



GCE AS/A LEVEL

2420U10-1A

THURSDAY, 16 MAY 2024 – AFTERNOON

PHYSICS – AS unit 1

Data Booklet

A clean copy of this booklet should be issued to candidates for their use during each AS unit 1 Physics examination.

Centres are asked to issue this booklet to candidates at the start of the course to enable them to become familiar with its contents and layout.

π

VALUES AND CONVERSIONS

Fundamental electronic charge	$e = 1.60 \times 10^{-19} \text{ C}$
Mass of an electron	$m_e = 9.11 \times 10^{-31} \text{ kg}$
Acceleration due to gravity at sea level	$g = 9.81 \text{ m s}^{-2}$
Gravitational field strength at sea level	$g = 9.81 \text{ N kg}^{-1}$
Planck constant	$h = 6.63 \times 10^{-34} \text{ J s}$
Speed of light in vacuo	$c = 3.00 \times 10^8 \text{ m s}^{-1}$
Stefan constant	$\sigma = 5.67 \times 10^{-8} \text{ W m}^{-2} \text{ K}^{-4}$
Wien constant	$W = 2.90 \times 10^{-3} \text{ m K}$

$$1 \text{ eV} = 1.60 \times 10^{-19} \text{ J}$$

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

$$v = u + at$$

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

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

$$v^2 = u^2 + 2ax$$

$$\Sigma F = ma$$

$$p = mv$$

$$W = Fx \cos \theta$$

$$\Delta E = mg\Delta h$$

$$E = \frac{1}{2}kx^2$$

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

$$Fx = \frac{1}{2}mv^2 - \frac{1}{2}mu^2$$

$$P = \frac{W}{t} = \frac{\Delta E}{t}$$

$$I = \frac{\Delta Q}{\Delta t}$$

$$I = nAve$$

$$R = \frac{V}{I}$$

$$P = IV = I^2 R = \frac{V^2}{R}$$

$$R = \frac{\rho l}{A}$$

$$V = E - Ir$$

$$\frac{V}{V_{\text{total}}} \left[\text{or } \frac{V_{\text{OUT}}}{V_{\text{IN}}} \right] = \frac{R}{R_{\text{total}}}$$

$$T = \frac{1}{f}$$

$$c = f\lambda$$

$$\lambda = \frac{a\Delta y}{D}$$

$$d \sin \theta = n\lambda$$

$$n = \frac{c}{v}$$

$$n_1 v_1 = n_2 v_2$$

$$\text{efficiency} = \frac{\text{useful energy transfer}}{\text{total energy input}} \times 100\%$$

$$n_1 \sin \theta_1 = n_2 \sin \theta_2$$

$$F = kx$$

$$n_1 \sin \theta_{\text{C}} = n_2$$

$$\sigma = \frac{F}{A}$$

$$E_{k\text{ max}} = hf - \phi$$

$$\varepsilon = \frac{\Delta l}{l}$$

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

$$E = \frac{\sigma}{\varepsilon}$$

$$W = \frac{1}{2}Fx$$

$$\lambda_{\text{max}} = \frac{W}{T}$$

$$P = A\sigma T^4$$

	leptons		quarks	
particle (symbol)	electron (e [−])	electron neutrino (ν _e)	up (u)	down (d)
charge (e)	− 1	0	+ $\frac{2}{3}$	− $\frac{1}{3}$
lepton number	1	1	0	0

MATHEMATICAL INFORMATION

SI MULTIPLIERS

Multiple	Prefix	Symbol
10^{-18}	atto	a
10^{-15}	femto	f
10^{-12}	pico	p
10^{-9}	nano	n
10^{-6}	micro	μ
10^{-3}	milli	m
10^{-2}	centi	c

Multiple	Prefix	Symbol
10^3	kilo	k
10^6	mega	M
10^9	giga	G
10^{12}	tera	T
10^{15}	peta	P
10^{18}	exa	E
10^{21}	zetta	Z

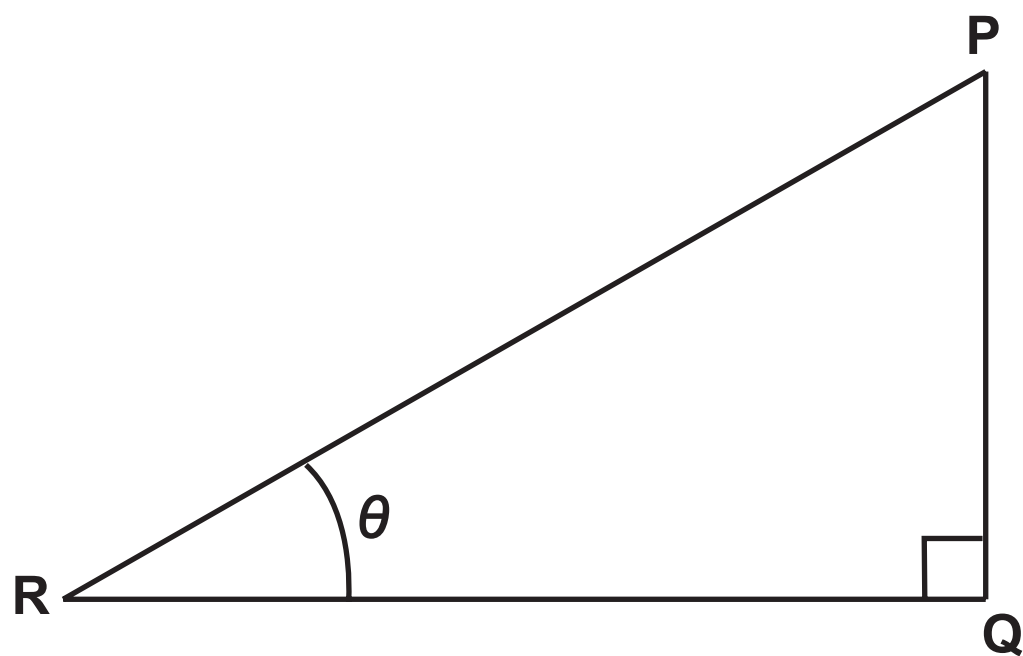
AREAS AND VOLUMES

Area of a circle = $\pi r^2 = \frac{\pi d^2}{4}$

Area of a triangle = $\frac{1}{2}$ base $\times$ height

SOLID	SURFACE AREA	VOLUME
rectangular block	$2(lh + hb + lb)$	lbh
cylinder	$2\pi r(r + h)$	$\pi r^2 h$
sphere	$4\pi r^2$	$\frac{4}{3}\pi r^3$

TRIGONOMETRY



$$\sin \theta = \frac{PQ}{PR}, \quad \cos \theta = \frac{QR}{PR}, \quad \tan \theta = \frac{PQ}{QR}, \quad \frac{\sin \theta}{\cos \theta} = \tan \theta$$

$$PR^2 = PQ^2 + QR^2$$