NAME _____

CHEMISTRY 101 SPRING 2003

EXAM 3 FORM A SECTIONS 501-509 DR. KEENEY-KENNICUTT

Directions: (1) Put your name, S.I.D. number and signature on the free response part of the exam where indicated.
(2) 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 one answer down for one question and the other answer down for the other question. If you get one correct you'll get half credit for 2.5 pts. If there is an ambiguous multiple choice question, use the last page to explain your answer.
(3) Do NOT write on the envelope.
(4) Bubble in OPTION A on the scanning sheet IF you want your grade posted.
(5) When finished, put the free response answers in the envelope with the scanning sheet. You can keep the multiple choice part - the answers will be given to you as you leave.
(6) There are a total of 28 questions (16 actual questions) - 104 pts.

PART 1

1&2. Which of the following Lewis dot formulas for an isolated atom of carbon is CORRECT?

(a)  (b)  (c)  (d)  (e) 

3&4. In the reaction: $H_2CO_3 + HBrO_3 \rightarrow H_3CO_3^+ + BrO_3^-$.

(a) H_2CO_3 is a base and HCO_3^- is its conjugate acid.

(b) $HBrO_3$ is a base and $H_3CO_3^+$ is its conjugate acid

(c) $HBrO_3$ is a base and BrO_3^- is its conjugate acid

(d) $H_3CO_3^+$ is a base and H_2CO_3 is its conjugate acid

(e) BrO_3^- is a base and $HBrO_3$ is its conjugate acid

5&6. The electron affinity of chlorine is best represented by the reaction:

(a) $Cl(g) + e^- \rightarrow Cl^-(g)$ (b) $Cl_2(g) \rightarrow Cl_2^-(g) + e^-$ (c) $Cl(g) + e^- \rightarrow Cl^+(g)$

(d) $Cl(g) \rightarrow Cl^-(g) + e^-$ (e) $Cl(g) \rightarrow Cl^+(g) + e^-$

7&8 Which species is NOT isoelectronic with xenon?

(a) Br^- (b) Te^{2-} (c) Ba^{2+} (d) Cs^+ (e) Sb^{3-}

9&10. Which of the following bonds is classified as nonpolar covalent?

(a) C-Cl (b) Na-Cl (c) S-P (d) N-Cl (e) C-O

11&12. Which molecule or ion does NOT have a trigonal planar electronic geometry?

(a) BCl_3 (b) SO_2 (c) NO_3^- (d) BrF_3 (e) AlH_3

13&14. The carbonate ion has _____ resonance structures.

(a) 1 (b) 2 (c) 3 (d) 4 (e) none

15&16. Draw the Lewis dot formula for acetone. How many sigma and pi bonds are present in a molecule of acetone?

(a) 8 σ bonds and 2 π bonds
(b) 9 σ bonds and 1 π bond
(c) 7 σ bonds and 1 π bond
(d) 5 σ bonds and 2 π bonds
(e) 9 σ bonds and 2 π bonds

17&18. According to Valence Bond Theory and Valence Shell Electron Pair Repulsion Theory, if the electronic geometry of an atom is octahedral, the hybridization is

(a) sp
(b) sp^2
(c) sp^3
(d) sp^3d
(e) sp^3d^2

19&20. Which of the following statements is FALSE?

(a) The Ba atom is larger than the Mg atom.
(b) The electron affinity of Br is more negative than that of Ca.
(c) The ionization energy of Si is less than that of Cl.
(d) The radii of Fe^{3+} is smaller than that of Fe.
(e) In order of decreasing radii: $Cl^- > S^{2-} > P^{3-}$

OVER Þ

21&22. Calculate the normality of a 150. mL solution that contains 5.00 g of H_3PO_4? Assume that the acid is to be neutralized completely.

(a) 1.02 N (b) 0.870 N (c) 0.335 N (d) 0.113 N (e) 0.667 N

23&24. How many milliliters of a 0.1012 N HCl solution is required to totally neutralize 25.86 mL of a 0.1134 N $Ba(OH)_2$ solution?

(a) 23.08 mL (b) 28.98 mL (c) 46.16 mL (d) 57.96 mL (e) 14.49 mL

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Form A Signature _____

PART 2

(24 pts) **25.** For each of species, draw the Lewis dot structure (2 pts and don't forget all the electrons). For the central atom, give the number of regions of high electron density (2 pts), the hybridization (2 pts), electronic geometry (2 pts), the molecular (or ionic) geometry (2 pts), and say if the species has a dipole moment (is polar) or not (2 pt).

(a) PF_2^- (b) SeF_4

	PF_2^-	**SeF_4**
Regions of High e^- Density		
Hybridization		
Electronic Geometry		
Molecular/Ionic Geometry		
Has dipole moment (yes/no)		

(4 pts) Draw a 3-dimensional representation of these 2 species using wedges and dotted lines. Show all lone pairs of electrons.

(a) PF_2^- (b) SeF_4

OVER Þ

(6 points) **26.** Write a short paragraph explaining the reasons why H_2SO_4 and H_2SO_3 have different acid strengths. Include in your paragraph the identity of the stronger acid (2 pts), comments about H-O bond strength and how it affects acid strength (2 pts), and the structures of the two acids (2 pt).

(3 points) **27.** Write the balanced acid-base reaction between 1 mole of H_3PO_4 and 1 mole of NaOH.

28. Consider the acid-base reaction between H_3PO_4 and NaOH.

(1 pt) (a) Write the balanced acid-base reaction. Assume all the H's in H_3PO_4 have been neutralized.

(b) If 155 mL of 0.271 M H_3PO_4 is added to 235 mL of 0.465 M NaOH, the resulting solution will be

(2 pts) (i) composed of what salt and what excess reactant?

(4 pts) (ii) What is the final concentration of the salt?

SCRAP PAPER OR COMMENTS ON EXAM

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