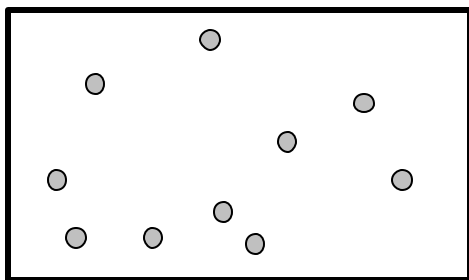


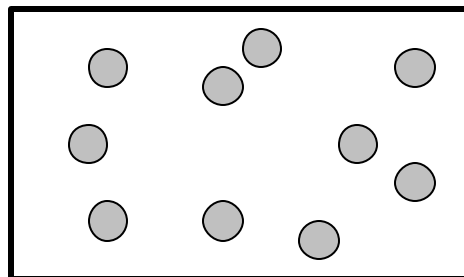
CHM 101 EXAM III

Show all calculations with units and proper number of significant figures! Write in clear and complete sentences. **GOOD LUCK!!!!**

1. Consider the boxes below each with 10 atoms of an inert gas.



He atoms



Kr atoms

Is the box realistic? Explain why or why not. (6)

Circle the correct answer: (9)

If both boxes were at the same temperature, then their

kinetic energies are equal. velocities are equal. masses are equal.

At a constant temperature, all 10 He atoms have the same velocity.

True False

How could you get the average velocity in the two boxes to be equal?

$T_{\text{He}} > T_{\text{Kr}}$

$T_{\text{He}} = T_{\text{Kr}}$

$T_{\text{He}} < T_{\text{Kr}}$

where T is temperature

2. Complete the table below. Electronegativities are given on the last page of the exam. (25)

| Compound | Lewis Dot Structure | Molecular Geometry | Electron Migration | Polar or Non-polar |
|----------------------------------|---------------------|--------------------|-----------------------|--------------------|
| CH ₂ Cl ₂ | | | C Cl C H | |
| PCl ₃ | | | P Cl | |
| H ₂ CO C in center | | | C O | |
| TeCl ₆ | | | Te Cl | |
| XeF ₄ | | | | |

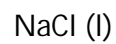
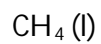
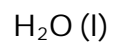
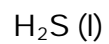
3. Which freon diffuses faster: CF_2Cl_2 or CFCl_3 (10)

Calculate the relative rate of diffusion for the two freons at room temperature.

If the temperature for the two freons were to decrease, how would the relative rate of diffusion respond?

4. A bubble of air was found trapped in ice in the mountains outside Denver. What mass of air ($\text{MM}_{\text{air}} = 29.0 \text{ g/mole}$) would occupy a 0.052 mL bubble at 0.80 atm and -3.0°C ? (10)

5. What is the intermolecular force (IMF) operating in the following liquids? (15)



6. The table below gives the water temperature and dissolved oxygen (DO) solubility monthly averages over a year for Shepardstown on the Potomac River. (25)

| Month | Temperature | DO |
|--------|-------------|------------|
| Jan. | 2.94°C | 12.86 mg/L |
| Feb. | 3.03 | 13.24 |
| March | 6.96 | 12.28 |
| April | 12.21 | 10.53 |
| May | 17.53 | 9.37 |
| June | 22.4 | 8.03 |
| July | 26.14 | 7.87 |
| August | 25.42 | 7.51 |
| Sept. | 21.73 | 7.85 |
| Oct. | 15.62 | 9.77 |
| Nov. | 9.01 | 11.13 |
| Dec. | 5.71 | 12.23 |

What time of year (month) is DO highest?

Plot a graph of DO as a function of temperature on your graph calculator, sketch and label the plot below.

Perform a linear regression on the data and record the equation in terms of the variables studied (not x and y).

Describe the goodness of fit.



What is the solubility of oxygen at 20°C? Describe how you got the value.