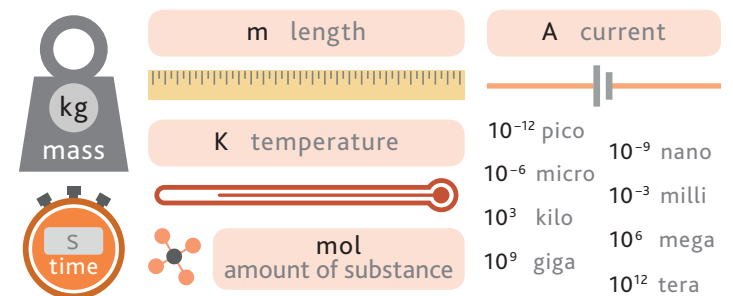


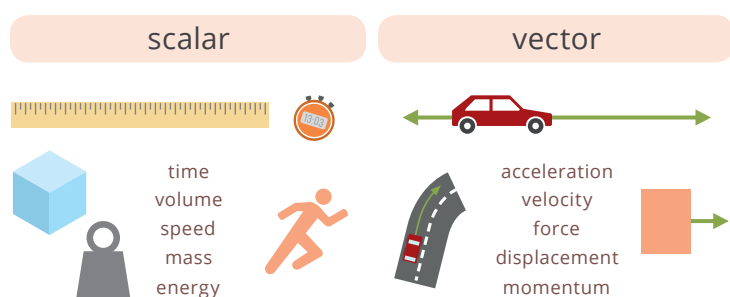
## 1.1 Physical quantities



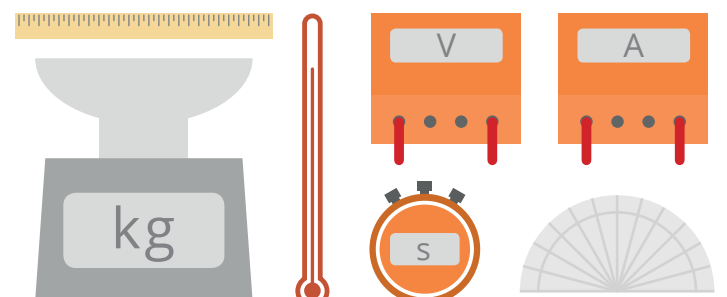
## 1.2 SI units



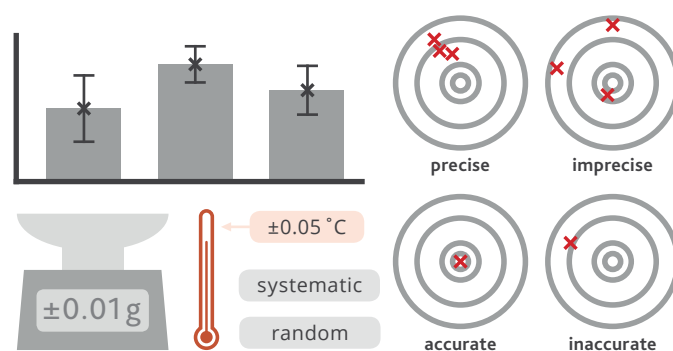
Units of measurement



## 1.4 Scalars and vectors



## 2.1 Measurements



## 2.2 Errors and uncertainties



Measurement uncertainty



equations of motion

$$v = u + at$$

$$s = (u + v)t/2$$

$$s = ut + \frac{1}{2}at^2$$

$$v^2 = u^2 + 2as$$

projectile motion

$$g = 9.81 \text{ m s}^{-2}$$

**3.1 Equations of motion**

$F = ma$  resultant force acceleration

$p = mv$

1<sup>st</sup> law 2<sup>nd</sup> law 3<sup>rd</sup> law

