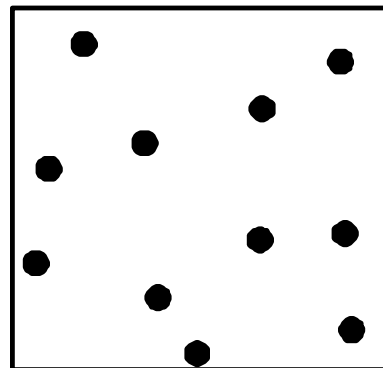


CHM 101 EXAM III

Show all calculations with units and correct significant figures. Write clearly and use complete sentences. GOOD LUCK!

1. Consider the box of gaseous argon atoms given to the right. Is the box a true picture of the gas?



How would you describe the motion of the atoms?

If the temperature decreased, how would the atoms behave in the gaseous state?

(10)

2. Which gas will diffuse faster? H_2S or SO_2 (10)

Compare the relative rate of diffusion of these two gases?

If the temperature changed, would the relative rate change? If so, how?

3. If you had a 1.00 L container of CO_2 at 25°C and 1.0 atm, how many molecules of CO_2 are in the container? (10)

4. Complete the table below. A table of electronegativities is given on the last page of the exam. Use an arrow to show the direction of electron migration in the bonds indicated. (20)

Molecule	Illustrate the geometry (sketch the structure)	Electron migration	Polar or non-polar molecule
CF ₄		C F	
AsCl ₃		As Cl	
XeF ₂		Xe F	
SF ₄		S F	
CO ₂		C O	

5. Consider the boiling points for the halogen molecules and a variety of inter-halogen compounds given in the table below. (15)

Halogen	MM	BP	Interhalogen	MM	BP
F ₂	38 g/mole	85 K	ClF	55 g/mole	173 K
Cl ₂	71	239	BrF	99	293
Br ₂	160	332	BrCl	116	278
I ₂	254	458	ICl	163	371
			IBr	207	389

On your graphing calculator plot and, then carefully sketch, the graph of boiling point as a function of molar mass. Label the axes.



Based on the graph, is molar mass the controlling variable for the change in boiling point? Why?

Are the IMF's in the liquids of the halogens and interhalogens the same or different? Explain.

6. The compound SCl_4F_2 can exist as either a polar or non-polar molecule. Illustrate the two isomers and explain why both polar and non-polar forms of the molecule exist. (10)

7. Rank the following dihalobenzenes, from most polar (1) to least polar (5). The structure of benzene is shown below. (10)

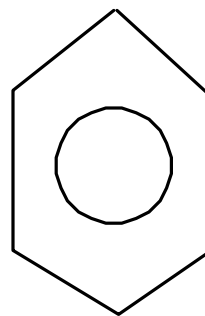
_____ 1-bromo-2-chlorobenzene

_____ 1,3-dibromobenzene

_____ 1,2-dibromobenzene

_____ 1,4-dichlorobenzene

_____ 1-bromo-4-chlorobenzene



8. A 0.055 mL bubble of methane gas forms at the bottom of a lake where the temperature is 10°C and pressure of 2.25 atm. The bubble rises in the water column to the surface where the pressure is 1.00 atm at 30°C . (15)

What is the volume of the bubble at the surface?

Why did the bubble rise in the water column from the bottom of the lake?