

CHEM232/BCHM205/ENCH241

Mid-Semester Test

Thursday 1 May 2008 12 noon

ANSWER ALL QUESTIONS IN THE SPACES PROVIDED

NAME (please print clearly): _____

Student ID number: _____

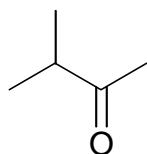
Signature: _____

Course (*circle one*): **BCHM205** **CHEM232** **ENCH241**

1. (4 marks) Using Newman projections viewed down the central carbon-carbon bond, draw the structures of the most stable and least stable conformations of (i) butane and (ii) 2,3-dimethylbutane.

2. (3 marks) Show the interconversion between the two chair conformations of methylcyclohexane and circle the conformation that is more stable.

3. (2 marks) The molecule shown below is in equilibrium with two enol tautomers. Draw them.



4. (5 marks) Draw the structures of:

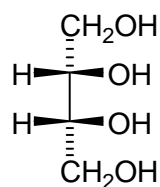
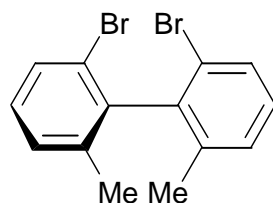
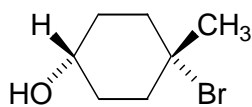
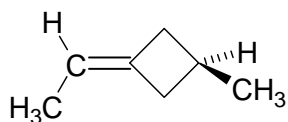
(i) a chiral molecule that does not contain a four coordinate carbon atom as its source of dissymmetry

(ii) a molecule that contains two stereogenic centres but is superimposable on its mirror image

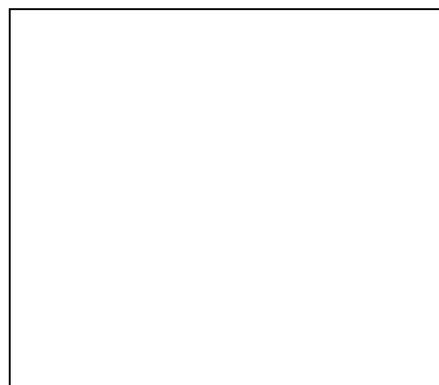
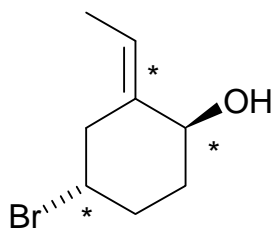
(iii) the resonance contributors for the allyl cation, $\text{CH}_2=\text{CH}-\text{CH}_2^+$

(iv) the resonance contributors for the conjugate base of nitromethane (CH_3NO_2)

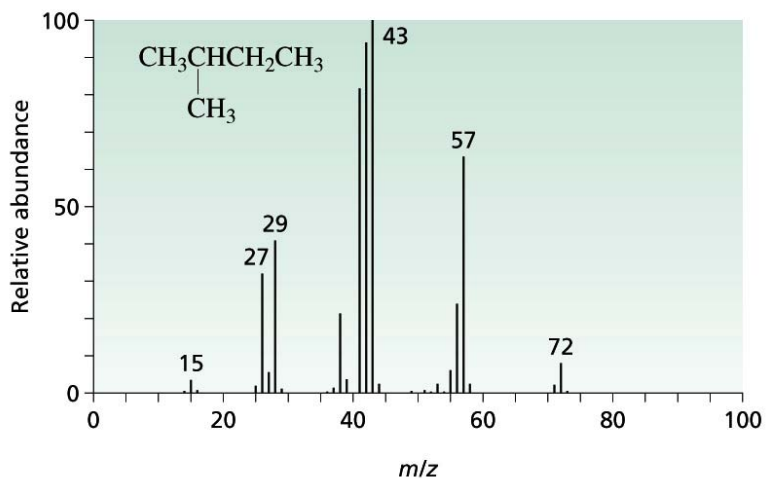
5. (4 marks) Indicate (Yes/No) whether each of the following compounds could exist as two different enantiomers.



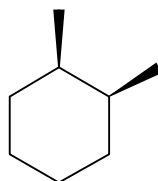
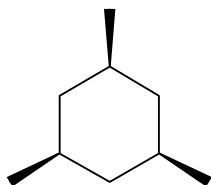
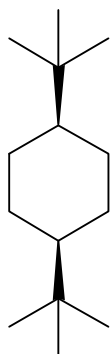
6. (4 marks) Assign appropriate stereochemical designators (R/S/E/Z) to each site labelled with an asterisk (*), and in the box draw the enantiomer of this molecule.



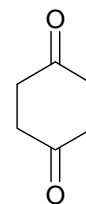
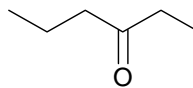
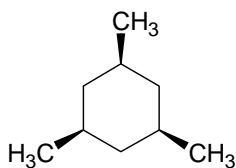
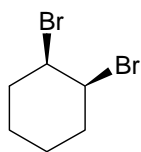
7. (1 mark) In the mass spectrum shown below circle only the peak corresponding to the molecular ion.



8. (2 marks) Which of these molecules is most likely to be locked in a single chair conformation? Draw that molecule in a chair conformation.

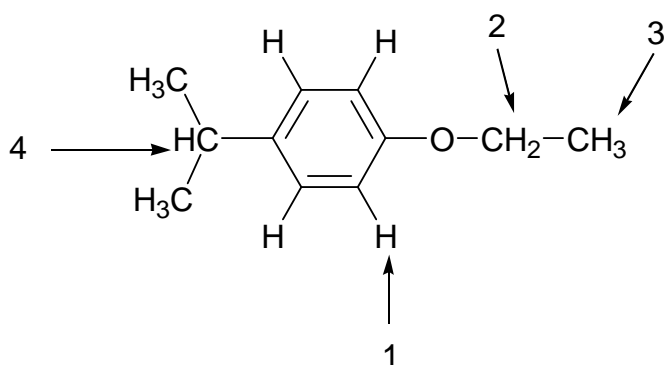


9. (4 marks) How many signals would there be in the ^{13}C NMR spectrum of each of the following compounds?



Ans:

10. (4 marks) Consider the molecule shown below. Into how many peaks would each of the protons (numbered 1 to 4) be split by spin-spin coupling?



Ans:

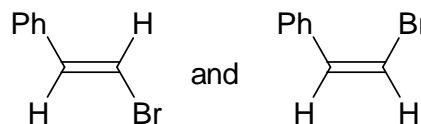
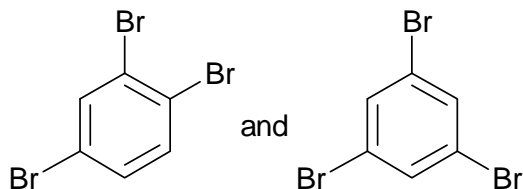
H 1

H 2

H 3

H 4

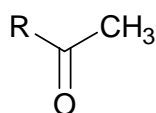
11. (3 marks) What is the simplest technique to distinguish between the following isomers?



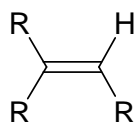
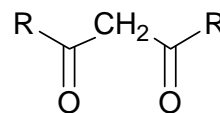
Ans:

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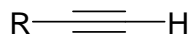
12. (4 marks) For each of the following pairs of compounds circle the one that is the more acidic.



or



or



or

