RAMA UNIVERSITY

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FACULTY OF ENGINEERING AND TECHNOLOGY

- The subcategory fluid mechanics is defined as the science that deals with the behavior of fluids at rest (fluid statics) or in motion (fluid dynamics), and the interaction of fluids with solids or other fluids at the boundaries.
- Fluid mechanics is also referred to as **fluid dynamics by considering fluids at rest as a special case of motion with zero** velocity
- Fluid mechanics itself is also divided into several categories
- The study of the motion of fluids that are practically incompressible (such as liquids, especially water, and gases at low speeds) is usually referred to as **hydrodynamics**
- A subcategory of hydrodynamics is **hydraulics, which deals with liquid** flows in pipes and open channels.
- **Gas dynamics deals with the flow of** fluids that undergo significant density changes, such as the flow of gases through nozzles at high speeds.
- The category **aerodynamics deals with the** flow of gases (especially air) over bodies such as aircraft, rockets, and Automobiles at high or low speeds

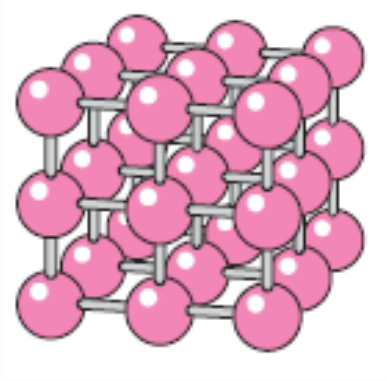
Concept of fluid

- A substance in the liquid or gas phase is referred to as a **fluid.**
- In a liquid, chunks of molecules can move relative to each other, but the volume remains relatively constant because of the strong cohesive forces between the molecules
- *Gas and vapor are often used as synonymous words. The vapor phase of a* substance is customarily called a *gas when it is above the critical temperature. Vapor usually implies a gas that is not far from a state of condensation.*
- Any practical fluid system consists of a large number of molecules, and the properties of the system naturally depend on the behavior of these molecules.
- The molecular spacing in the liquid phase is not much different from that of the solid phase, except the molecules are no longer at fixed positions relative to each other and they can rotate and translate freely

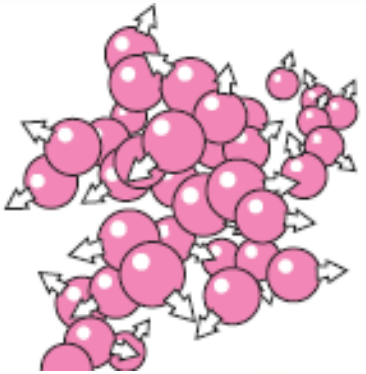
Application Areas of Fluid Mechanics

- vacuum cleaners
- supersonic aircraft
- Aircraft and spacecraft
- Boats
- Human body
- Cars
- Piping and plumbing
- Industrial application
- Power plants
- Natural flows and weather
- Wind and hydro turbines
- Cooling of electronic components

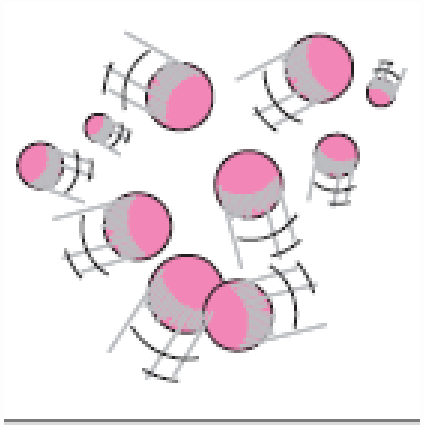
Difference Between Solids, Liquids And Gases



Solid



Liquid



Gas

a Solid does form a free surface	a liquid does form a free surface	gas does not form a free surface
molecules are at relatively fixed positions in a solid,	groups of molecules move about each other in the liquid phase,	molecules move about at random in the gas phase.

Difference b/w Solid and Liquid

Solid	Liquid
More Compact Structure Attractive Forces between the molecules are larger therefore more closely packed Solids can resist tangential stresses in static condition Whenever a solid is subjected to shear stress It undergoes a definite deformation α or breaks α is proportional to shear stress upto some limiting condition Solid may regain partly or fully its original shape when the tangential stress is removed	Less Compact Structure Attractive Forces between the molecules are smaller therefore more loosely packed Fluids cannot resist tangential stresses in static condition. Whenever a fluid is subjected to shear stress No fixed deformation Continious deformation takes place until the shear stress is applied A fluid can never regain its original shape, once it has been distorded by the shear stress