

STATES OF MATTER



Third Marking Period

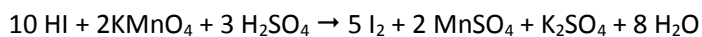
Multiple Choice Homework

Each lecture in class is accompanied by five (5) multiple choice questions, which will be instrumental in helping you reinforce the material covered in class, and help you study for the test. ALL of the questions for a particular unit will be due the day of the test, when this booklet will be turned into me for a homework grade. If you finish a section before the day of the test I will grade it for you, allowing you to see which questions you missed, however I will not put a grade in the grade book for the homework till the day of the test. Meaning I will grade any section as many times as you like till you get all the questions correct. Do not miss the opportunity to earn an easy 100 in the grade book

Unit 7 Homework

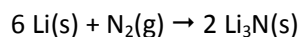
Mole to mole ratio

Use the following equation to answer the next two (2) questions.



- If 4.0 moles of KMnO_4 were to react with excess HI & H_2SO_4 , how many moles of I_2 would be produced?**
 - 1.0
 - 2.5
 - 5.0
 - 10.
- If 3 moles H_2SO_4 react with excess of the other reagents, how many moles of I_2 would be produced?**
 - 1.0
 - 2.5
 - 5.0
 - 10.
- How many moles of I_2 will be needed to react with N_2 to produce 6.0 mol NI_3 ?**
 - 1.0
 - 2.0
 - 6.0
 - 9.0

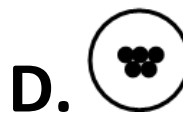
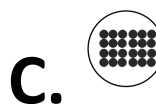
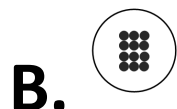
Use the following reaction and diagram to answer the next two (2) questions



- Which species is shown in the diagram?**
 - Li
 - N_2
 - Li_3N
 - All species are shown

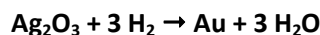


- Which image best represents the amount of the other reagent that is needed to react with all of the species shown**

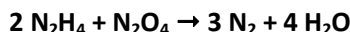


Mass to mass

1. According to the reaction below, what mass of Au ($107.9^{\text{g/mol}}$) is produced when 0.0500 mol of Ag_2O_3 is reduced completely with excess H_2 ?

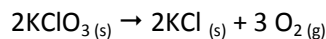


- a. 5.34g
b. 10.7
c. 13.3
d. 21.4
2. When excess N_2H_4 is mixed 92g of N_2O_4 what is the maximum mass of water that can be produced?



- a. 9.0 g
b. 18 g
c. 36 g
d. 72 g

Use the following formula to answer the next three (3) questions



3. According to the reaction above, what mass of KClO_3 ($122.5^{\text{g/mol}}$) would be required to produce 16g of oxygen?

- a. 0.33 g
b. 91.9 g
c. 40.8 g
d. 81.7 g

5. According to the reaction above, how much O_2 and KCl be produced from 30.6g KClO_3 ?

	<u>O_2</u>	<u>KCl</u>
a.	12.0g	18.6g
b.	12.0g	37.3g
c.	128g	74.5g
d.	4.00g	18.6g

4. If 61.25 g KClO_3 decomposes by the reaction above, what mass of KCl can be produced?

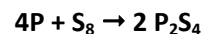
- a. 37.25g
b. 74.5g
c. 149g
d. 61.25g

Volume to Volume

1. How many moles of nitrogen gas occupy 44.8L of volume at STP?

- a. 0.5
b. 1.0
c. 1.6
d. 2.0

2. If the following reaction takes place at STP, how many liters of each reactant are needed to produce 22.4L of diphosphorous tetrasulfide?



