

**CHEMISTRY 102****FALL 2008****EXAM 1 FORM A****SECTION 501****DR. KEENEY-KENNICUTT**

- Directions: (1) Put your name on PART 1 and your name and signature on PART 2 of the exam where indicated.  
 (2) Sign the Aggie Code on PART 2 of this exam.  
 (3) Each multiple choice question is actually 2 questions on your scanning sheet. If you are sure of an answer, **put the same answer down for both questions** for 5 pts. If you cannot decide between two answers, put your best answer down for the first (odd) question and the other answer down for the second (even) question. If you get the first one correct you'll get 3 pts; if you get the second one correct you'll get 2 pts. If there is an ambiguous multiple choice question, use the last page to explain your answer.  
 (4) Do NOT write on the envelope.  
 (5) When finished, put everything in the envelope and wait to be excused. At the table, take everything out of the envelope. You can pick up the multiple choice part with the answers outside my office after 3pm.  
 (6) There are a total of 34 questions (20 actual questions).

**PART 1**

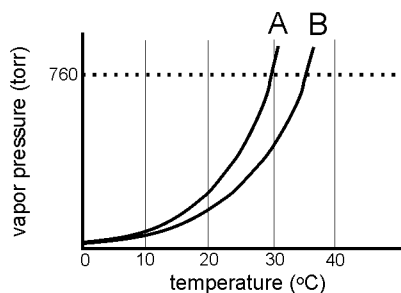
**1&2.** The term "exothermic" means that heat \_\_\_\_\_ in a reaction.

- (a) is absorbed                      (b) has a positive value                      (c) equals its entropy  
 (d) is released                      (e) is a reactant

**3&4.** Which pair(s) of liquids is(are) NOT miscible?

- (1) water and ethanol  
 (2) water and acetic acid  
 (3) water and hexane, C<sub>6</sub>H<sub>14</sub>
- (a) 1,2 only      (b) 2 only      (c) 3 only      (d) 1,2,3      (e) 2,3 only

**5&6.** Consider the diagram given on the right, showing the vapor pressure curves for two systems as a function of temperature. Curve A is the vapor pressure curve for Liquid A and Curve B results when a solute is dissolved in Liquid A.



If one were to calculate the boiling point elevation for this system, the answer would be about \_\_\_\_\_°C:

- (a) 5                      (b) 10                      (c) 30                      (d) 35                      (e) 40

**7&8.** Which of the following statements about entropy is FALSE?

- (a) Entropy can be thought of as the amount of disorder in a system.
- (b) A perfect crystal of an element has zero entropy at 0 K.
- (c) The Second Law of Thermodynamics says that we can determine if a reaction or process is spontaneous if we calculate only the change in entropy of the surroundings.
- (d) The units of entropy are typically J/K.
- (e) Entropy,  $S$ , is a state function.

**9&10.** Which process is accompanied by an INCREASE in entropy?

- (a)  $\text{Fe}^{2+}(\text{aq}) + \text{S}^{2-}(\text{aq}) \rightarrow \text{FeS}(\text{s})$
- (b)  $3\text{H}_2(\text{g}) + \text{N}_2(\text{g}) \rightarrow 2\text{NH}_3(\text{g})$
- (c) 1 mol  $\text{Ne}(\text{g})$  in a 10 L container  $\rightarrow$  1 mole  $\text{Ne}(\text{g})$  in a 1 L container
- (d)  $\text{KCl}(\text{s}) \rightarrow \text{KCl}(\text{aq})$
- (e)  $\text{H}_2\text{O}(\text{g}) \rightarrow \text{H}_2\text{O}(\text{s})$

**11&12.** Which of the following soluble ionic compounds has the largest ideal van't Hoff factor,  $i_{\text{ideal}}$ ?

- (a)  $\text{NH}_4\text{NO}_3$       (b)  $\text{NaCl}$       (c)  $\text{AlCl}_3$       (d)  $\text{KCN}$       (e)  $\text{Li}_2\text{HPO}_4$

**13&14.** A reaction is spontaneous when:

- (a) the reaction is at equilibrium.
- (b) the entropy of the system increases.
- (c) the reaction completely converts to reactants.
- (d) the reaction proceeds in the forward direction to make products.
- (e) its enthalpy change is equal to zero.

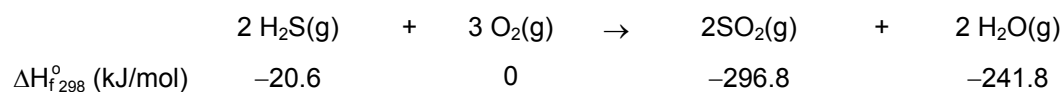
**15&16.** What is TRUE about osmotic pressure?

