

Modified Enlarged 18pt

CAMBRIDGE OCR

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**GCSE (9–1) Combined Science B
(Twenty First Century Science)**

J260 04/08

Data and Equation Sheet

INSTRUCTIONS

**Do NOT send this Data and Equation Sheet for marking.
Keep it in the centre or recycle it.**

EQUATIONS IN PHYSICS

Key: HT = Higher Tier only

	P1 RADIATION AND WAVES	
	wave speed = frequency × wavelength	$v = f\lambda$

	P2 SUSTAINABLE ENERGY	
	energy transferred = power × time	$E = Pt$
	efficiency = $\frac{\text{useful energy transferred}}{\text{total energy transferred}}$	

	P3 ELECTRIC CIRCUITS	
	charge = current × time	$Q = It$
	potential difference = current × resistance	$V = IR$
	potential difference = $\frac{\text{work done (energy transferred)}}{\text{charge}}$	$V = \frac{W}{Q}$
	power = $\frac{\text{energy transferred}}{\text{time}}$	$P = \frac{E}{t}$
	energy transferred (work done) = charge × potential difference	$E = QV$
	power = potential difference × current	$P = VI$
	power = (current) ² × resistance	$P = I^2R$
	potential difference across primary coil × current in primary coil = potential difference across secondary coil × current in secondary coil	$V_p I_p = V_s I_s$
HT	force = magnetic flux density × current × length of conductor	$F = BIl$

	P4 EXPLAINING MOTION		
	weight = mass × gravitational field strength		$W = mg$
	average speed = $\frac{\text{distance}}{\text{time}}$		$v = \frac{s}{t}$
	acceleration = $\frac{\text{change in speed}}{\text{time taken}}$		$a = \frac{v - u}{t}$
	(final speed) ² – (initial speed) ² = 2 × acceleration × distance		$v^2 - u^2 = 2as$
HT	momentum = mass × velocity		$p = mv$
HT	change in momentum = resultant force × time for which it acts		$\Delta p = Ft$
	force = mass × acceleration		$F = ma$
	work done = force × distance (along the line of action of the force)		$W = Fs$
	kinetic energy = $\frac{1}{2} \times \text{mass} \times (\text{speed})^2$		$E = \frac{1}{2}mv^2$
	gravitational potential energy = mass × gravitational field strength × height		$E = mgh$
	power = $\frac{\text{energy transferred}}{\text{time}}$		$P = \frac{E}{t}$

ω

	P6 MATTER – MODELS AND EXPLANATIONS		
	density = $\frac{\text{mass}}{\text{volume}}$		$\rho = \frac{m}{V}$
	change in internal energy = mass × specific heat capacity × change in temperature		$\Delta E = mc\Delta\theta$
	energy to cause a change of state = mass × specific latent heat		$E = ml$
	force exerted by a spring = spring constant × extension		$F = kx$
	energy stored in a stretched spring = $\frac{1}{2} \times \text{spring constant} \times (\text{extension})^2$		$E = \frac{1}{2}kx^2$

The Periodic Table of the Elements

(1)	(2)	Key atomic number Symbol name relative atomic mass										(3)	(4)	(5)	(6)	(7)	(0)																		
1	18																																		
1	H hydrogen 1.0															2	He helium 4.0																		
3	Li lithium 6.9	4	Be beryllium 9.0											10	Ne neon 20.2																				
11	Na sodium 23.0	12	Mg magnesium 24.3											18	Ar argon 39.9																				
19	K potassium 39.1	20	Ca calcium 40.1	21	Sc scandium 45.0	22	Ti titanium 47.9	23	V vanadium 50.9	24	Cr chromium 52.0	25	Mn manganese 54.9	26	Fe iron 55.8	27	Co cobalt 58.9	28	Ni nickel 58.7	29	Cu copper 63.5	30	Zn zinc 65.4	31	Ga gallium 69.7	32	Ge germanium 72.6	33	As arsenic 74.9	34	Se selenium 79.0	35	Br bromine 79.9	36	Kr krypton 83.8
37	Rb rubidium 85.5	38	Sr strontium 87.6	39	Y yttrium 88.9	40	Zr zirconium 91.2	41	Nb niobium 92.9	42	Mo molybdenum 95.9	43	Tc technetium	44	Ru ruthenium 101.1	45	Rh rhodium 102.9	46	Pd palladium 106.4	47	Ag silver 107.9	48	Cd cadmium 112.4	49	In indium 114.8	50	Sn tin 118.7	51	Sb antimony 121.8	52	Te tellurium 127.6	53	I iodine 126.9	54	Xe xenon 131.3
55	Cs caesium 132.9	56	Ba barium 137.3	● lanthanoids 57–71		72	Hf hafnium 178.5	73	Ta tantalum 180.9	74	W tungsten 183.8	75	Re rhenium 186.2	76	Os osmium 190.2	77	Ir iridium 192.2	78	Pt platinum 195.1	79	Au gold 197.0	80	Hg mercury 200.6	81	Tl thallium 204.4	82	Pb lead 207.2	83	Bi bismuth 209.0	84	Po polonium	85	At astatine	86	Rn radon
87	Fr francium	88	Ra radium	● actinoids 89–103		104	Rf rutherfordium	105	Db dubnium	106	Sg seaborgium	107	Bh bohrium	108	Hs hassium	109	Mt meitnerium	110	Ds darmstadtium	111	Rg roentgenium	112	Cn copernicium			114	F1 flerovium			116	Lv livermorium				