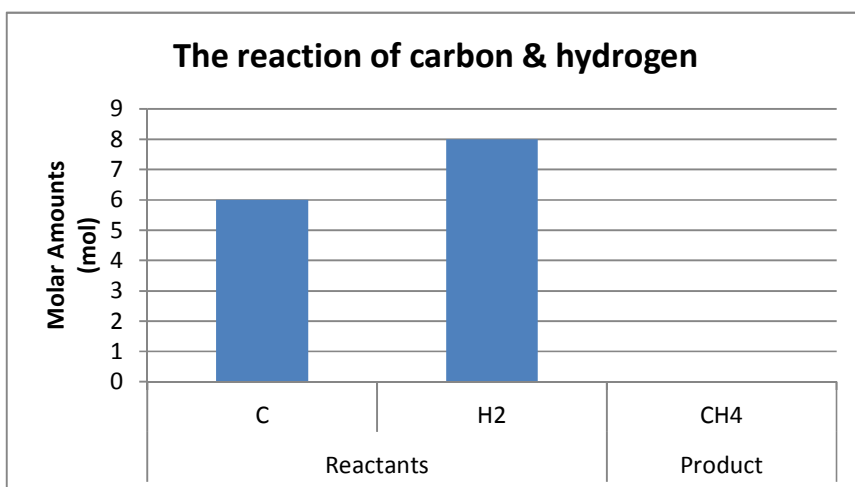
	<u>Phosphorous</u>	<u>Sulfur</u>
a.	22.4L	22.4L
b.	44.8L	11.2L
c.	22.4L	11.2L
d.	89.6L	22.4L

3. Given the reaction below, what volume of O_2 gas is required to react with excess CS_2 to produce 4.0L of SO_2 ?
(assume all gasses are at $0^\circ C$ and 1.0atm)
- $$CS_2(s) + 3 O_2(g) \rightarrow CO_2(g) + 2 SO_2(g)$$
- 6 L
 - 12 L
 - 22.4 L
 - $\frac{1}{3} \times 22.4$
4. The mass of 2.0×10^{23} molecules of a gas has a mass of 10.0 grams. What volume does 15.0 g of the gas occupy at STP?
- 7.46 L
 - 11.2 L
 - 22.4 L
 - 67.2 L
5. Three balloons are filled with 0.5mol of three different gasses, those gasses are Xe, CO_2 , and N_2 . Which expression below accurately depicts the volume of each balloon at $0^\circ C$ and 1.0atm?
- $Xe > CO_2 > N_2$
 - $CO_2 > N_2 > Xe$
 - $N_2 = CO_2 < Xe$
 - $N_2 = Xe = CO_2$

Limiting Reagent

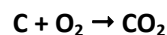
1. A sample of 32.7g of zinc metal is added to 10.0 moles of hydrochloric acid (HCl), producing zinc chloride ($ZnCl_2$) and hydrogen gas. The volume of hydrogen gas produced by this reaction at 1.0atm and $0^\circ C$ would be:
- 11.2 L
 - 22.4 L
 - 44.8 L
 - 7.46 L
2. Hydrogen and nitrogen gas react to form ammonia, how many grams of each reactant would be needed to produce 34g of ammonia?
- | | Hydrogen | Nitrogen |
|----|----------|----------|
| a. | 3.0g | 1.0g |
| b. | 6.0 | 14g |
| c. | 6.0g | 28g |
| d. | 17g | 17g |
3. Given the graph to the right, which of the following correctly pairs the balanced equation and the limiting reagent for this reaction?

Equation	Limiting reagent
a. $C + 4H_2 \rightarrow CH_4$	H_2
b. $C + 2H_2 \rightarrow CH_4$	C
c. $C + 4H \rightarrow CH_4$	H_2
d. $C + 2H_2 \rightarrow CH_4$	H_2



4. Which of the following is NOT true?
- Limiting reagents are the reagent you have the least of
 - Limiting reagents limits the amount of product produced
 - Theoretical yields must be calculated based only on the limiting reagents
 - Excess reagent is the reagent that remains after the reaction is complete

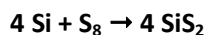
5. According to the reaction below, if 12g C and 16g O₂ react, how many grams of CO₂ can be produced?



