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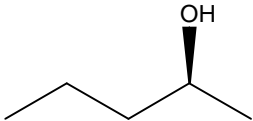
UNIVERSITY OF MEMPHIS

Department of Chemistry

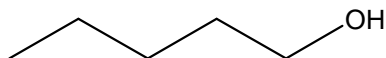
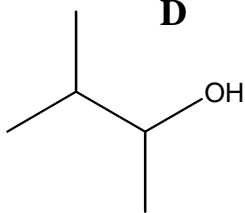
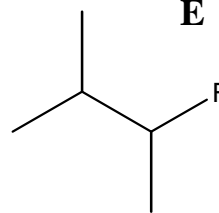
CHEM 3311 Unit I Examination, Fall 2003

Dr. Abby Parrill

1. Fill in the blanks in the following table (2% each blank=16%).

Condensed Structure	Line Structure	Name	Functional Group Names	Expected IR Peak Positions
		Z-2-heptene		
				

2. Order the following structures based on increasing boiling points. Provide a brief explanation for your order (5% order, 6% explanation=11%).

A**B****C****D****E**

Lowest

Highest

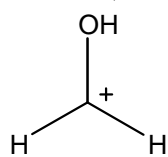
3. a. Draw the structures of the two lowest energy conformations of trans-1,4-dimethylcyclohexane.
 a. Are these two conformations you drew identical, enantiomers, or diastereomers?
 b. Identify the relative energies of the two structures (either same, or indicate the higher and lower energy conformation).
 c. Briefly explain your relative energies.

	Conformation 1	Conformation 2
Structures (a) (4%)		
Relationship (b) (2%)		
Relative Energies (c) (2%)		
Energy Explanation (d) (2%)		

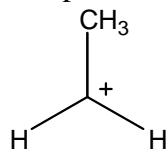
4. Identify the hybridization and geometry of the underlined carbon atom in the following structures. (3% per structure = 9%)

	Hybridization	Geometry
a. <u>C</u> H ₃ CH ₂ CH ₃	_____	_____
b. <u>C</u> H ₂ =CHCH ₃	_____	_____
c. <u>C</u> H=CCH ₃	_____	_____

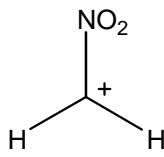
5. Order the carbocations below from least stable to most stable. Provide a brief explanation for the most and least stable. (5% order, 6% explanation=11%)



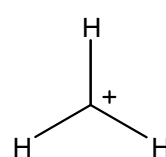
A



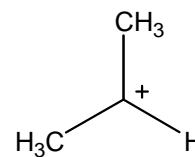
B



C



D

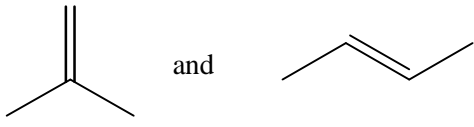


E

Least _____

Most

6. For each pair of molecules, indicate whether IR, MS or NMR would most rapidly distinguish the two. Briefly describe what difference you would look for in the spectra (only the type of spectrum you indicate). (3% per pair = 9%)

