PHYSICS 2APHY and 2BPHY

Formulae and constants sheet

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Physics 2A/2B: Formulae and constants sheet

Forces and motion

Mean velocity	$v_{av} = \frac{s}{t} = \frac{v+u}{2}$
Equations of motion	$a = \frac{\Delta v}{\Delta t}$; $s = ut + \frac{1}{2}at^2$; $v^2 = u^2 + 2as$; $v = u + at$
Force	$F = ma$
Weight force	$F = mg$
Momentum	$p = mv$
Change in momentum (impulse)	$F\Delta t = mv - mu$
Kinetic energy	$E_k = \frac{1}{2}mv^2$
Gravitational potential energy	$E_p = mgh$
Work done	$W = Fs = \Delta E$
Power	$P = \frac{W}{t} = \frac{\Delta E}{t} = Fv_{av}$

Particles

Energy of photon	$E = hf$
Activity	$A = \frac{\Delta N}{\Delta t}$
Half-life	$A = A_0(\frac{1}{2})^n$
Absorbed radiation dose	$\text{absorbed dose} = \frac{E}{m}$
Dose equivalent	$\text{dose equivalent} = \text{absorbed dose x quality factor}$
Mass-energy relationship	$E = mc^2$
Change of temperature	$Q = mc\Delta T$
Change of state	$Q = mL$
Absolute zero of temperature	$0\,K = -273^\circ C$

Electricity and magnetism

Electric current	$I = \frac{q}{t}$
Electric field	$E = \frac{F}{q} = \frac{V}{d}$
Work and energy	$W = qV = VIt$
Ohm's law	$V = IR$
Resistances in series	$R_T = R_1 + R_2 + ...$
Resistances in parallel	$\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2} + ...$
Power	$P = VI = I^2R = \frac{V^2}{R}$

Physical constants

Speed of light in vacuum or air	c	$= 3.00 \times 10^{8}$ m s^{-1}
Electron charge	e	$= -1.60 \times 10^{-19}$ C
Electron volt	1 eV	$= 1.60 \times 10^{-19}$ J
Unified atomic mass unit	1 u	$= 1.66 \times 10^{-27}$ kg
Mass of electron	m_e	$= 9.11 \times 10^{-31}$ kg
Mass of proton	m_p	$= 1.67 \times 10^{-27}$ kg
Mass of neutron	m_n	$= 1.68 \times 10^{-27}$ kg
Mass of alpha	m_α	$= 6.65 \times 10^{-27}$ kg
Mass–energy equivalent	1 u	= 931 MeV
Tonne	1 tonne	$= 10^3$ kg $= 10^6$ g

Physical data

Mean acceleration due to gravity on Earth	g	$= 9.80$ m s^{-2}

Quality factors

Approximate quality factor for alpha radiation	QF_α	= 20
Approximate quality factor for beta radiation	QF_β	= 1
Approximate quality factor for gamma radiation	QF_γ	= 1
Approximate quality factor for slow neutrons	QF_{sn}	= 3
Approximate quality factor for fast neutrons	QF_{fn}	= 10

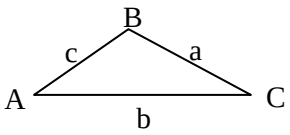
Prefixes of the metric system

Factor	Prefix	Symbol	Factor	Prefix	Symbol
10^{12}	tera	T	10^{-3}	milli	m
10^{9}	giga	G	10^{-6}	micro	μ
10^{6}	mega	M	10^{-9}	nano	n
10^{3}	kilo	k	10^{-12}	pico	p

Mathematical expressions

Given $ax^2 + bx + c = 0$, $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

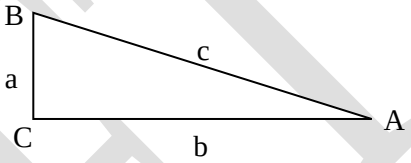
The following expressions apply to the triangle ABC as shown:



$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$b = \sqrt{a^2 + c^2 - 2ac\cos B}$$

The following expressions apply to the right-angled triangle ABC as shown:

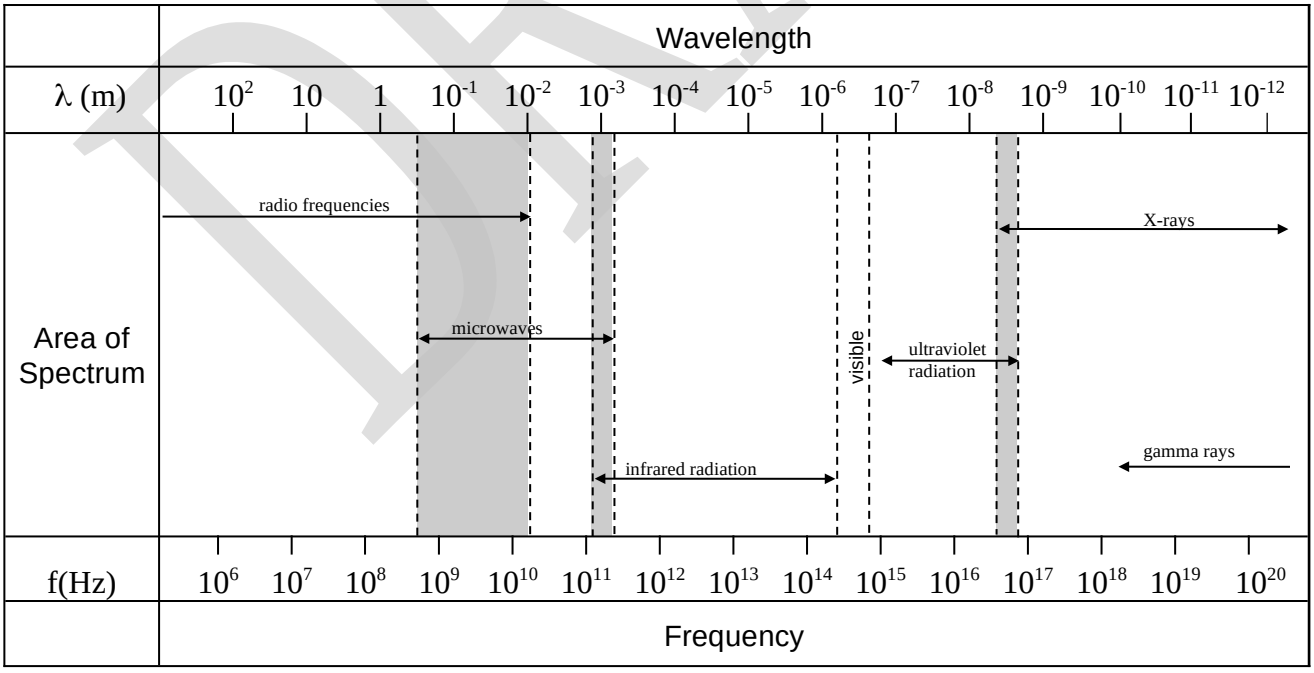


$$\sin A = \frac{a}{c}$$

$$\cos A = \frac{b}{c}$$

$$\tan A = \frac{a}{b}$$

Electromagnetic spectrum



Note: 1. Shaded areas represent regions of overlap.
2. Gamma rays and X-rays occupy a common region.