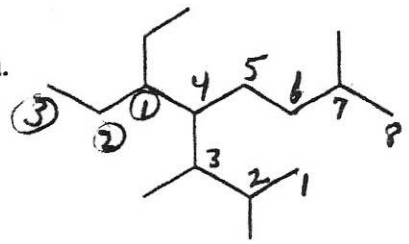
Alt. Exam 1

1. Give an acceptable IUPAC name for each of the compounds in **a-c.** Draw the structure of the compound in **d.** Be sure to indicate the **stereochemistry** where appropriate. (16 points)

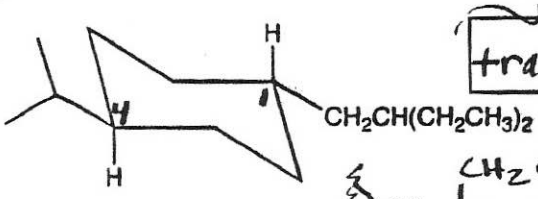
a.



4-(1-ethylpropyl)-2,3,7-trimethyloctane

1 1 2

b.



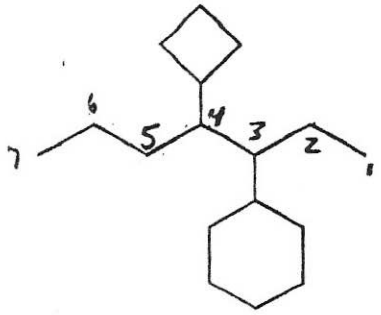
1 1 1 1

trans-1-(2-ethylbutyl)-4-isopropylcyclohexane

or

trans-1-(2-ethylbutyl)-4-(methylethyl) cyclohexane

c.

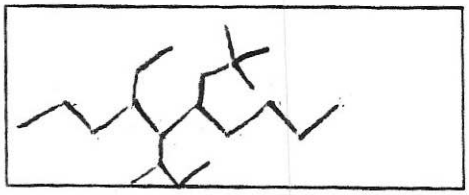


4-cyclobutyl-3-cyclohexylheptane

1 1 2

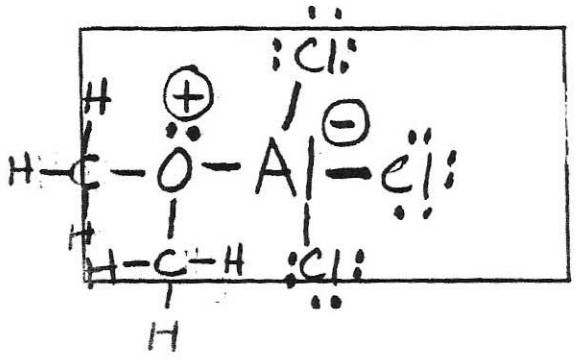
d. 5-sec-butyl-4-ethyl-6-neopentyldecane

+1 +1 +1 +1 +1



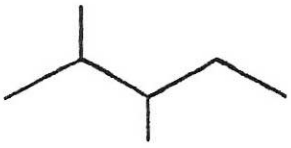
2. Draw a proper Lewis structure for the condensed formula below. Be sure to show all lone pairs and formal charges. (5pts)

