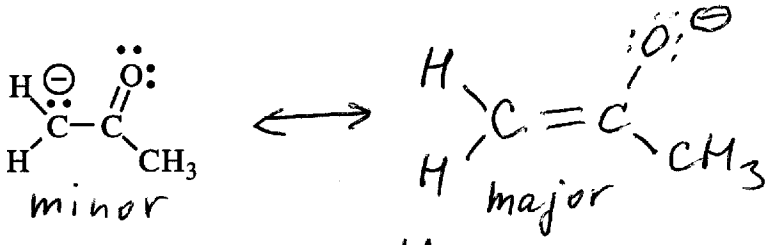
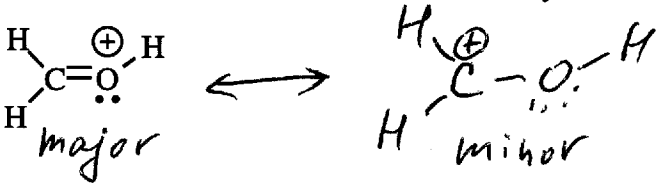
Chemistry 2521, Fall Semester 2001
Sample Midterm 1 Exam
(Chapters 1, 2, 3 of Brown & Foote text)

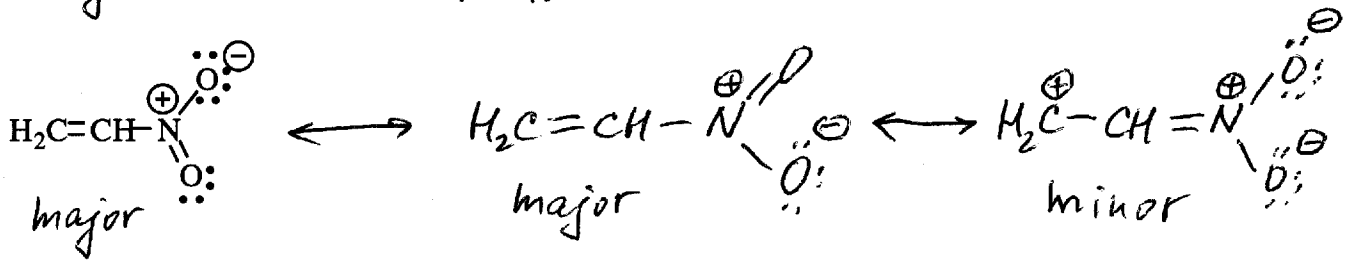
This exam has 9 problems on 4 pages. Make sure your copy is complete and correct.
Answer key is available in PDF format at: **www.d.umn.edu/~vzhdanki/2521/**

Printed Name Key

1. (12; 4 pts each) Draw reasonable **resonance contributors** for each of the following species. Label which resonance contributor(s) is **major** and which **minor**.

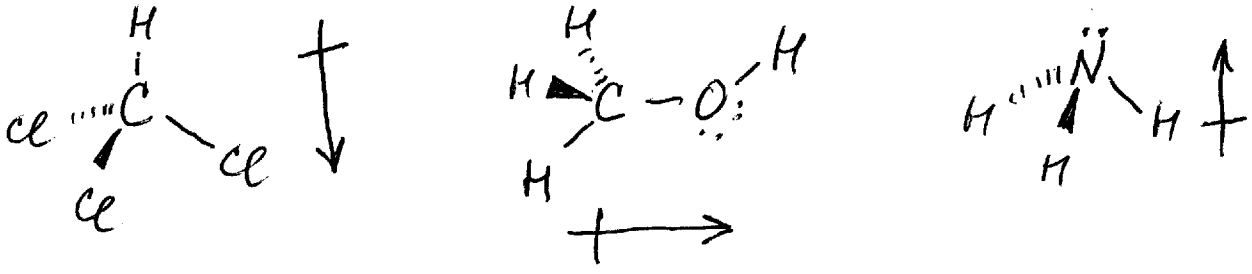




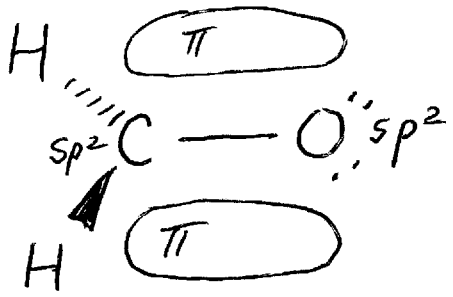


2. (12; 4 pts each) Draw each of the following molecules in **three dimensions**. Show the direction of a **dipole moment** for each molecule.

