

Name Key (print) Name unrelated - wrong (sign)

Please show work for partial credit on the Long Answers and in some of the Short Answer Questions. Multiple choice questions have no partial credit. (2 pts print AND sign exam)  $^{\circ}C + 273.15 = K$  760 mm Hg = 1 atm  $PV = nRT$ ,  $R = 0.08206 \text{ (L atm)/(mol K)}$ ,  $P_1V_1 / P_2V_2 = T_1 / T_2$

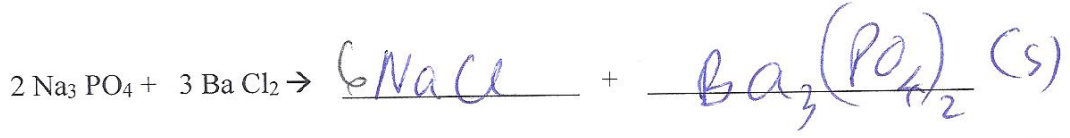
Part I MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question. (No Partial Credit for MC) (3 pts per question, 21 pts total)

- 1) Standard (STP) pressure for gases is BA = bad attempt 1) C  
A) 100 atm B) 760 atm C) 1 atm D) 0 atm
- 2) Which of the following ions will form an insoluble sulfate? NA = not attempt 2) B  
A)  $S^{2-}$  B)  $Ca^{2+}$  C)  $Cl^{-1}$  D)  $K^{+}$
- 3) You have 2 samples of gases in the same size container at the same pressure. The gas in the first container has a Kelvin temperature 4 times that of the gas in the other container. The ratio of the number of moles of gas in the first container compared to that in the second is: 3) A  
A) 1:4 B) 4:1 C) 1:1 D) 2:1
- 4) Which of the following salts is insoluble in water 4) B  
A)  $Pb(NO_3)_2$  B)  $AgCl$  C)  $K_2CO_3$  D)  $Na_2S$
- 5) Dalton's law of partial pressure states that: 5) C  
A) The volume of a fixed amount of gas is directly proportional to its temperature in Kelvin at constant pressure.  
B) The volume of a fixed amount of gas is inversely proportional to its pressure at constant temperature.  
C) The total pressure of a mixture of gases is the sum of the partial pressure of all of the gaseous compounds.  
D) Equal amounts of gases occupy the same volume at constant temperature and pressure.
- 6) Avogadro's law states that 6) A  
A) The number of moles of a gas is directly related to the volume of the gas at constant temperature and pressure.  
B) The total pressure of a mixture of gases is the sum of the partial pressure of all of the gaseous compounds.  
C) The volume of a fixed amount of gas is inversely proportional to its pressure at constant temperature.  
D) The rate of effusion of gases are inversely proportional to the square roots of their molar masses.
- 7) Consider three 1-L flasks at STP. Flask A contains  $NH_3$  gas, flask B contains  $NO_2$  gas, and flask C contains  $N_2$  gas. Which contains the largest number of molecules? 7) C  
A) Flask B B) Flask A  
C) All are the same. D) More information is needed to answer.

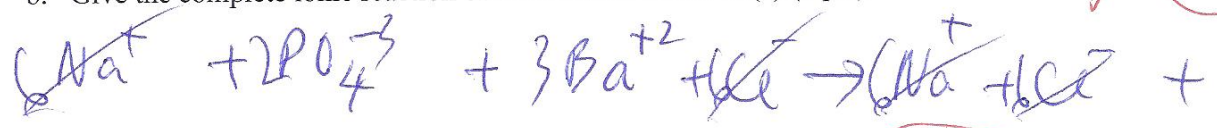
**Part II: Short Answers** (38 pts) Show work on all questions for partial and full credit even on questions which do not specify.

$^{\circ}\text{C} + 273.15 = \text{K}$     $760 \text{ mm Hg} = 1 \text{ atm}$     $PV = nRT$ ,  $R = 0.08206 \text{ (L atm)/(mol K)}$ ,  $P_1V_1 / P_2V_2 = T_1 / T_2$

1. Complete the following reaction (12 pts) (Unrelated - all pts off)   BA - 4   attempt - 2   Wrong formula
- a. Molecular reaction: (hint: look at your solubility rules table) (8pts, 4 pts each)



- b. Give the complete ionic reaction of the reaction above in (a) (2 pts) - attempt (-1/2)



- c. Give the net ionic reaction of the reaction above in (a) (2 pts) - BA - 1    $\text{Ba}_3(\text{PO}_4)_2 (s)$



2. Give the oxidation state in the following reagents. (show work or explain) (12 pts, 3 pt each)

a.  $\text{F}_2$  0  
element

b. F in  $\text{BaF}_2$  -1  
group 7  $\rightarrow 7 - 8 = -1$

c. Ni 0  
element

d. S in  $\text{SO}_2$  +4  
 $S + 2(-2) = 0$   
 $S = +4$

3. Convert the following: (show work) (8 pts, 4 pts each)

$38.2 \text{ }^{\circ}\text{C}$  to 311.35 K    $780.1 \text{ mm Hg} = \underline{1.03}$  atm (NW + Wrong -4)