- 11g
- 22g
- 44g
- 88g

Percent Yield

1. 14.0g of silicon reacted with sufficient sulfur to produce 11.5g of silicon dioxide. Which of the following best represents the percent yield of the reaction?



- 0.5%
- 2.5%
- 25%
- 50%

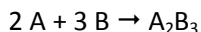
4. A reaction has a percent yield of 90%, and the original sample contained 30g B and enough A to reach completion. What mass of A₂B₃ was produced?

- 7g
- 63g
- 70g
- 77g

5. After completing an experiment where a student was to find the mass of calcium in a compound by capturing a the precipitate formed. The student reported a value of 41.312g Ca, the actual value should have been 24.125g. Which of the following is the most likely explanation for this difference

- The precipitate was masses while it was still wet
- The student lost some of her sample transferring it from one container to the next
- The precipitate captured was not calcium, but the a by-product of the reaction
- The scale the student used was not accurate

Use the reaction below to answer the next three (3) questions



molar mass of A is 20^g/_{mol} and B is 10^g/_{mol}

2. If 4 moles of A reacts with excess B, and produces 2 moles of A₂B₃ what is the percent yield of the reaction?
- 1%
 - 25%
 - 50%
 - 100%
3. If 4.00g A reacts with excess B, and produces 8g A₂B₃ which best represents the percent yield of the reaction?
- 3.50%
 - 14.3%
 - 100.0%
 - 114%

Unit 7 Homework

Name: _____

Mole to mole

1. A B C D
2. A B C D
3. A B C D
4. A B C D
5. A B C D

Mass to mass

1. A B C D
2. A B C D
3. A B C D
4. A B C D
5. A B C D

Volume to volume

1. A B C D
2. A B C D
3. A B C D
4. A B C D
5. A B C D

limiting reactant

1. A B C D
2. A B C D
3. A B C D
4. A B C D
5. A B C D

Percent yield

1. A B C D
2. A B C D
3. A B C D
4. A B C D
5. A B C D

Unit 8 Homework

States of Matter

Use the following choices to answer the next three (3) questions. Choices may be used once, more than once, or not at all.

- a. Solid
- b. Liquid
- c. Gas
- d. Plasma

1. The greatest attractive forces between its molecules
2. Molecules experience only vibrational movement
3. Weak attractions allow particles to move around each other

4. What property, or properties, of liquid allows it to be poured

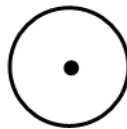
- a. Surface tension
- b. Viscosity
- c. Adhesion & cohesion
- d. Fluidity

5. The particles or molecules of a solid are often described as a

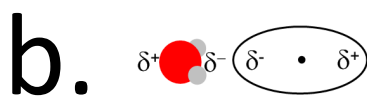
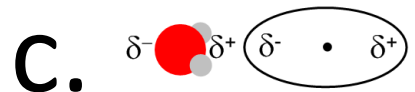
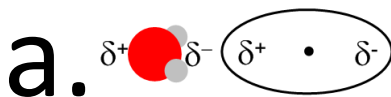
- a. Lattice
- b. Hard
- c. Malleable
- d. Capillary action

Intermolecular forces (IMF)

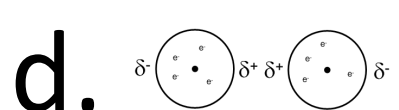
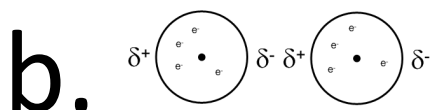
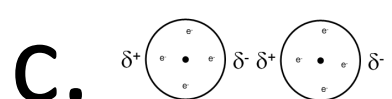
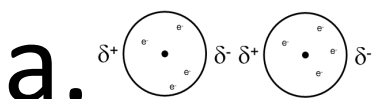
The next Two (2) questions refer to monoatomic molecule pictured below having no dipole moment. The dot indicates the location of the nucleus in all diagrams



1. The molecule is placed near a water molecule and experiences a dipole-induced dipole intermolecular force as a result. Which of the following best represents this interaction?



