

Chemistry 150

Exam 1

Be sure to put your name on each page. This page can be removed from your exam so that you will have a Periodic Table handy throughout the exam, it does not need to be turned in. Show all your work for non-multiple choice problems which require any sort of calculation, no credit will be given for answers without work shown. If you have shown a significant amount of work or multiple drawings for a problem, draw a box around what you consider your final answer.

Avogadro's Number = 6.022×10^{23} units/mol

$32.00^\circ\text{F} = 0.000^\circ\text{C} = 273.15\text{K}$

1 foot = 12 inches

1 inch = 2.54cm (exactly)

1 pound = 453.6 g = 16 ounces

1 amu = 1.6605×10^{-24} g

Masses of subatomic particles:

Proton $1.00728\text{amu} = 1.6726 \times 10^{-24}$ g

Neutron $1.00866\text{amu} = 1.6749 \times 10^{-24}$ g

Electron $0.000549\text{amu} = 9.1094 \times 10^{-28}$ g

1 H 1.0079																	2 He 4.0026
3 Li 6.941	4 Be 9.0122											5 B 10.811	6 C 12.011	7 N 14.007	8 O 15.999	9 F 18.998	10 Ne 20.180
11 Na 22.990	12 Mg 24.305											13 Al 26.982	14 Si 28.086	15 P 30.974	16 S 32.066	17 Cl 35.453	18 Ar 39.948
19 K 39.098	20 Ca 40.078	21 Sc 44.956	22 Ti 47.88	23 V 50.942	24 Cr 51.996	25 Mn 54.938	26 Fe 55.847	27 Co 58.933	28 Ni 58.69	29 Cu 63.546	30 Zn 65.39	31 Ga 69.723	32 Ge 72.61	33 As 74.922	34 Se 78.96	35 Br 79.904	36 Kr 83.80
37 Rb 85.468	38 Sr 87.62	39 Y 88.906	40 Zr 91.224	41 Nb 92.906	42 Mo 95.94	43 Tc (98)	44 Ru 101.07	45 Rh 102.91	46 Pd 106.42	47 Ag 107.87	48 Cd 112.41	49 In 114.82	50 Sn 118.71	51 Sb 121.76	52 Te 127.60	53 I 126.90	54 Xe 131.29
55 Cs 132.91	56 Ba 137.33	57 La 138.91	72 Hf 178.49	73 Ta 180.95	74 W 183.84	75 Re 186.21	76 Os 190.23	77 Ir 192.22	78 Pt 195.08	79 Au 196.97	80 Hg 200.59	81 Tl 204.38	82 Pb 207.2	83 Bi 208.98	84 Po (209)	85 At (210)	86 Rn (222)
87 Fr (223)	88 Ra 226.03	89 Ac 227.03	104 Rf (261)	105 Db (262)	106 Sg (263)	107 Bh (262)	108 Hs (265)	109 Mt (266)	110 (269)	111 (272)	112 (277)		114		116		

58 Ce 140.12	59 Pr 140.91	60 Nd 144.24	61 Pm (145)	62 Sm 150.36	63 Eu 151.97	64 Gd 157.25	65 Tb 158.93	66 Dy 162.50	67 Ho 164.93	68 Er 167.26	69 Tm 168.94	70 Yb 173.04	71 Lu 174.97
90 Th 232.04	91 Pa 231.04	92 U 238.03	93 Np 237.05	94 Pu (244)	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (251)	99 Es (252)	100 Fm (258)	101 Md (258)	102 No (259)	103 Lr (260)

Multiple Choice: Circle the letter of the most correct response. (5pts. per question)

- Which of the following sets of elements contains a metal, a metalloid and a nonmetal?
 - V, K, W
 - Ir, Ne, O
 - N, P, Br
 - Ca, F, As
 - Te, Ge, Si
- Which of the following is *not* part of Atomic Theory?
 - All matter is composed of atoms
 - All atoms of a given element have the same chemical properties
 - The atomic number of an atom is equal to the number of protons in the nucleus
 - Compounds are formed by the chemical combination of two or more different kinds of atoms
 - A chemical reaction involves joining, separating or rearranging atoms
- Which of the following formulas is *least* likely to be an ionic compound?
 - SO₂
 - V(NO₃)₃
 - KBr
 - SrCl₂
 - Mg₃(PO₄)₂
- Different isotopes of an element:
 - Have the same number of electrons
 - Have the same charge
 - Have the same number of neutrons
 - Have the same mass number
 - Have the same number of protons
- Which of the following represents the shortest length?
 - 2.8cm
 - 3.1×10^{-7} km
 - 17 mm
 - 0.11 miles
 - 5.6×10^3 m
- Which of the following ions has the *fewest* oxygens?
 - Sulfide
 - Perchlorate
 - Nitrite
 - Hypochlorite
 - Hydroxide

7. Complete the following table (3pts per box):

<i>Symbol</i>	<i>Number of Protons</i>	<i>Number of Neutrons</i>	<i>Number of Electrons</i>	<i>Atomic Number</i>	<i>Mass Number</i>	<i>Charge</i>
	26	31	23			
K			19		39	
				50	121	0
Be		5	4			

Multiple Choice Calculations (9pts each):

8. What is the formula weight of ammonium sulfate?
- 209.155 g/mol
 - 130.123 g/mol
 - 114.124 g/mol
 - 113.093 g/mol
 - 66.127 g/mol
9. How many lead atoms are present in a 4.819g sample of lead (Atomic # = 82)?
- 395.2 atoms
 - 3.539×10^{22} atoms
 - 2.380×10^{26} atoms
 - 0.02326 atoms
 - 1.401×10^{22} atoms
10. 6.893mols of scandium (Atomic # 21) has a mass of how many grams?
- 44.956 g
 - 309.9 g
 - 0.3282 g
 - 144.8 g
 - 0.1533 g
11. What is the mass of a sample of calcium (Atomic # = 20) that contains 3.24×10^{24} Ca atoms?
- 5.38 g
 - 0.186 g
 - 216 g
 - 40.078 g
 - 108 kg

12. The Periodic Table in the front of SL104 is 8 feet wide. What is its width in cm?
- a. 24 cm
 - b. 38 cm
 - c. 240 cm
 - d. 20. cm
 - e. 2400 cm

Problems:

13. Lutetium has two naturally occurring isotopes. The more abundant, ^{175}Lu , is 97.41% abundant and has a mass of 174.940770amu. What is the mass of the less abundant isotope? (13pts)
14. You are attempting to design a synthetic oxygen transport drug that can supplement the hemoglobin in human blood. After you synthesize a likely candidate, you submit a sample for analysis and find that the material has the following composition: %Fe = 15.33; %C = 65.96; %H = 3.32; %N = 15.38. What is the *empirical* formula of this substance? Additional analysis reveals that each molecule of this substance contains 4 iron atoms. What is the molecular formula and molecular weight of this substance? (14pts)