

# CHM 1143

# Exam 2

#1-#5 20 points each

Multiple choice 10 points each  
with 2 free misses

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- 1) 65 g of  $C_6H_{12}O_6$  was dissolved in 450 g of water. Calculate the boiling point of the solution. ( $k_{bp} = 0.52 \text{ }^\circ\text{C/m}$  for water).
- 2) 55.0 g of ethanol ( $C_2H_6O$ ) was added to water. The resulting solution was 0.45 molal. What was the mass of the water?

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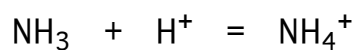
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- 3) Titration of 25.00 mL of an aqueous ammonia solution required 27.22 mL of 0.2121 M HCl. What was the  $[\text{NH}_3]$  in the ammonia solution?



- 4) Concentrated  $\text{HClO}_4$  has a density of 1.67 g/mL and contains 71%  $\text{HClO}_4$  by weight. Calculate the molarity and molality of the solution.

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5) a) Circle the water soluble compounds

NaF Hg<sub>2</sub>Cl<sub>2</sub> FeSO<sub>4</sub> Ni(OH)<sub>2</sub> Ca(NO<sub>3</sub>)<sub>2</sub> TiCl<sub>2</sub> CuS

b) Circle the strong acids

HF H<sub>2</sub>SO<sub>3</sub> HBr HClO<sub>3</sub> HIO<sub>4</sub> HNO<sub>3</sub> HC<sub>2</sub>H<sub>3</sub>O<sub>2</sub>

c) Circle the compounds which act as weak bases in water

CH<sub>3</sub>NH<sub>2</sub> NaBr KF NH<sub>3</sub> LiNO<sub>3</sub> LiNO<sub>2</sub> NaNO<sub>3</sub>

d) What is the critical temperature of a substance?

e) Calculate the density of Kr gas at 298 K and 1 atm (R=0.08205 L atm/mol K)

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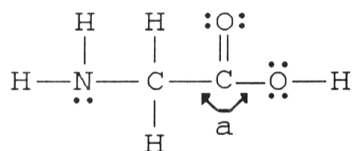
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**MULTIPLE CHOICE.** Choose the one alternative that best completes the statement or answers the question.

- 1) The bond angle marked a in the following molecule is about \_\_\_\_\_. 1) \_\_\_\_\_



- A) 120°      B) 180°      C) 60°      D) 90°      E) 109.5°
- 2) In liquids, the attractive intermolecular forces are \_\_\_\_\_. 2) \_\_\_\_\_  
A) not strong enough to keep molecules from moving past each other  
B) strong enough to hold molecules relatively close together but not strong enough to keep molecules from moving past each other  
C) very weak compared with kinetic energies of the molecules  
D) strong enough to hold molecules relatively close together  
E) strong enough to keep the molecules confined to vibrating about their fixed lattice points
- 3) Which one of the following exhibits dipole-dipole attraction between molecules? 3) \_\_\_\_\_  
A) PH<sub>3</sub>      B) C<sub>10</sub>H<sub>22</sub>      C) CO<sub>2</sub>      D) Br<sub>2</sub>      E) CCl<sub>4</sub>
- 4) Which one of the following should have the lowest boiling point? 4) \_\_\_\_\_  
A) CH<sub>4</sub>      B) NH<sub>3</sub>      C) HCl      D) H<sub>2</sub>S      E) CH<sub>3</sub>OH
- 5) Of the following substances, \_\_\_\_\_ has the highest boiling point. 5) \_\_\_\_\_  
A) N<sub>2</sub>  
B) CH<sub>3</sub>CH<sub>2</sub>OH  
C) HOCH<sub>2</sub>CH<sub>2</sub>OH  
D) C<sub>2</sub>H<sub>6</sub>  
E) F<sub>2</sub>
- 6) Elemental iodine (I<sub>2</sub>) is a solid at room temperature. What is the major attractive force that exists among different I<sub>2</sub> molecules in the solid? 6) \_\_\_\_\_  
A) covalent-ionic interactions  
B) dipole-dipole rejections  
C) dipole-dipole attractions  
D) London dispersion forces  
E) ionic-dipole interactions

