

## 29:12 FINAL EXAM FORMULAE AND CONSTANTS

$$1 \text{ eV} = 1.6 \times 10^{-19} \text{ J} \quad h = 6.626 \times 10^{-34} \text{ J s}$$

$$1 \text{ amu (u)} = 1.6605 \times 10^{-27} \text{ kg} \quad 1 \text{ amu} \times c^2 = 931.5 \text{ MeV}$$

$$m_{\text{elec}} = 9.11 \times 10^{-31} \text{ kg} \quad m_{\text{prot}} = 1.672 \times 10^{-27} \text{ kg} \quad m_{\text{neut}} = 1.674 \times 10^{-27} \text{ kg}$$

$$A = Z + N \quad {}^A_Z X \quad r \approx (1.2 \times 10^{-15} \text{ m}) A^{1/3} \quad \text{Binding Energy} = (\text{mass defect}) c^2 = (\Delta m) c^2$$

$$\text{Absorbed dose} = (\text{Energy absorbed}) / (\text{Mass of absorbing material})$$

$$\text{Relative biological effectiveness} = (\text{dose of 200 keV X-rays that produces a certain biological effect}) / (\text{dose of radiation that produces the same biological effect})$$

Quark	Symbol	Charge
Up	U	+2/3
Down	D	-1/3
Charm	C	+2/3
Strange	S	-1/3
Top	T	+2/3
Bottom	B	-1/3

### The Periodic Table of Elements

1 H 1.008																	2 He 4.00								
3 Li 6.941	4 Be 9.012											13 B 10.81	14 C 12.01	15 N 14.01	16 O 16.00	17 F 18.998	18 Ne 20.179								
9 Na 22.99	10 Mg 24.305	11 Al 26.98	12 Si 28.086	13 P 30.97	14 S 32.06	15 Cl 35.453	16 Ar 39.948	19 K 39.098	20 Ca 40.08	21 Sc 44.96	22 Ti 47.90	23 V 50.94	24 Cr 51.996	25 Mn 54.94	26 Fe 55.85	27 Co 58.93	28 Ni 58.70	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	58 Ce 140.9	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									
87 Fr (223)	88 Ra (226.0)	89 Ac (227)	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)									

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
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)