Name: ___

SECTIONS 501-511

SPRING 2005 DR. KEENEY-KENNICUTT

Directions: (1) Put 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 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.
- (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 the exam.
- (6) There are a total of 27 questions (15 actual questions).

PART 1

- **1&2.** Which of the following bonds can be classified as polar covalent?
 - (a) H-F (b) Ca-Zn (c) N-Cl (d) Na-Br (e) C-S
- **3&4.** In the reaction: $H_2SO_4 + HCIO_4 \rightarrow H_3SO_{4^+} + CIO_4^-$ the two Bronsted bases are
 - (a) H_2SO_4 and $HCIO_4$

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- (b) H_2SO_4 and CIO_4^-
- (c) $H_3SO_4^+$ and CIO_4^-
- (d) $HCIO_4$ and CIO_4^-
- (e) H_2SO_4 and $H_3SO_4^+$

5&6. The number of protons and electrons found in the sulfur ion that is isoelectronic with a noble gas is:

- (a) 16 p and 16 e⁻ (b) 18 p and 16 e⁻ (c) 16 p and 18 e⁻
- (d) 18 p and 17 e⁻ (e) some other combination

7&8. Arrhenius defined a base as:

- (a) an electron-pair donor
- (b) a hydroxide-ion source in water
- (c) an electron-pair acceptor
- (d) a hydrogen-ion source in water
- (e) a metal-ion source in water
- **9&10.** Here is the structure for most students' friend: caffeine. Which of the following hybridization assignments is NOT correct?

Beware - I did not put the lone pairs of electrons into the diagram.



(a) $O_1 - sp^2$ (b) $C_2 - sp^2$ (c) $C_3 - sp^3$ (d) $N_4 - sp^2$ (e) they are all correct

11&12. Which of the following statements is CORRECT with regard to atomic or ionic size?

- (1) S^{2−} < Cl[−]
- (2) Br < Br⁻
- (3) Li⁺ < Li
- (4) P < N

	(0) 2 a 10 3 (0) 2 a 10 4 (e)			()	(D) 5 anu 4) i anu z	(a)
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13&14.	Which response	e includes on	ly the speci	es below	that exhibit	resonance?		
		(1) NC	D ₂ (2)	BF ₃ (3) CO ₂	(4) H ₂ CO ₃		
(a)	1 only	(b) 1, 2	(c)	3 only	(d)	1, 3, 4	(e)	another combination

15&16. Which group has the outer electron configuration of $ns^2(n-1)d^{1-10}$?

- (a) alkaline earths (b) transition metals (c) noble gases
- (d) alkali metals
- (e) lanthanides

- **17&18.** According to Valence Bond Theory and Valence Shell Electron Pair Repulsion Theory, if the electronic geometry is octahedral, the hybridization must be:
 - (a) sp (b) sp^2 (c) sp^3 (d) sp^3d (e) sp^3d^2

19&20. Which of the following molecules is polar?

(a) PF ₃	(b) BBr ₃	(c) SiF ₄	(d) BeF ₂	(e) SF ₆
() 3	() =	(-)4	() = 2	(-)

21&22. Which indication of relative acid strength is WRONG?

(a) $H_2SO_4 > HSO_4^-$	(b) HF < HI	(c) $H_2SeO_4 < H_2SO_4$
(d) $H_2S < H_2Se$	(e) $HBrO_2 > HBrO_3$	

23&24. If 255 mL of 1.00 M HCl solution is added to 155 mL of 2.00 M NaOH, the resulting solution will be ______ M in NaCl.

(a) 0.250 M	(b) 1.50 M	(c) 0.321 M	(d) 0.622 M	(e) 0.915 M
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Signature _____

Form A

PART 2

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

(24 pts) **25.** (i) Draw the Lewis dot structures for the following species (2 pts each). Show all lone pairs of 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 or not (2 pts).

(a) SeF_3^-

(b) SeF₂

	SeF₃ [−]	SeF ₂
Regions of High e Density		
Hybridization		
Electronic Geometry		
Molecular Geometry		
Dipole Moment? (Yes or No)		

(6 pts) (ii) Draw a 3-dimensional representation of these 2 species using wedges and dotted lines. Show <u>ALL</u> lone pairs of electrons, not just the ones on the central atom. Show the bond angles.

(a) SeF_3^- (b) SeF_2

 $OVER \Rightarrow$

- **26.** The first ionization energy of lithium is +520 kJ/mol of atoms.
- (3 pts) (a) Define ionization energy in a formal way (include an equation).

(2 pts) (b) What is the <u>general</u> trend of the first ionization energies of Group A elements with position in the periodic table? You can draw and label a diagram.

27. Here again is the structure for caffeine.



- (a) (2 pts) How many sigma bonds are present?
- (b) (2 pts) How many pi bonds are present?
- (c) (1 pt) How many lone pairs of electrons are present? ______(You have to look for them!)

SCRAP PAPER OR COMMENTS ON EXAM

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