

Mark the answers for Questions 1-13 on your Scantron. Each Question is worth 2 pt

- 1) (2.1) Two atoms must represent the same element if they both have the same:
 - A) number of electron shells
 - B) atomic number
 - C) number of neutrons
 - D) atomic mass

- 2) (2.1) The smallest particle of an element that can be identified as that element is:
 - A) a proton
 - B) a neutron
 - C) a molecule
 - D) an atom

- 3) (2.1) The neutral atom always contains:
 - A) the same number of protons and neutrons
 - B) the same number of neutrons and electrons
 - C) the same number of protons and electrons
 - D) the same number of protons, neutrons and electrons

- 4) (2.1) Almost all of the mass of an atom exists in its:
 - A) first energy level
 - B) outermost energy level
 - C) nucleus
 - D) electrons

- 5) (2.1) Which subatomic particle contributes least to the mass of the atom?
 - A) Proton
 - B) Neutron
 - C) Electron
 - D) All of these contribute equally.

- 6) (2.1) Which particle(s) are in the nucleus?
 - A) protons only
 - B) neutrons only
 - C) protons and neutrons
 - D) protons and electrons

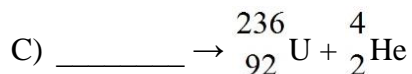
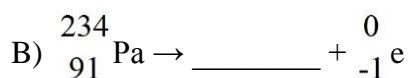
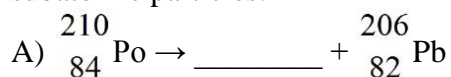
(15 pt) (2.2) Complete the following table:

Symbol	Atomic #	Mass #	#p	#n	#e
$^{131}_{53}\text{I}$					53
	43	99	43		43
$^{37}_{17}\text{Cl}$			17	20	
	26	56			23

- 7) (2.2) Adding one neutron to the nucleus of an atom:
- A) increases the atomic number and the mass number by one unit
 - B) increases its atomic mass by one unit, but does not change its atomic number
 - C) increases its atomic number by one unit but does not change its atomic mass
 - D) does not change either its atomic number or its atomic mass
- 8) (2.2) Isotopes have the:
- A) same number of protons but different number of electrons
 - B) same number of protons but different number of neutrons
 - C) same number of neutrons but different number of electrons
 - D) all of the above
- 9) (2.3) Which of the following represents a pair of isotopes?
- A) ${}^{14}_6\text{C}$, ${}^{14}_7\text{N}$ B) ${}^1_1\text{H}$, ${}^2_1\text{H}$ C) ${}^{32}_{16}\text{S}$, ${}^{32}_{16}\text{S}^{-2}$ D) O_2 , O_3
- 10) (2.4) Of the following, the radioisotope most useful in treating disorders of the thyroid gland is:
- A) C-14 B) Tc-99m C) U-238 D) I-131
- 11) (2.4) The form of radioactivity that penetrates matter most easily is:
- A) alpha particles B) gamma rays C) beta particles D) protons
- 12) (2.6) The amount of a radioisotope that remains after two half-lives have passed is:
- A) 98% B) 75% C) 50% D) 25%
- 13) (2.6) Given the following half-lives, identify which of the following radioactive nuclides would disappear first given the same initial quantities.
- A) U-238 ($t_{1/2} = 4.5 \times 10^9$ yr)
 - B) C-14 ($t_{1/2} = 5730$ yr)
 - C) I-123 ($t_{1/2} = 132$ min)
 - D) F-18 ($t_{1/2} = 110$ min)
- (4 pt) (2.6) Thallium-201 is a radioisotope used in brain scans. If the recommended dose is 3.0 mCi and a vial contains 60 mCi in 50 mL, how many milliliters should be injected?

