

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

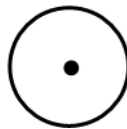
- a. Surface tension
- b. Viscosity
- c. Adhesion & cohesion
- d. Fluidity

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

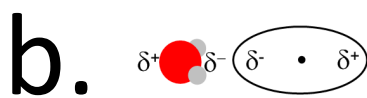
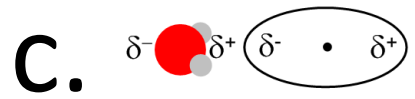
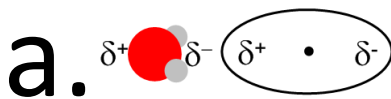
- a. Lattice
- b. Hard
- c. Malleable
- d. Capillary action

Intermolecular forces (IMF)

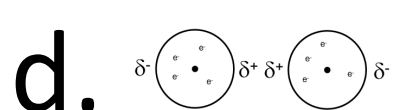
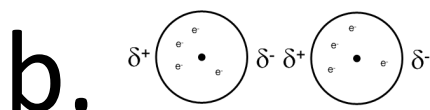
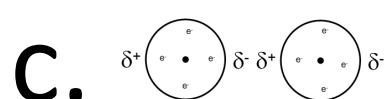
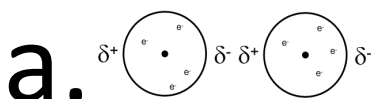
The next Two (2) questions refer to monoatomic molecule pictured below having no dipole moment. The dot indicates the location of the nucleus in all diagrams



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

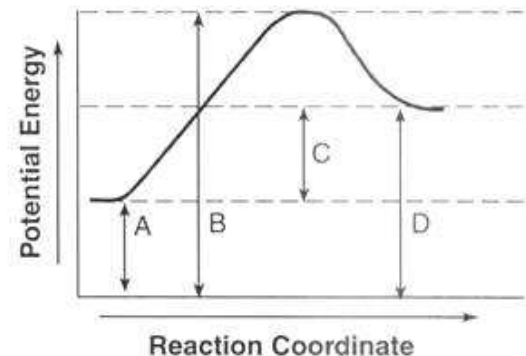
The next three (3) questions refer to the potential energy diagram to the right

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

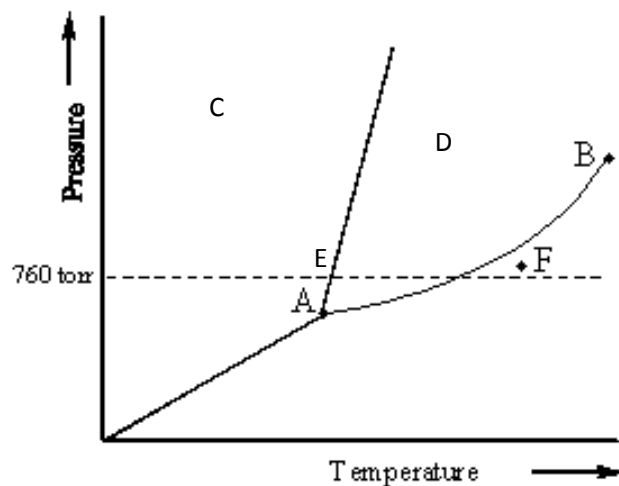
5. Which of the following correctly shows the enthalpy value for the condensation of 50g of water?

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

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