

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?
 - Na, Mg, Al
 - N, O, F
 - Cu, Ni, Fe
 - Ar, Si, Ag
 - H, He, Cl
- Which of the following organic molecules has the most carbon atoms?
 - Methanol
 - Pentyne
 - Butane
 - Ethyl amine
 - Propene
- Which of the following formulas is *most ionic*?
 - PbO
 - RbBr
 - Fe₂S₃
 - SF₆
 - ZnSe
- Different isotopes of an element:
 - Have the same number of protons
 - Have the same mass number
 - Have the same number of neutrons
 - Have the same charge
 - Have the same number of electrons
- Which of the following represents the *largest mass*?
 - 1.4×10^{-3} kg
 - 8.82×10^{-8} mg
 - 29.2 kg
 - 3.6×10^8 mg
 - 785 g
- Which of the following polyatomic ions has the *fewest oxygen atoms*?
 - sulfate
 - hypochlorite
 - cyanide
 - phosphate
 - nitrite

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>
	21	24	19			
In			49		112	
				7	14	-3
Mg		13	10			

Multiple Choice Calculations (9pts each):

8. What is the formula weight of magnesium carbonate?
- 36.316 g/mol
 - 84.313 g/mol
 - 100.312 g/mol
 - 108.618 g/mol
 - 144.321 g/mol
9. How many titanium atoms are present in a 8.313g sample of titanium (Atomic # = 22)?
- 0.1736 atoms
 - 398.0 atoms
 - 1.046×10^{23} atoms
 - 2.275×10^{23} atoms
 - 5.006×10^{24} atoms
10. 4.842mols of silicon (Atomic # 14) has a mass of how many grams?
- 0.1724 g
 - 4.842 g
 - 67.79 g
 - 136.0 g
 - 2.916×10^{24} g
11. What is the mass of a sample of copper (Atomic # = 29) that contains 1.31×10^{24} Cu atoms?
- 2.18 g
 - 29.2 g
 - 63.1 g
 - 138 g
 - 163 g

12. A block of wood has a mass of 3.991 pounds. What is its mass in milligrams?
- 8.799×10^{-6} mg
 - 1.810 mg
 - 8.799 mg
 - 113.7 mg
 - 1.810×10^6 mg

Problems:

13. The newly discovered element Dragonium (Dg) has two stable isotopes. ^{318}Dg has a mass of 318.813amu and ^{315}Dg has a mass of 315.864amu. If the average atomic mass of Dg is 317.061amu, what is the percent abundance of the heavier isotope? (13pts)
14. A number of biologically important structures and processes rely on the formation of disulfide bonds. You have isolated a natural product that has a disulfide bond and has been analyzed to have the following composition: %C = 35.81, %H = 6.01, %O = 23.85, %N = 10.44, %S = 23.90. What is the *empirical* formula of this substance? Disulfide bonds always contain 2 sulfur atoms. What is the molecular formula and molecular weight of this substance? (14pts)