2. The molecule is placed near an identical molecule and experiences an induced-dipole (London dispersion) intermolecular force. Which of the following best represents this interaction?



3. Which of the following exhibits hydrogen bonding?

- a. BH_3
- b. HCl
- c. NF_3
- d. $\text{C}_2\text{H}_5\text{OH}$

4. What is the strongest attractive force being overcome when liquid water boils?

- a. Ionic bonds
- b. Covalent bonds
- c. Hydrogen bonds
- d. Dipole-dipole bonds

5. Which of the following would you expect to have the highest boiling point?

- a. Ne
- b. F_2
- c. CO_2
- d. CH_4

Introduction to Thermodynamics

1. A solid dissolves in water and the solution becomes quite hot, which of the following is TRUE about the dissolution of the solid?

- a. The process is endothermic
- b. The process has a negative enthalpy ($-\Delta H$)
- c. The amount of entropy, ΔS , is decreasing
- d. The solubility will be the same regardless of the temperature of the water

2. Which of the following shows and decrease in entropy ($-\Delta S$)?

- a. A salt solutions crystallizes
- b. Solid carbon dioxide sublimates
- c. a salt dissolves into solution
- d. solid potassium chlorate decomposes into potassium chloride and oxygen gas

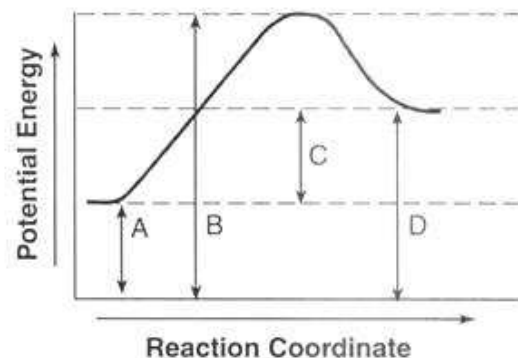
The next three (3) questions refer to the potential energy diagram to the right

3. The line that represents the enthalpy of the reaction (ΔH_{rxn}) is

4. Which line would be changed with the addition of a catalyst (if more than one answer is correct select all that apply)

5. Which of the following statements can be made about this reaction based solely on this graph

- a. $\Delta H < 0$
- b. $\Delta S > 0$
- c. $\Delta H > 0$
- d. $\Delta S = 0$



Changes in Temperature (Kinetic Energy)

- Which of the following is NOT an acceptable unit for specific heat?
 - $\frac{J}{g^{\circ}C}$
 - $\frac{cal}{g^{\circ}C}$
 - $\frac{J}{mol^{\circ}C}$
 - $\frac{J}{mol}$
- A sample of Al with a mass 10.0g is heated from 27°C to 37°C. If the specific heat of Al is 0.9 J/g°C how much energy was applied to the sample?
 - 0.9 J
 - 9.0 J
 90. J
 900. J
- What mass of liquid water can be heated from freezing to boiling with 42 kJ of energy, if the specific heat of water is 4.2 J g⁻¹ °C⁻¹?
 - 4.2 g
 - 100 g
 - 42 g
 - 1000 g
- Two students perform an experiment to determine the molar enthalpy of glucose (C₆H₁₂O₆, molar mass = 180^g/mol). A total of 18.0g glucose is placed in a bomb calorimeter containing 10.0 g water. And the glucose is combusted with excess oxygen. The molar heat of combustion of glucose is 2800 kJ/mol. The specific heat of water is 4.2 J g⁻¹ °C⁻¹. What will be the change in temperature experienced by the water?
 - 3.7°C
 - 6.7°C
 - 37°C
 - 67°C
- An unknown metal sample with a mass of 2 g is heated to a temperature 52°C, and dropped into 100g of water with a temperature of 30°C. The final temperature of the system is 31°C. Given that the specific heat of water is 4.2 J/g°C, what is the specific heat of the unknown metal?
 - 1.0 $\frac{J}{g^{\circ}C}$
 - 2.0 $\frac{J}{g^{\circ}C}$
 10. $\frac{J}{g^{\circ}C}$
 20. $\frac{J}{g^{\circ}C}$

