

CHEMISTRY 102**FALL 2008****EXAM 1 FORM C****SECTION 502****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 33 questions (19 actual questions).
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PART 1

1&2. Which of the following statements is FALSE?

- (a) A reaction is spontaneous if ΔS_{system} increases.
- (b) Hess' Law calculation allows you to calculate the enthalpy involved in a reaction.
- (c) If a reaction is exothermic, heat is being released.
- (d) Endothermic processes are those with $\Delta H > 0$.
- (e) $\Delta S_{\text{universe}} = \Delta S_{\text{surroundings}} + \Delta S_{\text{system}}$

3&4. Which of the following pairs of liquids are NOT miscible?

- (a) $\text{CH}_3\text{CH}_2\text{OH} / \text{CH}_3\text{OH}$ (b) $\text{C}_6\text{H}_6 / \text{CCl}_4$
- (c) $\text{CCl}_4 / \text{CHCl}_3$ (d) $\text{CH}_3\text{CH}_2\text{OH} / \text{H}_2\text{O}$
- (e) $\text{CHOOH} / \text{CCl}_4$

5&6. Which of the following compounds has $\Delta H_f^\circ = 0$?

- (a) $\text{Br}_2(\text{g})$ (b) $\text{Ne}(\text{g})$ (c) $\text{O}(\text{g})$ (d) $\text{Hg}(\text{s})$ (e) $\text{Mg}(\text{g})$

7&8. For a solution of Na_2SO_4 , the ideal van't Hoff factor, i_{ideal} , would be:

- (a) 2 (b) 3 (c) 4 (d) 5 (e) 7

9&10. Which statement(s) list(s) the substance with the lower entropy first and the higher entropy second?

- (1) $\text{KCl(s)} < \text{K}^+(\text{aq}) + \text{Cl}^-(\text{aq})$
(2) $\text{CH}_3\text{CH}_2\text{CH}_3 < \text{CH}_3\text{CH}_3$
(3) $\text{H}_2\text{O}(\ell) \text{ at } 20^\circ\text{C} < \text{H}_2\text{O(s)} \text{ at } -40^\circ\text{C}$

- (a) 2 only (b) 3 only (c) 1 only (d) 1,2 only (e) 1,3 only

11&12. The best representation for the reaction whose heat of reaction is equal to the standard molar enthalpy of formation for $\text{BaCO}_3(\text{s})$ is:

- (a) $\text{Ba(s)} + \text{C}(\text{graphite,s}) + 3/2 \text{O}_2(\text{g}) \rightarrow \text{BaCO}_3(\text{s})$
(b) $2\text{Ba(s)} + 2 \text{C}(\text{diamond,s}) + 3\text{O}_2(\text{g}) \rightarrow 2\text{BaCO}_3(\text{s})$
(c) $\text{Ba}^{2+}(\text{aq}) + \text{CO}_3^{2-}(\text{aq}) \rightarrow \text{BaCO}_3(\text{s})$
(d) $\text{BaCO}_3(\text{s}) \rightarrow \text{Ba(s)} + \text{C}(\text{graphite,s}) + 3/2 \text{O}_2(\text{g})$
(e) $\text{BaCO}_3(\text{s}) \rightarrow \text{Ba}^{2+}(\text{aq}) + \text{CO}_3^{2-}(\text{aq})$

13&14. Which of the following statements is FALSE about osmotic pressure?

- (a) It is a colligative property.
(b) It depends on the number of particles (ions, molecules or a mixture of both) in the solution.
(c) Osmotic pressure can be measured in torr or atmospheres.
(d) When a semi-permeable membrane separates 2 solutions of different concentrations, solvent flows through the membrane to try to equalize the concentrations.
(e) It results from the flow of solute across a semi-permeable membrane.

15&16. Here is a listing of the molal boiling point constants (K_b values) for 3 solvents. If 0.10 mol of a soluble, nonelectrolyte were dissolved in 100 g of each solvent, what will be the order of increasing boiling point elevations of the resulting solutions?