$38.2 + 273.15 = 311.35$     $(780.1 / 760)$  (NW - 2)

4. What are the conditions at STP? (6 pts, 3 pts each)

T = 0  $^{\circ}\text{C}$    P = 1 atm

**Part III: Long Answer** (40 pts) Show work for partial credit and full credit even on questions which do not specify.

$^{\circ}\text{C} + 273.15 = \text{K}$     $760 \text{ mm Hg} = 1 \text{ atm}$     $PV = nRT$ ,  $R = 0.08206 \text{ (L atm)/(mol K)}$ ,  $P_1V_1 / P_2V_2 = T_1 / T_2$

1. Given the reaction below and assuming complete reaction (20 pts)



*BA -10   Attempt -2*

If you start out with 25.2 grams of NaCl (FW NaCl = 58.50 g/mol) how many grams of the  $\text{PbCl}_2$  (FW  $\text{PbCl}_2 = 278.2 \text{ g/mol}$ ) products will you make?

$$25.2 \text{ g NaCl} \times \frac{1 \text{ mol NaCl}}{58.50 \text{ g NaCl}} \times \frac{1 \text{ mol PbCl}_2}{2 \text{ mol NaCl}} \times \frac{278.2 \text{ g PbCl}_2}{1 \text{ mol PbCl}_2} =$$

59.92 g  $\text{PbCl}_2$

*BA -10   Attempt -2*

2. You have a gas at 780.2 mm Hg, 278.2 K and 3.78 Liters. The gas is compressed and result in new conditions of 878.2 mm Hg, and 2.78 Liters of the final volume, what is the new temperature in Kelvin? (20 pts)

$P_1 = 780.2 \text{ mmHg}$     $T_1 = 278.2 \text{ K}$     $V_1 = 3.78 \text{ L}$

$P_2 = 878.2 \text{ mmHg}$     $T_2 = ?$     $V_2 = 2.78 \text{ L}$

$$\frac{(878.2 \text{ mmHg})(2.78 \text{ L})}{(780.2 \text{ mmHg})(3.78 \text{ L})} = \frac{T_2}{278.2 \text{ K}}$$

$$(878.2)(2.78)(278.2) = T_2 = 230.3 \text{ K}$$

$$(780.2)(3.78)$$

unrelated - totally wrong answer

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Part I MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question. (No Partial Credit for MC) (3 pts per question, 21 pts total)

- 1) Which of the following ions will form an insoluble sulfate? 1) A  
A)  $\text{Ca}^{2+}$  B)  $\text{Cl}^{-1}$  C)  $\text{K}^{+}$  D)  $\text{S}^{-2}$  (BA = bad attempt)
- 2) Consider three 1-L flasks at STP. Flask A contains  $\text{NH}_3$  gas, flask B contains  $\text{NO}_2$  gas, and flask C contains  $\text{N}_2$  gas. Which contains the largest number of molecules? 2) D  
A) Flask A B) More information is needed to answer.  
C) Flask B D) All are the same. (NA = not attempted)
- 3) Avogadro's law states that 3) A  
A) The number of moles of a gas is directly related to the volume of the gas at constant temperature and pressure.  
B) The rate of effusion of gases are inversely proportional to the square roots of their molar masses.  
C) The total pressure of a mixture of gases is the sum of the partial pressure of all of the gaseous compounds.  
D) The volume of a fixed amount of gas is inversely proportional to its pressure at constant temperature.
- 4) You have 2 samples of gases in the same size container at the same pressure. The gas in the first container has a Kelvin temperature 4 times that of the gas in the other container. The ratio of the number of moles of gas in the first container compared to that in the second is: 4) C  
A) 2:1 B) 1:1 C) 1:4 D) 4:1
- 5) Which of the following salts is insoluble in water 5) C  
A)  $\text{K}_2\text{CO}_3$  B)  $\text{Na}_2\text{S}$  C)  $\text{AgCl}$  D)  $\text{Pb}(\text{NO}_3)_2$
- 6) Dalton's law of partial pressure states that: 6) C  
A) The volume of a fixed amount of gas is inversely proportional to its pressure at constant temperature.  
B) Equal amounts of gases occupy the same volume at constant temperature and pressure.  
C) The total pressure of a mixture of gases is the sum of the partial pressure of all of the gaseous compounds.  
D) The volume of a fixed amount of gas is directly proportional to its temperature in Kelvin at constant pressure.
- 7) Standard (STP) pressure for gases is 7) A  
A) 1 atm B) 0 atm C) 760 atm D) 100 atm

**Part II: Short Answers** (38 pts) Show work on all questions for partial and full credit even on questions which do not specify.

