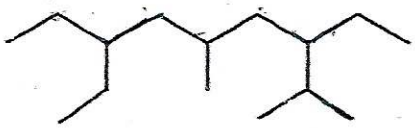
EXAM 1 / Fall 2002

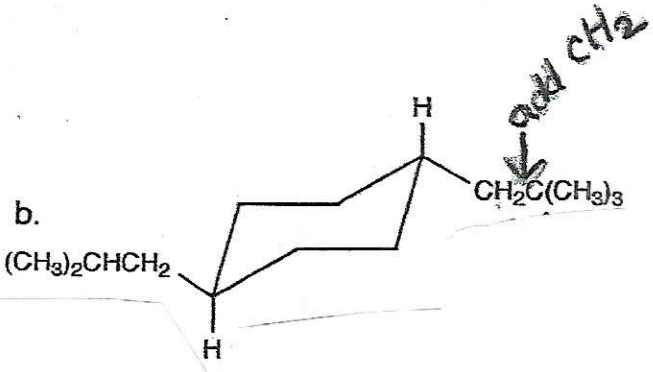
1. NOMENCLATURE: (15 points, 5 pts. each)

Give an acceptable IUPAC name for each of the following compounds. Be sure to indicate the **stereochemistry** where appropriate.

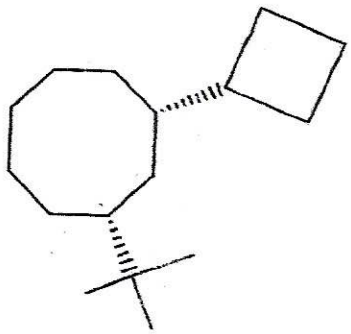
a.



b.

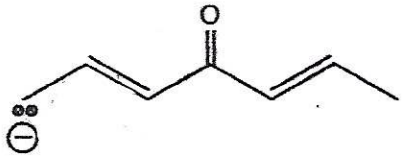


c.



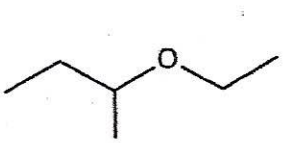
2. For each structure given, draw the important resonance contributors. Circle the major contributor (14 pts.) 2 pts each structure / 2 pts. each circle

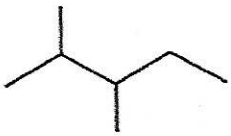
a.

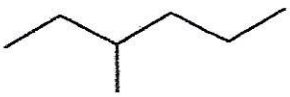


b.

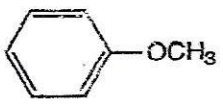
3. Place the following compounds in order of increasing boiling point. (1=lowest, 3=highest) (6 pts.)

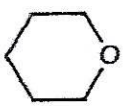


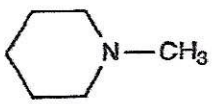


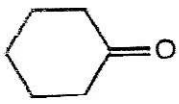


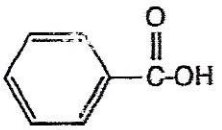
4. Circle the compounds that can form hydrogen bonds in a pure state. (4 pts.)

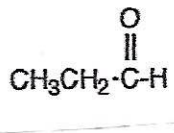








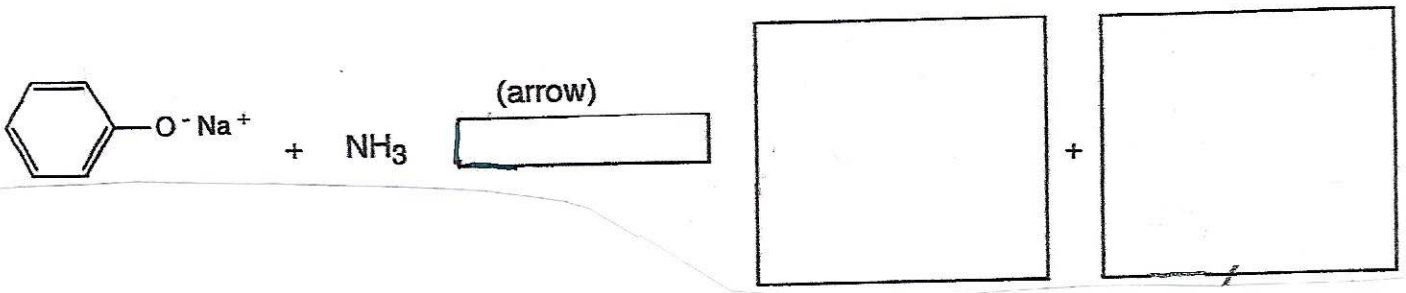




5. Place the following compounds in order of increasing acidity. (1=least acidic, 3=most acidic) (6 pts.)

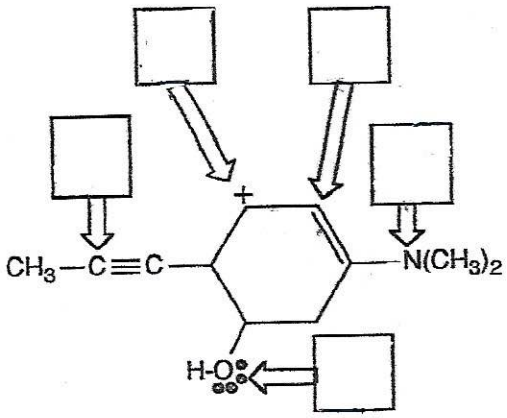
2pts. each

6. Predict the products that would result from an acid/base reaction between the two compounds below and place the answers in the boxes provided. Predict the direction of the equilibrium, and indicate the direction by placing an arrow in the box. (6 pts.) 2pts. each

