

## CONSTANTS

$$R = 8.3145 \text{ J mol}^{-1}\text{K}^{-1}$$

$$R = 0.08206 \text{ L atm mol}^{-1}\text{K}^{-1}$$

$$N_A = 6.022 \times 10^{23} \text{ atoms/mol}$$

$$F = 96,485 \text{ C/mol}$$

$$c = 3 \times 10^8 \text{ m/s}$$

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

## CONVERSION FACTORS

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

$$1 \text{ A} = 1 \text{ C/sec}$$

$$1 \text{ V} = 1 \text{ J/C}$$

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

## EQUATIONS

$$E = E^\circ - \left( \frac{RT}{nF} \right) \ln Q$$

zero order:  $[A] = -kt + [A]_0$

$$t_{1/2} = \frac{[A]_0}{2k}$$

$$E = E^\circ - \left( \frac{0.0257}{n} \right) \ln Q \text{ at } 25^\circ\text{C}$$

first order:  $\ln [A] = -kt + \ln [A]_0$

$$t_{1/2} = \frac{0.693}{k}$$

$$E = E^\circ - \left( \frac{0.0592}{n} \right) \log Q \text{ at } 25^\circ\text{C}$$

second order:  $\frac{1}{[A]} = kt + \frac{1}{[A]_0}$

$$t_{1/2} = \frac{1}{k[A]_0}$$

$$E^\circ = \left( \frac{RT}{nF} \right) \ln K$$

$$I = \frac{nF}{t}$$

$$\Delta G = \Delta H - T\Delta S$$

$$\Delta G = -nFE$$

$$k = A e^{-E_a/RT}$$

$$\Delta G^\circ = \Delta H^\circ - T\Delta S^\circ$$

$$\Delta G^\circ = -nFE^\circ$$

$$\ln k = \frac{-E_a}{R} \left( \frac{1}{T} \right) + \ln A$$

$$\Delta G^\circ = -RT \ln K$$

$$\Delta G = \Delta G^\circ + RT \ln Q$$

$$\ln \left( \frac{k_2}{k_1} \right) = \frac{E_a}{R} \left( \frac{1}{T_1} - \frac{1}{T_2} \right)$$

$$\Delta E = q + w$$

$$\Delta S = q_{\text{rev}}/T$$

$$\Delta S = nR \ln(V_2/V_1)$$

$$w = -P_{\text{ext}}\Delta V$$

$$\Delta S_{\text{vap}} = \Delta H_{\text{vap}}/T_b$$

$$\Delta S = n c_v \ln(T_2/T_1)$$

$$w_{\text{rev}} = -nRT \ln(V_2/V_1)$$

$$\Delta S_{\text{fus}} = \Delta H_{\text{fus}}/T_m$$

$$\Delta S = n c_p \ln(T_2/T_1)$$

$$q_{\text{rev}} = nRT \ln(V_2/V_1)$$

$$\Delta H = n c_p \Delta T$$

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

$$q_v = n c_v \Delta T$$

$$q = Mc\Delta T$$

$$\Delta E = n c_v \Delta T$$

$$H = E + PV$$

$$q_p = n c_p \Delta T$$

$$PV = nRT$$

$$c_p = c_v + R$$

$$c_v = (3/2)R \text{ for monatomic ideal gas}$$

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

$$\Delta E = -(2.18 \times 10^{-18} \text{ J}) \left( \frac{Z^2}{n_{\text{final}}^2} - \frac{Z^2}{n_{\text{initial}}^2} \right)$$

## PERIODIC TABLE

		1A															8A		
		1																2	
		H																He	
		1.008																4.003	
		3A	4A		5A			6A		7A									
		5	6		7			8		9									
		B	C		N			O		F									
		10.81	12.01		14.01			16.00		19.00									
		13	14		15			16		17									
		Al	Si		P			S		Cl									
		26.98	28.09		30.97			32.07		35.45									
Period	2	3	4	5	6	7	8	9	10	11	12	31	32	33	34	35	36		
	Li	Be											Ga	Ge	As	Se	Br	Kr	
	6.941	9.012											69.72	72.61	74.92	78.96	79.90	83.80	
	3	11	12	3	4	5	6	7	8	9	10	11	12	31	32	33	34	35	36
	Na	Mg											In	Sn	Sb	Te	I	Xe	
	22.99	24.30											114.8	118.7	121.8	127.6	126.9	131.3	
4	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	30	31	32	33	34	35	36	
39.10	40.08	44.96	47.88	50.94	52.00	54.94	55.85	58.93	58.69	63.55	65.39	65.39	69.72	72.61	74.92	78.96	79.90	83.80	
5	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	47	49	50	51	52	53	54	
85.47	87.62	88.91	91.22	92.91	95.94	(98)	101.1	102.9	106.4	107.9	112.4	112.4	114.8	118.7	121.8	127.6	126.9	131.3	
6	55	56	La-Lu	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	
Cs	Ba	La-Lu	Hf	Ta	W	Re	Os	Ir	Pt	Au	80	80	81	82	83	84	85	86	
132.9	137.3	La-Lu	178.5	180.9	183.8	186.2	190.2	192.2	195.1	197.0	200.6	200.6	204.4	207.2	209.0	(209)	(210)	(222)	