$CHCl_3$ CH_3OH NH_3

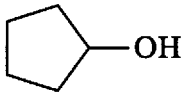


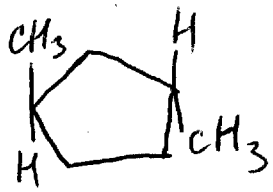
3. (10) Draw a **three-dimensional** representation of formaldehyde, $\mathbf{H_2C{=}O}$. Show the **shape** of the **π-orbital** and indicate **hybridization of carbon and oxygen atoms** on this picture. (You don't need to show the shape of σ-orbitals on your drawings).



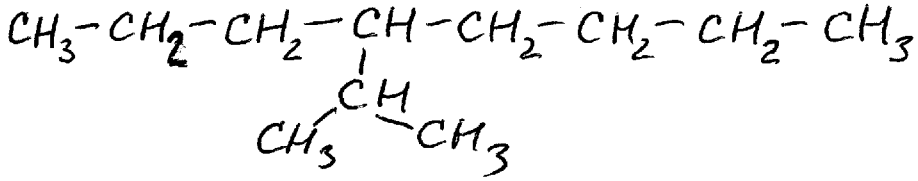
4. (10; 2 pts each) Give either the IUPAC name or the correct structure for each of the following compounds.

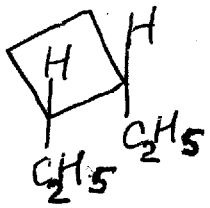
(a)  2,4-dimethylpentane

(b)  cyclopentanol

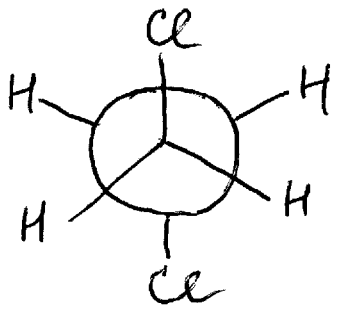
(c) *trans*-1,3-dimethylcyclopentane 

(d) 4-isopropyloctane



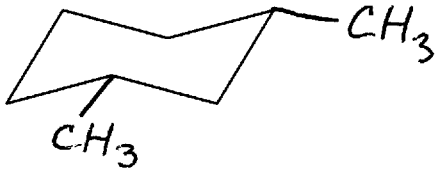
(e) 1,2-*cis*-diethylcyclobutane 

5. (5) Draw a **Newman projection** of the most stable staggered conformation of 1,2-dichloroethane, $ClCH_2CH_2Cl$.

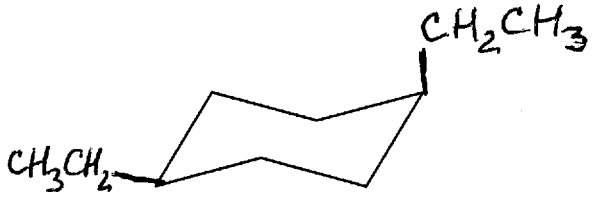


6. (15; 5 pts each) Make a three dimensional drawing of the **most stable** chair **conformation** for each of the following compounds. (Use the provided template; make sure to show **correct axial or equatorial** bonds to the substituents):

