Name:(Please Print) _____ February 18, 2005

First exam   Ch 24, 11, 12

Useful information: R = 0.08206 L amt/mol K = 8.314 J/mol K $K = (°C + 273.15°C)\left(\frac{1K}{1°C}\right)$
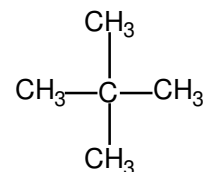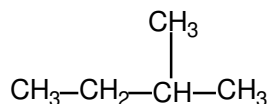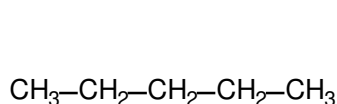
1atm = 760 torr = 760 mm Hg $\ln\left(\frac{P_1}{P_2}\right) = \frac{\Delta H_{vap}}{R}\left(\frac{1}{T_2} - \frac{1}{T_1}\right)$ $C_g = kP_g$ $P = X_A P_A°$
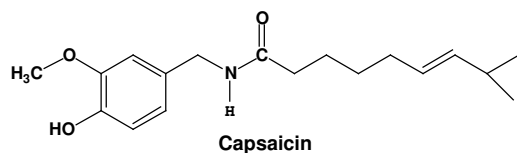
$\Delta T_f = K_f m$ $\Delta T_b = K_b m$ $\pi = MRT$ $q = ms\Delta T$

1. Give the IUPAC name of the following compounds: (5 pt.)

$CH_3-CH_2-CH_2-CH_2-CH_3$

$CH_3-CH_2-\overset{\overset{\displaystyle CH_3}{|}}{CH}-CH_3$

$CH_3-\overset{\overset{\displaystyle CH_3}{|}}{\underset{\underset{\displaystyle CH_3}{|}}{C}}-CH_3$

2. How could you test whether your compound with the formula, C_6H_{12}, is cyclohexane or 1-hexene? (4 pt.)

3. a. Capsaicin gives hot peppers their heat. Identify at least three functional groups in the molecule below. (6 pt.)


Capsaicin

   b. Is this the cis or trans isomer? (2 pt.)

4. Helium atoms do not combine to form He_2 molecules, yet He atoms do attract one another weakly through (3 pt.)

    A. dipole-dipole forces.   B. ion-dipole forces.   C. hydrogen bonding
    D. dipole-induced dipole forces.   E. London (dispersion) forces.

5. Which one of the following substances will have **both** dispersion forces and dipole-dipole forces? (3 pt.)

    A. HCl   B. CH_4 C. Br_2 D. H_2 E. CO_2

6. Which of the following liquids would have the highest viscosity at 25°C? (3 pt.)

    A. CH_3OCH_3 B. CH_2Cl_2 C. C_2H_5OH D. CH_3Br E. $HOCH_2CH_2OH$

7. The molar heats of sublimation and fusion of iodine are 62.3 kJ/mol and 15.3 kJ/mol, respectively. Calculate the molar heat of vaporization of liquid iodine. (5 pt.)

8. Circle the member of each pair that would have the stronger intermolecular forces of attraction. (8 pt.)
    a. H_2S or H_2Se
    b. HF or HCl
    d. NH_3 or PH_3
    e. SF_4 or $C_{10}H_{22}$

9. Identify the following solids as ionic, covalent network, metallic or molecular: (8 pt.)
    a. diamond   _____

    b. ice   _____

    c. sugar   _____

    d. sodium   _____

10. Calculate the amount of heat that must be absorbed by 10.0 g of ice at −20°C to convert it to liquid water at 60.0°C. Given:Specific heat (ice) = 2.1 J/g·°C, Specific heat (water) = 4.18 J/g·°C, ΔH_{fus} = 6.0 kJ/mol. (7 pt.)

11. The vapor pressure of ethanol is 400 mmHg at 63.5°C. Its molar heat of vaporization is 39.3 kJ/mol. What is vapor pressure of ethanol, in mmHg, at 34.9°C? (7 pt.)

12.
   a. What phases exist at the points labeled a, b, and c? (6 pt.)
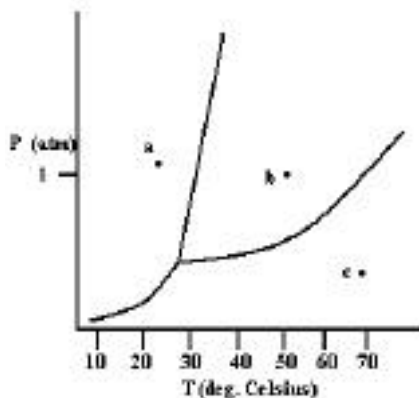
   a._____
   b. _____
   c._____

   b. What is the normal boiling point on this diagram? (2 pt.)
   c. What is the normal melting point on this diagram? (2 pt.)

13. Which of the following liquids would make a good solvent for iodine, I_2? (3 pt.)

   A. HCl   B. H_2O C. CH_3OH D. NH_3 E. CS_2

14. The vapor pressure of water at 20°C is 17.5 mmHg. What is the vapor pressure of water over a solution prepared from 2.00×10^2 g of sucrose ($C_{12}H_{22}O_{11}$, MW = 342.30) and 3.50×10^2 g water (MW = 18.02)? (7 pt.)

15. 0.102 g of an unknown compound dissolved in 100. mL of water has an osmotic pressure of 28.1 mmHg at 20°C. Calculate the molar mass of the compound. (8 pt.)

16. Arrange the following aqueous solutions in order of *increasing* boiling points. (3 pt.)

  0.050 m $Mg(NO_3)_2$; 0.100 m ethanol; 0.090 m NaCl

17. Thyroxine, an important hormone that controls the rate of metabolism in the body, can be isolated from the thyroid gland. If 0.455 g of thyroxine is dissolved in 10.0 g of benzene, the freezing point of the solution is 5.144°C. Pure benzene freezes at 5.444°C and has a K_f of 5.12°C/m. What is the molar mass of thyroxine? (8 pt.)