$(CH_3)_2OAlCl_3$

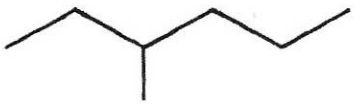


3. Place the compounds below in order of increasing melting point. (1=lowest, 3=highest melting point) (6 pts.)

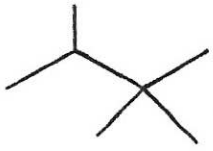
2pts each



2



1



3

4. Place the compounds below in order of increasing solubility in H_2O. (1=least soluble, 3=most soluble) (6 pts.)

2pts each

$CH_3CH_2OCH_2CH_3$

1

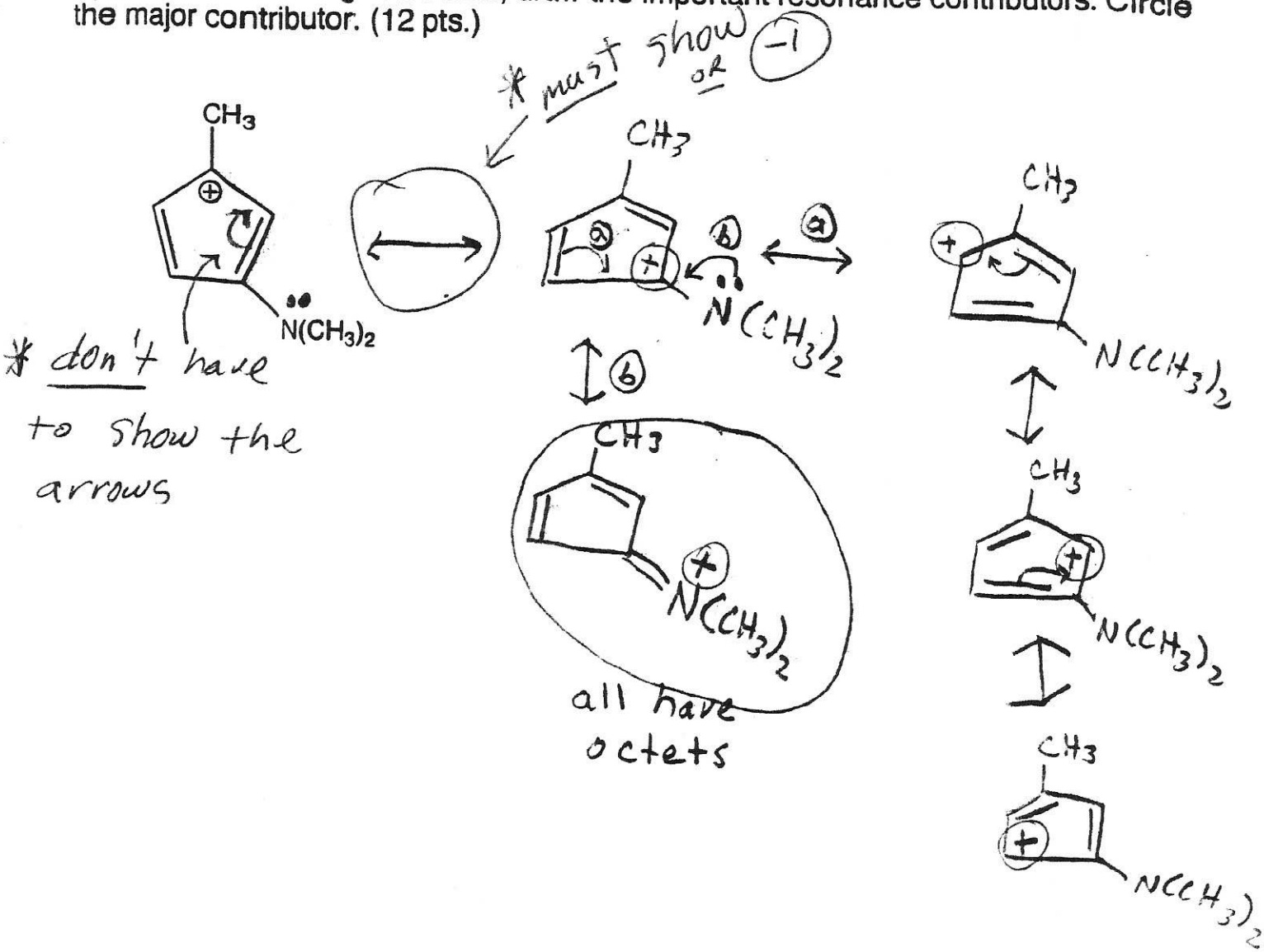
CH_3CH_2OH

3

$CH_3CH_2NH_2$

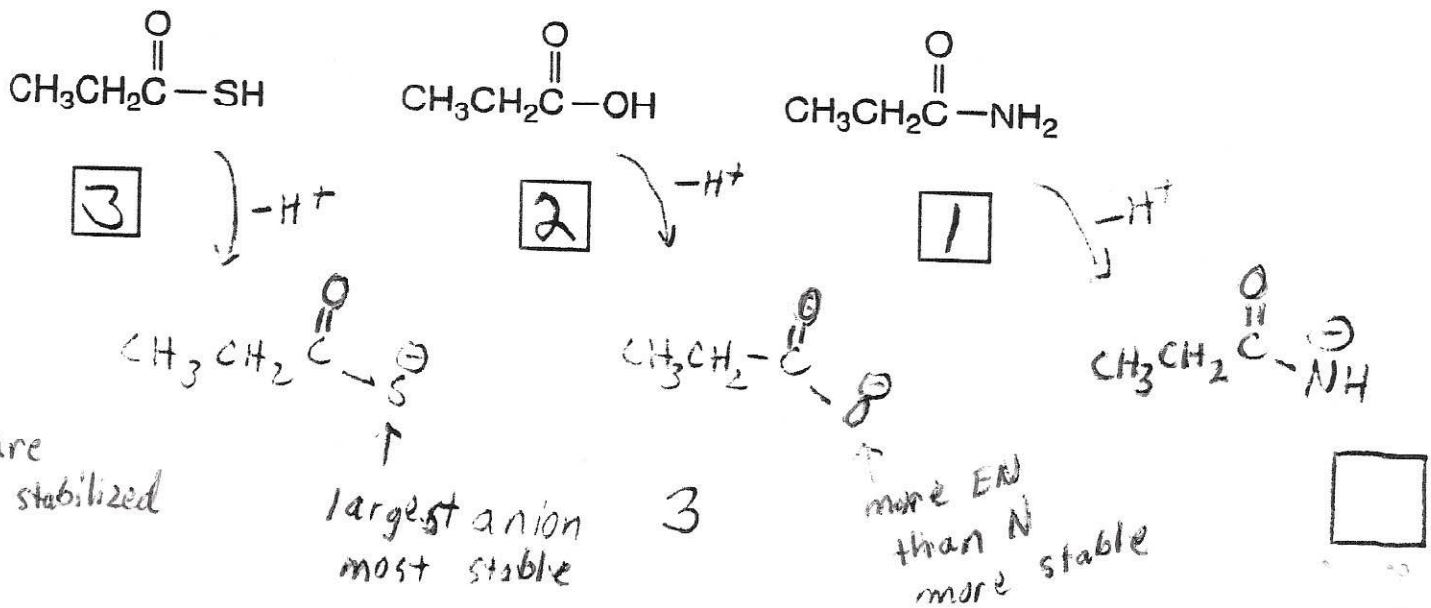
2

5. For the structure given below, draw the important resonance contributors. Circle the major contributor. (12 pts.)

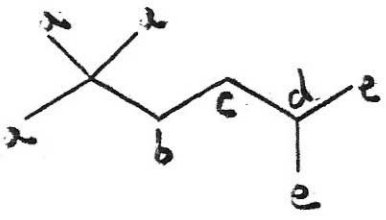


