercritical fluids are also considered a mesophase, in this case a state of matter that exists under high pressure and temperature and has properties that are intermediate between those of liquids and gases. Supercritical fluids will also be discussed later because of their increased utilization in pharmaceutical agent processing.

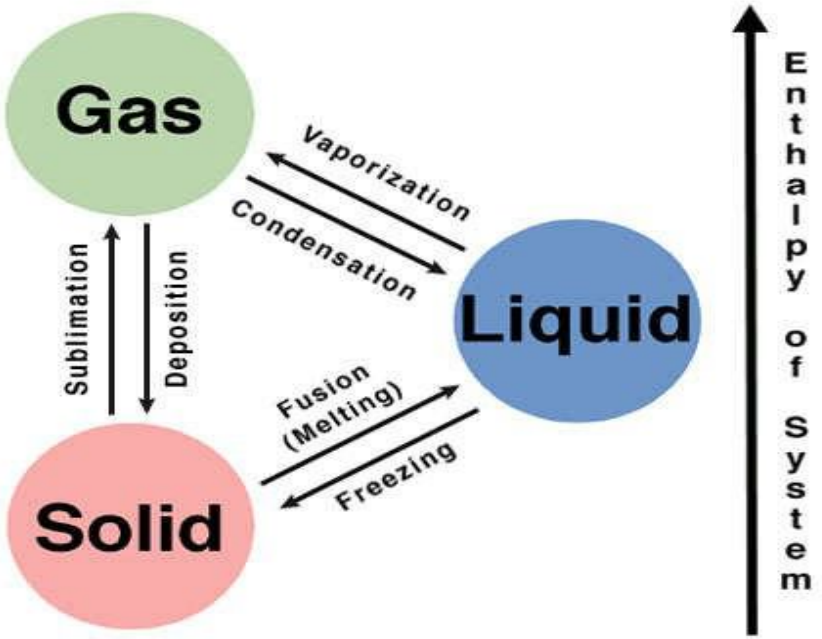


Some Characteristics of Gases, Liquids and Solids and the Microscopic Explanation for the Behavior

Gas	Liquids	Solids
Assumes the shape and volume of its container particles can move past one another	Assumes the shape of the part of the container which it occupies particles can move/slide past one another	Retains a fixed volume and shape rigid - particles locked into place
Compressible lots of free space between particles	Not easily compressible little 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


Solid
Liquid
Gas
Temperature
Molecular Motions
Molecular Interactions


solid
deposition
solidify
sublime
melt
vapourise
condense
gas
liquid



Changes in the state of matter

Freezing: Freezing is a phase transition in which 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. This occurs when the internal energy of the solid increases, typically by the application of heat or pressure, which increases the substance's temperature to the melting point.

Deposition: Deposition is a thermodynamic process, a phase transition in which gas transforms into solid without passing through the liquid phase. The reverse of deposition is sublimation.

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 snow forms in clouds, as well as how frost and hoar frost form on the ground or other surfaces.

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

Vaporization: Vapourization (or vapourisation) of an element or compound is a phase transition from the liquid phase to vapor.

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

THANK YOU