

## CONSTANTS PAGE FOR 102 FINAL EXAM

$$K = ^\circ\text{C} + 273$$

$$PV = nRT$$

$$R = 0.08206 \text{ L atm/mol K}$$

$$\text{Avogadro's number, } N = 6.022 \times 10^{23}$$

$$1 \text{ atm} = 760 \text{ torr} = 760 \text{ mm Hg}$$

$$\text{kinetic energy} = (1/2) mv^2$$

$$R_H = 2.178 \times 10^{-18} \text{ J}$$

$$h = 6.626 \times 10^{-34} \text{ J}\cdot\text{sec}$$

$$c = \lambda\nu = 2.998 \times 10^8 \text{ m/sec}$$

$$E = h\nu = hc/\lambda$$

$$E_n = -Z^2R_H(1/n^2), Z = \text{atomic number}$$

$$\Delta E = -Z^2R_H \left( \frac{1}{n_2^2} - \frac{1}{n_1^2} \right)$$

$$\frac{P_1V_1}{n_1T_1} = \frac{P_2V_2}{n_2T_2}$$

$$\left( P + \frac{an^2}{V^2} \right) (V - nb) = nRT$$

$$P \cdot M = dRT, M = \text{molar mass}$$

$$d = \text{density} = \text{mass/volume}$$

$$P_{\text{total}} = P_1 + P_2 + P_3 + \dots$$

$$\text{STP} = 0^\circ\text{C and } 1 \text{ atm}$$

$$\% \text{ yield} = \frac{\text{actual}}{\text{theoretical}} \times 100$$

$$1 \text{ J} = 1 \text{ kg m}^2/\text{sec}^2$$

$$101.3 \text{ J} = 1 \text{ L}\cdot\text{atm}$$

$$M_1V_1 = M_2V_2$$

$$KE_{\text{AVE}} = (3/2) RT$$

$$1 \text{ L} = 1000 \text{ mL}; 10^9 \text{ nm} = 1 \text{ m} = 100 \text{ cm}$$

$$\lambda = h/mv$$

$$R = 8.3145 \text{ J/mol}\cdot\text{K} = 0.08206 \frac{\text{L}\cdot\text{atm}}{\text{mol}\cdot\text{K}}$$

$$\Delta E = q + w$$

$$\Delta H = \Delta E + \Delta(PV)$$

$$\Delta H_{\text{rxn}}^\circ = \sum \Delta H_{\text{f, prod}}^\circ - \sum \Delta H_{\text{f, reactants}}^\circ$$

$$w = -P\Delta V = -RT\Delta n$$

(at constant P and T)

$$\Delta E_{\text{univ}} = \Delta E_{\text{surr}} + \Delta E_{\text{sys}}$$

$$\text{mass \% A} = \frac{\text{mass of A}}{\text{total mass}} \times 100$$

$$\frac{\text{rate 1}}{\text{rate 2}} = \sqrt{\frac{M_2}{M_1}} \quad (M = \text{molar mass})$$

$$K_p = K(RT)^{\Delta n}$$

$$q = s \times \text{mass} \times \Delta T$$

### Solubility rules:

1. Most nitrate salts are soluble.
2. Most salts of alkali metals and ammonium cations are soluble.
3. Most chloride, bromide and iodide salts are soluble. Exceptions: salts containing  $\text{Ag}^+$ ,  $\text{Pb}^{2+}$  and  $\text{Hg}_2^{2+}$  ions are insoluble.
4. Most sulfate salts are soluble. Exceptions: sulfates containing  $\text{Ca}^{2+}$ ,  $\text{Ba}^{2+}$ ,  $\text{Pb}^{2+}$  and  $\text{Hg}_2^{2+}$  ions are insoluble.
5. Most hydroxide salts are insoluble. Exceptions: hydroxides containing alkali metals,  $\text{Ba}^{2+}$ ,  $\text{Sr}^{2+}$  and  $\text{Ca}^{2+}$  ions are soluble.
6. Most sulfide, carbonate, chromate and phosphate salts are insoluble. Exceptions: salts of alkali metals and ammonium cations are soluble.

# PERIODIC TABLE OF THE ELEMENTS

1A

8A

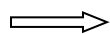
1 H 1.008	2A																2 He 4.003
3 Li 6.941	4 Be 9.012											5 B 10.81	6 C 12.01	7 N 14.01	8 O 16.00	9 F 19.00	10 Ne 20.18
11 Na 22.99	12 Mg 24.31											13 Al 26.98	14 Si 28.09	15 P 30.97	16 S 32.07	17 Cl 35.45	18 Ar 39.95
19 K 39.10	20 Ca 40.08	21 Sc 44.96	22 Ti 47.88	23 V 50.94	24 Cr 52.00	25 Mn 54.94	26 Fe 55.85	27 Co 58.93	28 Ni 58.69	29 Cu 63.55	30 Zn 65.38	31 Ga 69.72	32 Ge 72.59	33 As 74.92	34 Se 78.96	35 Br 79.90	36 Kr 83.80
37 Rb 85.47	38 Sr 87.62	39 Y 88.91	40 Zr 91.22	41 Nb 92.91	42 Mo 95.94	43 Tc (98)	44 Ru 101.1	45 Rh 102.9	46 Pd 106.4	47 Ag 107.9	48 Cd 112.4	49 In 114.8	50 Sn 118.7	51 Sb 121.8	52 Te 127.6	53 I 126.9	54 Xe 131.3
55 Cs 132.9	56 Ba 137.3	57 La* 138.9	72 Hf 178.5	73 Ta 180.9	74 W 183.9	75 Re 186.2	76 Os 190.2	77 Ir 192.2	78 Pt 195.1	79 Au 197.0	80 Hg 200.6	81 Tl 204.4	82 Pb 207.2	83 Bi 209.0	84 Po (209)	85 At (210)	86 Rn (222)
87 Fr (223)	88 Ra 226	89 Ac† (227)	104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt	110 Ds	111 Rg	112 Cn						

atomic number → 

26 Fe 55.85
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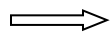
 ← atomic mass

lanthanides\*



58 Ce 140.1	59 Pr 140.9	60 Nd 144.2	61 Pm (145)	62 Sm 150.4	63 Eu 152.0	64 Gd 157.3	65 Tb 158.9	66 Dy 162.5	67 Ho 164.9	68 Er 167.3	69 Tm 168.9	70 Yb 173.0	71 Lu 175.0
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actinides†



90 Th 232.0	91 Pa (231)	92 U 238.0	93 Np (237)	94 Pu (244)	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (251)	99 Es (252)	100 Fm (257)	101 Md (258)	102 No (259)	103 Lr (260)
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