stationary uniform motion  $F = ma$

**4.1 Momentum and Newton's laws of motion**

$W = mg$

terminal velocity

terminal velocity

MASS: 75kg WEIGHT: 735N

MASS: 75kg WEIGHT: 122N

**4.2 Non-uniform motion**

uniform gravitational field uniform electric field

$F = mg$   $F = Eq$

$g$   $m$   $F$   $E$   $q$   $F$

**5.1 Types of force**

REPEL

ATTRACT

REPEL

**17.1 Concept of an electric field**

$E = \frac{\Delta V}{\Delta d}$

$F = \frac{QV}{d}$

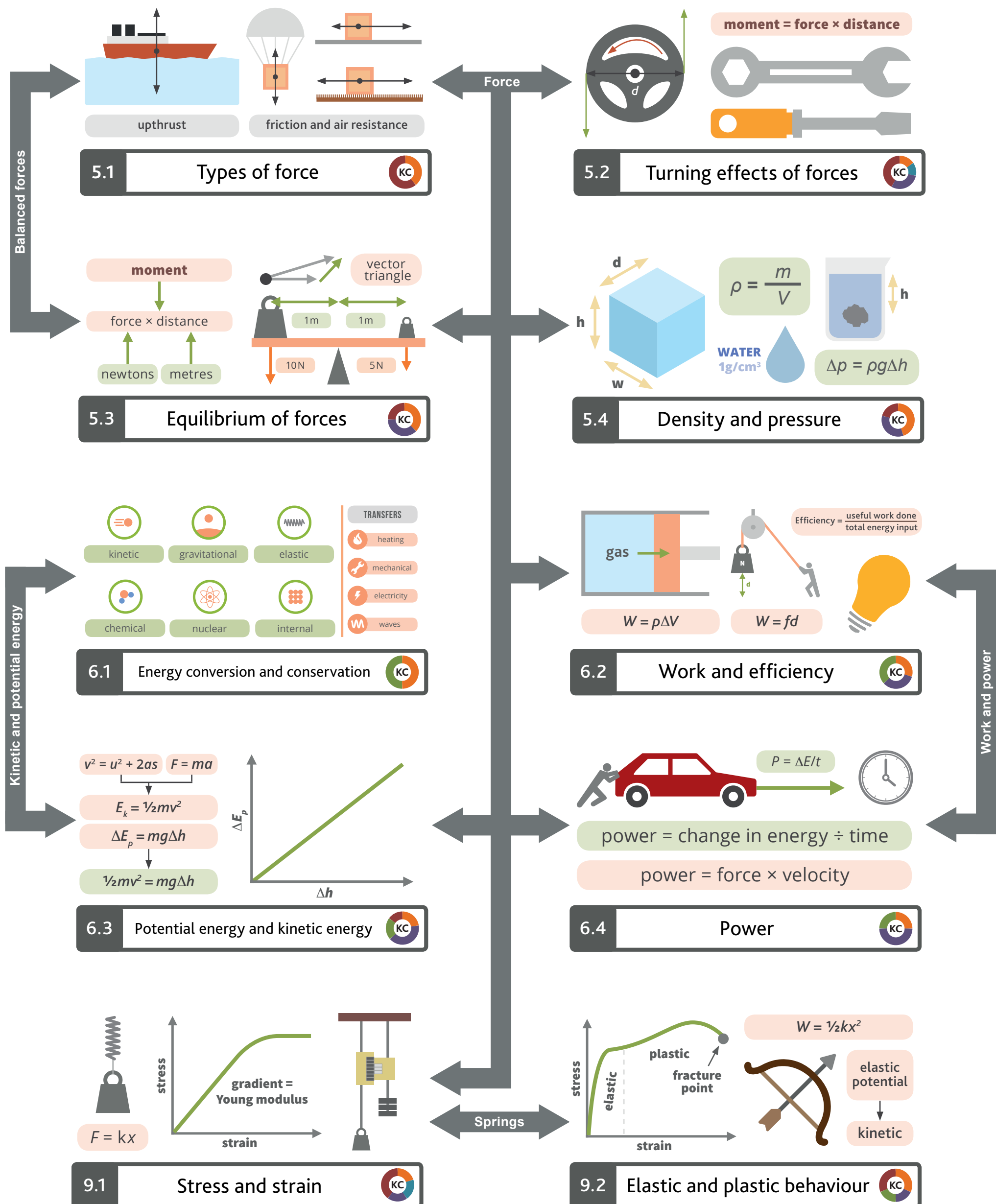
**17.2 Uniform electric fields**

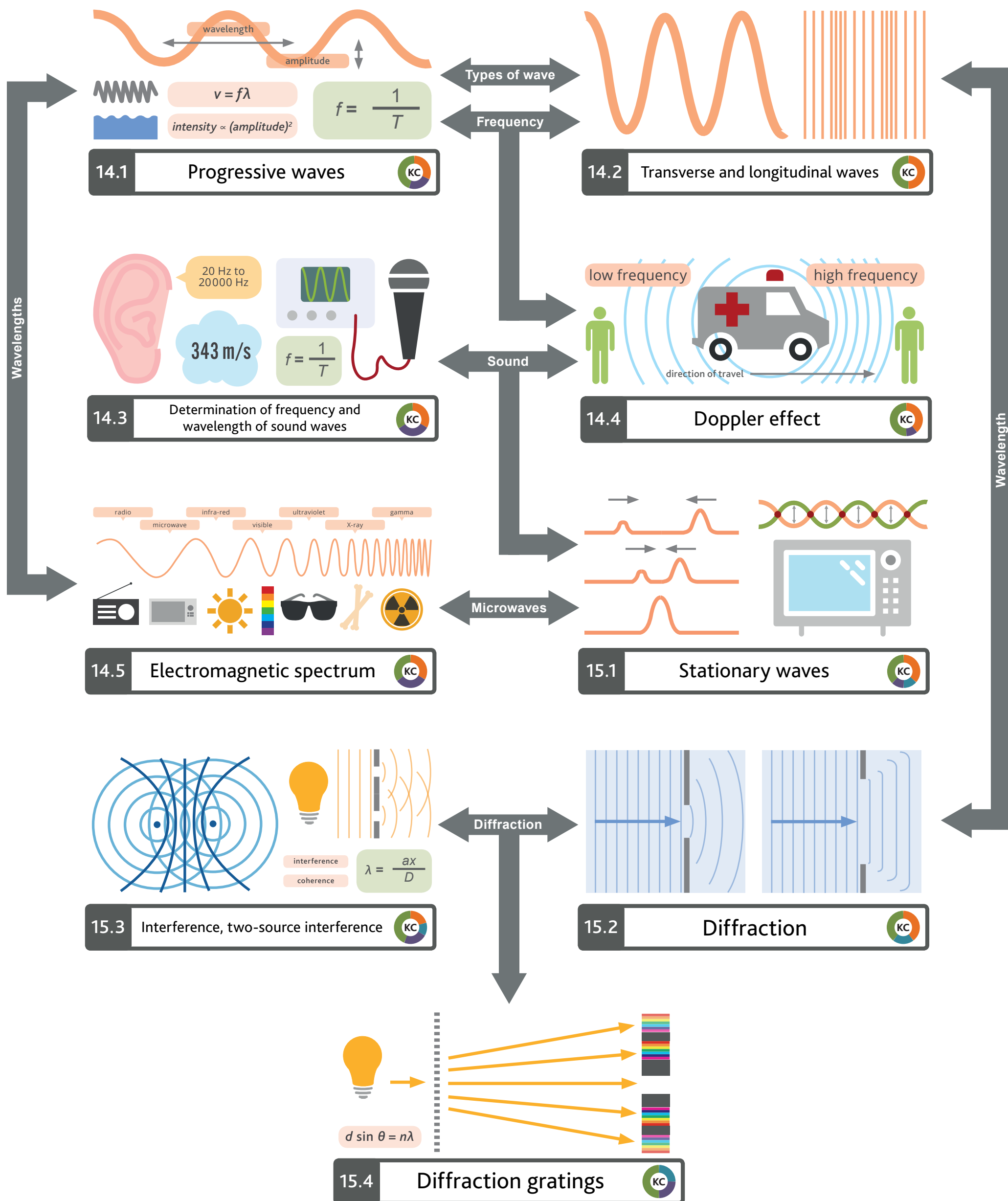
Momentum conserved:  $m_1v_1 + m_2v_2 = m_1v'_1 + m_2v'_2$

