DATA

Avogadro constant (N) = $6.022 \times 10^{23} \text{ mol}^{-1}$	Velocity of light (c) = $2.998 \times 10^8 \text{ m s}^{-1}$
1 faraday = 96 485 coulombs	Density of water at 25 °C = 0.9971 g cm ⁻³
$1 \text{ A} = 1 \text{ C s}^{-1}$	Acceleration due to gravity = 9.81 m s^{-2}
Universal gas constant (R)	$1 \text{ newton } (N) = 1 \text{ kg m s}^{-2}$
$8.314 \text{ J K}^{-1} \text{ mol}^{-1}$	
$8.206 \times 10^{-2} \text{ L atm K}^{-1} \text{ mol}^{-1}$	
Planck's constant (h) = 6.626×10^{-34} J s	1 pascal (Pa) = 1 N m^{-2}
Molar volume of ideal gas	$pH = -\log_{10}[H^+]$
• at 0 °C and 100 kPa = 22.71 L	$pH + pOH = 14.00 \text{ at } 25^{\circ}\text{C}$
• at 25 °C and 100 kPa = 24.79 L	$K_{\rm a} = \{ [{\rm H}^+] [{\rm A}^-] \} / [{\rm HA}] $
• at 0 °C and 101.3 kPa = 22.41 L	$pH = pK_a + \log_{10}\{[A^-] / [HA]\}$
• at 25 °C and 101.3 kPa = 24.47 L	PV = nRT
	E = hv
Surface area of sphere $A = 4\pi r^2$	$c = v\lambda$

