



**PHYSICS**

**STAGE 2**

**FORMULAE AND CONSTANTS SHEET**

**2010**



**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	$p = mv$ ; $\Sigma p_{before} = \Sigma p_{after}$
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  $\Delta t$

**Particles**

---

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	$E = mc^2$
Change of temperature	$Q = mc\Delta T$
Change of state	$Q = mL$
Absolute zero of temperature	$0\text{ K} = -273\text{ }^\circ\text{C}$

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

**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.....	$1 \text{ eV}$	=	$1.60 \times 10^{-19} \text{ J}$
Unified atomic mass unit .....	$1 \text{ u}$	=	$1.66 \times 10^{-27} \text{ kg}$
Mass of electron .....	$m_e$	=	$9.11 \times 10^{-31} \text{ kg}$
Mass of proton.....	$m_p$	=	$1.67 \times 10^{-27} \text{ kg}$
Mass of neutron.....	$m_n$	=	$1.68 \times 10^{-27} \text{ kg}$
Mass of alpha .....	$m_\alpha$	=	$6.65 \times 10^{-27} \text{ kg}$
Mass–energy equivalent.....	$1 \text{ u}$	=	$931 \text{ MeV}$
Tonne .....	$1 \text{ tonne}$	=	$10^3 \text{ kg} = 10^6 \text{ g}$

**Physical data**

---

Mean acceleration due to gravity on Earth.....	$g$	=	$9.80 \text{ m s}^{-2}$
Specific heat capacity of water .....	$c_w$	=	$4.18 \times 10^3 \text{ J kg}^{-1} \text{ K}^{-1}$
Specific heat capacity of ice .....	$c_i$	=	$2.10 \times 10^3 \text{ J kg}^{-1} \text{ K}^{-1}$
Specific heat capacity of steam .....	$c_s$	=	$2.00 \times 10^3 \text{ J kg}^{-1} \text{ K}^{-1}$
Latent Heat of fusion for $\text{H}_2\text{O}$ .....	$L_f$	=	$3.34 \times 10^5 \text{ J kg}^{-1}$
Latent heat of vaporisation for $\text{H}_2\text{O}$ .....	$L_v$	=	$2.26 \times 10^6 \text{ J kg}^{-1}$

**Quality factors**

---

Approximate quality factor for alpha radiation .....	$QF_\alpha$	=	20
Approximate quality factor for beta radiation.....	$QF_\beta$	=	1
Approximate quality factor for gamma radiation.....	$QF_\gamma$	=	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	$\mu$
$10^6$	mega	M	$10^{-9}$	nano	n
$10^3$	kilo	k	$10^{-12}$	pico	p

# Periodic Table

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18

1 H 1.008 Hydrogen	2 He 4.003 Helium																
3 Li 6.941 Lithium	4 Be 9.012 Beryllium																
11 Na 22.99 Sodium	12 Mg 24.31 Magnesium																
19 K 39.10 Potassium	20 Ca 40.08 Calcium	21 Sc 44.96 Scandium	22 Ti 47.88 Titanium	23 V 50.94 Vanadium	24 Cr 52.00 Chromium	25 Mn 54.94 Manganese	26 Fe 55.85 Iron	27 Co 58.93 Cobalt	28 Ni 58.69 Nickel	29 Cu 63.55 Copper	30 Zn 65.38 Zinc	31 Ga 69.72 Gallium	32 Ge 72.59 Germanium	33 As 74.92 Arsenic	34 Se 78.96 Selenium	35 Br 79.90 Bromine	36 Kr 83.80 Krypton
37 Rb 85.47 Rubidium	38 Sr 87.62 Strontium	39 Y 88.91 Yttrium	40 Zr 91.22 Zirconium	41 Nb 92.91 Niobium	42 Mo 95.94 Molybdenum	43 Tc 99.44 Technetium	44 Ru 101.1 Ruthenium	45 Rh 102.9 Rhodium	46 Pd 106.4 Palladium	47 Ag 107.9 Silver	48 Cd 112.4 Cadmium	49 In 114.8 Indium	50 Sn 118.7 Tin	51 Sb 121.8 Antimony	52 Te 127.6 Tellurium	53 I 126.9 Iodine	54 Xe 131.3 Xenon
55 Cs 132.9 Caesium	56 Ba 137.3 Barium	57 *La 138.9 Lanthanum	72 Hf 178.5 Hafnium	73 Ta 180.9 Tantalum	74 W 183.9 Tungsten	75 Re 186.2 Rhenium	76 Os 190.2 Osmium	77 Ir 192.2 Iridium	78 Pt 195.1 Platinum	79 Au 197.0 Gold	80 Hg 200.6 Mercury	81 Tl 204.4 Thallium	82 Pb 207.2 Lead	83 Bi 209.0 Bismuth	84 Po Polonium	85 At Astatine	86 Rn Radon
87 Fr Francium	88 Ra 226.0 Radium	89 **Ac Actinium	104 Rf Rutherfordium	105 Db Dubnium	106 Sg Seaborgium	107 Bh Bohrium	108 Hs Hassium	109 Mt Meitnerium	110 Ds Darmstadtium	111 Rg Roentgenium							

6 C 12.01 Carbon	* Lanthanide Series	64 Gd 157.3 Gadolinium	65 Tb 158.9 Terbium	66 Dy 162.5 Dysprosium	67 Ho 164.9 Holmium	68 Er 167.3 Erbium	69 Tm 168.9 Thulium	70 Yb 173.0 Ytterbium	71 Lu 175.0 Lutetium
	** Actinide Series	90 Th 232.0 Thorium	91 Pa 231.0 Protactinium	92 U 238.0 Uranium	93 Np 237.0 Neptunium	94 Pu 244.0 Plutonium	95 Am 243.0 Americium	96 Cm 250.0 Curium	97 Bk 247.0 Berkelium

- ← Atomic Number
- ← Symbol
- ← Atomic Mass
- ← Name





**Copyright**

© Curriculum Council, 2010

This document—apart from any third party copyright material contained in it—may be freely copied, or communicated on an intranet, for non-commercial purposes by educational institutions, provided that it is not changed in any way and that the Curriculum Council is acknowledged as the copyright owner.

Copying or communication for any other purpose can be done only within the terms of the Copyright Act or by permission of the Curriculum Council.

Copying or communication of any third party copyright material contained in this document can be done only within the terms of the Copyright Act or by permission of the copyright owners.