GCE AS/A LEVEL

2420U10-1A

THURSDAY, 15 MAY 2025 – 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.

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VALUES AND CONVERSIONS

Fundamental electronic charge	e	=	$1 \cdot 60 \times 10^{-19}$ C
Mass of an electron	m_e	=	$9 \cdot 11 \times 10^{-31}$ kg
Acceleration due to gravity at sea level	g	=	$9 \cdot 81$ m s^{-2}
Gravitational field strength at sea level	g	=	$9 \cdot 81$ N kg^{-1}
Planck constant	h	=	$6 \cdot 63 \times 10^{-34}$ J s
Speed of light in vacuo	c	=	$3 \cdot 00 \times 10^{8}$ m s^{-1}
Stefan constant	σ	=	$5 \cdot 67 \times 10^{-8}$ W m^{-2} K^{-4}
Wien constant	W	=	$2 \cdot 90 \times 10^{-3}$ m K

1 eV = $1 \cdot 60 \times 10^{-19}$ J

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

$$v = u + at$$

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

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

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

$$\sum F = ma$$

$$p = mv$$

$$W = Fx\cos\theta$$

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

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

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

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

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

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

$$I = nAve$$

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

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

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

$$V = E - Ir$$

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

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

$$c = f\lambda$$

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

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

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

$$n_1v_1 = n_2v_2$$

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

$$F = kx$$

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

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

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

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

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

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

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

$$n_1 \sin\theta_C = n_2$$

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

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

	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

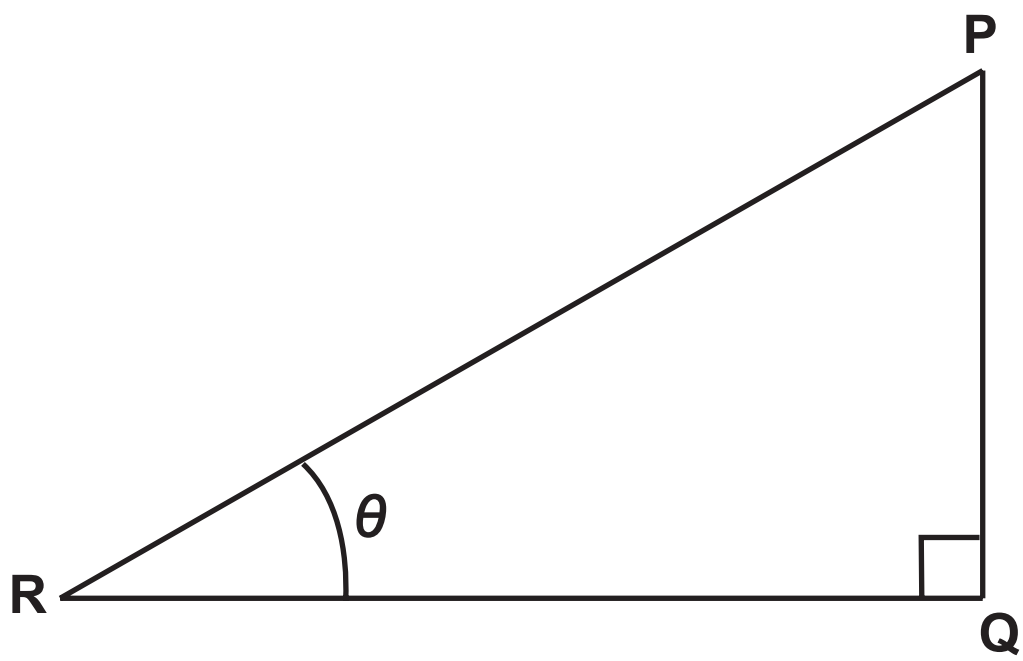
AREAS AND VOLUMES

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

Area of a triangle = $\dfrac{1}{2}$ base × 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



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

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