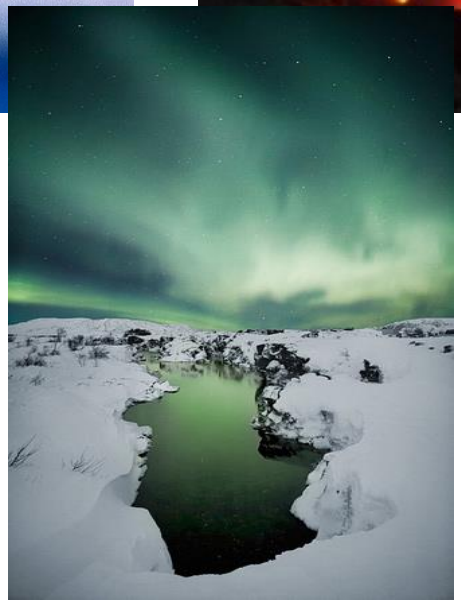
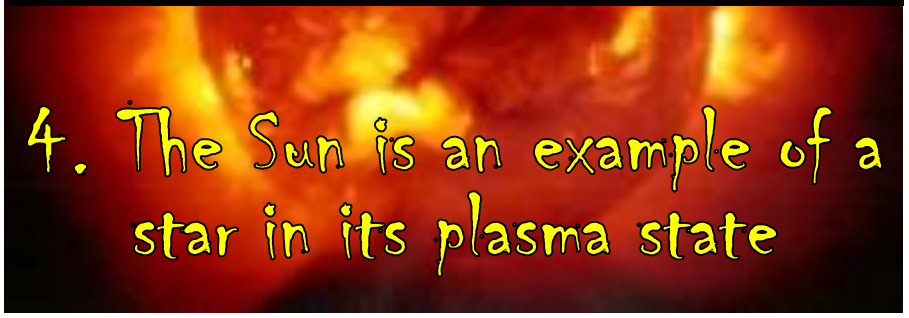
How many states of matter can you find in each picture?



Some places where plasmas are found…



Everyday Properties of Matter

We can <u>observe</u> the following about <u>ordinary matter</u>:

- How it **looks** (Shiny, Dull, Color, etc.)
- How it **feels** (Hard, Soft, Rough, Smooth, etc.)
- How it **smells** (Sweet, Sharp, Terrible, No Smell, etc.)
- How it **sounds** (Loud, Soft, Echo, No Sound, etc.)
- What it **does** (Bounce, Stretch, Break, Magnetize etc.)

PROPERTIES

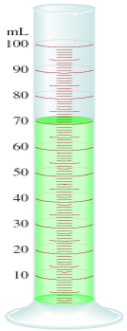
- Anything **else**?

- How it **moves**
- How it **changes**

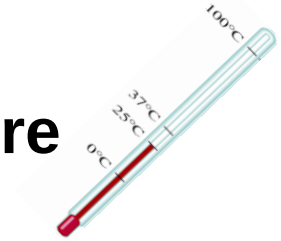
Physical Properties of Matter

We can describe <u>physical properties</u> of matter in terms of physical quantities and laws.

- **An *<u>extensive</u>* property depends upon how much matter is being considered:**
  - **mass**
  - **volume**
  - **electrical charge**



- **An *<u>intensive</u>* property does *<u>not</u>* depend upon how much matter is being considered:**
  - **density**
  - **temperature**
  - **color**



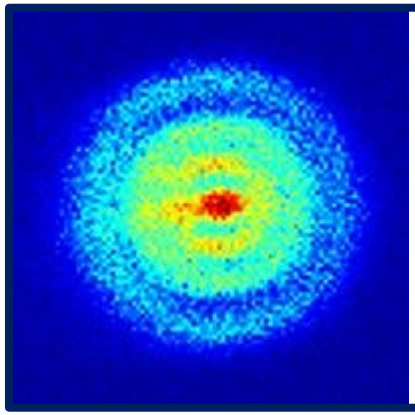
  - **elasticity**
  - **metallicity**
  - **solubility etc…**