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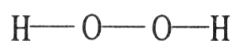
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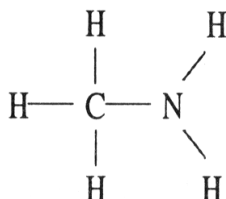
7) Which one of the following substances will not have hydrogen bonding as one of its intermolecular forces?

7) \_\_\_\_\_

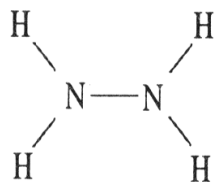
A)



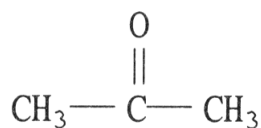
B)



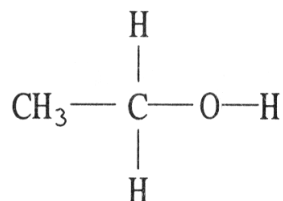
C)



D)



E)



8) Which of the following molecules has hydrogen bonding as its only intermolecular force?

8) \_\_\_\_\_

A)  $\text{H}_2\text{O}$

B)  $\text{C}_6\text{H}_{13}\text{NH}_2$

C)  $\text{HF}$

D)  $\text{C}_5\text{H}_{11}\text{OH}$

E) None, all of the above exhibit dispersion forces.

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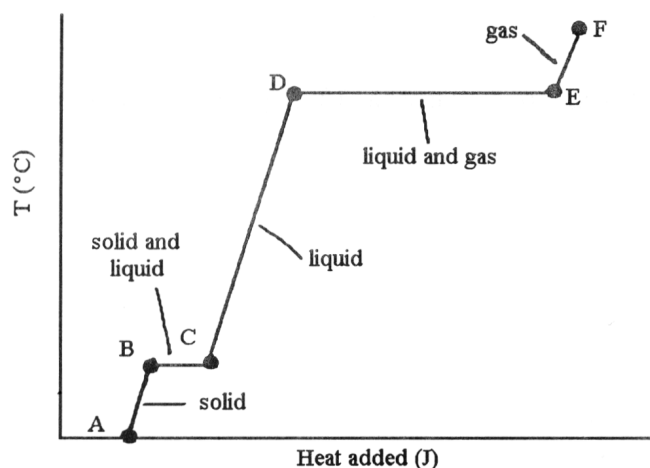
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- 9) The phase changes B → C and D → E are not associated with temperature increases because the heat energy is used up to \_\_\_\_\_. 9) \_\_\_\_\_
- A) increase distances between molecules
  - B) increase the velocity of molecules
  - C) increase the density of the sample
  - D) break intramolecular bonds
  - E) rearrange atoms within molecules
- 10) The vapor pressure of a liquid \_\_\_\_\_. 10) \_\_\_\_\_
- A) decreases linearly with increasing temperature
  - B) decreases nonlinearly with increasing temperature
  - C) increases linearly with increasing temperature
  - D) is totally unrelated to its molecular structure
  - E) increases nonlinearly with increasing temperature
- 11) A solution with a concentration higher than the solubility is \_\_\_\_\_. 11) \_\_\_\_\_
- A) is unsaturated
  - B) is supersaturated
  - C) is not possible
  - D) is supercritical
  - E) is saturated
- 12) Which one of the following substances would be the most soluble in CCl<sub>4</sub>? 12) \_\_\_\_\_
- A) NH<sub>3</sub>
  - B) CH<sub>3</sub>CH<sub>2</sub>OH
  - C) NaCl
  - D) H<sub>2</sub>O
  - E) C<sub>10</sub>H<sub>22</sub>