Phase change (Potential Energy)

- When a substance changes from a liquid to a gas at its normal boiling point, which of the following is NOT true?
 - The potential energy of the system increases
 - The distance between the molecules increases
 - The vapor pressure of the liquid is less than 1 atm
 - The temperature of the liquid remains the same
- Which of the following would have a positive enthalpy value (+ΔH)?
 - Deposition
 - Solidification
 - Condensation
 - Sublimation

Use the following table to answer the next three (3) questions about water (H₂O)

Specific Heat	Enthalpy of fusion (ΔH_{fus})	Enthalpy of vaporization (ΔH_{vap})
$4.2 \frac{\text{J}}{\text{g}^\circ\text{C}}$	$6010 \frac{\text{J}}{\text{mol}}$	$40700 \frac{\text{J}}{\text{mol}}$

3. How many joules are released when 1.8 g H₂O at 0.0°C solidify?

- 0.42 J
- 76 J
- 601 J
- 1.1×10^5 J

4. How many grams of water can be boiled at 100°C with the application of 20350 J?

- 0.5 g
- 1.0 g
- 9.0 g
- 18 g

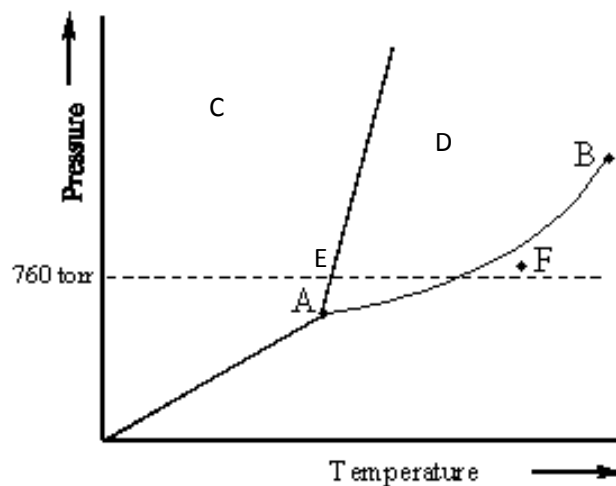
5. Which of the following correctly shows the enthalpy value for the condensation of 50g of water?

- $50(40700)$
- $\frac{-50(40700)}{18}$
- $-50(40700)$
- $\frac{50(40700)}{18}$

Phase Change Diagrams

Use the following diagram to answer then next five questions

- At which point is the substance a liquid
- At which point is the following reaction occurring
 $X_{(g)} \leftrightarrow X_{(l)} \leftrightarrow X_{(s)}$
- Which letter corresponds to the normal boiling point of substance X?
- Which point is the critical point
- At which point does X have the least attractive forces?



