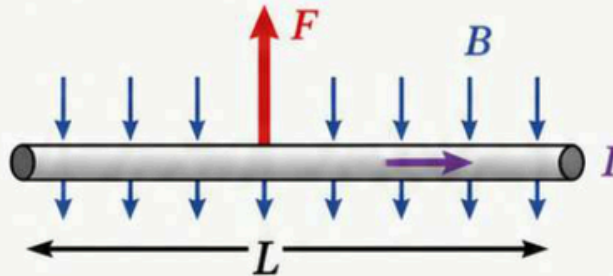


# GCSE MAGNETISM & ELECTROMAGNETISM

## IMPORTANT FORMULAS

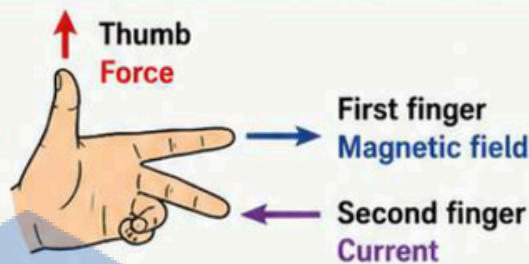
### 1) FORCE ON A CURRENT-CARRYING WIRE IN A MAGNETIC FIELD

$$F = BIL$$



- $F$  = force (N)
- $B$  = magnetic flux density (T)
- $I$  = current (A)
- $L$  = length of wire (m)

Direction given by  
Fleming's Left-Hand Rule

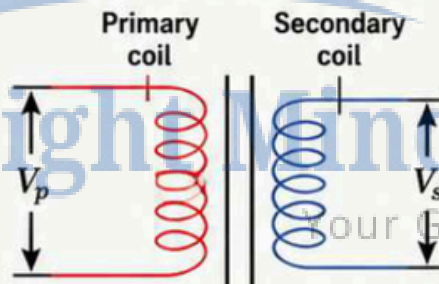


#### REMEMBER

Point thumb, first finger and second finger at right angles to each other as shown.

### 2) CHANGE VOLTAGE USING COIL (TRANSFORMER EQUATION)

$$\frac{V_p}{V_s} = \frac{N_p}{N_s}$$



- $V$  = voltage (V)
- $N$  = number of turns
- $p$  = primary
- $s$  = secondary

### 3) POWER RELATION

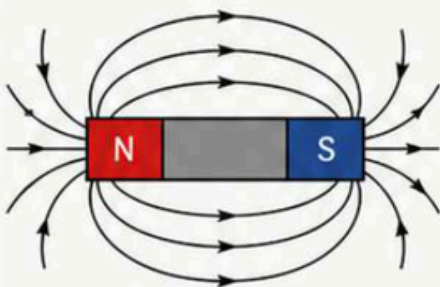
$$V_p I_p = V_s I_s$$

- $V$  = voltage (V)
- $I$  = current (A)

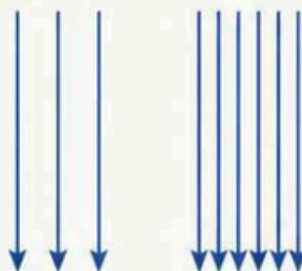
In an ideal transformer, input power = output power (ignoring energy losses)

### 4) MAGNETIC FIELDS

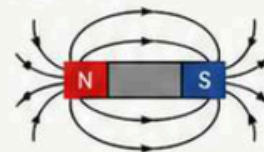
- Field lines go **North** → **South**



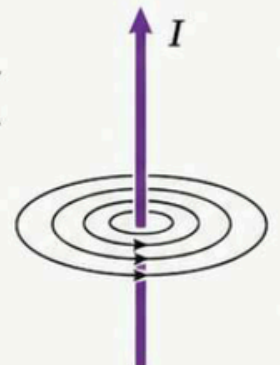
- Stronger field = lines closer together



- Around a **bar magnet** → curved lines



- Around a **wire** → concentric circles



# GCSE PARTICLE MODEL OF MATTER

## IMPORTANT FORMULAS

### CHANGES OF STATE

- **Melting** (solid → liquid)



- **Freezing** (liquid → solid)



- **Boiling/Evaporation** (liquid → gas)



- **Condensing** (gas → liquid)



- **Sublimation** (solid ↔ gas)



	<b>Solid</b> (fixed shape, fixed volume)
	<b>Liquid</b> (no fixed shape, fixed volume)
	<b>Gas</b> (no fixed shape, no fixed volume)



