



# GAMSAT Section 3: Physics Equations

A selection of physics equations you may find it helpful to be familiar with for GAMSAT.

Please provide feedback on this resource so I can improve it!  
Feedback link - <https://www.surveymonkey.co.uk/r/JWHM2HR>

## Forces and Motion

$$F = ma$$

- F is force
- m is mass
- a is acceleration

$$W = mg$$

- W is weight
- m is mass
- g is the acceleration of gravity (A.K.A. gravitational field strength)

$$p = mv$$

- p is momentum
- m is mass
- v is velocity

$$\text{Work done} = Fd$$

- F is force
- d is displacement

$$\text{Power} = \text{Work done} / \text{time} \quad \text{Moment} = Fd$$

- F is force
- d is distance between the pivot and the point where the force is acting

Friction or drag = - work done (i.e. thermal energy released)



## GAMSAT Section 3: Physics Equations

$$KE = \frac{1}{2}mv^2$$

- KE is kinetic energy
- m is mass
- v is velocity

$$GPE = mgh$$

- GPE is gravitational potential energy
- m is mass
- g is the acceleration of gravity (A.K.A. gravitational field strength)
- h is height

$$GPE_i + KE_i = GPE_f + KE_f$$

- $GPE_i$  is initial gravitational potential energy
- $GPE_f$  is final gravitational potential energy
- $KE_i$  is initial kinetic energy
- $KE_f$  is final kinetic energy

### Kinematic (SUVAT) equations

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

$$s = \frac{1}{2}(u + v)t$$

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

$$s = vt - \frac{1}{2}at^2$$

$$v = u + at$$

- s is the body's displacement
- u is the body's initial velocity
- v is the body's final velocity
- a is the body's acceleration
- t is the time



# GAMSAT Section 3: Physics Equations

## Electricity

Electric field strength =  $F / q$

- F is force
- q is charge

Electrical potential energy =  $qV$

- q is charge
- V is voltage

$V = IR$

- I is current
- R is resistance

$V = k Q/r$

- Q charge magnitude
- r distance of charge from point charge
- k is a constant =  $8.99 \times 10^9 \text{ Nm}^2/\text{C}^2$

$I = \Delta Q / t$

- I is current
- Q is charge
- t is time

$R = \rho L/A$

- R is resistance
- $\rho$  is resistivity
- A is area of conductor
- L is length of conductor



## GAMSAT Section 3: Physics Equations

$$\sigma = 1/\rho$$

- $\sigma$  is conductivity
- $\rho$  is resistivity

$$C = q/V$$

- C is capacitance
- q is charge
- V is voltage

$$P = VI$$

- P is power
- V is voltage
- I is current

$$P = V^2 / R$$

- P is power
- V is voltage
- R is resistance

$$P = I^2R$$

- P is power
- I is current
- R is resistance

### Lenses

$$1/F = 1/d_o + 1/d_i$$

- F is focal length
- $d_o$  is distance of object from lens
- $d_i$  is distance of image from lens



## GAMSAT Section 3: Physics Equations

$$1/F = 1/h_o + 1/h_i$$

- F is focal length
- $h_o$  is height of object
- $h_i$  is height of image

$$M = - d_i / d_o$$

- M is magnification
- $d_o$  is distance of object from lens
- $d_i$  is distance of image from lens

$$M_{tot} = M_1 M_2$$

- $M_{tot}$  is total magnification
- $M_1$  is magnification of the first lens
- $M_2$  is magnification of the second lens

$$P = 1 / F$$

- P is optical power
- F is focal length

### Density and Pressure

$$\text{Pressure} = F / A$$

- F is force
- A is area

$$\text{Density} = m/V$$

- m is mass
- V is volume



## GAMSAT Section 3: Physics Equations

### Units breakdown

Force and Motion	
Joule	Nm
Newton	$\text{Kgms}^{-2}$
Pascal	$\text{Nm}^{-2}$
Electricity	
Joule	$\text{CV}$
Siemens (unit of conductance)	$\Omega^{-1}$
Amp	$\text{Cs}^{-1}$
Volt	$\text{JC}^{-1}$
Coloumb	$6.242 \times 10^{18}$ electrons
Faraday	$\text{CV}^{-1}$
Lenses	
Dioptre (unit of optical power)	$\text{m}^{-1}$