Physics SN3 Equation Sheet

Simple Harmonic Motion

$$F = -kx$$

$$x(t) = A\cos(\omega t + \phi)$$

$$\omega = 2\pi f = \frac{2\pi}{T}$$

$$\omega = \sqrt{\frac{k}{m}}$$

$$\omega = \sqrt{\frac{g}{L}}$$

$$K = \frac{1}{2}mv^2 = \frac{p^2}{2m}$$

$$U_g = mgh$$

$$U_e = \frac{1}{2}kx^2$$

Waves and Sound

$$y(x,t) = A\sin(kx \pm \omega t + \phi)$$

$$k = \frac{2\pi}{\lambda}$$

$$v = f\lambda = \frac{\omega}{k}$$

$$v = \sqrt{\frac{F_T}{\mu}}$$

$$\langle P \rangle = \frac{1}{2}\mu A^2\omega^2 v$$

$$I = \frac{\langle P \rangle}{A}$$

$$y(x,t) = A_{\mathrm{SW}}\sin(kx)\cos(\omega t)$$

$$\beta = 10\log_{10}\left(\frac{I}{1.0\times10^{-12}\ \mathrm{W/m^2}}\right)$$

$$f_{beat} = |f_2 - f_1|$$

$$f_o = f_s\left(\frac{v \pm v_o}{v \mp v_s}\right)$$

$$v = \left(331\frac{\mathrm{m}}{\mathrm{s}}\right)\sqrt{\frac{T}{273\ \mathrm{K}}}$$

Interference and Diffraction

$$I_p = I_0\cos^2(\theta)$$

$$\frac{\text{phase diff}}{2\pi} = \frac{\text{path diff}}{\lambda}$$

$$d\sin\theta = m\lambda$$

$$\phi = 2\pi\left(\frac{d\sin\theta}{\lambda}\right)$$

$$I_2 = I_1\cos^2\left(\frac{\phi}{2}\right)$$

$$a\sin\theta = m\lambda$$

$$\sigma = 2\pi\left(\frac{a\sin\theta}{\lambda}\right)$$

$$I_1 = I_{max}\left(\frac{\sin(\sigma/2)}{\sigma/2}\right)^2$$

Quantum (or Modern)

$$P = \frac{kA\Delta T}{d}$$

$$P = \sigma eA(T_1^4 - T_2^4)$$

$$\lambda_{max}T = 2.898\times10^{-3}\ \mathrm{m\cdot K}$$

$$E = hf$$

$$p = \frac{E}{c}$$

$$K_{max} = eV_0 = hf - \phi$$

$$p = \frac{h}{\lambda}$$

$$\Delta x\Delta p_x \geq \frac{h}{4\pi}$$

$$E_n = \frac{-Z^2\cdot 13.6\ \mathrm{eV}}{n^2}$$

$$\psi_n(x) = \sqrt{\frac{2}{L}}\sin\left(\frac{n\pi x}{L}\right)$$

$$E_n = \frac{n^2h^2}{8mL^2}$$

Nuclear

$$r = (1.2\ fm)A^{1/3}$$

$$T_{\frac{1}{2}} = \frac{\ln 2}{\lambda}$$

$$N = N_0e^{-\lambda t}$$

$$A(t) = -\frac{dN}{dt}$$

$$\Delta m = Zm_p + (A-Z)m_n - m_{nuc}$$

$$E_b = \Delta mc^2$$

$$BEN = \frac{E_b}{A}$$

$$Q = \left(m_{reactants} - m_{products}\right)c^2$$

Constants

Speed of sound in air (20°) = 343 m/s

Visible spectrum: 400 nm to 700 nm

$$c = 3.00\times10^8\ \mathrm{m/s}$$

$$\sigma = 5.670\times10^{-8}\frac{\mathrm{W}}{\mathrm{m^2\cdot K^4}}$$

$$1\ u = 931.494\ \mathrm{MeV}/c^2 = 1.66054\times10^{-27}\ \mathrm{kg}$$

$$1\ \mathrm{Ci} = 3.70\times10^{10}\ \mathrm{Bq}$$

$$e = 1.60\times10^{-19}\ \mathrm{C}$$

$$1\ \mathrm{eV} = 1.60\times10^{-19}\ \mathrm{J}$$

$$m_e = 9.11\times10^{-31}\ \mathrm{kg} = 0.5110\ \mathrm{MeV}/c^2$$

$$m_p = 1.673\times10^{-27}\ \mathrm{kg} = 938.2721\ \mathrm{MeV}/c^2$$

$$m_n = 1.675\times10^{-27}\ \mathrm{kg} = 939.5654\ \mathrm{MeV}/c^2$$

$$h = 6.63\times10^{-34}\ \mathrm{J\cdot s} = 4.14\times10^{-15}\ \mathrm{eV\cdot s}$$

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THE PERIODIC TABLE of ELEMENTS

1 H 1.008																	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 22.990	12 Mg 24.305											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 65.39	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 131.30
55 Cs 132.9	56 Ba 137.3	57 La * 138.9	72 Hf 178.5	73 Ta 180.9	74 W 183.8	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 (210)	85 At (210)	86 Rn (222)
87 Fr (223)	88 Ra (226)	89 Ac ** (227)	104 Rf (257)	105 Db (260)	106 Sg (263)	107 Bh (262)	108 Hs (265)	109 Mt (266)	110 Ds (281)	111 Rg (280)	112 Cn (285)	113 Nh (284)	114 Fl (289)	115 Mc (288)	116 Lv (293)	117 Ts (294)	118 Og (294)

*	58 Ce 140.1	59 Pr 140.9	60 Nd 144.2	61 Pm (147)	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
**	90 Th 232.0	91 Pa (231)	92 U 238.0	93 Np (237)	94 Pu (242)	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (249)	99 Es (254)	100 Fm (253)	101 Md (256)	102 No (254)	103 Lr (257)