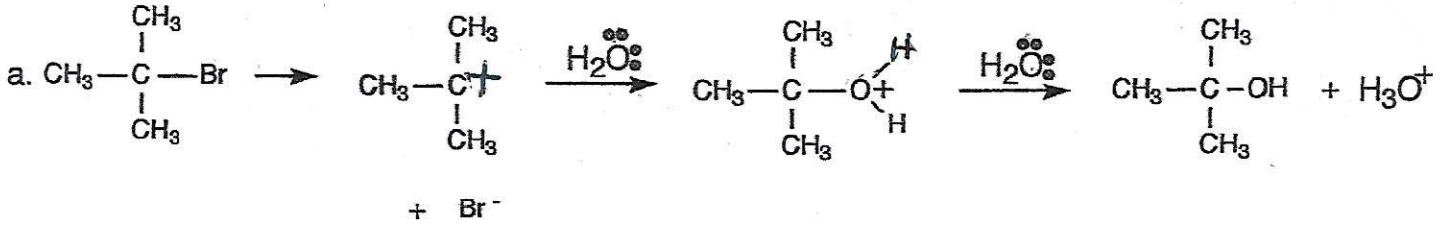


7. For the molecule below determine the hybridizaton of the indicated atoms and place the answers in the boxes provided. (10 pts.)

2pts. each

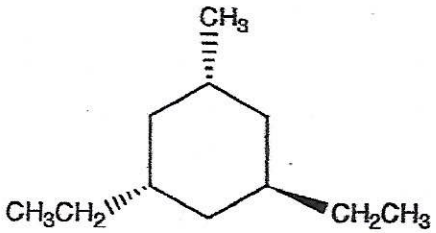


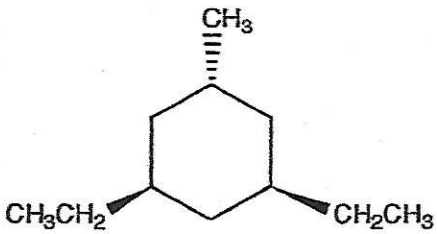
8. For the reactions below, provide curved arrows to indicate the movements of electron pairs associated with bond breaking and bond forming, i.e., provide the mechanisms. (10 pts.)

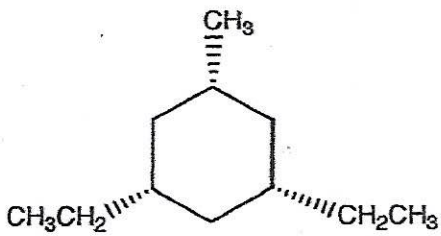
a. 

b. 

9. For the each of the following substituted cyclohexanes, draw the more stable conformation in the large box. Place the cyclohexanes in order of increasing stability (1=least stable, 3=most stable). (12 pts.)





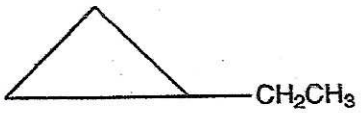


1pt each ☐ ☐ ☐

☐ ☐ ☐

mono

10. Draw all structural isomers and geometric isomers (cis/trans) resulting from the dibromination of ethylcyclopropane (structure **A**). Place geometric isomers next to each other and circle them. (11 pts.)



A

11. Consider the following reaction:

a. Given the bond dissociation energies (BDE) below, calculate the overall $\Delta H°$ (4 pts.)

b. Are the products or reactants favored at equilibrium? (2 pts.)

Bond	Bond-Dissociation Energy kcal/mol
H—X bonds and X—X bonds	
H—H	104
D—D	106
F—F	38
Cl—Cl	58
Br—Br	46
I—I	36
H—F	136
H—Cl	103
H—Br	88
H—I	71
HO—H	119
HO—OH	51
Methyl bonds	
CH_3—H	104
CH_3—F	109
CH_3—Cl	84
CH_3—Br	70
CH_3—I	56
CH_3—OH	91
Bonds to primary carbons	
CH_3CH_2—H	98
CH_3CH_2—F	107
CH_3CH_2—Cl	81
CH_3CH_2—Br	68
CH_3CH_2—I	53
CH_3CH_2—OH	91
$CH_3CH_2CH_2$—H	98
$CH_3CH_2CH_2$—F	107
$CH_3CH_2CH_2$—Cl	81
$CH_3CH_2CH_2$—Br	68
$CH_3CH_2CH_2$—I	53
$CH_3CH_2CH_2$—OH	91

Bond		Bond-Dissociation Energy kcal/mol
Bonds to secondary carbons		
$(CH_3)_2CH$—H		95
$(CH_3)_2CH$—F		106
$(CH_3)_2CH$—Cl		80
$(CH_3)_2CH$—Br		68
$(CH_3)_2CH$—I		53
$(CH_3)_2CH$—OH		91
Bonds to tertiary carbons		
$(CH_3)_3C$—H		91
$(CH_3)_3C$—F		106
$(CH_3)_3C$—Cl		79
$(CH_3)_3C$—Br		65
$(CH_3)_3C$—I		50
$(CH_3)_3C$—OH		91
Other C—H bonds		
$PhCH_2$—H	(benzylic)	85
CH_2=$CHCH_2$—H	(allylic)	87
CH_2=CH—H	(vinyl)	108
Ph—H	(aromatic)	110
C—C bonds		
CH_3—CH_3		88
CH_3CH_2—CH_3		85
CH_3CH_2—CH_2CH_3		82
$(CH_3)_2CH$—CH_3		84
$(CH_3)_3C$—CH_3		81