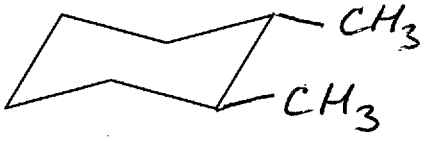
(a) *cis*-1,3-dimethylcyclohexane



(b) *cis*-1,4-diethylcyclohexane

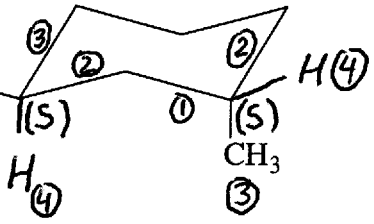


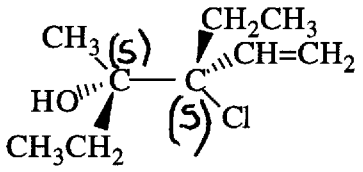
(c) *trans*-1,2-dimethylcyclohexane



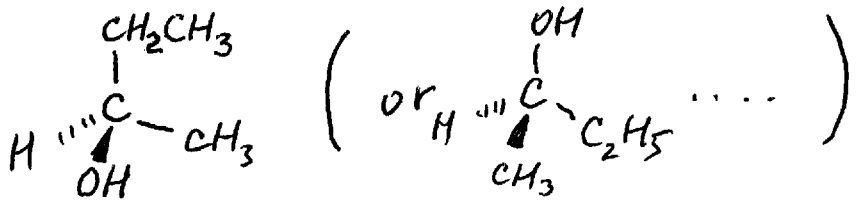
7 (12 pts) Assign the **R,S** configuration to each **stereocenter** in the following compound (3 pts each stereocenter):

(a) $(CH_3)_2CH$–



(b) 

8. (4 pts) Make a **three-dimensional drawing** of **(R)-2-butanol**:



9. (20, 4 pts each) For each of the following questions (a)-(e) **circle** the item that is the correct answer.

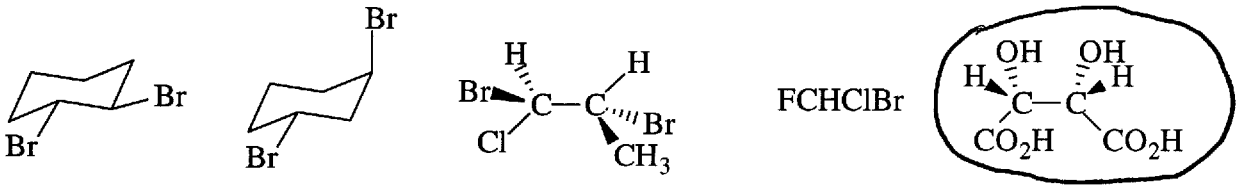
(a) Which one of the following atoms has the ground-state **electron configuration** of $1s^2 2s^2 2p^3$?

C O F (N) S Cl B Ne P

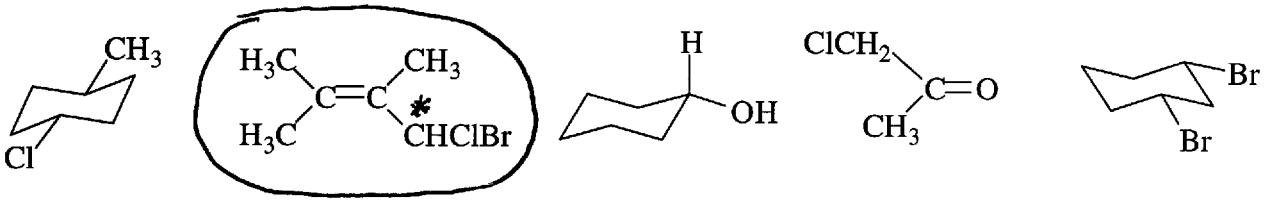
(b) Which one of the following compounds has the **ionic** bond?

CH_3OH C_2H_6 (CH_3CH_2ONa) NH_3 H_2O CH_4

(c) Which one of the following compounds is a **meso** form?



(d) Which one of the following molecules is **chiral**?



(e) Which one of the following compounds has **four** stereoisomers?

2-bromobutane 3,4-dichlorohexane methylcyclopentane 1,1-dimethylcyclobutane
1,4-dichlorocyclohexane (2,3-dibromopentane) 1,2-dibromocyclohexane