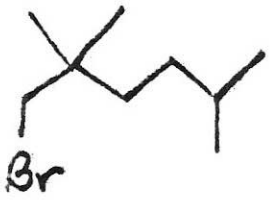
6. Place the compounds in order of increasing acidity. (1=least acidic, 3=most acidic) (6 pts.)

2 pts. each

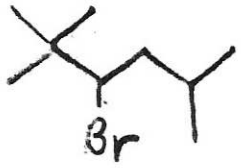


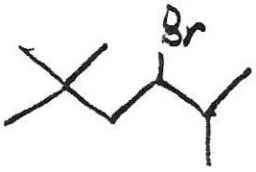
7. Draw all structural isomers resulting from the monobromination of 2,2,5-trimethyhexane (shown below). You will be penalized for duplicate structures. (10 pts.)



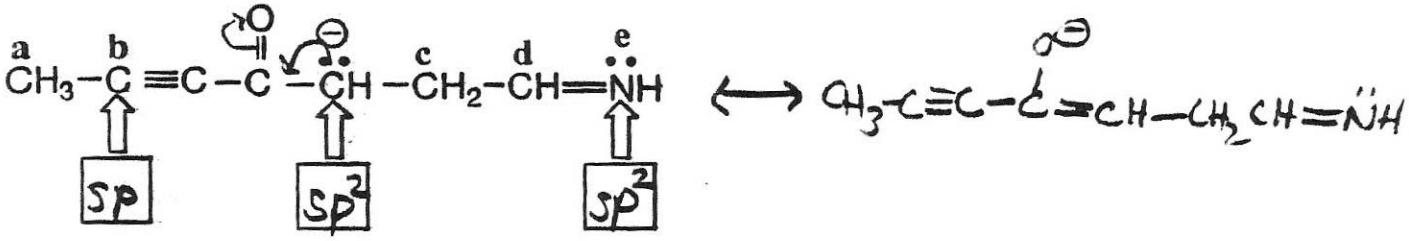


2pts each
(-1) for any duplicate or incorrect





8. Consider the structure below and answer the following questions.

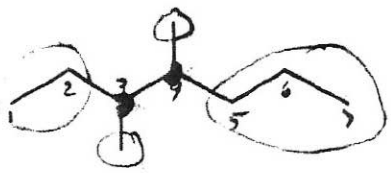


a. Write the hybridization of each atom indicated by an arrow in the box provided. (6 pts.)

