

Seat No. _____

Name KEY
(Please print your name and **circle** your last name)

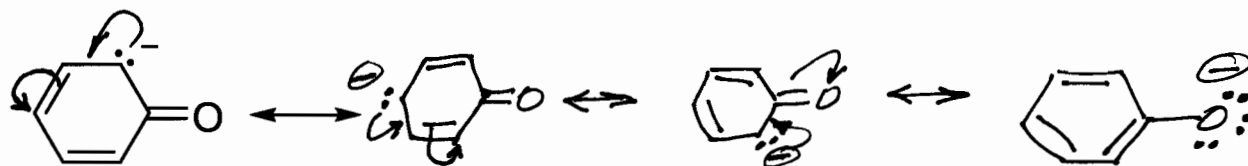
CHEMISTRY 331

EXAM I

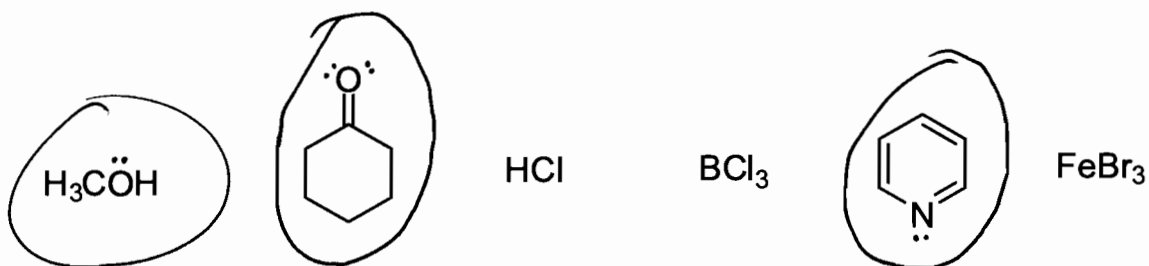
Wednesday, February 6, 2008

- | | |
|--------------------|-------|
| I. (8 points) | _____ |
| II. (12 points) | _____ |
| III. (10 points) | _____ |
| IV. (6 points) | _____ |
| V. (5 points) | _____ |
| VI. (9 points) | _____ |
| VII. (8 points) | _____ |
| VIII. (9 points) | _____ |
| IX. (10 points) | _____ |
| X. (6 points) | _____ |
| XI. (6 points) | _____ |
| XII. (6 points) | _____ |
| XIII. (5 points) | _____ |
| <hr/> | |
| TOTAL (100 points) | _____ |

- I. (8 pts.) Draw two additional resonance structures for the one provided here. Clearly show all π -bonds, lone pairs of e's and charge location. Use curved arrows to indicate e-pair movement.



- II. (12 pts.) Circle each of the compounds likely to behave as Lewis Bases.



- III. (10 pts.) Draw the most stable conformer of *trans*-1,4-dimethylcyclohexane and of its *cis*-isomer.



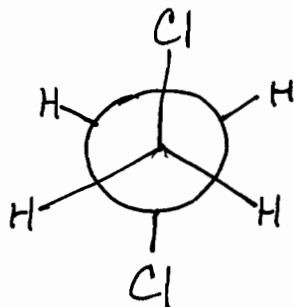
trans-
diequatorial
vs.
diaxial



cis-
[only option]

IV. (6 pts.) Cyclohexane is more stable than cyclopentane despite the fact that the angles of a regular pentagon (108°) are almost exactly the same as those of a tetrahedron. This is due to puckering (or equivalent) of the six-membered ring to minimize both angle and torsional strains.

V. (5 pts.) Draw a Newman projection of the anti conformation of 1,2-dichloroethane.

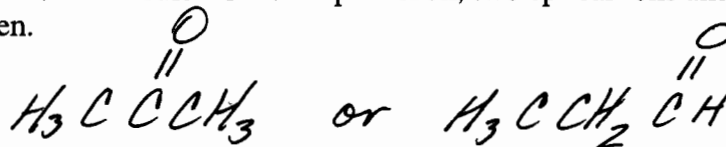


VI. (9 pts.) Using condensed structures provide an example of

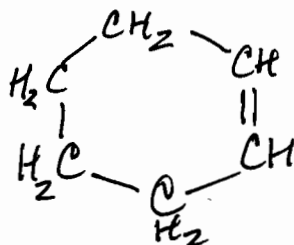
(a) a 4-carbon molecule with two sp^3 -hybridized carbons and two that are sp -hybridized.