Law of Conservation of Energy



Energy is **transferred**, not created/destroyed



Energy in a particle



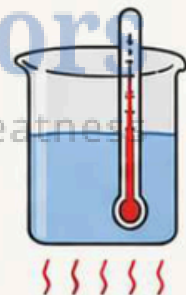
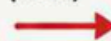
Internal Energy = **Kinetic Energy** + **Potential Energy**

### SPECIFIC HEAT CAPACITY

$$E = mc\Delta T$$

- $E$  = energy (J)
- $m$  = mass (kg)
- $c$  = specific heat capacity (J/kg°C)
- $\Delta T$  = temperature change (°C)

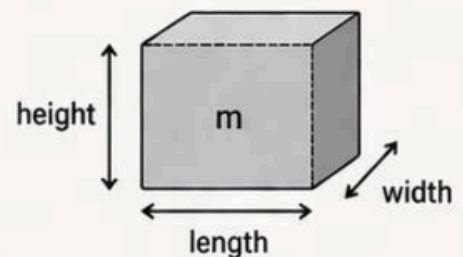
Add energy (heat)



### DENSITY

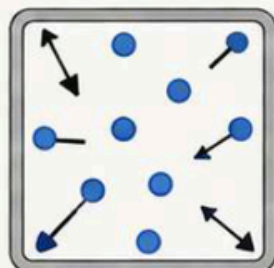
$$\rho = \frac{m}{V}$$

- $\rho$  = density (kg/m<sup>3</sup>)
- $m$  = mass (kg)
- $V$  = volume (m<sup>3</sup>)



### GAS PRESSURE

- Caused by particles colliding with container walls



#### KEY IDEAS



- Higher temperature → faster particles → higher pressure

$m$



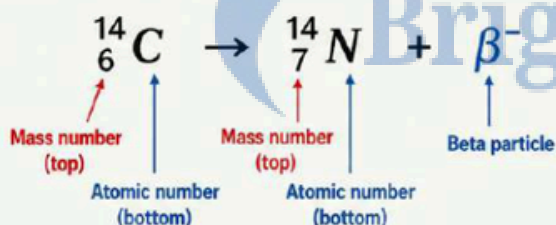
- Smaller volume → more collisions → higher pressure

# GCSE ATOMIC STRUCTURE & RADIOACTIVITY IMPORTANT FORMULAS

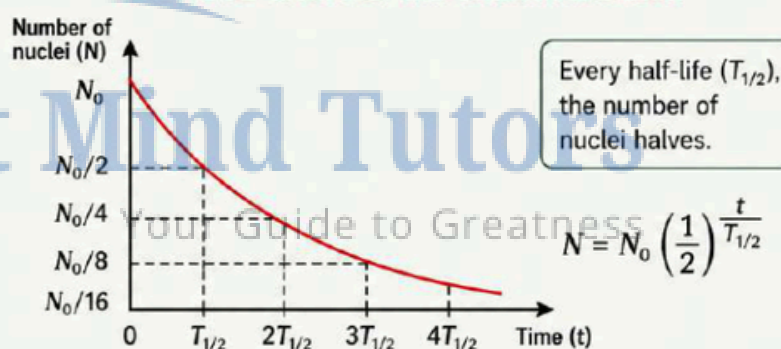
Type	Symbol	Charge	Penetration	Range
 Alpha	$\alpha$	<b>+2</b>	<b>Low</b> (stopped by paper)	<b>Short</b>
 Beta	$\beta^-$	<b>-1</b>	<b>Medium</b> (stopped by aluminium)	<b>Medium</b>
 Gamma	$\gamma$	<b>0</b>	<b>High</b> (needs lead/concrete)	<b>Long</b>

## NUCLEAR EQUATION

- Mass number & atomic number must balance
- Example:



## HALF-LIFE GRAPHS: EXPONENTIAL DECAY



### Key points:

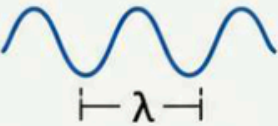
- Alpha is the most strongly ionising.
- Gamma is the most penetrating.





### Useful constants:

- Speed in air  $\approx 340$  m/s
- 1 half-life =  $T_{1/2}$

# GCSE WAVE & ELECTROMAGNETIC IMPORTANT FORMULAS

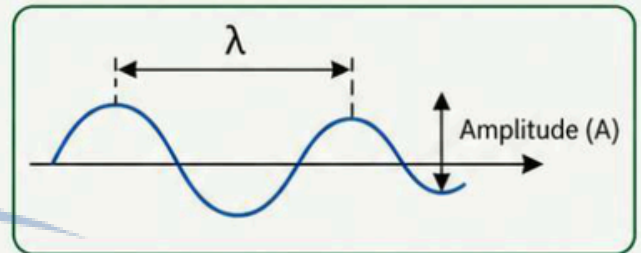
1)  Speed of wave  $v = f \times \lambda$