Mass vs Weight

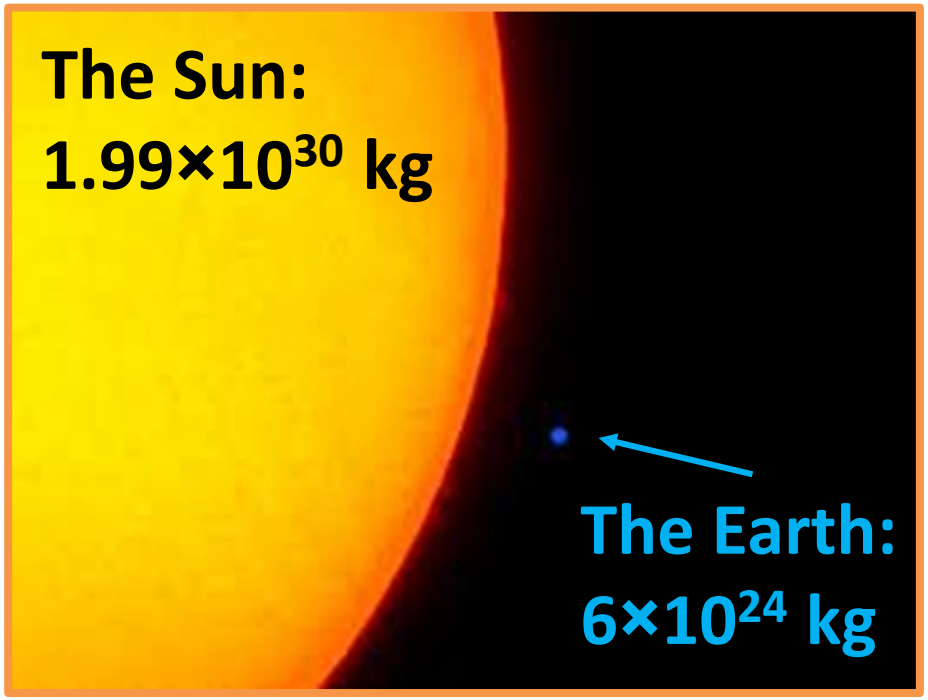
- **Mass** is the amount of material in an object (doesn't change).
- **Weight** is a measure of how strongly gravity is pulling on an object (decreases as elevation increases).
- Note: on the Earth's surface, terms "weight" and "mass" are used interchangeably since we use a **weighing scale** to determine mass.

- Example: **What is the weight of a Martian on Mars and Moon if it weighs 50 kg on Earth?**
  - Gravity on Moon is 0.16 of Earth gravity while gravity on Mars is 0.38 of Earth gravity.
  - **Answer:** this Martian weighs 8.3 kg on Moon and 18.8 kg on Mars (the numbers shown by the scale), but **his/her mass is still 50 kg!!!**

Examples

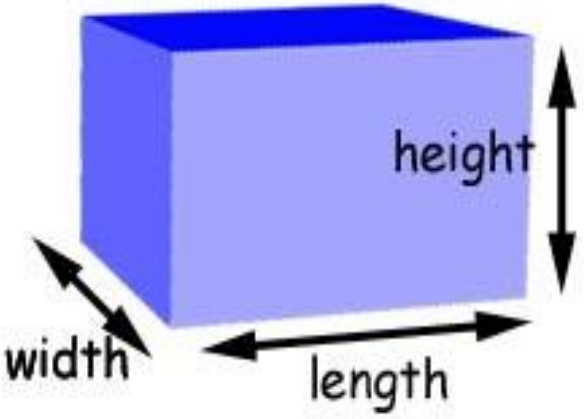


The mass of a smallest atom, Hydrogen, is 1.67×10^{-27} kg



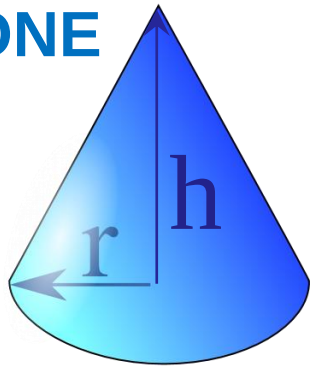
The mass of a blue whale heart can reach 450 kg

Volume

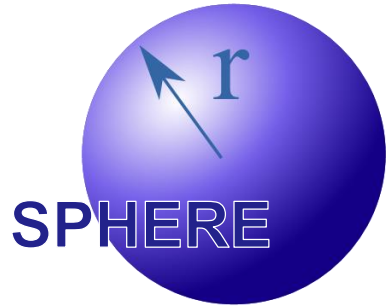


- **Volume is the amount of three-dimensional space that a substance or shape occupies or contains:**
  - **SI unit is m^3**
  - **$V_{rectangular\ prism}$ = length × width × height**

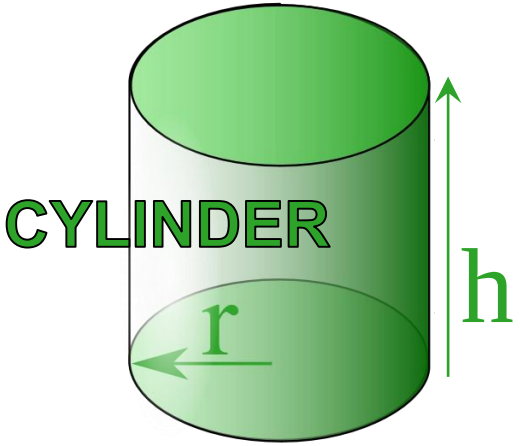
CONE



$$\left(\frac{1}{3}\right)\pi r^2 h$$



$$\left(\frac{4}{3}\right)\pi r^3$$



$$\pi r^2 h$$

Where r = radius, h = height, and π = 3.14