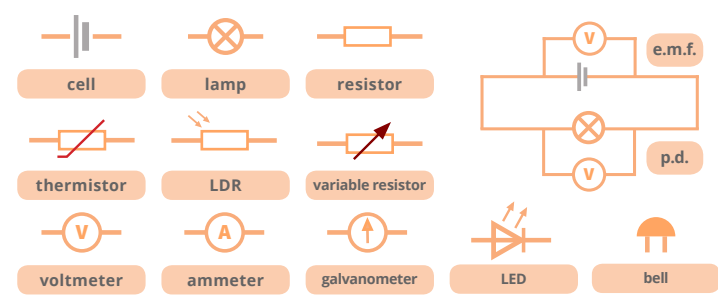
elastic collision inelastic collision

**4.3 Linear momentum and its conservation**

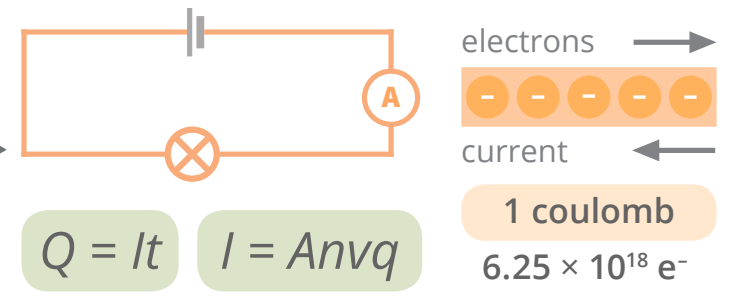
# 3 Forces, work and materials







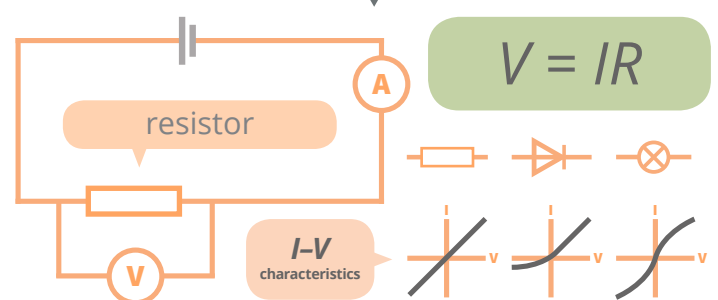
## 20.1 Practical circuits



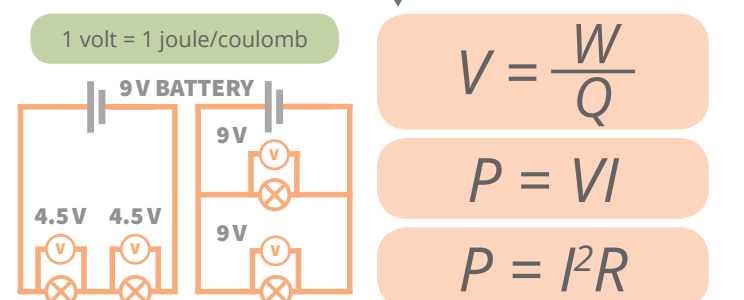
## 19.1 Electric current



## Circuits



## 19.3 Resistance and resistivity

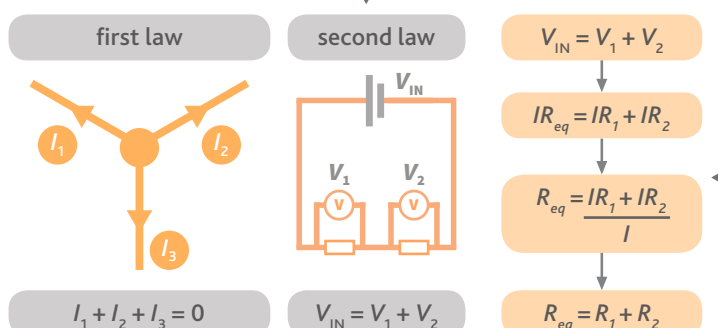


## 19.2 Potential difference and power

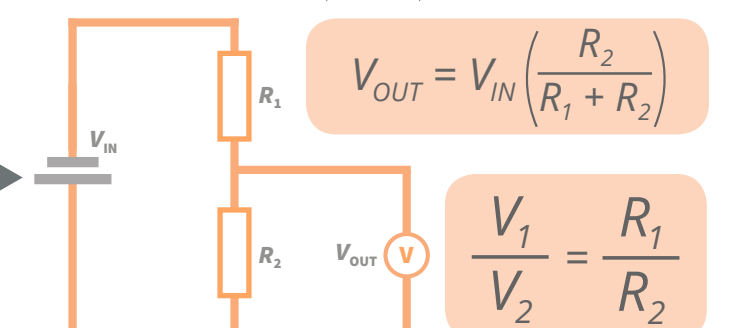


Resistance

Potential difference

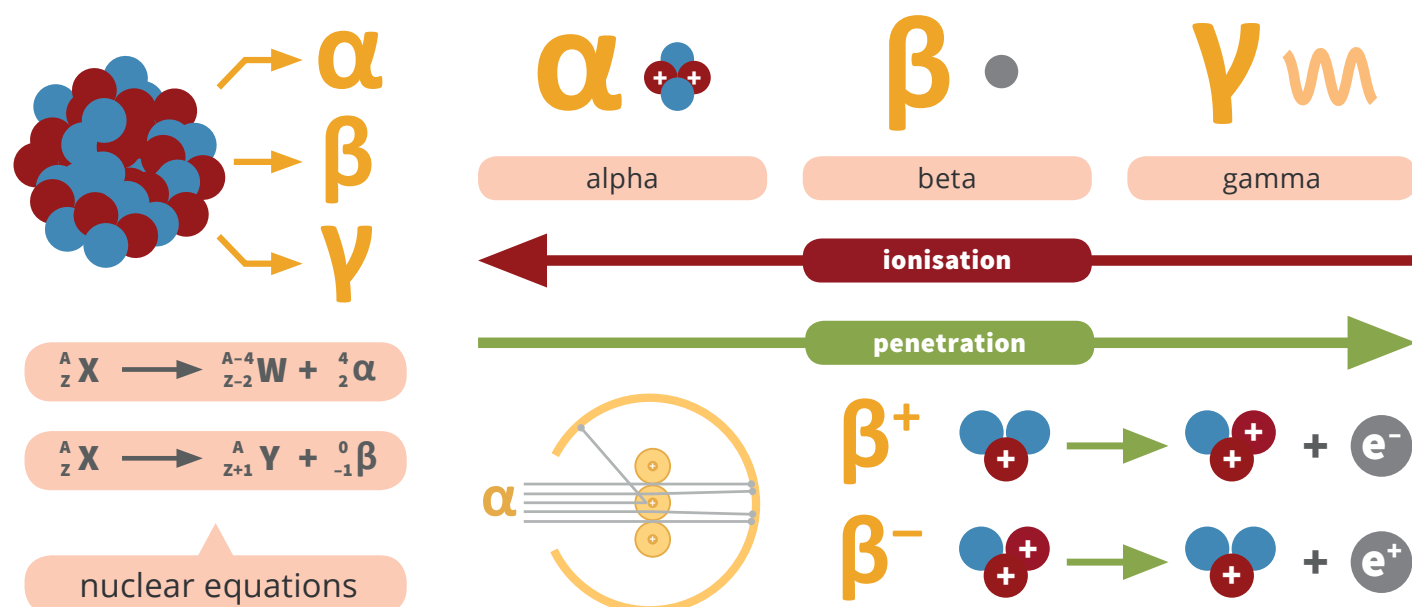


## 20.2 Kirchhoff's laws



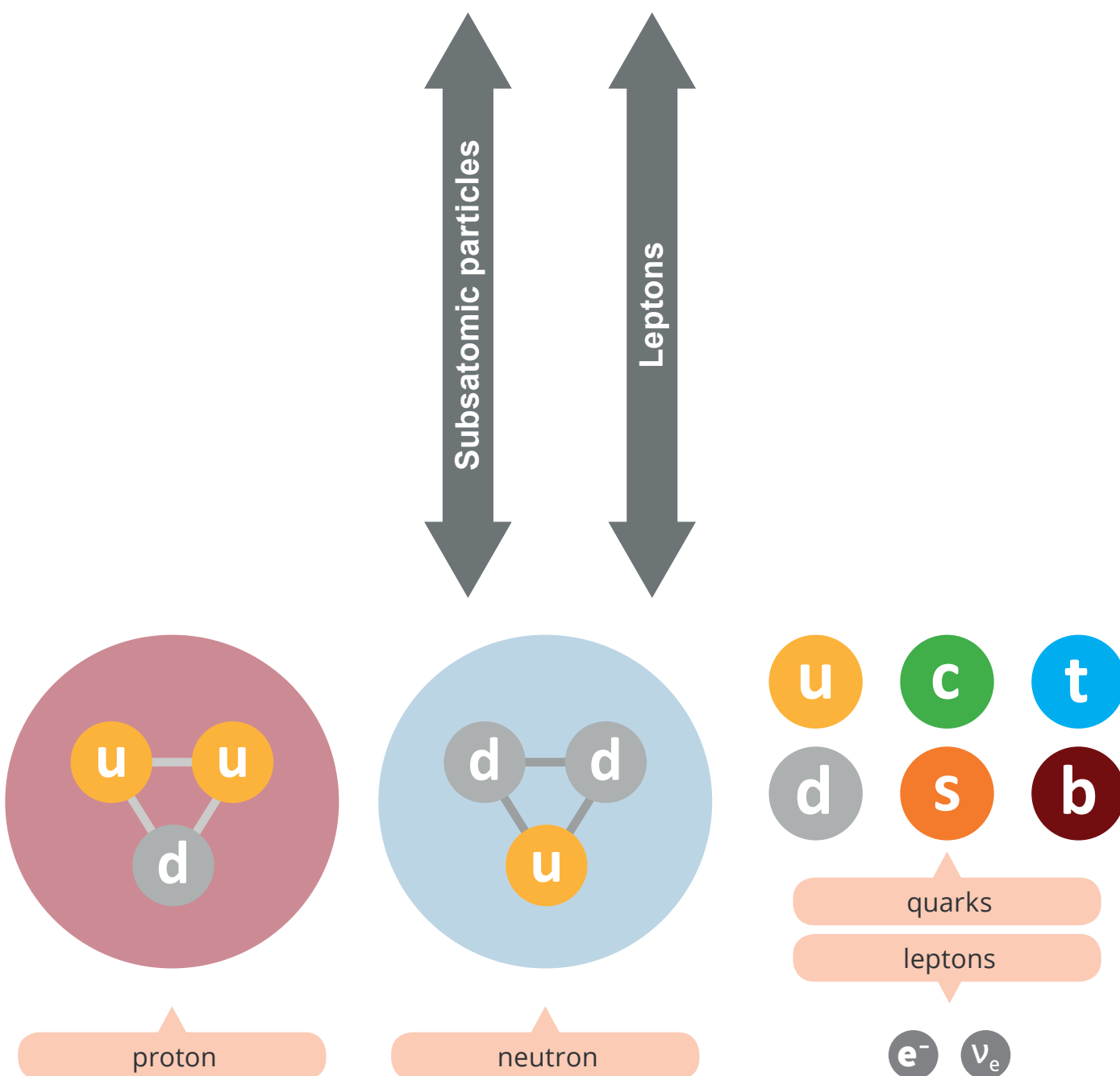
