Chem1A, General Chemistry I

1.) Use the following data to calculate the total heat absorbed, in kJ, by 238.5 mL of acetone (C_3H_6O) originally at 24.3°C and heated to 78.6°C.

Density (g/mL)	Specific heat capacity for liquid (J/g °C)	Specific heat capacity for vapor (J/g °C)	Heat of vaporization (kJ/mol)	Boiling Point (°C)
0.793	2.16	1.29	31.0	56.5

2.) A typical brand of root beer contains 0.13% H_3PO_4 by mass. Assume the density of the soda is 1.11 g/mL and that 1 oz. = 29.6 mL.

(A) How many mg of H_3PO_4 are present in one 12 oz. can?

(B) Calculate the solution's concentration of H_3PO_4 in molarity (M).

(C) Calculate the solution's concentration of H_3PO_4 in molality (m), assuming all the other components in the soda to be the solvent.

3.) A 113 mL sample of 5.2 M hexane (C_6H_{14}) is mixed with 125 mL of 4.8 M ethanol (C_2H_5OH) at 25°C. The vapor pressures of pure hexane and pure ethanol are 151 torr and 55.1 torr, respectively.

(A) Calculate the partial pressure of hexane over the solution, in torr.

(B) Calculate the partial pressure of the ethanol over the solution, in torr.

(C) Calculate the total pressure above the solution, in torr.

(D) Calculate the mole fraction of hexane in the **vapor** above the solution.

(E) Calculate the mole fraction of ethanol in the **vapor** above the solution.

4.) Draw the molecular orbital diagram for C_2^+. What is the expected bond order? Is it stable? Is it paramagnetic or diamagnetic?

5.) For each of the following molecules, determine the **electronic domain** and the **molecular** geometries around *each* central atom. Also list the **hybridization** expected around *each* central atom and give the total number of σ or π bonds present in the structure.

a.) CO_2

b.) ClO_3^-

c.) $HONO_2$