(1)	Chloroform	3.67 °C/m
(2)	Ethanol	1.22 °C/m
(3)	Benzene	2.53 °C/m

- (a) (1) < (2) < (3) (b) (2) < (1) < (3) (c) (2) < (3) < (1)
 (d) (3) < (1) < (2) (e) (1) < (3) < (2)

17&18. In the laboratory you are asked to make a 0.575 m KNO_3 solution using 16.8 g of KNO_3 . How much water should you use?

- (a) 9.66 kg (b) 0.289 kg (c) 0.104 kg (d) 0.422 kg (e) 2.11 kg

19&20. What is the enthalpy change of the reaction below at 298 K and 1 atm pressure?

	$\text{SiH}_4(\text{s})$	+	$2\text{O}_2(\text{g})$	\rightarrow	$\text{SiO}_2(\text{s})$	+	$2\text{H}_2\text{O}(\text{g})$
$\Delta H_{\text{f}298}^\circ$ (kJ/mol)	+34		0		-910.9		-285.8

- (a) -955 kJ (b) -1159 kJ (c) -1230 kJ
 (d) -1517 kJ (e) -1250 kJ

25&26. When 10.0 grams of an unknown nonelectrolyte are dissolved in 250. grams of benzene, C_6H_6 , the freezing point of the resulting solution is $3.77^\circ C$. Pure benzene freezes at $5.48^\circ C$ and its K_f value is $5.12^\circ C/m$. What is the molecular weight of the compound?

- (a) 60. g/mol (b) 80.0 g/mol (c) 100. g/mol (d) 110. g/mol (e) 120. g/mol

27&28. What is the molarity of a 7.22 m aqueous solution of K_2CO_3 if the density of the solution is 1.54 g/mL? (Assume that you have 1kg = 1000 g of water.)

- (a) 4.14 M (b) 5.57 M (c) 6.17 M (d) 7.25 M (e) 6.83 M

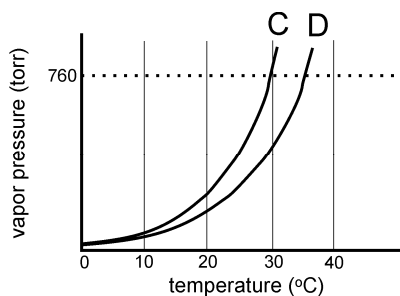
PART 2

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

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

- (a) sodium chlorite
- (b) nickel(II) chromate
- (c) $\text{Sr}(\text{CN})_2$
- (d) $\text{Co}(\text{CH}_3\text{COO})_3$
- (e) acetone
- (f) CH_3CH_3

30. (2 pts) Consider the diagram given on the right, showing the vapor pressure curves for two systems as a function of temperature. Curve C is the vapor pressure curve for Liquid C and Curve D results when a solute is dissolved in Liquid C.



What is the approximate normal boiling point of the pure solvent: _____ °C:

31. Consider this reaction at 25°C:

	$2\text{CO}_2(\text{g})$	\rightarrow	$\text{O}_2(\text{g})$	+	$2\text{CO}(\text{g})$
S°_{298} (J/mol·K)	213.6		205.0		197.6

- (2 pt) (a) Does the entropy of the system increase or decrease as the reaction goes forward? Why? (No calculation required).

OVER \Rightarrow

(3 pts) (b) Calculate ΔS° for the system:

(3 pts) (d) Calculate $\Delta S^\circ_{\text{surroundings}}$ if the ΔH° for the forward reaction is +566 kJ at 25°C:

(2 pts) (e) Calculate $\Delta S^\circ_{\text{universe}}$ in J/K

(1 pt) (f) Is the reaction spontaneous? _____ (yes or no)

(5 pts) **32.** An aqueous solution of 5.61 g of iron(II) nitrate per liter will have an osmotic pressure (in atm) at 27°C of approximately: (Assume complete dissociation of the salt.) For partial credit, use NaCl.
R = 0.0821 L·atm/mol·K.

33. Grammar Bonus (1pt): Residents of our country _____ (spend or spends) more than \$31 billion a year on fast food.

SCRAP PAPER OR COMMENTS ON EXAM

CHEMISTRY 102
EXAM 1 Form C

FALL 2008
Section 502

NAME _____