- (a) Ions are surrounded by water molecules and therefore can pass through a semi-permeable membrane.
- (b) Only solvent molecules pass through the semi-permeable membrane.
- (c) Solvent passes through the membrane from higher concentration to a solution of lower concentration.
- (d) Osmotic pressure is independent of the number of solute particles in solution.
- (e) Osmotic pressure increases as the solute concentration difference decreases.

**17&18.** How many grams of KBr are required to prepare 150. mL of 0.400 M KBr solution?

- (a) 6.00 g      (b) 7.14 g      (c) 7000 g      (d) 2.67 g      (e) 44.5 g

**19&20.** Consider the following reaction and standard free energy of formation data:



Calculate the  $\Delta H^{\circ}$  for the reaction.

- (a) -1036 kJ      (b) -558.8 kJ      (c) -48.3 kJ      (d) +208.9 kJ      (e) -518.0 kJ

**21&22.** What is the mass of solution if a student has prepared a 0.600 m solution using 25.0 g of NaF?

- (a) 998 g      (b) 1017 g      (c) 967 g      (d) 455 g      (e) 42.0 g

**23&24.** If the osmotic pressure of an aqueous solution of an enzyme (a non-electrolyte) is 3.71 torr at 22°C, what was the molarity of the solution?  $R = 62.4 \text{ L}\cdot\text{torr}/\text{mol}\cdot\text{K}$ .

- (a)  $0.388 \times 10^{-3} \text{ M}$       (b)  $0.278 \times 10^{-3} \text{ M}$       (c)  $2.75 \times 10^{-3} \text{ M}$   
(d)  $8.11 \times 10^{-3} \text{ M}$       (e)  $0.202 \times 10^{-3} \text{ M}$

**25&26.** The freezing point of a solution of 3.024 g of an unknown nonelectrolyte dissolved in 75.15 g of benzene is  $1.29^{\circ}\text{C}$ . Pure benzene freezes at  $5.48^{\circ}\text{C}$  and its  $K_f$  value is  $5.12^{\circ}\text{C/m}$ . What is the molecular weight of the compound?

- (a) 49.2 g/mol      (b) 58.8 g/mol      (c) 61.4 g/mol      (d) 42.4 g/mol      (e) 36.1 g/mol

**27&28.** Calculate  $\Delta S_{\text{universe}}$  for a reaction at  $25^{\circ}\text{C}$  if  $\Delta S_{\text{system}} = +245 \text{ J/K}$  and  $\Delta H_{\text{system}} = -166 \text{ kJ}$ .

- (a) +238 J/K      (b) +79 J/K      (c) +802 J/K      (d) +615 J/K      (e) +51 J/K



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**PART 2**

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Please read and sign: "On my honor, as an Aggie, I have neither given nor received unauthorized aid on this exam." \_\_\_\_\_

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(12 pts) **29.** Give the name or formula of the following compounds:

- (a) iron(II) sulfate
- (b) potassium hypoiodite
- (c)  $\text{BaF}_2$
- (d)  $\text{NaCH}_3\text{COO}$
- (e)  $\text{CH}_3\text{OH}$
- (f) ethyne (acetylene)

(2 pts) **30.** (a) Why is it important to know the standard state of an element?

(3 pts) (b) What does  $\Delta H_f^\circ$  actually mean? Include the definition in your answer.  
Use this reaction to illustrate your answer:  $\text{Mg(s)} + \frac{1}{2} \text{O}_2(\text{g}) \rightarrow \text{MgO(s)}$

**OVER** ⇒

(5 pts) **31.** The boiling point (in °C) for a solution of 15.0 g of lithium phosphate in 135 g of water is approximately: (Assume complete dissociation of the salt)  $K_b$  for water = 0.512 °C/m. For partial credit, use NaCl as your salt.

(5 pts) **32.** How much heat is released when 4.00 g of  $\text{BaCl}_2$  is produced according to the following reaction:



(3 pts) **33.** Define colligative property and give a real-life application of a colligative property.

(1 pt) **34.** Grammar bonus: Camels, contrary to popular thinking, \_\_\_\_\_(does/do) not store water in their humps.

# SCRAP PAPER OR COMMENTS ON EXAM

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**CHEMISTRY 102**  
EXAM 1 Form A

**FALL 2008**  
Section 501

NAME \_\_\_\_\_

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