Boyles, Charles, Gay-Lussac, & Dalton's Law

- A sample of gas is cooled from 20°C to 10°C. If the pressure remains constant, the volume would be expected to:
 - Reduce by half
 - Stay the same
 - Decrease slightly
 - Double
- If the gas at standard temperature and pressure is confined in a rigid 0.25L container, what would the pressure be if the temperature were increased to 127°C
 - 1.46 torr
 - 5.19×10^2 torr
 - 1.11×10^3 torr
 - 9.65×10^4 torr
- A balloon contains 1.0 mol Xe_(g) and is at standard temperature and pressure, what would the volume of the gas be if the temperature were held constant and the external pressure on the gas is reduced to 380 torr
 - 0.50 L
 - 11.2 L
 - 22.4 L
 - 8500 L
- A 1.0 L container is filled with 0.5 mole CO_{2(g)}, 0.7 mole N_{2(g)}, and 0.8 mole O_{2(g)}. If the total pressure inside the flask is 2.0 atm, what is the partial pressure of the CO_{2(g)}?
 - 0.25 atm
 - 0.50 atm
 - 1.0 atm
 - 2.0 atm
- Which of the following equations correctly identifies the relationship between pressure and temperature?
 - $\frac{P}{T} = R$
 - $PT = R$
 - $\frac{PT}{V} = R$
 - $\frac{T}{PV} = R$

The ideal Gas law

- Which expression gives the volume of a gas if 0.75mol are at 27°C and 0.9atm?
 - $V = \frac{(0.75)(0.0821)(27)}{0.9}$
 - $V = \frac{(0.75)(0.0821)(300)}{0.9}$
 - $V = \frac{(0.75)(300)}{0.9}$
 - $V = \frac{(0.9)}{(0.75)(300)}$
- How many moles of carbon dioxide are present in balloon at 127°C, if it occupies 0.9 L at 360 torr?
 - 0.0129 mol
 - 0.0409 mol
 - 9.87 mol
 - 31.1 mol
- Under which conditions do gases behave most ideally?

	<u>Pressure</u>	<u>Temperature</u>	<u>Number of molecules</u>
a.	Low	Low	Few
b.	High	High	Many
c.	Low	High	Few
d.	High	Low	many

4. Which of the following gasses would behave the MOST like an ideal gas?

- a. NO₂
- b. He
- c. O₂
- d. H₂

5. What is the molar mass of a gas with a density of 1.43 g/L at STP?

- a. 0.0 g/mol
- b. 16 g/mol
- c. 32 g/mol
- d. 35 g/mol

Kinetic Molecular Theory

1. When the actual gas volume is greater than predicted by the ideal gas law, the explanation lies in the fact that the ideal gas law does NOT include a factor for molecular:

- a. Volume
- b. Mass
- c. Velocity
- d. Attraction

2. The kinetic energy of which gas is the greatest?

- a. 2 mol Xe at 1 atm and 27°C
- b. 1 mol H₂ at 1 atm and 400K
- c. 6 mol O₂ at 3 atm and 0°C
- d. 0.5 mol CH₄ at 10 atm and 300K

3. At standard temperature 0.5 mol CO₂ and 1.0 mol H₂ have the same:

- a. Density
- b. Average molecular kinetic energy
- c. Effusion rate
- d. Average molecular speed

4. When the actual gas volume is smaller than predicted by the ideal gas law, the explanation lies in the fact that the ideal gas law does NOT include a factor for molecular:

- a. Volume
- b. Mass
- c. Velocity
- d. Attraction

5. All of the following are equal to 1.5 atm except:

- a. 1140 torr
- b. 152 kPa
- c. 1.52 bar
- d. 760 mmHg

Unit 8 Homework

Name: _____

States of Matter

1. (A) (B) (C) (D)
2. (A) (B) (C) (D)
3. (A) (B) (C) (D)
4. (A) (B) (C) (D)
5. (A) (B) (C) (D)

IMFs

1. (A) (B) (C) (D)
2. (A) (B) (C) (D)
3. (A) (B) (C) (D)
4. (A) (B) (C) (D)
5. (A) (B) (C) (D)

Thermodynamics

1. (A) (B) (C) (D)
2. (A) (B) (C) (D)
3. (A) (B) (C) (D)
4. (A) (B) (C) (D)
5. (A) (B) (C) (D)

Kinetic Energy

1. (A) (B) (C) (D)
2. (A) (B) (C) (D)
3. (A) (B) (C) (D)
4. (A) (B) (C) (D)
5. (A) (B) (C) (D)