(b) a 3-carbon molecule with one sp^2 carbon, two sp^3 carbons and one sp^2 oxygen.

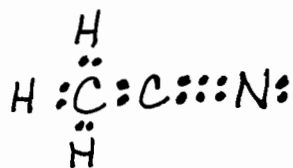


(c) a 6-carbon molecule w/4 sp^3 and 2 sp^2 carbons and the molecular formula of C_6H_{10} .

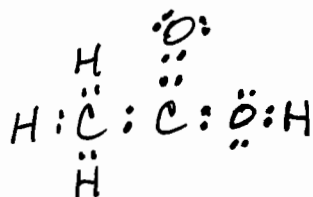


VII. (8 pts.) Provide Lewis (e-dot) structures for (a) and (b) which show all valence-shell electrons.

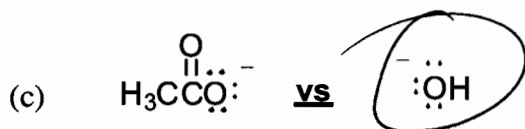
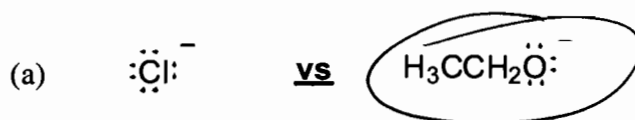
(a) H_3CCN (acetonitrile)



(b) $\text{H}_3\text{CCO}_2\text{H}$ (acetic acid)

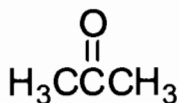


VIII. (9 pts.) Circle the strongest Brønsted-Lowry base in each pair.

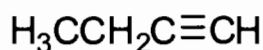


IX. (10 pts.) Under each of the following compounds put the number corresponding to the functional group in the compound.

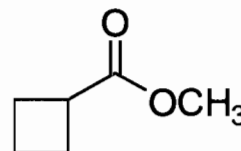
- | | |
|-------------|--------------------|
| 1) aldehyde | 6) carboxylic acid |
| 2) amine | 7) alkyne |
| 3) halide | 8) ether |
| 4) alcohol | 9) alkane |
| 5) ketone | 10) ester |



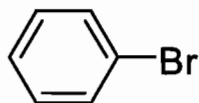
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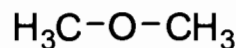
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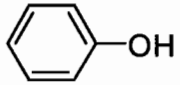
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3

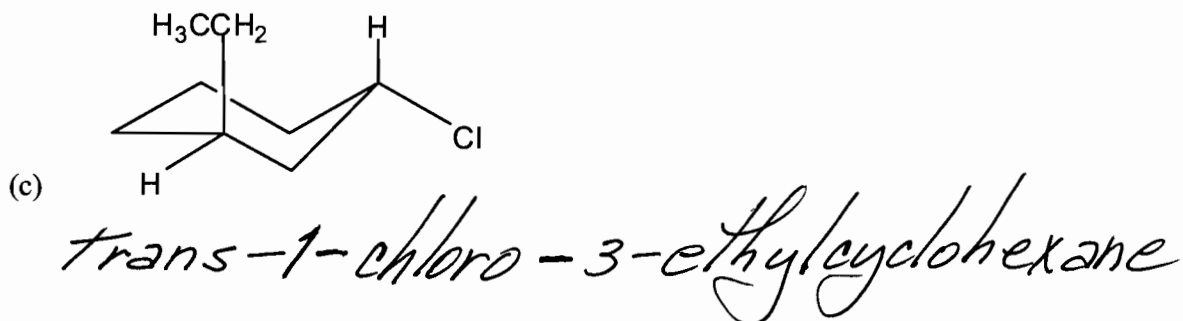
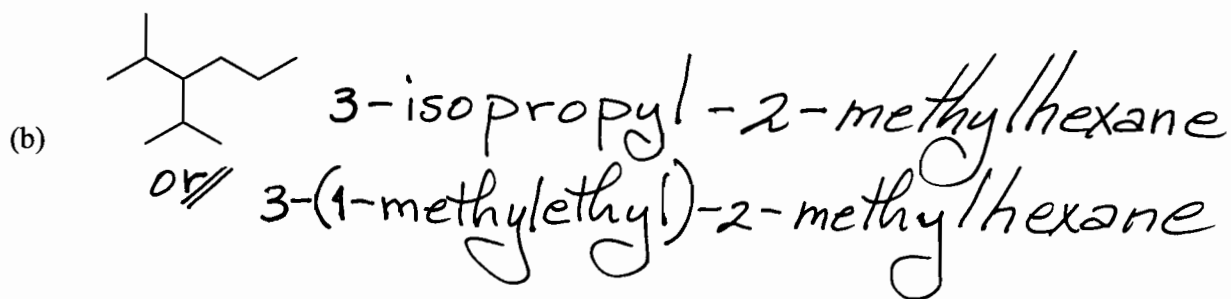
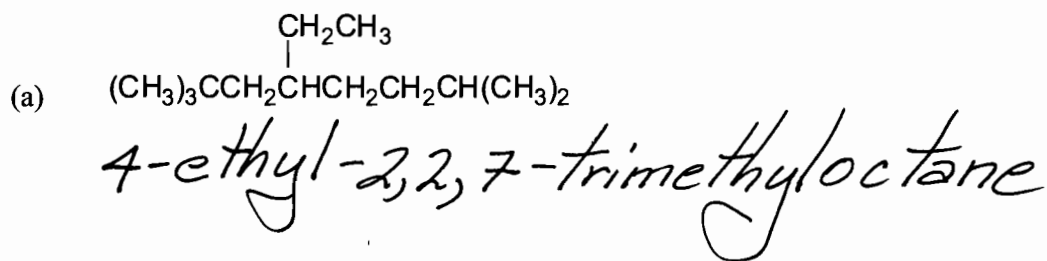