Periodic Table of Elements

1																	18
1 H 1.008	2		atomic number Symbol atomic weight									13	14	15	16	17	2 He 4.003
3	4											5	6	7	8	9	10
6.94	9.01											D 10.81	12.01	14.01	16.00	F 19.00	20.18
11	12											13	14	15	16	17	18
Na 22.99	Mg	3	4	5	6	7	8	9	10	11	12	AI 26.98	SI 28.09	P 30.97	S 32.07	CI 35.45	Ar 39.95
19	20	21	22	23	24	25	26	27	28	20	30	21	22	22	24	35	36
				20	24	20	20	21	20	25	50	51	32	33	34	55	50
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Ĉu	Zn	Ga	Ge	As	Se	Br	Kr
K 39.10	Ca 40.08	Sc 44.96	Ti 47.87	V 50.94	Cr 52.00	Mn 54.94	Fe 55.85	Co 58.93	Ni 58.69	Cu 63.55	Zn 65.38	Ga 69.72	Ge 72.63	As 74.92	Se 78.97	Br 79.90	Kr 83.80
K 39.10 37	Ca 40.08	Sc 44.96 39	Ti 47.87 40	V 50.94	Cr 52.00 42	Mn 54.94 43	Fe 55.85	Co 58.93 45	Ni 58.69 46	Cu 63.55 47	2n 65.38 48	Ga 69.72	Ge 72.63	AS 74.92 51	52 52	Br 79.90	Kr 83.80
K 39.10 37 Rb	Ca 40.08 38 Sr	Sc 44.96 39 Y	47.87 40 Zr	V 50.94 41 Nb	Cr 52.00 42 Mo	Mn 54.94 43 TC	Fe 55.85 44 Ru	Co 58.93 45 Rh	Ni 58.69 46 Pd	Cu 63.55 47 Ag	Zn 65.38 48 Cd	Ga 69.72 49 In	52 Ge 72.63 50 Sn	53 As 74.92 51 Sb	52 52 Te	Br 79.90 53	50 Kr 83.80 54 Xe
K 39.10 37 Rb 85.47	Ca 40.08 38 Sr 87.62	Sc 44.96 39 Y 88.91	47.87 40 Zr 91.22	V 50.94 41 Nb 92.91	Cr 52.00 42 Mo 95.95	Mn 54.94 43 Tc -	Fe 55.85 44 Ru 101.1	Co 58.93 45 Rh 102.9	Ni 58.69 46 Pd 106.4	Cu 63.55 47 Ag 107.9	2n 65.38 48 Cd 112.4	Ga 69.72 49 In 114.8	Ge 72.63 50 Sn 118.7	As 74.92 51 Sb 121.8	52 78.97 52 Te 127.6	Br 79.90 53 126.9	54 54 131.3
K 39.10 37 Rb 85.47 55	Ca 40.08 38 Sr 87.62 56	Sc 44.96 39 Y 88.91	Ti 47.87 40 Zr 91.22 72	V 50.94 41 Nb 92.91 73	Cr 52.00 42 Mo 95.95 74	43 TC - 75	Fe 55.85 44 Ru 101.1	Co 58.93 45 Rh 102.9 77	Ni 58.69 46 Pd 106.4 78	63.55 47 Ag 107.9 79	2n 65.38 48 Cd 112.4 80	Ga 69.72 49 In 114.8 81	50 50 50 50 50 50 50 50 50 50 50 50 50 5	As 74.92 51 Sb 121.8 83	52 78.97 52 127.6 84	Br 79.90 53 126.9 85	54 54 Xe 131.3 86
K 39.10 37 Rb 85.47 55 Cs	Ca 40.08 38 Sr 87.62 56 Ba	Sc 44.96 39 Y 88.91 57-71	Ti 47.87 40 Zr 91.22 72 Hf	V 50.94 41 Nb 92.91 73 Ta	Cr 52.00 42 Mo 95.95 74 W	Mn 54.94 43 Tc - 75 Re	Fe 55.85 44 Ru 101.1 76 Os	Co 58.93 45 Rh 102.9 77 Ir	Ni 58.69 46 Pd 106.4 78 Pt	Cu 63.55 47 Ag 107.9 79 Au	2n 65.38 48 Cd 112.4 80 Hg	Ga 69.72 49 In 114.8 81 TI	Ge 72.63 50 Sn 118.7 82 Pb	As 74.92 51 Sb 121.8 83 Bi	34 Se 78.97 52 Te 127.6 84 Po	Br 79.90 53 126.9 85 At	50 Kr 83.80 54 Xe 131.3 86 Rn
K 39.10 37 Rb 85.47 55 Cs 132.9	Ca 40.08 38 Sr 87.62 56 Ba 137.3	Sc 44.96 39 Y 88.91 57-71	Ti 47.87 40 Zr 91.22 72 Hf 178.5	V 50.94 41 Nb 92.91 73 Ta 180.9	Cr 52.00 42 Mo 95.95 74 W 183.8	Mn 54.94 43 Tc - 75 Re 186.2	Fe 55.85 44 Ru 101.1 76 Os 190.2	Co 58.93 45 Rh 102.9 77 Ir 192.2	Ni 58.69 46 Pd 106.4 78 Pt 195.1	Cu 63.55 47 Ag 107.9 79 Au 197.0	30 Zn 65.38 48 Cd 112.4 80 Hg 200.6	Ga 69.72 49 114.8 81 TI 204.4	Ge 72.63 50 Sn 118.7 82 Pb 207.2	As 74.92 51 Sb 121.8 83 Bi 209.0	34 Se 78.97 52 Te 127.6 84 Po -	Br 79.90 53 126.9 85 At -	50 Kr 83.80 54 Xe 131.3 86 Rn -
K 39.10 37 Rb 85.47 55 Cs 132.9 87	Ca 40.08 38 Sr 87.62 56 Ba 137.3 88	Sc 44.96 39 Y 88.91 57-71	Ti 47.87 40 Zr 91.22 72 Hf 178.5 104	V 50.94 41 Nb 92.91 73 Ta 180.9 105	Cr 52.00 42 MO 95.95 74 W 183.8 106	²⁰ Mn 54.94 43 Tc - 75 Re 186.2 107	Fe 55.85 44 Ru 101.1 76 Os 190.2 108	27 Co 58.93 45 Rh 102.9 77 Ir 192.2 109	28 Ni 58.69 46 Pd 106.4 78 Pt 195.1 110	29 Cu 63.55 47 Ag 107.9 79 Au 197.0 111	30 Zn 65.38 48 Cd 112.4 80 Hg 200.6 112	Ga 69.72 49 In 114.8 81 TI 204.4 113	Ge 72.63 50 Sn 118.7 82 Pb 207.2 114	As 74.92 51 Sb 121.8 83 Bi 209.0 115	34 Se 78.97 52 Te 127.6 84 PO - 116	Br 79.90 53 1 126.9 85 At - 117	50 Kr 83.80 54 Xe 131.3 86 Rn - 118
K 39.10 37 Rb 85.47 55 Cs 132.9 87 Fr	Ca 40.08 38 Sr 87.62 56 Ba 137.3 88 Ra	Sc 44.96 39 Y 88.91 57-71 89-103	Ti 47.87 40 Zr 91.22 72 Hf 178.5 104 Rf	V 50.94 41 Nb 92.91 73 Ta 180.9 105 Db	Cr 52.00 42 MO 95.95 74 W 183.8 106 Sg	20 Mn 54.94 43 TC - 75 Re 186.2 107 Bh	Fe 55.85 44 Ru 101.1 76 OS 190.2 108 HS	27 Co 58.93 45 Rh 102.9 77 Ir 192.2 109 Mt	Ni 58.69 46 Pd 106.4 78 Pt 195.1 110 Ds	29 Cu 63.55 47 Ag 107.9 79 Au 197.0 111 Rg	2n 65.38 48 Cd 112.4 80 Hg 200.6 112 Cn	Ga 69.72 49 In 114.8 81 TI 204.4 113 Nh	Ge 72.63 50 Sn 118.7 82 Pb 207.2 114 FI	As 74.92 51 Sb 121.8 83 Bi 209.0 115 Mc	34 Se 78.97 52 Te 127.6 84 PO - 116 LV	Br 79.90 53 I 126.9 85 At - 117 Ts	50 Kr 83.80 54 Xe 131.3 86 Rn - 118 Og

57	58	59	60	61	62	63	64	65	66	67	68	69	70	71
La	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
138.9	14 <mark>0.1</mark>	140.9	144.2	-	150.4	152.0	157.3	158.9	162.5	164.9	167.3	168.9	173.0	175.0
89	90	91	92	93	94	95	96	97	98	99	100	101	102	103
Ac	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr
-	232.0	231.0	238.0	- 19 ¹⁰	-		1	-	-	1.5	-	-	- 1	-

2022 Australian Science Olympiad Examination - Chemistry ©Australian Science Innovations ABN 81731558309