

CHEMISTRY 101**EXAM 3 FORM B****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).
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PART 1

1&2. The number of protons and electrons found in the aluminum ion that is isoelectronic with a noble gas is:

- (a) 13 p and 16 e⁻ (b) 10 p and 13 e⁻ (c) 13 p and 10 e⁻
(d) 13 p and 13 e⁻ (e) some other combination

3&4. Which of the following bonds can be classified as polar covalent?

- (a) Cu-Ti (b) H-F (c) S-I (d) C-S (e) Na-F

5&6. Which indication of relative acid strength is WRONG?

- (a) $\text{H}_2\text{S} < \text{H}_2\text{Se}$ (b) $\text{H}_2\text{SeO}_4 < \text{H}_2\text{SO}_4$ (c) $\text{HBrO}_2 > \text{HBrO}_3$
(d) $\text{H}_2\text{SO}_4 > \text{HSO}_4^-$ (e) $\text{HF} < \text{HI}$

7&8. In the reaction: $\text{H}_2\text{SO}_4 + \text{HClO}_4 \rightarrow \text{H}_3\text{SO}_4^+ + \text{ClO}_4^-$, the two Bronsted acids are

- (a) H_2SO_4 and ClO_4^-
- (b) H_2SO_4 and HClO_4
- (c) H_3SO_4^+ and ClO_4^-
- (d) HClO_4 and ClO_4^-
- (e) HClO_4 and H_3SO_4^+

9&10. Which group has the outer electron configuration of $ns^2 np^5$?

- (a) Group VA
- (b) halogens
- (c) noble gases
- (d) alkali metals
- (e) Group VIA

11&12. According to Valence Bond Theory and Valence Shell Electron Pair Repulsion Theory, if the electronic geometry is tetrahedral, the hybridization must be:

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

13&14. Arrhenius defined an acid 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

15&16. Which response includes only the molecules or ions below that exhibit resonance?

(1) PF_5 (2) CS_2 (3) CO_2 (4) SO_2

(a) 4 only (b) 1, 3 (c) 2, 3 (d) 2, 3, 4 (e) another combination

17&18. Which of the following statements is CORRECT with regard to atomic or ionic size?

(1) $\text{Br} < \text{Br}^-$ (2) $\text{P} < \text{N}$ (3) $\text{S}^{2-} < \text{Cl}^-$ (4) $\text{Li}^+ < \text{Li}$

(a) 1 and 4 (b) 3 and 4 (c) 2 and 4 (d) 2 and 3 (e) 1 and 3

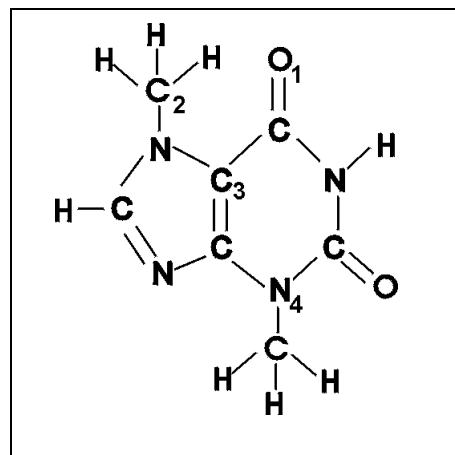
19&20. Which of the following molecules is polar?

(a) SiH_4 (b) BeF_2 (c) CO_2 (d) H_2S (e) SbF_5

21&22. Here is the structure theobromine, one of the components of tea.

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

23&24. If 50.0 mL of 2.00 M HBr solution is added to 45.0 mL of 3.00 M KOH, the resulting solution will be _____ M in KBr.

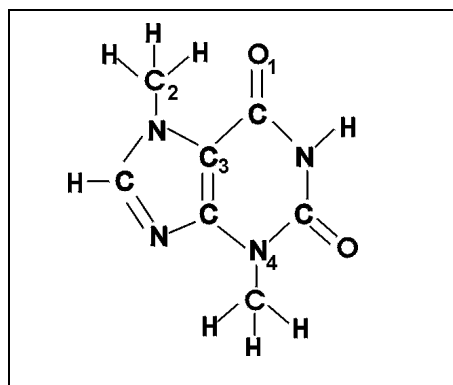
- (a) 0.100 M (b) 0.135 M (c) 2.50 M (d) 1.05 M (e) 1.75 M

PART 2

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

- 25.** Here again is the structure for theobromine, one of the components of tea.

Note: there is no bromine in theobromine.



- (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? _____

- 26.** The electron affinity of chlorine is -349 kJ/mol of atoms.

(3 pts) (a) Define electron affinity in a formal way (include an equation).

- (2 pts) (b) What is the general trend of the electron affinities of A group elements with position in the periodic table? You can draw and label a diagram.

OVER \Rightarrow

(24 pts) **27.** (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) PBr_3

(b) ClBr_4^-

	PBr_3	ClBr_4^-
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 ALL lone pairs of electrons, not just the ones on the central atom. Show the bond angles.

(a) PBr_3

(b) ClBr_4^-

SCRAP PAPER OR COMMENTS ON EXAM

CHEMISTRY 101

EXAM 3 Form B

Spring 2005

S 501-511

NAME _____
