

Chemistry 150

Exam 2

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

Density of Water = 1.000g/mL

$R = 0.08206 \text{ L}\cdot\text{atm}/\text{mol}\cdot\text{K}$

$PV = nRT$

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 (279)		116 (289)		

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)

Score

Multiple Choice: Circle the letter of the most correct response. (7pts. per question)

- Which of the following combinations of aqueous solutions would you expect to form a precipitate?
 - Hydrochloric acid + Lithium sulfite
 - Sodium acetate + Nickel(II) nitrate
 - Silver(I) nitrate + Potassium carbonate
 - Ammonium phosphate + Potassium carbonate
 - Sodium hydroxide + Nitric acid
- Which of the following is **not** a redox reaction?
 - $\text{Mg(s)} + 2 \text{HCl(aq)} \rightarrow \text{MgCl}_2\text{(aq)} + \text{H}_2\text{(g)}$
 - $\text{NH}_4\text{NO}_3\text{(aq)} + \text{NaC}_2\text{H}_3\text{O}_2\text{(aq)} \rightarrow \text{NH}_4\text{C}_2\text{H}_3\text{O}_2\text{(aq)} + \text{NaNO}_3\text{(aq)}$
 - $2 \text{CuNO}_3\text{(aq)} + \text{Sn(s)} \rightarrow 2 \text{Cu(s)} + \text{Sn(NO}_3)_2\text{(aq)}$
 - $4 \text{Fe(s)} + 3 \text{O}_2\text{(g)} \rightarrow 2 \text{Fe}_2\text{O}_3\text{(s)}$
 - $2 \text{C}_2\text{H}_2\text{(g)} + 5 \text{O}_2\text{(g)} \rightarrow 4 \text{CO}_2\text{(g)} + 2 \text{H}_2\text{O(g)}$
- Under which of the following conditions is a gas most “ideal”?
 - High temperature, high pressure
 - High volume, low pressure
 - Low pressure, high temperature
 - High pressure, high volume
 - Room temperature, 25°C
- Consider the following reaction:
$$a \text{K}_3\text{PO}_4\text{(aq)} + b \text{Ca(NO}_3)_2\text{(aq)} \rightarrow c \text{Ca}_3\text{(PO}_4)_2\text{(s)} + d \text{KNO}_3\text{(aq)}$$
For every mol of $\text{K}_3\text{PO}_4\text{(aq)}$ that reacts, how many mols of $\text{Ca}_3\text{(PO}_4)_2\text{(s)}$ are formed?
 - 0.25 mols
 - 0.5 mols
 - 1 mol
 - 2 mols
 - 3 mols
- Consider the following reaction:
$$\text{Mn(NO}_3)_3\text{(aq)} + \text{CrSO}_4\text{(aq)} \rightarrow \text{MnSO}_4\text{(aq)} + \text{Cr(NO}_3)_3\text{(aq)}$$
What is being **reduced** in this reaction?
 - $\text{Mn(NO}_3)_3\text{(aq)}$
 - $\text{CrSO}_4\text{(aq)}$
 - $\text{MnSO}_4\text{(aq)}$
 - $\text{Cr(NO}_3)_3\text{(aq)}$
 - This is not a redox reaction
- Which of the following is a correct gas law relationship?
 - $PT = nRV$
 - $n_1T_1 = n_2T_2$
 - $V_1n_1 = V_2n_2$
 - $P_1T_1 = P_2T_2$
 - $P_1 / V_1 = P_2 / V_2$

7. In which of the following formulas does phosphorus have the **highest** oxidation number?
- Na_3PO_4
 - PH_3
 - H_3PO
 - P_4
 - KH_2PO_3
8. Which of the following would you expect to be **insoluble** in water?
- FeSO_4
 - NaI
 - $\text{Pb}(\text{NO}_3)_2$
 - $\text{NH}_4\text{C}_2\text{H}_3\text{O}_2$
 - BaSO_4

Multiple Choice Calculations (12pts each):

9. What is the pressure of 5.612mols of ideal gas at 13.64°C in a 50.0L vessel?
- 7.94atm
 - 6.28atm
 - 2.64atm
 - 0.159atm
 - 0.126atm
10. A 3.98L steel tank contains an ideal gas at 26.81°C and 3.94atm. What is the temperature of the tank if the pressure changes to 1.48atm?
- 909°C
 - 525°C
 - 71.4°C
 - 10.1°C
 - $-160.^\circ\text{C}$
11. A reaction produces 762.8mL of ideal gas at 1.06atm pressure and 26.94°C . How many mols of gas did the reaction produce?
- 366 mols
 - 32.8 mols
 - 1.06 mols
 - 0.366 mols
 - 0.0328 mols
12. You have dissolved 15.00g of magnesium acetate in enough water to make 200.00mL of solution. What is the concentration of the resulting solution?
- 0.8998 M
 - 0.5267 M
 - 0.1800 M
 - 0.1053 M
 - 5.267×10^{-4} M

Problems: (23pts each)

13. You would like to take some atmospheric measurements. You fill a weather balloon to a volume of 338.0L at 20.91°C and 0.959atm pressure. How many mols of gas are contained in the balloon? After you release the balloon, it rises to an altitude where the temperature is -11.67°C and the pressure is 0.567atm. A small hole in the balloon has allowed 14.30% of the original gas to escape. What is the volume of the balloon at this altitude?

14. 100.0mL of 1.299M iron(III) nitrate solution is combined with 100.0mL of 1.491M sodium carbonate solution.

- Write a correctly balanced net ionic equation for the reaction that takes place.
- How many grams of precipitate will this reaction form?
- You recover 9.614g of precipitate. What is the percent yield?