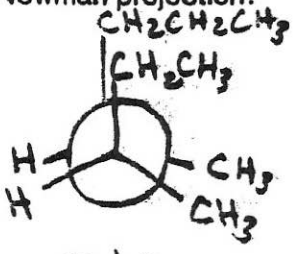
b. What is the C_c-C_d-N_e bond angle? (2 pts.) 120°

c. The sigma bond between the atoms labeled **a** and **b** is formed by the overlap of what types of orbitals? Be specific. (2 pts.) sp^3-sp

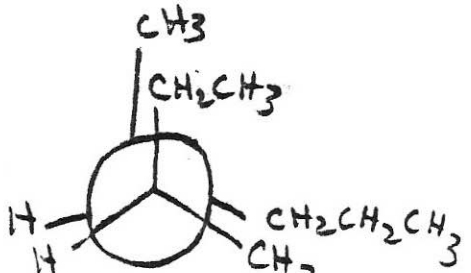
9. Viewing the molecule along the C3-C4 bond, construct the Newman projection of the least stable conformation of 3,4-dimethylheptane. (5 points)



Newman projection:

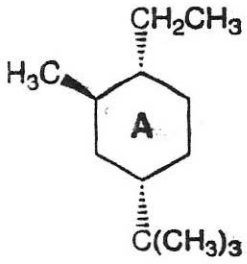


5pts

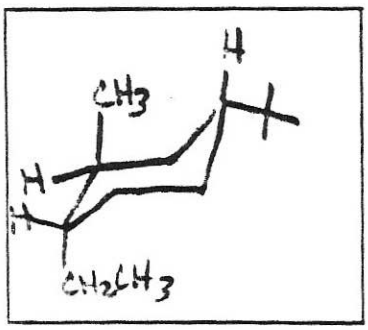


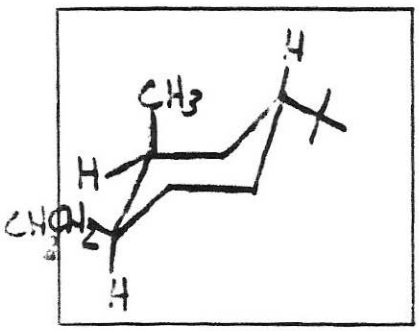
3pts

10. a. Draw the more stable chair conformation for each of the substituted cyclohexanes shown below. (8 points)



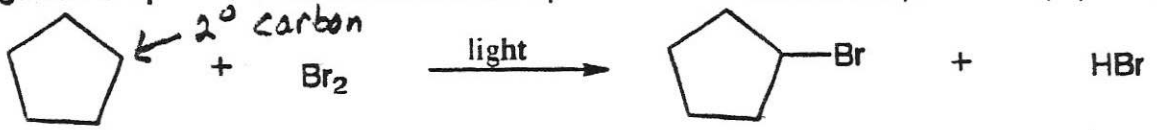
4pts each



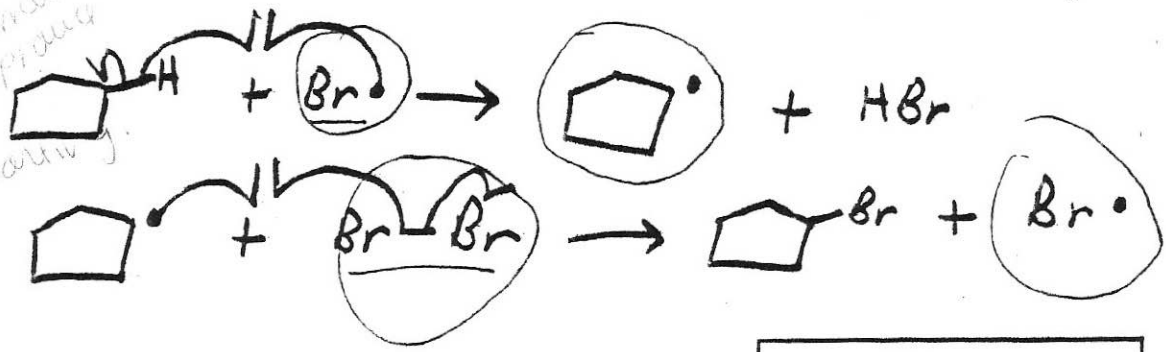


b. Which isomer is more stable? A or B? (2 points) B

11. An equation representing the halogenation of an alkane is shown below. a) Provide the **propagation steps** of the mechanism that explain the formation of the products. (6 points)

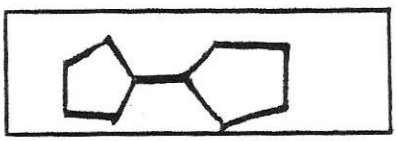


3pts



3pts

b. Consider the **termination steps**, and provide a structure for a possible side product. (2pt.)



c. Given the bond dissociation energies (BDE) below, calculate the overall Δ H°for the reaction in the box provided. You must show your work to receive credit! (4 points)

$\Delta H = (95 + 46) - (68 + 88) = -15\ kcal/mol$

$\Delta H^\circ = (95 + 46) + (-68 + -88) = -15\ kcal/mol$

d. Are the products or reactants favored at equilibrium? (2 points)

products

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		108
$(CH_3)_2CH$—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