## 20.3 Potential dividers





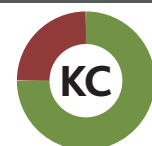
26.1

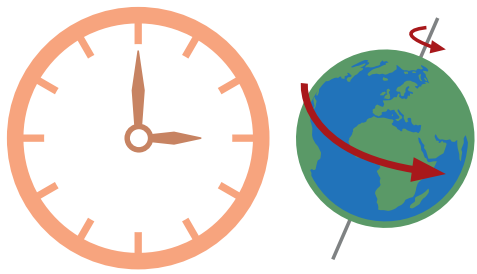
## Atoms, nuclei and radiation



26.2

## Fundamental particles





$$180^\circ = \pi \text{ rad}$$

$$90^\circ = \pi/2 \text{ rad}$$

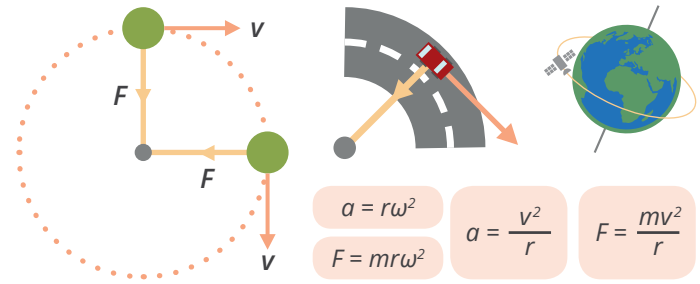
$$v = r\omega$$

### 7.1 Kinematics of uniform circular motion



Circular motion

Angular speed



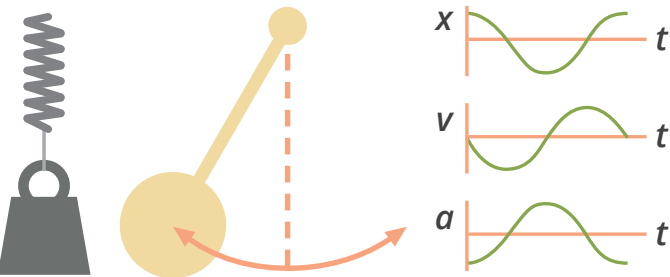
$$a = r\omega^2$$

$$F = mr\omega^2$$

$$a = \frac{v^2}{r}$$

$$F = \frac{mv^2}{r}$$

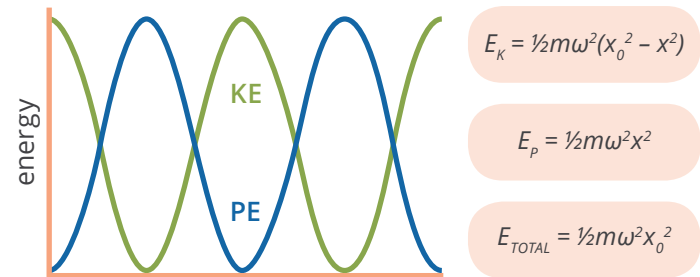
### 7.2 Centripetal acceleration and centripetal force



