



GCE AS/A LEVEL

2420U10-1A



S24-2420U10-1A

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.

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

$$g = 9.81 \text{ ms}^{-2}$$

Gravitational field strength at sea level

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

Planck constant

$$h = 6.63 \times 10^{-34} \text{ Js}$$

Speed of light in vacuo

$$c = 3.00 \times 10^8 \text{ ms}^{-1}$$

Stefan constant

$$\sigma = 5.67 \times 10^{-8} \text{ W m}^{-2} \text{ K}^{-4}$$

Wien constant

$$W = 2.90 \times 10^{-3} \text{ mK}$$

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

$\rho = \frac{m}{V}$	$I = \frac{\Delta Q}{\Delta t}$																							
$v = u + at$	$I = nAve$																							
$x = \frac{1}{2}(u + v)t$	$R = \frac{V}{I}$																							
$x = ut + \frac{1}{2}at^2$	$P = IV = I^2R = \frac{V^2}{R}$																							
$v^2 = u^2 + 2ax$	$R = \frac{\rho l}{A}$																							
$\Sigma F = ma$	$V = E - Ir$																							
$p = mv$	$\frac{V}{V_{\text{total}}}\left[\text{or } \frac{V_{\text{OUT}}}{V_{\text{IN}}}\right] = \frac{R}{R_{\text{total}}}$																							
$W = Fx\cos\theta$	$T = \frac{1}{f}$																							
$\Delta E = mg\Delta h$	$c = f\lambda$																							
$E = \frac{1}{2}kx^2$	$\lambda = \frac{a\Delta y}{D}$																							
$E = \frac{1}{2}mv^2$	$d\sin\theta = n\lambda$																							
$Fx = \frac{1}{2}mv^2 - \frac{1}{2}mu^2$	$n = \frac{c}{v}$																							
$P = \frac{W}{t} = \frac{\Delta E}{t}$	$n_1v_1 = n_2v_2$																							
efficiency = $\frac{\text{useful energy transfer}}{\text{total energy input}} \times 100\%$	$n_1\sin\theta_1 = n_2\sin\theta_2$																							
$F = kx$	$n_1\sin\theta_{\text{C}} = n_2$																							
$\sigma = \frac{F}{A}$	$E_{\text{kmax}} = hf - \phi$																							
$\varepsilon = \frac{\Delta l}{l}$	$p = \frac{h}{\lambda}$																							
$E = \frac{\sigma}{\varepsilon}$																								
$W = \frac{1}{2}Fx$																								
$\lambda_{\text{max}} = \frac{W}{T}$																								
$P = A\sigma T^4$																								
<table><tr><td></td><td colspan="2">leptons</td><td colspan="2">quarks</td></tr><tr><td>particle (symbol)</td><td>electron (e⁻)</td><td>electron neutrino (ν_e)</td><td>up (u)</td><td>down (d)</td></tr><tr><td>charge (e)</td><td>- 1</td><td>0</td><td>+ $\frac{2}{3}$</td><td>- $\frac{1}{3}$</td></tr><tr><td>lepton number</td><td>1</td><td>1</td><td>0</td><td>0</td></tr></table>					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	
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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

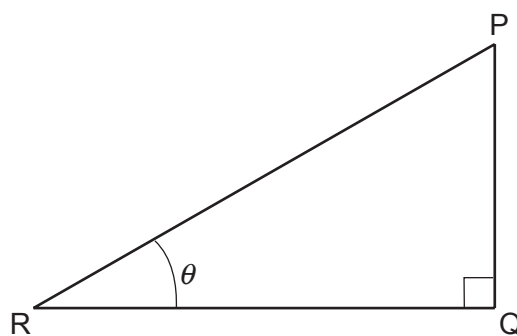
Areas and Volumes

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

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

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



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

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