States of Matter

- **Matter can exist in several different *forms*, or *states of aggregation*.**

- **Matter commonly exists in four fundamental states:**
  - Solid
  - Liquid
  - Gas
  - Plasma

- **The different states of matter are based upon distance between particles (atoms and/or molecules), particle arrangement, and energy of particles.**

SOLIDS

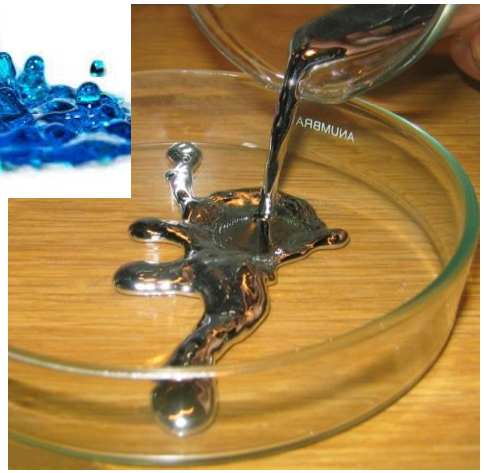
- **Particles of <u>solids</u> are tightly packed.**
- **The forces (*electromagnetic!*) between particles are strong: the particles cannot move freely but <u>can only vibrate about a fixed position</u>.**
- **Solids have a stable, definite shape and a definite volume.**
- **Solids can only change their shape *by force*, as when broken or cut.**

LIQUIDS

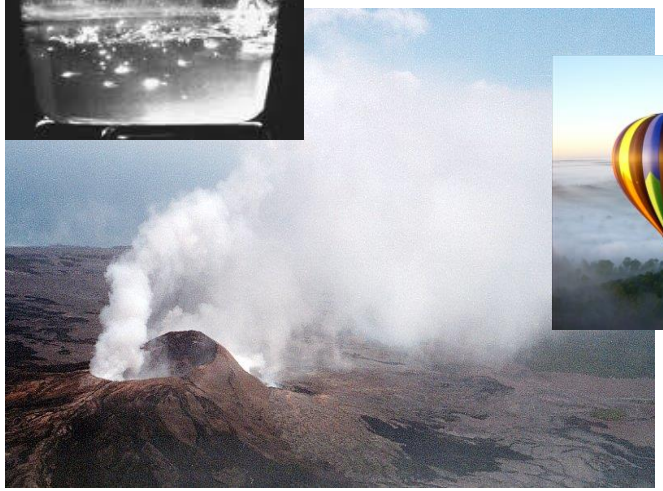
- **Particles of <u>liquids</u> are tightly packed but are far enough apart to slide over one another (*mobile structure*).**
- **The shape of a liquid is not definite but is determined by its container.**

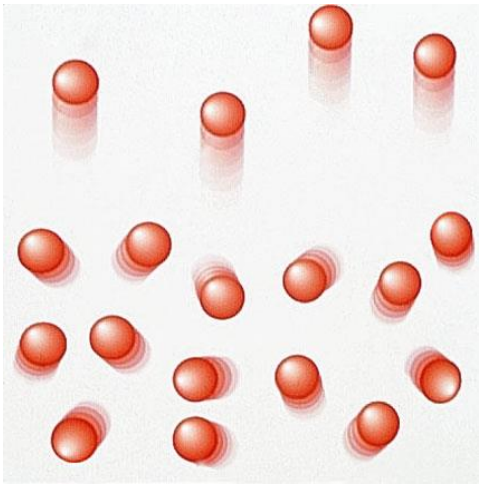
- **Liquids are known to be *nearly incompressible*. At constant temperature and pressure, liquids have a definite volume.**

- **The volume of liquid is usually greater than the volume of the corresponding solid (the best-known *exception* being *water*).**



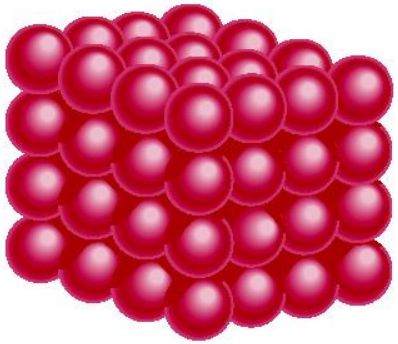
GAS



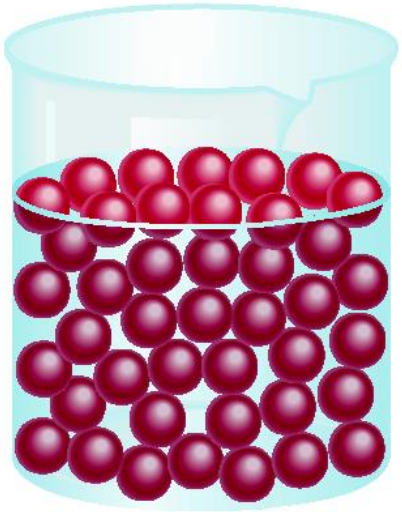


- **Particles of a gas are very far apart and move freely.**
- **A gas has an indefinite shape and an indefinite volume: it will expand to *fill the entire container* in which it is confined.**
    - **A gas is *compressible*.**

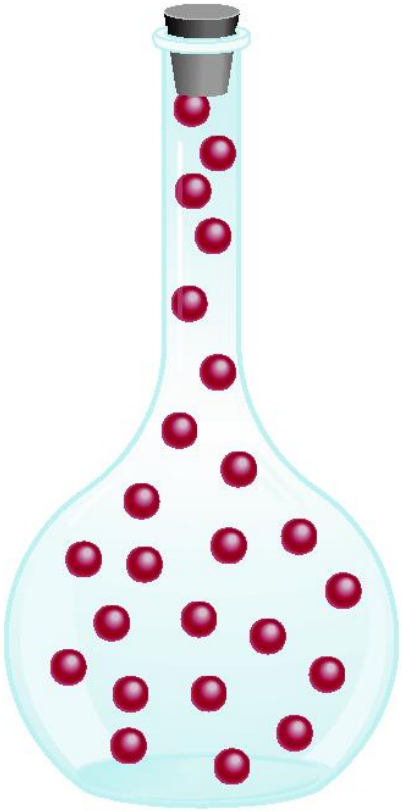
A Comparison: The Three States of Matter



Solid



Liquid



Gas

Example: ICE → WATER → WATER VAPOR