ELEMENTS LISTED IN ATOMIC NUMBER ORDER:

ATOMIC NUMBER	NAME	SYMBOL	RELATIVE ATOMIC MASS
1	Hydrogen	H	1.0
2	Helium	He	4.0
3	Lithium	Li	6.9
4	Beryllium	Be	9.0
5	Boron	B	10.8
6	Carbon	C	12.0
7	Nitrogen	N	14.0
8	Oxygen	O	16.0
9	Fluorine	F	19.0
10	Neon	Ne	20.2
11	Sodium	Na	23.0
12	Magnesium	Mg	24.3
13	Aluminium	Al	27.0
14	Silicon	Si	28.1
15	Phosphorus	P	31.0
16	Sulfur	S	32.1
17	Chlorine	Cl	35.5
18	Argon	Ar	39.9
19	Potassium	K	39.1
20	Calcium	Ca	40.1
21	Scandium	Sc	45.0
22	Titanium	Ti	47.9
23	Vanadium	V	50.9
24	Chromium	Cr	52.0
25	Manganese	Mn	54.9
26	Iron	Fe	55.8
27	Cobalt	Co	58.9
28	Nickel	Ni	58.7
29	Copper	Cu	63.5
30	Zinc	Zn	65.4
31	Gallium	Ga	69.7
32	Germanium	Ge	72.6
33	Arsenic	As	74.9
34	Selenium	Se	79.0
35	Bromine	Br	79.9
36	Krypton	Kr	83.8
37	Rubidium	Rb	85.5
38	Strontium	Sr	87.6
39	Yttrium	Y	88.9
40	Zirconium	Zr	91.2
41	Niobium	Nb	92.9
42	Molybdenum	Mo	95.9

ATOMIC NUMBER	NAME	SYMBOL	RELATIVE ATOMIC MASS
43	Technetium	Tc	
44	Ruthenium	Ru	101.1
45	Rhodium	Rh	102.9
46	Palladium	Pd	106.4
47	Silver	Ag	107.9
48	Cadmium	Cd	112.4
49	Indium	In	114.8
50	Tin	Sn	118.7
51	Antimony	Sb	121.8
52	Tellurium	Te	127.6
53	Iodine	I	126.9
54	Xenon	Xe	131.3
55	Caesium	Cs	132.9
56	Barium	Ba	137.3
72	Hafnium	Hf	178.5
73	Tantalum	Ta	180.9
74	Tungsten	W	183.8
75	Rhenium	Re	186.2
76	Osmium	Os	190.2
77	Iridium	Ir	192.2
78	Platinum	Pt	195.1
79	Gold	Au	197.0
80	Mercury	Hg	200.6
81	Thallium	Tl	204.4
82	Lead	Pb	207.2
83	Bismuth	Bi	209.0
84	Polonium	Po	
85	Astatine	At	
86	Radon	Rn	
87	Francium	Fr	
88	Radium	Ra	
104	Rutherfordium	Rf	
105	Dubnium	Db	
106	Seaborgium	Sg	
107	Bohrium	Bh	
108	Hassium	Hs	
109	Meitnerium	Mt	
110	Darmstadtium	Ds	
111	Roentgenium	Rg	
112	Copernicium	Cn	
114	Flerovium	Fl	
116	Livermorium	Lv	

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