**Intermolecular Forces, Liquids, and Phase Diagrams Essential Concept Exercises**

1. Which of the following will have the largest surface tension at a given temperature?

a. CCl4 b. CH2Cl2 c. CH3Cl d. CH3OH e. CH3CH2OH

1. When a thin glass tube is put into water, the water rises 1.4 cm. When the same tube is put into hexane, the hexane rises only 0.4 cm. Explain the difference.
2. List all the intermolecular attractive forces in each of the following:

CH3CH2OH in water \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

NaCl in water \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Benzene, C6H6 \_\_\_\_\_\_\_\_\_**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. For each of the following pairs, tell which would have a lower vapor pressure and briefly explain your answer.

a) PF3 and PCl3 b) CH3OH and CH3Cl

c) 

1. Arrange following in order of increasing boiling point and explain ordering

CO2, NH3, Ne, NaF, SO2

1. A 45.0 gram sample of ice at -10.0oC is dropped into 150.0 grams of water at 75.5oC. Determine the final temperature of the mixture. Assume that no heat is transferred in or out of the system.

specific heat of ice 2.06 J/goC 37.1 J/moloC

specific heat of water 4.184 J/goC 75.4 J/moloC

specific heat of steam 2.0 J/goC 36 J/moloC

heat of fusion 333 J/g 6.01 kJ/mol

heat of vaporization 2260 J/g 40.7 kJ/mol

1. SHOW ALL WORK. Benzene has a heat of vaporization of 30.72 kJ/mol and a normal boiling point of 80.1 °C. At what temperature in Celsius does benzene boil when the external pressure is 445 torr?
2. Construct a phase diagram for compound "X" using the data below:

Triple Point 283 K and 0.50 atm

Critical Temperature 325 K

Normal Freezing Point 291 K

Normal Boiling Point 301 K

Critical Pressure 2.25 atm

* Label the solid, liquid, gas, and super-critical fluid phases by area.
* Label the fusion line as F, the sublimation line as S, and the vaporization line as V.
* Which state is more dense, the liquid or the solid?
* Which state exists at 295 K and 2.8 atm?
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