



PHYSICS

STAGE 2

FORMULAE AND DATA

2014

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Forces and motion

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

Note: the variable t refers to the 'time taken' sometimes referred to as the 'change in time' or Δt .

Nuclear physics

Activity	$A = \frac{\Delta N}{t}$
Half-life	$A = A_0 \left(\frac{1}{2}\right)^n$
Absorbed radiation dose	absorbed dose = $\frac{E}{m}$
Dose equivalent	dose equivalent = absorbed dose \times quality factor
Mass-energy relationship	$E = mc^2$

Heating and cooling

Change of temperature	$Q = mc\Delta T$
Change of state	$Q = mL$
Absolute zero	$0 \text{ K} = -273^\circ\text{C}$

Electricity and magnetism

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

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Physical constants

Speed of light in vacuum or air	c	=	$3.00 \times 10^8 \text{ m s}^{-1}$
Electron charge	e	=	$-1.60 \times 10^{-19} \text{ C}$
Electron volt.....	1 eV	=	$1.60 \times 10^{-19} \text{ J}$
Unified atomic mass unit	1 u	=	$1.66 \times 10^{-27} \text{ kg}$
Rest mass of electron.....	m_e	=	$9.11 \times 10^{-31} \text{ kg}$
Rest mass of proton	m_p	=	$1.67 \times 10^{-27} \text{ kg}$
Rest mass of neutron	m_n	=	$1.67 \times 10^{-27} \text{ kg}$
Rest mass of alpha.....	m_α	=	$6.64 \times 10^{-27} \text{ kg}$
Mass–energy equivalent.....	1 u	=	931 MeV
Tonne.....	1 t	=	$10^3 \text{ kg} = 10^6 \text{ g}$

Physical data

Mean acceleration due to gravity on Earth.....	g	=	9.80 m s^{-2}
Specific heat capacity of water	c_w	=	$4.18 \times 10^3 \text{ J K}^{-1} \text{ kg}^{-1}$
Specific heat capacity of ice	c_i	=	$2.10 \times 10^3 \text{ J K}^{-1} \text{ kg}^{-1}$
Specific heat capacity of steam.....	c_s	=	$2.00 \times 10^3 \text{ J K}^{-1} \text{ kg}^{-1}$
Latent heat of fusion for H_2O	L_f	=	$3.34 \times 10^5 \text{ J kg}^{-1}$
Latent heat of vaporisation for H_2O	L_v	=	$2.26 \times 10^6 \text{ J kg}^{-1}$

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