Potential Energy

1. (A) (B) (C) (D)
2. (A) (B) (C) (D)
3. (A) (B) (C) (D)
4. (A) (B) (C) (D)
5. (A) (B) (C) (D)

Phase Change

1. (A) (B) (C) (D) (E) (F)
2. (A) (B) (C) (D) (E) (F)
3. (A) (B) (C) (D) (E) (F)
4. (A) (B) (C) (D) (E) (F)
5. (A) (B) (C) (D) (E) (F)

Gas Laws

1. (A) (B) (C) (D)
2. (A) (B) (C) (D)
3. (A) (B) (C) (D)
4. (A) (B) (C) (D)
5. (A) (B) (C) (D)

Ideal Gas Law

1. (A) (B) (C) (D)
2. (A) (B) (C) (D)
3. (A) (B) (C) (D)
4. (A) (B) (C) (D)
5. (A) (B) (C) (D)

KMT

1. (A) (B) (C) (D)
2. (A) (B) (C) (D)
3. (A) (B) (C) (D)
4. (A) (B) (C) (D)
5. (A) (B) (C) (D)

Unit 9 Homework

Units of Concentration

1. What is the concentration of a solution produced by dissolving 20g NaOH in enough water to produce a 250mL solution?
 - a. 0.5 M
 - b. 0.25 M
 - c. 1.0 M
 - d. 2.0 M
2. A solution is 10% hydrochloric acid (HCl) by mass, if a student has 250mL of solution what other information would be necessary to calculate the molarity (M) of the solution?
 - a. The temperature of the solution
 - b. The density of the solution
 - c. The identity of the solvent
 - d. The solubility of HCl
3. A solution is prepared by dissolving 20g benzene in 100g carbon tetrachloride, what is the percent by mass of the solution?
 - a. 17%
 - b. 20%
 - c. 83%
 - d. 500%
4. What is the molality (m) of a solution prepared by dissolving 29.25g NaCl in 3.00kg of water?
 - a. 0.0002
 - b. 0.17
 - c. 1.53
 - d. 9.75
5. What is the mole fraction of NaCl in a solution of 58.5g NaCl in 180mL H₂O?
 - a. 0.10
 - b. 0.90
 - c. 0.091
 - d. 0.20

Dilutions

1. What volume of 5.0M NaOH is needed to produce a 500mL solution of 1M NaOH?
 - a. 100mL
 - b. 10mL
 - c. 1mL
 - d. 0.1mL
2. How much water would you need to add to 10mL of 6.0M HCl, to produce a solution that is 0.2M?
 - a. 300
 - b. 290
 - c. 30
 - d. 3.0

Use the following choices for the next two (2) questions. *You may select ALL that apply*