2)  Frequency Time period =  $\frac{1}{f}$

3)  Energy of a wave  $E = h \times f$

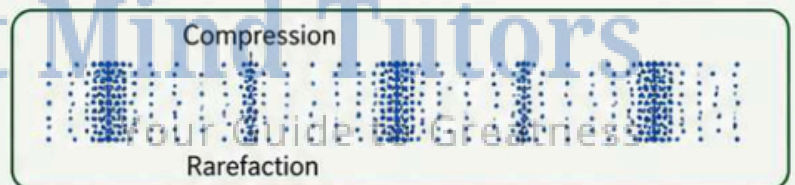
## Key terms

- Wavelength ( $\lambda$ ) = distance between waves (m)
- Frequency ( $f$ ) = waves per second (Hz)
- Amplitude = height (energy)
- Period ( $T$ ) = time for one wave (s)



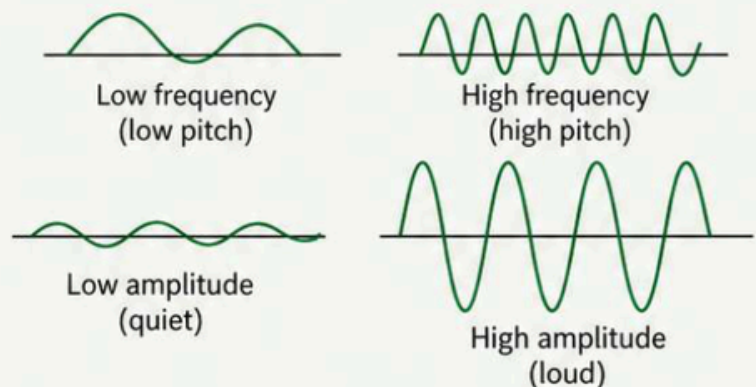
## SOUND


- Longitudinal wave
- Needs medium (no vacuum)



## Links




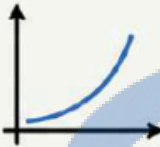



- Frequency  $\rightarrow$  pitch
- Amplitude  $\rightarrow$  loudness



 Speed in air  $\approx 340 \text{ m/s}$

- Wave speed (light):  $3.0 \times 10^8 \text{ m/s}$
- Planck's constant:  $6.63 \times 10^{-34} \text{ Js}$

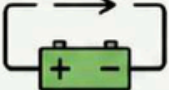




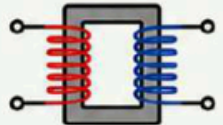
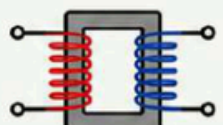
## GCSE FORCES, MOTION & ACCELERATION IMPORTANT FORMULAS

- 1)  Speed  $s = \frac{d}{t}$
- 2)  Velocity  $v = \frac{\Delta x}{\Delta t}$   $\Delta x = \text{change in displacement}$
- 3)  Acceleration  $a = \frac{v - u}{t}$
- 4)  SUVAT Equations  $v = u + at$   $s = ut + \frac{1}{2}at^2$   
 $v^2 = u^2 + 2as$
- 5)  Newtons Second Law  $F = ma$
- 6)  Momentum  $p = mv$
- 7)  Reaction Time  $0.2 - 0.9$

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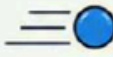
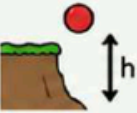


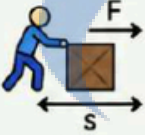


## GCSE ELECTRICITY IMPORTANT FORMULAS

- 1)  Charge Flow  $Q = I \times t$
- 2)  Energy Transfer  $E = Q \times V$
- 3)  Ohms Law  $V = I R$
- 4)  Power  $P = I V$  or  $P = I^2 R$
- 5)  Resistivity  $R = \rho \times \frac{l}{A}$
- 6)  Transformer Equation  $\frac{V_p}{V_s} = \frac{N_p}{N_s}$
- 7)  Ideal Transformer  $V_p I_p = V_s I_s$

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## GCSE PHYSICS ENERGY TOPIC IMPORTANT FORMULAS

-  Kinetic Energy  $E_k = \frac{1}{2} mv^2$
-  Gravitational Potential Energy  $E_p = mgh$
-  Elastic Potential Energy  $E = \frac{1}{2} ke^2$
-  Specific Heat Capacity  $Q = mc \Delta t$
-  Work done  $W = Fs$
-  Power  $P = \frac{E}{T}$
-  Energy Efficiency  $\text{Efficiency} = \frac{\text{useful output}}{\text{total input}} \times 100$

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