8

X. (6 pts) Phenol, , is much more acidic than is ethanol, $\text{H}_3\text{CCH}_2\text{OH}$ (pKa 10 vs. 16). Explain why this is so in one concise statement.

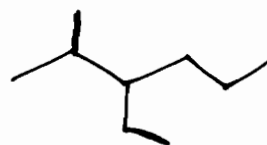
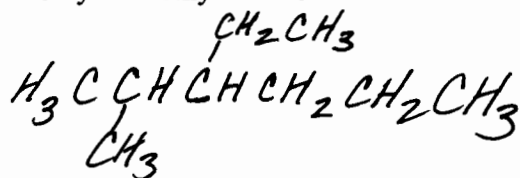
The conjugate base is stabilized by resonance delocalization of the negative charge, which is not possible for $\text{CH}_3\text{CH}_2\text{O}^-$.
(see problem I)

XI. (6 pts.) Provide a proper IUPAC name for each of the following compounds.

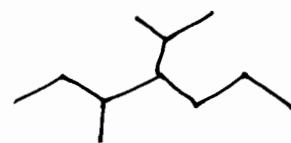
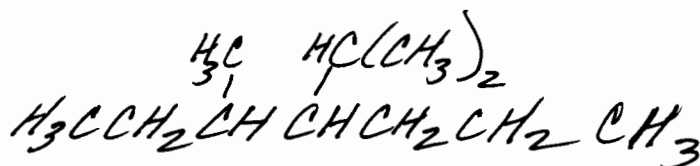


XII. (6 pts.) Draw structures corresponding to each of the following names.

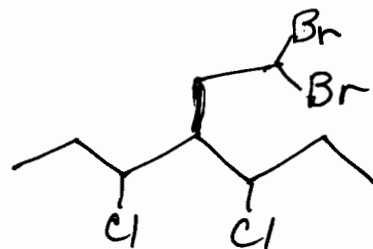
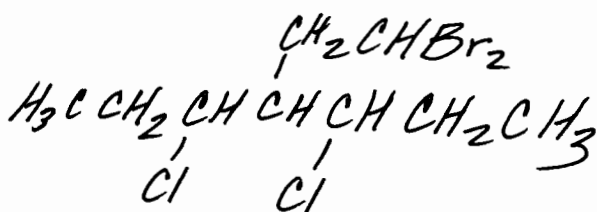
(a) 3-ethyl-2-methylhexane



(b) 4-isopropyl-3-methylheptane



(c) 4-(2,2-dibromoethyl)-3,5-dichloroheptane



XIII. (5 pts.) Show the products of the following reaction and use curved arrows to illustrate the required e-flow leading to them.