### 13.1 Simple harmonic oscillations



Simple harmonic motion

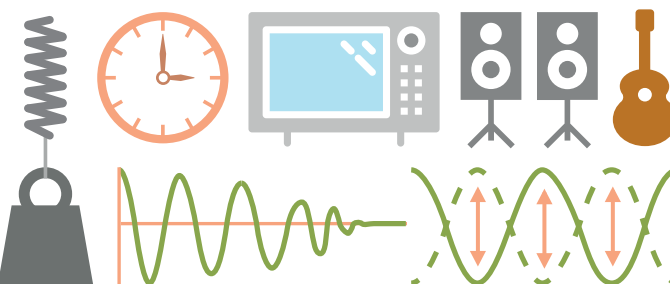


$$E_K = \frac{1}{2}m\omega^2(x_0^2 - x^2)$$

$$E_P = \frac{1}{2}m\omega^2x^2$$

$$E_{TOTAL} = \frac{1}{2}m\omega^2x_0^2$$

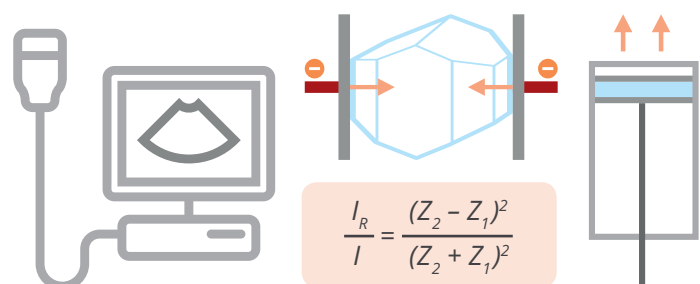
### 13.2 Energy in simple harmonic motion