(10 pt) (2.3) A hypothetical element contains three isotopes of mass 16.0 amu, 17.0 amu, and 18.0 amu with relative abundances of 20.0%, 50.0% and 30.0%, respectively. The average atomic mass is:

(9 pt) (2.5) Complete the following equations with the symbol for the atom or particle represented by the blank space. Show the mass numbers and atomic numbers of the isotopes formed or the symbols of the subatomic particles:



(6 pt) (2.6) Krypton-81m is used for lung ventilation studies. Its half-life is 13 seconds. How long does it take the activity of this isotope to reach one-quarter of its original value? *Show your work.*

(6 pt) (2.7) Why is a radioactive nuclide which is an alpha emitter a bad choice in medical diagnostics or imaging? *Give two reasons in a complete sentence or two.*

PERIODIC CHART OF THE ELEMENTS

1 H 1.00797																	1 H 1.00797	2 He 4.0026
3 Li 6.939	4 Be 9.0122											5 B 10.811	6 C 12.0112	7 N 14.0067	8 O 15.9994	9 F 18.9984	10 Ne 20.183	
11 Na 22.9898	12 Mg 24.312											13 Al 26.9815	14 Si 28.086	15 P 30.9738	16 S 32.064	17 Cl 35.453	18 Ar 39.948	
19 K 39.102	20 Ca 40.08	21 Sc 44.956	22 Ti 47.90	23 V 50.942	24 Cr 51.996	25 Mn 54.9380	26 Fe 55.847	27 Co 58.9332	28 Ni 58.71	29 Cu 63.54	30 Zn 65.37	31 Ga 69.72	32 Ge 72.59	33 As 74.9216	34 Se 78.96	35 Br 79.909	36 Kr 83.80	
37 Rb 85.47	38 Sr 87.62	39 Y 88.905	40 Zr 91.22	41 Nb 92.906	42 Mo 95.94	43 Tc (99)	44 Ru 101.07	45 Rh 102.905	46 Pd 106.4	47 Ag 107.870	48 Cd 112.40	49 In 114.82	50 Sn 118.69	51 Sb 121.75	52 Te 127.60	53 I 126.904	54 Xe 131.30	
55 Cs 132.905	56 Ba 137.34	*57 La 138.91	72 Hf 178.49	73 Ta 180.948	74 W 183.85	75 Re 186.2	76 Os 190.2	77 Ir 192.2	78 Pt 195.09	79 Au 196.967	80 Hg 200.59	81 Tl 204.37	82 Pb 207.19	83 Bi 208.980	84 Po (210)	85 At (210)	86 Rn (222)	
87 Fr (223)	88 Ra (226)	†89 Ac (227)	104 Rf (261)	105 Db (262)	106 Sg (266)	107 Bh (262)	108 Hs (265)	109 Mt (266)	110 ? (271)	111 ? (272)	112 ? (277)							

* Lanthanide Series

58 Ce 140.12	59 Pr 140.907	60 Nd 144.24	61 Pm (147)	62 Sm 150.35	63 Eu 151.96	64 Gd 157.25	65 Tb 158.924	66 Dy 162.50	67 Ho 164.930	68 Er 167.26	69 Tm 168.934	70 Yb 173.04	71 Lu 174.97
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† Actinide Series

90 Th 232.038	91 Pa (231)	92 U 238.03	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 (256)	103 Lr (257)
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USEFUL CONVERSION FACTORS AND RELATIONSHIPS

Length

SI unit: meter (m)

1 km = 0.62137 mi
 1 mi = 5280 ft
 = 1.6093 km
 1 m = 1.0936 yd
 1 in. = 2.54 cm (exactly)
 1 cm = 0.39370 in.
 1 Å = 10⁻¹⁰ m

Mass

SI unit: kilogram (kg)

1 kg = 2.2046 lb
 1 lb = 453.59 g
 = 16 oz
 1 amu = 1.6605402 x 10⁻²⁴ g

Temperature

SI unit: Kelvin (K)

0 K = -273.15°C
 = -459.67°F
 K = °C + 273.15
 °C = $\frac{5}{9}$ (°F - 32°)
 °F = $\frac{9}{5}$ °C + 32°

Energy (derived)

SI unit: joule (J)

1 J = 1 kg·m²/s²
 1 J = 0.2390 cal
 = 1 C x 1 V
 1 cal = 4.184 J
 1 eV = 1.602 x 10⁻¹⁹ J

Pressure (derived)

SI unit: Pascal (Pa)

1 Pa = 1 N/m²
 = 1 kg/m·s²
 1 atm = 101,325 Pa
 = 760 torr
 = 14.70 lb/in²
 1 bar = 10⁵ Pa

Volume (derived)

SI unit: cubic meter (m³)

1 L = 10⁻³ m³
 = 1 dm³
 = 10³ cm³
 = 1.0567 qt
 1 gal = 4 qt
 = 3.7854 L
 1 cm³ = 1 mL
 1 in³ = 16.4 cm³

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