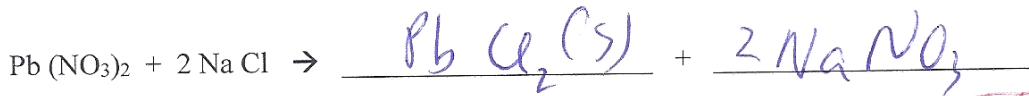
$^{\circ}\text{C} + 273.15 = \text{K}$      $760 \text{ mm Hg} = 1 \text{ atm}$      $PV = nRT$ ,  $R = 0.08206 \text{ (L atm)/(mol K)}$ ,  $P_1V_1/P_2V_2 = T_1/T_2$

1. Complete the following reaction (12 pts)

*BA - 4*    *attempt - 2*

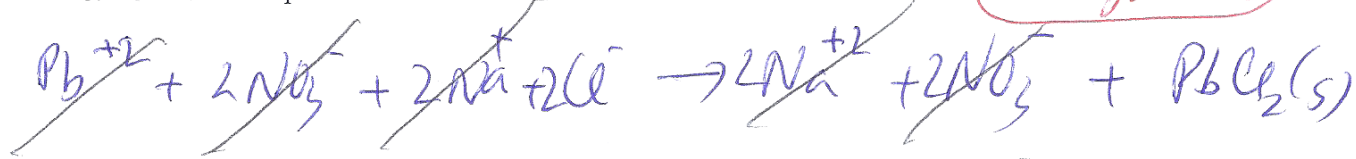
a. Molecular reaction: (hint: look at your solubility rules table) (8pts, 4 pts each)

*wrong formula - 1*



b. Give the complete ionic reaction of the reaction above in (a) (2 pts)

*attempt - 1/2*



c. Give the net ionic reaction of the reaction above in (a) (2 pts)

*BA - 1*



2. Give the oxidation state in the following reagents. (show work or explain) (12 pts, 3 pt each)

a.  $\text{H}_2$  0  
element

b. H in HBr +1  
group 1  $\rightarrow$  (+1)

c. Cr 0  
element

d. N in  $\text{NO}_3^{-1}$  +5  
 $N + 3(-2) = -1$   
 $N = -1 + 6 = +5$

3. Convert the following: (show work) (8 pts, 4 pts each)

$102.2 \text{ }^{\circ}\text{C}$  to 375.35 K

$678.3 \text{ mm Hg} =$  0.8925 atm

*NW - 2*

$102.2^{\circ}\text{C} + 273.15$

$\frac{678.3}{760} = 0.8925$

*NW + wrong - 4*

4. What are the conditions at STP? (6 pts, 3 pts each)

$P =$  1 atm     $T =$  0  $^{\circ}\text{C}$

**Part III: Long Answer** (40 pts) Show work for partial credit and full credit even on questions which do not specify.

$^{\circ}\text{C} + 273.15 = \text{K}$     $760 \text{ mm Hg} = 1 \text{ atm}$     $PV = nRT$ ,  $R = 0.08206 \text{ (L atm)/(mol K)}$ ,  $P_1V_1 / P_2V_2 = T_1 / T_2$

1. Given the reaction below and assuming complete reaction (20 pts)



*BA = -10*   *attempt -2*

If you start out with 25.2 grams of  $\text{Na}_3\text{PO}_4$  (FW  $\text{Na}_3\text{PO}_4 = 163.97 \text{ g/mol}$ ) how many grams of the  $\text{Ba}_3(\text{PO}_4)_2$  (FW  $\text{Ba}_3(\text{PO}_4)_2 = 601.84 \text{ g/mol}$ ) products will you make?

$$25.2 \text{ g Na}_3\text{PO}_4 \times \frac{1 \text{ mol Na}_3\text{PO}_4}{163.97 \text{ g Na}_3\text{PO}_4} \times \frac{1 \text{ mol Ba}_3(\text{PO}_4)_2}{2 \text{ mol Na}_3\text{PO}_4} \times \frac{601.84 \text{ g Ba}_3(\text{PO}_4)_2}{1 \text{ mol Ba}_3(\text{PO}_4)_2} =$$

$$46.2 \text{ g Ba}_3(\text{PO}_4)_2$$

*math algebra*  
*-2*

*BA = -10*   *attempt -2*

2. If you have 2.5 moles of a gas at  $32.2^{\circ}\text{C}$  at  $1.32 \text{ atm}$ , how many liters of the gas do you have? (20 pts)

$$n = 2.5 \text{ mol} \quad T = 32.2^{\circ}\text{C} + 273.15$$

$$P = 1.32 \text{ atm} \quad PV = nRT$$

$$(1.32 \text{ atm})(V) = (2.5 \text{ mol}) \left( \frac{0.08206 \text{ L atm}}{\text{mol K}} \right) (305.35)$$

$$V = \frac{(2.5 \text{ mol}) (0.08206 \text{ L atm}) (305.35)}{1.32 \text{ atm}}$$

$$V = 47.5 \text{ L}$$