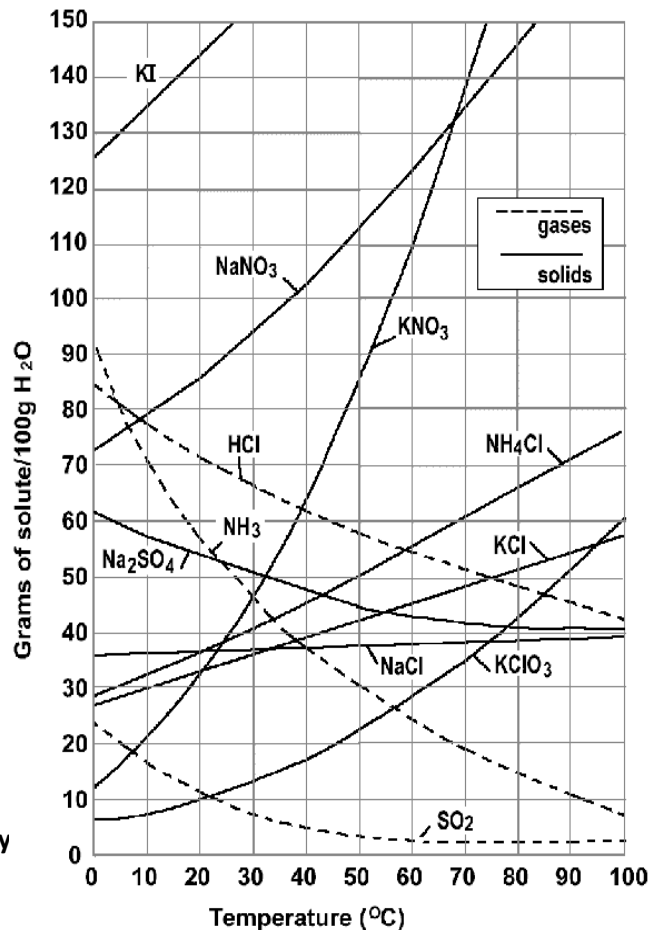
- a. Graduated cylinder
 - b. Gram scale
 - c. Pipet
 - d. Volumetric flask
3. What pieces of laboratory equipment would be most accurate to use to create a 1.0M KOH solution from solid KOH
 4. What pieces of laboratory equipment would be most accurate to use to create a 0.1M solution from a 1.5M stock solution

5. What volume of 18.1M H_2SO_4 would be needed to produce 500mL of 1.0M H_2SO_4 ?
- 9.0 L
 - 0.5 L
 - 0.1 L
 - 27.6 mL

Solubility Curves

Use the solubility curve to the right to answer ALL questions in this section

- Which of the following solutions is a gas?
 - KI
 - HCl
 - NH_4Cl
 - NaCl
- A solution that is made in which so much is added that a precipitate collects on the bottom is called:
 - Saturated
 - Unsaturated
 - Supersaturated
 - Concentrated
- How many grams of NH_3 can dissolve in 50mL of water at 28°C ?
 - 12.5g
 - 25g
 - 50g
 - 100g
- Which of the following substances has the lowest solubility at 10°C ?
 - SO_2
 - KClO_3
 - KI
 - KNO_3
- How many grams of KNO_3 can dissolve in 150mL of water at 50°C ?
 - 43g
 - 85g
 - 128g
 - 170g



Colligative Properties

- Which of the following solutions would have the highest boiling point?**
 - 0.2m NaCl
 - 0.2m C₂H₅OH
 - 0.2m K₂SO₄
 - 0.2m Al₂S₃

- An unknown nonelectrolyte is dissolved in 1kg of solvent, and the boiling point is increased by 10°C. Given that the boiling point elevation constant (K_b) is 1.00°C/m, determine the number of moles of solute present in solution.**
 - 1 mol
 - 5 mol
 - 8 mol
 - 10 mol

- A nonelectrolyte is added to 200g of water. Which of the following is true of the solution?**
 - The vapor pressure will decrease
 - The boiling point will decrease
 - The freezing point will increase
 - The density will decrease

- A 2.0m solution has a boiling point of 103.1°C. The K_b for water is 0.52°C/m, which of the following could be the solute?**
 - NaCl
 - KOH
 - CaF₂
 - Al₂O₃

- What is the boiling point of a solution that is produced by dissolving 20g NaOH in 2L H₂O if the K_b of H₂O is 0.52°C/m?**
 - 100.0°C
 - 100.3°C
 - 100.4°C
 - 101.0°C

Unit 9 Homework

Name: _____

Units of Concentration

1. A B C D
2. A B C D
3. A B C D
4. A B C D
5. A B C D

Dilutions

1. A B C D
2. A B C D
3. A B C D
4. A B C D
5. A B C D

Solubility Curves

1. A B C D
2. A B C D
3. A B C D
4. A B C D
5. A B C D

Colligative Properties

1. A B C D
2. A B C D
3. A B C D
4. A B C D
5. A B C D