### 13.3 Damped and forced oscillations, resonance

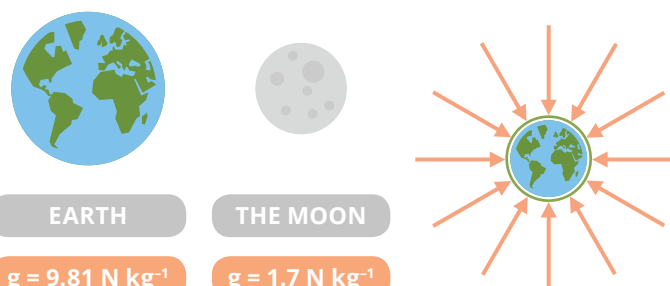


Sound waves



$$\frac{I_R}{I} = \frac{(Z_2 - Z_1)^2}{(Z_2 + Z_1)^2}$$

### 14.6 Production and use of ultrasound in diagnosis



EARTH

THE MOON

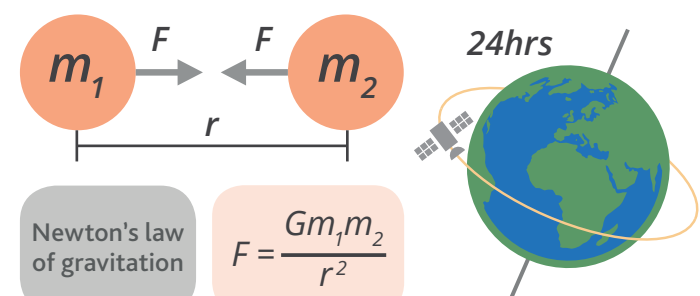
$$g = 9.81 \text{ N kg}^{-1}$$

$$g = 1.7 \text{ N kg}^{-1}$$

### 8.1 Gravitational field



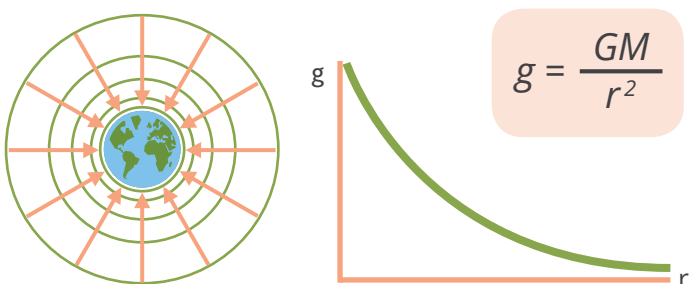
Gravitational fields



Newton's law of gravitation

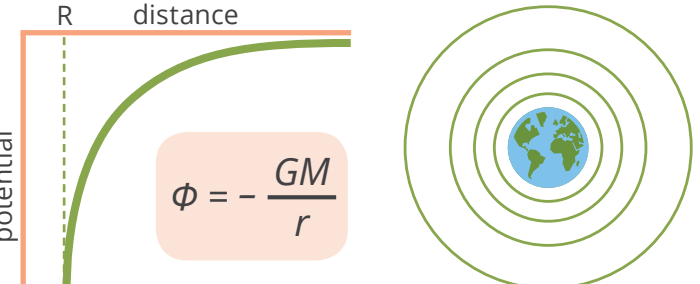
$$F = \frac{Gm_1m_2}{r^2}$$

### 8.2 Gravitational force between point masses



$$g = \frac{GM}{r^2}$$

### 8.3 Gravitational field of a point mass



$$\phi = -\frac{GM}{r}$$

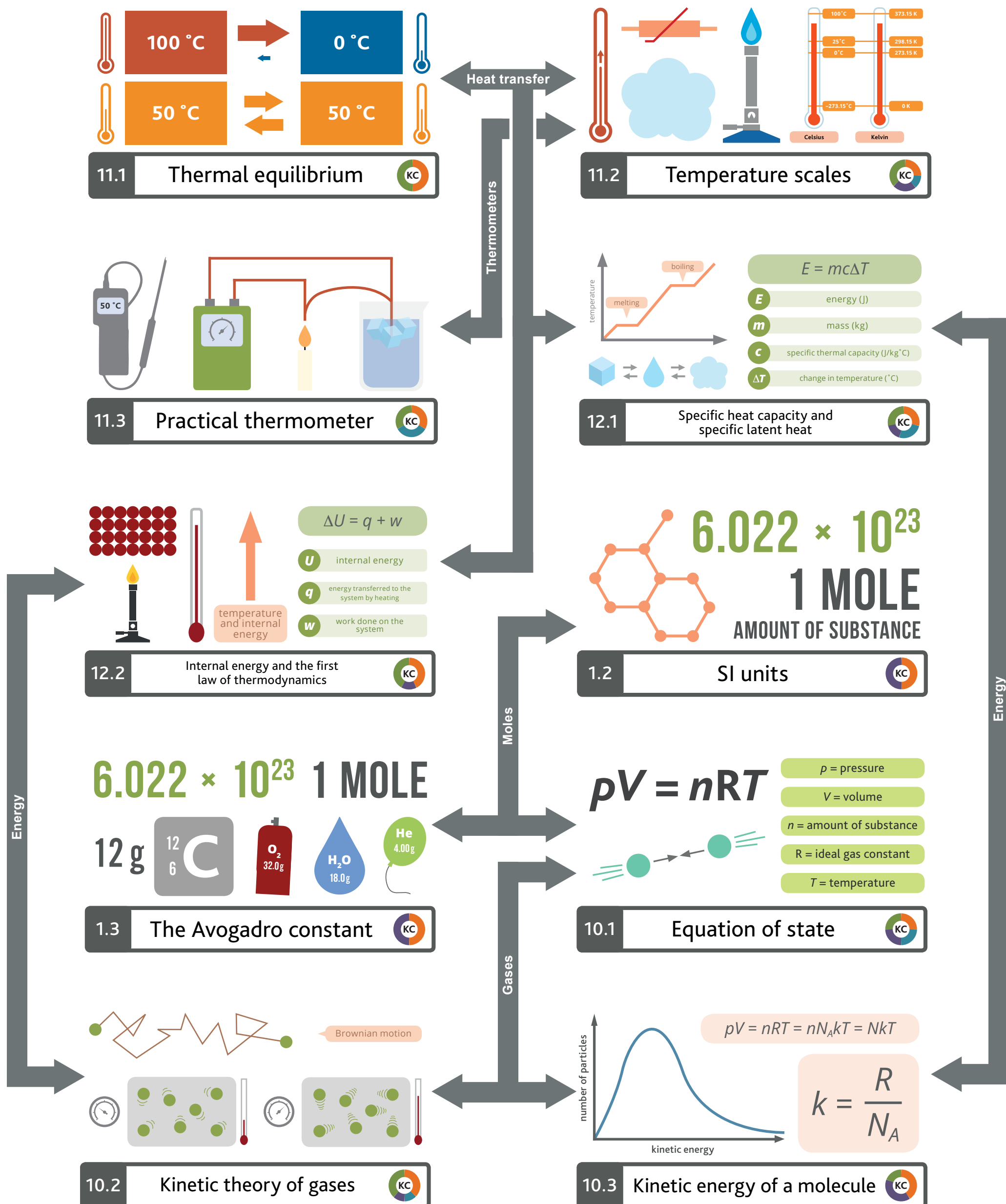
### 8.4 Gravitational potential



Satellite orbits



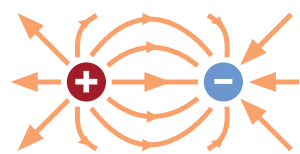






# 9

# Electricity and electronics

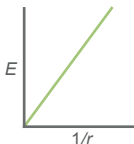


$$F = \frac{Q_1 Q_2}{4\pi\epsilon_0 r^2}$$

17.3 Electric forces between point charges KC



$$E = \frac{Q}{4\pi\epsilon_0 r^2}$$

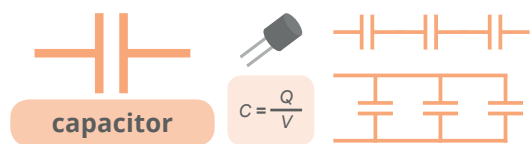


17.4 Electric field of a point charge KC

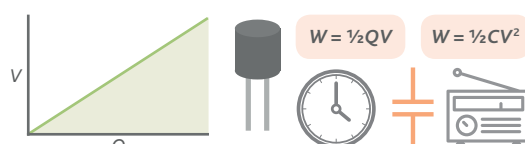


$$V = \frac{Q}{4\pi\epsilon_0 r}$$

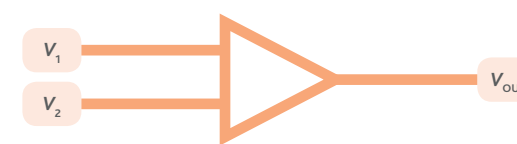
17.5 Electric potential KC



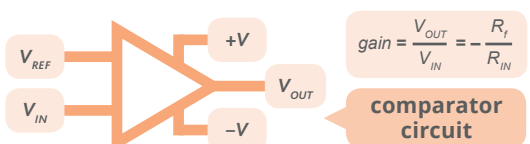
18.1 Capacitors and capacitance KC



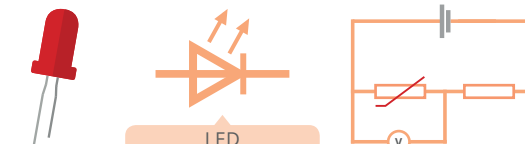