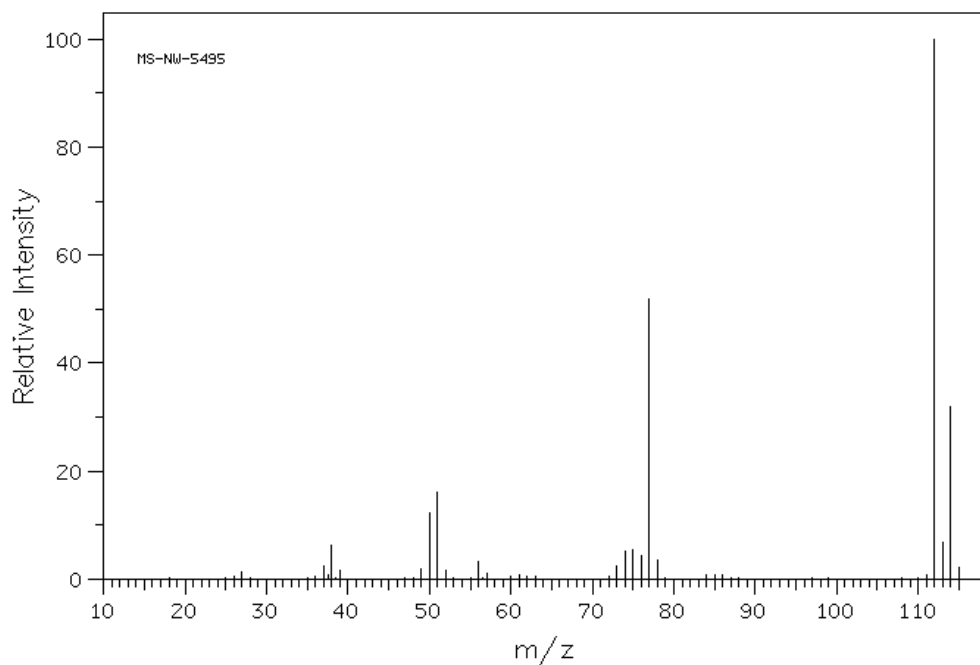
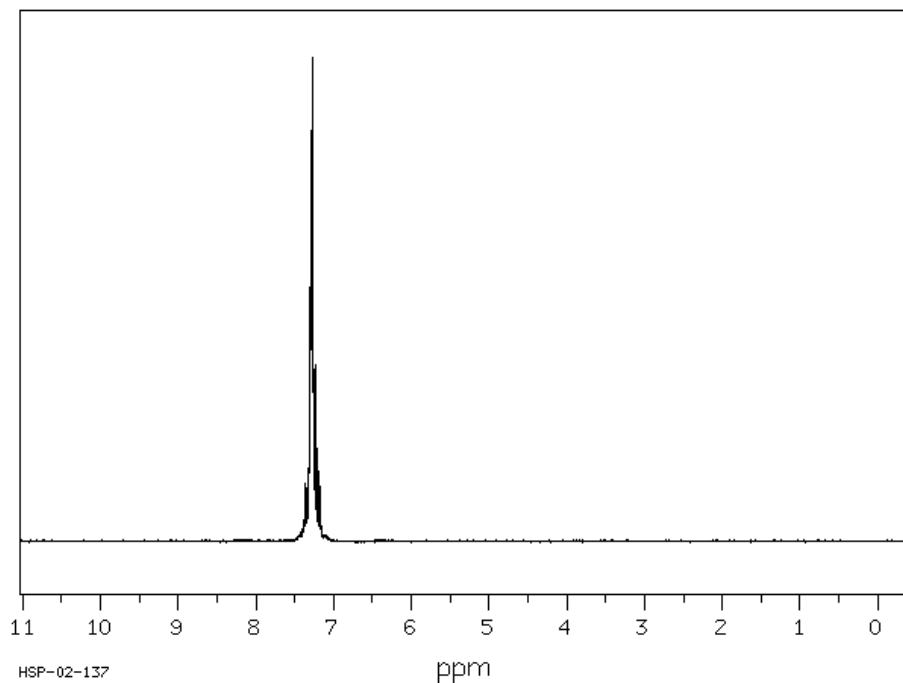
Structure Pairs	Spectrum Type	Difference
$(\text{CH}_3)_3\text{C}$ and $((\text{CH}_3)_3\text{C})_3\text{C}$		
$\text{CH}_3\text{CH}_2\text{OCH}_3$ and $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$		
		

7. a. Draw all stereoisomers of 2,3-pentanediol.
 a. Label your structures with letters (A-?), and indicate which pairs are enantiomers.
 b. Indicate which pairs are diastereomers.
 c. Select one of your isomers, and indicate the configuration of each stereogenic center.

Structures (a) (4%)	
Enantiomeric pair(s) (b) (2%)	
Diastereomeric pair(s) (c) (2%)	
Configuration (d) (2%)	Structure Label: Configuration(s):

8. The term “toxicity” is very imprecise as a number of factors influence the hazard associated with exposure to a particular hazard. Indicate at least three factors that influence “toxicity”. (6%)

9. ^1H NMR and mass spectra are shown for an unknown structure. Draw the structure and note the meaning you derived from relevant (not necessarily all) peaks in these spectra in order to derive that structure. The data below the mass spectrum are the relative abundances for peaks >100 . (5% structure, 7% meaning=12%)



m/z	rel. abundance
112.0	100
113.0	6
114.0	31
115.0	2

10. Identify the relationship between the following pairs of structures. Select from identical, non-isomeric, constitutional isomers, enantiomers or diastereomers. (2 % each pair = 6 %)

Structure Pair	Relationship
