NAME _____

CHEMISTRY 102 FALL 2008

EXAM 1 FORM B 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. Which pair(s) of liquids is(are) NOT miscible?

(1) formic acid and water
(2) benzene and water
(3) pentane, C_5H_{12}, and water

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

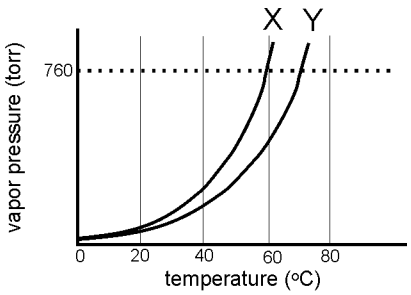
3&4. The term "endothermic" means that heat _____ in a reaction.

(a) is absorbed (b) has a negative value (c) is released
(d) equals its entropy (e) is a product

5&6. Which of the following statements about entropy is FALSE?

(a) The units of entropy are typically J/K.
(b) Entropy can be thought of as the amount of disorder in a system.
(c) Entropy, S, is a state function.
(d) 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.
(e) A perfect crystal of an element has zero entropy at 0 K.

7&8. Consider the diagram given on the right, showing the vapor pressure curves for two systems as a function of temperature. Curve X is the vapor pressure curve for Liquid X and Curve Y results when a solute is dissolved in Liquid X.



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

(a) 80 (b) 60 (c) 40 (d) 20 (e) 10

9&10. What is TRUE about osmotic pressure?

(a) Osmotic pressure increases as the solute concentration difference decreases.

(b) Solvent passes through the membrane from higher concentration to a solution of lower concentration.

(c) Ions are surrounded by water molecules and therefore can pass through a semi-permeable membrane.

(d) Only solvent molecules pass through the semi-permeable membrane.

(e) Osmotic pressure is independent of the number of solute particles in solution.

11&12. Which process is accompanied by a DECREASE in entropy?

(a) $2NH_3(g) \rightarrow 3H_2(g) + N_2(g)$

(b) $KCl(s) \rightarrow KCl(aq)$

(c) $Al^{3+}(aq) + PO_4^{3-}(aq) \rightarrow AlPO_4(s)$

(d) $H_2O(s) \rightarrow H_2O(g)$

(e) 1 mol $SO_2(g)$ in a 1 L container $\rightarrow$ 1 mole $SO_2(g)$ in a 10 L container

13&14. A reaction is spontaneous when:

(a) the reaction is at equilibrium.

(b) the reaction proceeds in the forward direction to make products.

(c) its enthalpy change is equal to zero.

(d) the entropy of the system increases.

(e) the reaction completely converts to products.

15&16. Which of the following soluble ionic compounds has the largest ideal van't Hoff factor, i_{ideal}?

(a) $AlCl_3$ (b) Li_2HPO_4 (c) NH_4NO_3 (d) NaCN (e) KCl

17&18. How many grams of NaF are required to prepare 250. mL of 0.500 M NaF solution?

(a) 6.00 g (b) 5.25 g (c) 0.084 g (d) 11.9 g (e) 44.5 g

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

	$MnO_2(s)$	+	2 CO(g)	$\rightarrow$	Mn(s)	+	2 CO_2(g)
$\Delta H^o_{f\,298}$ (kJ/mol)	−520.9		−110.5		0		−393.5

Calculate the ΔH^o for the reaction.

(a) −1024.9 kJ (b) +48.3 kJ (c) −45.1 kJ (d) +239.6 kJ (e) −208.9 kJ

21&22. If the osmotic pressure of an aqueous solution of an enzyme (a non-electrolyte) is 12.2 torr at 27°C, what was the molarity of the solution? R = 62.4 L·torr/mol·K.

(a) 7.48×10^{-3} M (b) 0.212×10^{-3} M (c) 1.44×10^{-3} M
(d) 5.21×10^{-3} M (e) 0.652×10^{-3} M

23&24. Calculate $\Delta S_{universe}$ for a reaction at 25°C if ΔS_{system} = –105 J/K and ΔH_{system} = +236 kJ.

(a) –897 J/K (b) +681 J/K (c) –91 J/K (d) +9.8 J/K (e) –169 J/K

25&26. What is the mass of solution if a student has prepared a 1.20 m solution using 25.0 g of KCl?

(a) 325 g (b) 256 g (c) 274. g (d) 304 g (e) 30.0 g

27&28. The freezing point of a solution of 5.884 g of an unknown nonelectrolyte dissolved in 45.12 g of benzene is 1.14°C. Pure benzene freezes at 5.48°C and its K_f value is 5.12 °C/m. What is the molecular weight of the compound?

(a) 154 g/mol (b) 168 g/mol (c) 67.1 g/mol (d) 424 g/mol (e) 36.2 g/mol

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EXAM 1 Section 501 (Please Block Print)

Form B

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 of the following compounds:

(a) ammonium nitrate

(b) copper(II) cyanide

(c) $CaSO_3$

(d) SnO

(e) CH_3COCH_3

(f) ethene (ethylene)

(3 pts) **30.** Define colligative property and give a real-life application of a colligative property.

(5 pts) **31.** The boiling point (in ^oC) for a solution of 25.0 g of potassium sulfate in 145 g of water is approximately: (Assume complete dissociation of the salt) K_b for water = 0.512 $^oC/m$. For partial credit, use NaCl as your salt.

OVER ⇒

(2 pts) **32.** (a) Why is it important to know the standard state of an element?

(3 pts) (b) What does ΔH°_{f} actually mean? Include the definition in your answer.
Use this reaction to illustrate your answer: $Ca(s) + \frac{1}{2} O_2(g) \rightarrow CaO(s)$

(5 pts) **33.** How much heat is released when 4.00 g of $BaCl_2$ is produced according to the following reaction:

$Ba(s) + Cl_2(g) \rightarrow BaCl_2(s)$ Given: $\Delta H^{\circ}_{f\,298}$ of $BaCl_2(s) = -806$ kJ/mol

(1 pt) **34.** Grammar Bonus: The tornadoes that tear through this county every spring _____ (is/are) more than just a nuisance.

SCRAP PAPER OR COMMENTS ON EXAM

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