States of Matter
What is Matter?

- Matter is defined as anything that occupies space and has mass.
- Examples: air, water, living things, non-living things.
- All matter is made of many small particles.
States of Matter

Solid
- Holds Shape
- Fixed Volume

Liquid
- Shape of Container
- Free Surface
- Fixed Volume

Gas
- Shape of Container
- Volume of Container
**Solid State**
Ordered and dense
Has a definite shape and volume.
Solids are very slightly compressible.

**Liquid State**
Disordered and usually slightly less dense.
Has a definite volume and takes the shape of the container.
Liquids are slightly compressible.

**Gas State**
Disordered and much lower density than crystal or liquid.
Does not have definite shape and volume.
Gases are highly compressible.
States of Matter

Ex.  | Ice       | Water     | Steam     | Ionized Gas
---   |-----------|-----------|-----------|-------------
Cold  | T<0°C     | Warm      | Hot       | Hotter      
      | 0<T<100 °C| 0<T<100 °C| T>100 °C  | T>100,000 °C
Phase changes in water

- Solid
  - melting
  - freezing
- Liquid
  - vaporization
  - condensation
- Gas

Pressure

Temperature (°C)

1 atm

4.58 torr

0.0098

100
Sublimation

- Transition of a substance directly from solid phase to gas phase without passing through an intermediate liquid phase
Phase changes in carbon dioxide

- Solid
- Liquid
- Vapour

Pressure, atm

Temperature, °C

Critical point
Triple point