18.2 Energy stored in a capacitor KC



21.1 The ideal operational amplifier KC



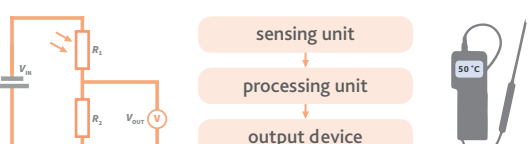
21.2 Operational amplifier circuits KC



21.3 Output devices KC



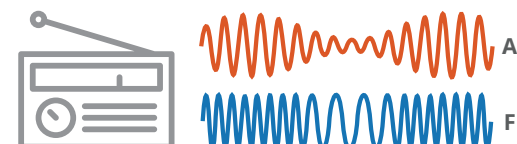
19.4 Sensing devices KC



20.3 Potential dividers KC



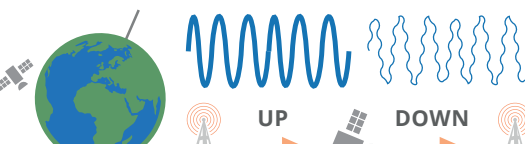
16.1 Communication channels KC



16.2 Modulation KC



16.3 Digital communication KC

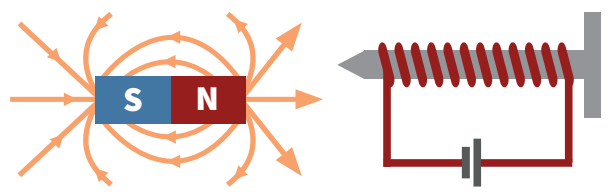


16.4 Relative merits of channels of communication KC

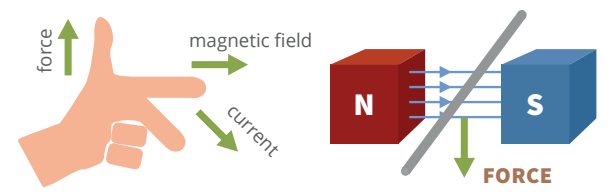


16.5 Attenuation KC



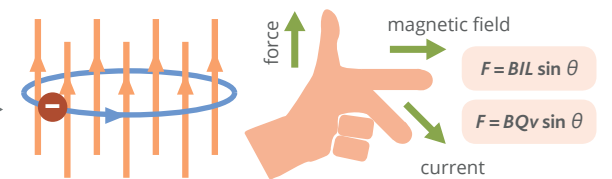


22.1 Concept of a magnetic field KC

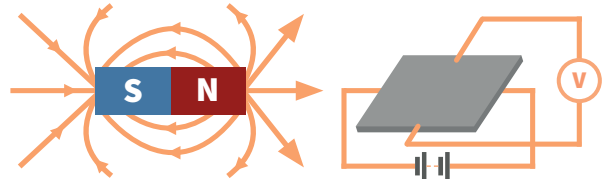


22.2 Force on a current-carrying conductor KC

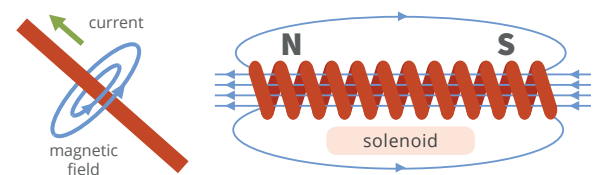
Fleming's left hand rule



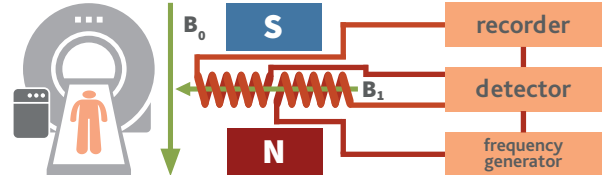
22.3 Force on a moving charge KC



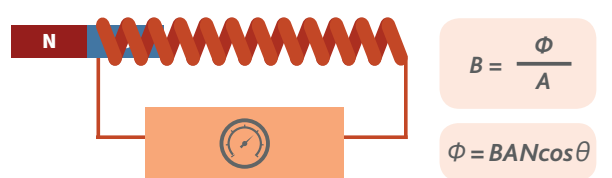
2.1 Measurements



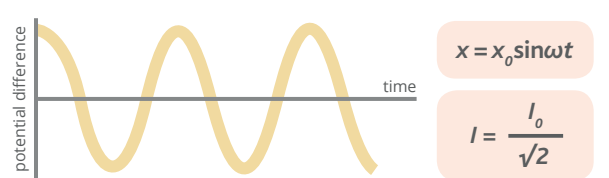
22.4 Magnetic fields due to currents KC



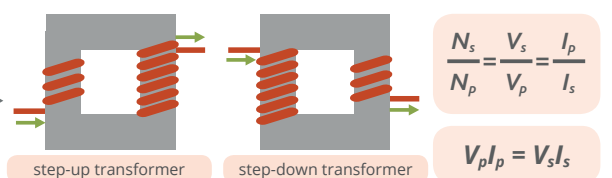
22.5 Nuclear magnetic resonance imaging KC



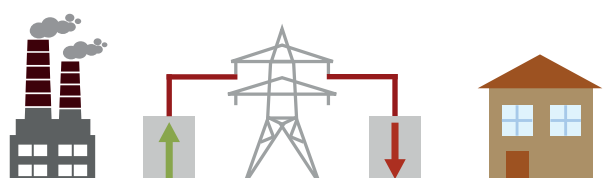
23.1 Laws of electromagnetic induction KC



24.1 Characteristics of alternating currents KC

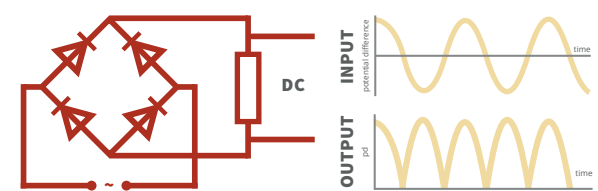


24.2 The transformer KC



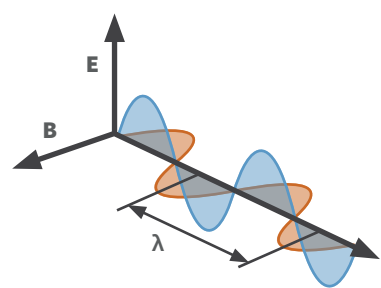
24.3 Transmission of electrical energy KC

