Metric system

Mass	Volume
Mass unit is gram (g)	***Volume unit is litre (L)***
1000 g = 1 kilogram (kg)	1000 L = 1 kilolitre (kL)
100 g = 1 hectagram (hg)	100 L = 1 hectalitre (hL)
10 g = 1 decagram (dkg)	10 L = 1 decalitre (dkL)
0.1 g = 1 desigram (dg)	0.1 L = 1 desilitre (dL)
0.01 g = 1 centigram (cg)	0.01 L = 1 centilitre (cL)
0.001 g = 1 milligram (mg)	0.001 L = 1 millilitre (mL)
0.0001 g = 1 microgram (µg)	0.0001 L = 1 microlitre (µL)
(apothecary) 1 oz = 31.1 g	16.23 minim = 1 mL
(avoirdupois) 1 oz = 28.35 g	1 fl oz = 29.57 mL
15.432 gm = 1 gram	1 pint = 473.2 mL
1 lb = 454 gram	1 galon = 3785 mL

SI has 2 class of units:

- **Basic units** — Meter (m) : distance
  Kilogram (kg): mass etc.

- **Derived units** — Square meter (m^2): area
  Newton (N): force
  Pascal (Pa): pressure
  Volt (V): electric potential etc.

SI basic units	Units and symbols
Mass	Kilogram (kg)
Distance	Meter (m)
Time	Second (s)
Electricity current	Ampere (A)
Temperature	Kelvin (K)
Amount of substance	Mole (mol)
Intensity of light	Candela (cd)

- Second is the duration of 9 192 631 770 periods of the radiation corresponding to the transition between the two hyperfine levels of the ground state of the caesium 133 atom.

Distance

- **Reference standart is meter (m)**
- Meter is the lenght of the path travelled by light in vacuum during a time interval of 1/ 299792458 of a second.

Kilometer	km	= 1000 meter
Hektometer	hm	= 100 meter
Dekameter	dkm	= 10 meter
meter	(m)	
Decimeter	dm	= 0.1 meter
Centimeter	cm	= 0.01 meter
Milimeter	mm	= 0.001 metre
Micron	μ	= 0.000001 meter
Millimicron	mμ	= 0.000000001 meter
Angtröm	A°	= 0.0000000001 meter
Micromicron	μμ	= 0.00000000001 meter

Mass

- **International reference standart is kilogram (kg).**
- Kilogram is equal to the mass of the international prototype of the kilogram.

Kilogram	kg	= 1000	gram
Hektogram	hg	= 100	gram
Decagram	dkg	= 10	gram
Gram	(g)		
Decigram	dg	= 0.1	gram
Centigram	cg	= 0.01	gram
Milligram	mg	= 0.001	gram
Microgram	μg	= 0.000001	gram

Volume

- **International reference standart is cubic meter (m^3) and in metric system it is used as liter (litre) (l, L)**

Kilolitre	kl	= 1000	litre
Hectolitre	hl	= 100	litre
Dekalitre	dkl	= 10	litre
	litre (l, L)		
Decilitre	dl	= 0.1	litre
Centilitre	cl	= 0.01	litre
Millilitre	ml	= 0.001	litre
Microlitre	μl	= 0.000001	litre

Difference between kilogram and litre

- These two units frequently incorrectly used interchangeably

Kilogram is basic SI unit for mass

Litre is a derived unit for volume

- Only water, aromatic water and oxygenated water as a density of 1 g/cm^3 thus 1 kg of these liquids are also 1L
- All other liquids have different density values.

Example: Density of olive oil is 0.8 g/cm^3 which means that 800 grams of olive oil equals to 1litre.

Difference between mass and gravity

Kütle ⟶ Mass

- ✓ is a physical measure of the amount of substance
- ✓ mass can be found by weighing in a balance

Ağırlık ⟶ Gravity

- ✓ is the force exerted downward by gravitational acceleration effect
- ✓ calculated mathematically, it is a force unit

SI unit system :

- **Mass is: kg**
- **Gravity is: a force unit Newton (N)**

Thermodynamic temperature

- **Reference standart is Kelvin (^oK)**
- **Kelvin is the fraction 1/273,15 of the thermodynamic temperature of the triple point of water.**
- In practice Celcius degree is generally used (^oC)

1 ^{o}C : 273.15 ^{o}K

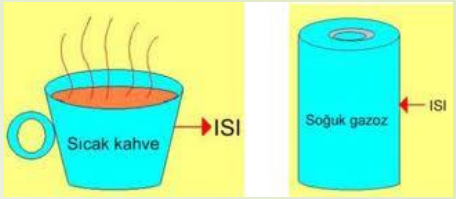
According to Celcius freezing point of water is 0 ^{o}C, the boiling point of water is 100 ^{o}C and it is equally graduated to 100 units between these two points.