AC and DC



24.4 Rectification KC

AC and DC



$$E = hf$$

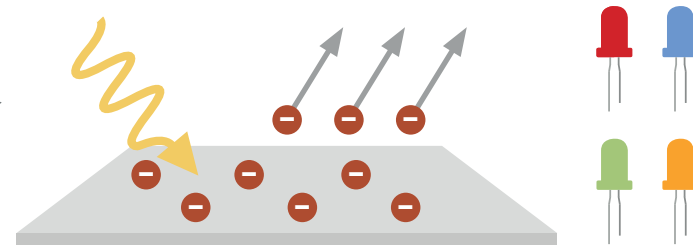
$$E = \frac{hc}{\lambda}$$

25.1

Energy of a photon



Photons

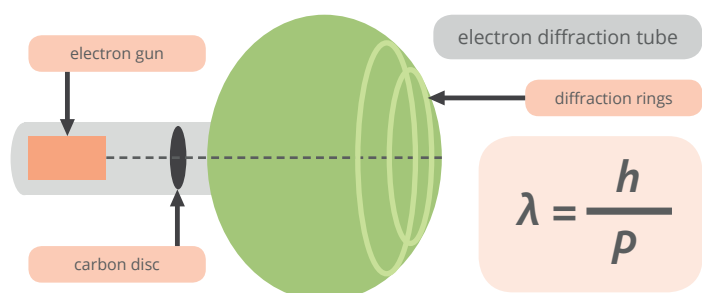


25.2

Photoelectric emission of electrons



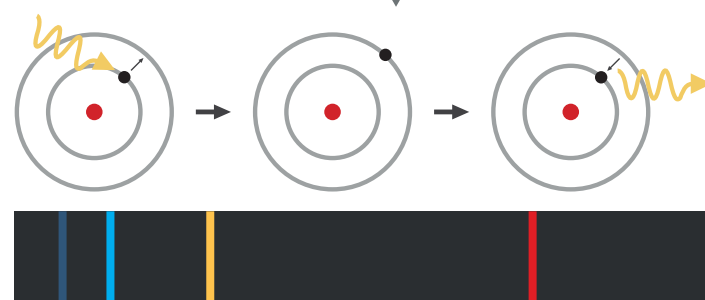
Wave-particle duality



$$\lambda = \frac{h}{p}$$

25.3

Wave-particle duality



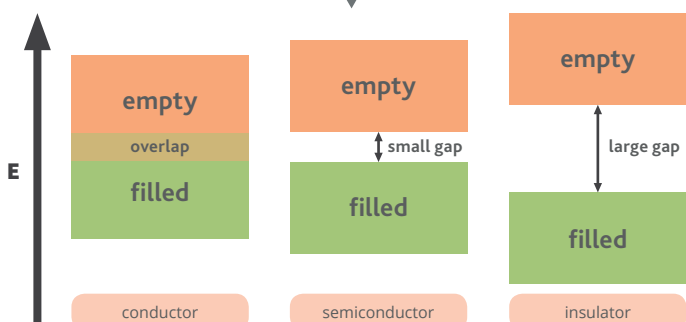
25.4

Energy levels in atoms and line spectra



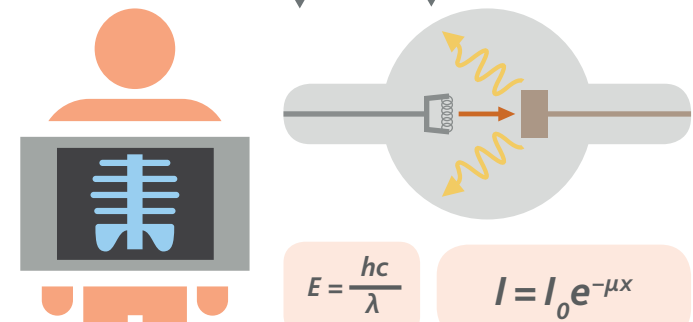
Energy levels

Emission



25.5

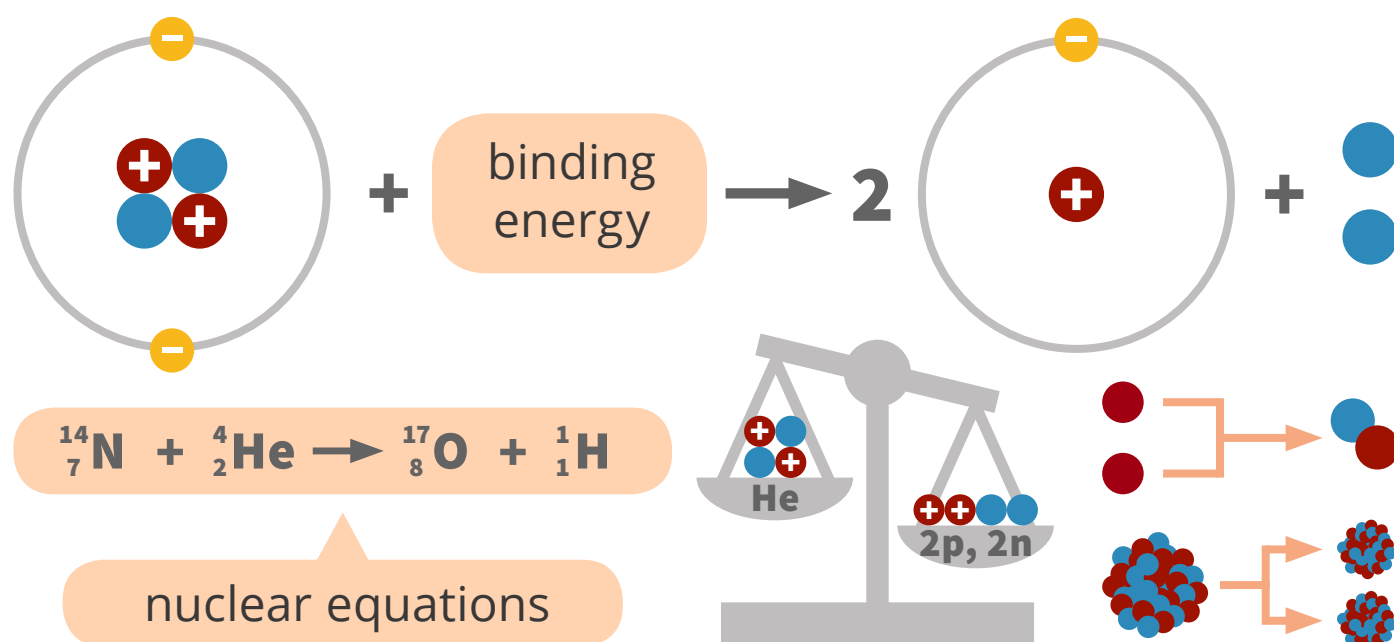
Band theory



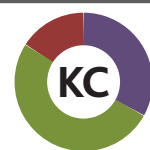
25.6

Production and use of X-rays

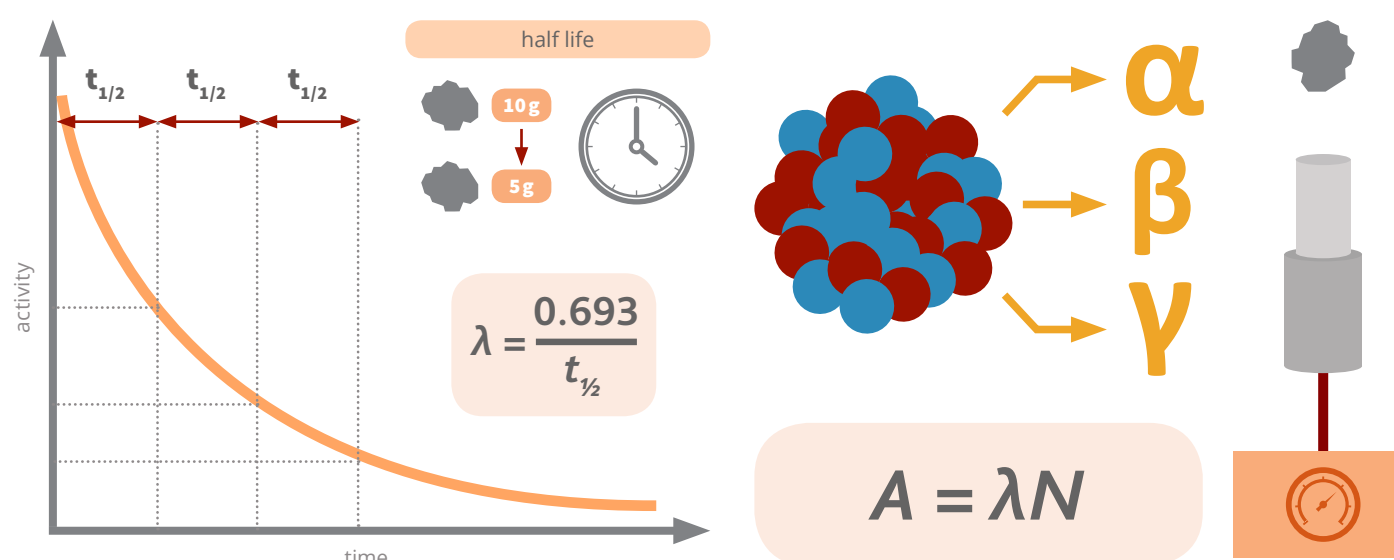




### 26.3 Mass defect and nuclear binding energy



Radioactive decay



### 26.4

### Radioactive decay