Temperature unit	°C	°K	°F
°C (Celsius)		°C+273.15	1.8 °C+32
°K (Kelvin)	°K-273.15		1.8K-459.4
°F (Fahrenheit)	0.556 F-32	0.556 F+255.3	

Celsius	Fahrenheit	°F = °C × 1.8 + 32
Fahrenheit	Celsius	°C = (°F – 32) / 1.8
Celsius	Kelvin	°K = °C + 273.15
Kelvin	Celsius	°C = °K – 273.15

	°F	°K	°C
Boiling point	**212**	**373**	**100**
C° = (5/9) x (F° – 32)			
Freezing point	**32**	**273.15**	**0**

Difference between temperature and heat



- **These terminologies are frequently misused**

  Example: it is wrong to say that heat is 25°C for weather , it is the temperature

Temperature (sıcaklık) : Kelvin unit

- is the thermal state of substance,
- it is an expression which gives the amount of heat energy

Heat (Isı): Joule unit

- is the energy transfering from one system to another which has lower temperature, due to temperature difference

- Calory (cal) is the amount of heat required to raise temperature of 1 g water from 14.5 °C to 15.5 °C (1 cal = 4.187 J)
- British Thermal Unit (BTU) (1 BTU = 252 cal = 1055 J)

Amount of substance

- Unit is mole
- Mole is the amount of substance of a system which contains as many elementary entities as there are atoms in 0,012 kg of carbon 12.

SI derived units

Hertz (Hz)	Frequency	s^{-1}
Newton (N)	force	$kg.m/s^2$
Pascal (Pa)	pressure	$kg/m.s^2$ (N/m^2)
Joule (J)	Energy/work	$kg.m^2/s^2$ (N/m)
Watt (W)	power	$kg.m^2/s^3$ (J/s)
Coulomb (C)	Electric charge	A.s
Volt (V)	Electric potential	$(kg.m^2)/(s^3.A)$ (W/A)
Ohm (Ω, omega)	Electric resistance	$kg.m^2.s^4.A^2$ (V/A)
Siemens (S, mho)	Electric conductance	$s^3.A^2/kg.m^2$ (A/V)
Celcius degree (°C)	temperature	(K-273,16)
Radian (rad)	Plane angle	$m.m^{-1}$
Becquerel (Bq)	activity	s^{-1}
Gray (Gy)	Absorbed dose	m^2/s^2(J/kg)
Sievert (Sv)	Dose equivalent	m^2/s^2 (Gy)

- **Newton (N)** is the force required to cause a mass of one kilogram to accelerate at a rate of one meter per second squared in the absence of other force-producing effects.
- **Joule (J)** is defined as the amount of energy exerted when a force of one Mewton is applied over a displacement of one meter.
  (Joule = newton x meter)
- **Watt (W)** is joule per second.
- **Radian (rad)** is a unit of measurement of angles equal to about 57.3°, equivalent to the angle subtended at the centre of a circle by an arc equal in length to the radius.
- **Siemens (S),** is the equivalent of one second cubed ampere squared per kilogram per meter squared ($1\ s^3 \cdot A^2 \cdot kg^{-1} \cdot m^{-2}$). The siemens is also the equivalent of an ampere per volt (A/V).

- **Pascal (Pa)** is the unit of pressure or stress in the SI system.

It is equivalent to one Newton of force applied over an area of one meter squared .

1 Pa = 1 N· m^{-2}.

1 Pa = 1 kg· m^{-1}· s^{-2}

- This is an important unit in viscosty calculations in semisolid and liquid formulations and substances.
- **Poise (p)** is another unit used in dynamic viscosity measurement (in CGS). The *poise* analogous unit in the SI system is (Pa·s)
- **Bar** is also a metric unit of pressure, but is not approved as part of the SI. It is equal to 10^5 Pa (10^5 N/m^2) This is approximately the pressure exerted by Earth's atmosphere at sea level.