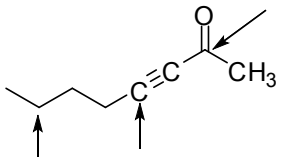
CHM 1321
Midterm 1
SAMPLE

Note: The points are given as a guide and are subject to minor changes.

Surname: _____ First name: _____

Student Number: _____

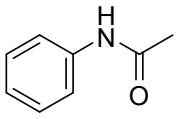
1. Identify the hybridization of the indicated atoms: **(3 points)**



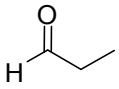
4. Draw the complete Lewis structure for the following molecules: **(4 points)**

   a. $(CH_3)_3N$

   b.



5. a) Draw the molecule below in using the LCAO method (**4 points**).



b) Label all the orbitals in part a (p, sp, sp^2, sp^3) (**3 points**).

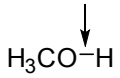
c) Label all the bonds in part a (σ, π) (**3 points**).

6.

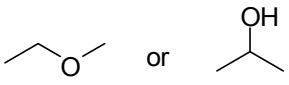
a. Identify the direction of the dipole in the indicated bonds. **(2 points)**
b. Are the indicated bonds ionic or covalent? **(2 points)**
c. Show how you came to the conclusion made in part b. **(1 points)**

i.

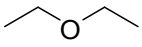
ii.



7. Circle the compound that will have the higher boiling point and explain your prediction. **(3 points)**

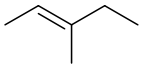


8. Would the following molecule be soluble in water? Explain your prediction. **(3 points)**



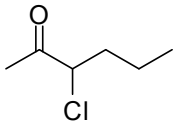
9. Give a brief explanation for "constitutional isomers" and show an example. **(3 points)**

10. Is the following molecule chiral? Explain clearly how you came to this conclusion. **(3 points)**

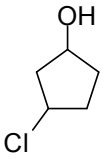


11. Name the following molecules using IUPAC nomenclature or accepted common names: **(4 points)**

a.



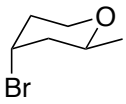
b.



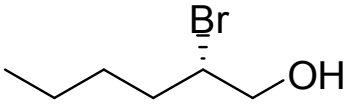
12. Draw the following molecules as line structures. **(4 points)**

a. 1,6-dibromohexane

b.



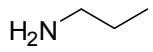
13. For the following molecule **(4 points)**
    a. Identify the stereocentre(s) with a star (*).
    b. Determine the priorities on each stereocentre.
    c. Assign the configuration of the stereocentre(s).



14.

a. Draw the two chair conformations of *cis*-1-ethyl-2-isopropylcyclohexane. **(5 points)**
b. For each structure, label the substituents as being axial or equatorial. **(2 points)**
c. Identify the most stable and least stable conformation. **(1 point)**

15. Consider the Newman projection of propan-1-amine down the C1-C2 bond.



a. Draw and name the Newman projection of the most stable conformation **(3 points)**

b. Draw and name the Newman projection of the least stable conformation **(3 points)**

16. Ephedrine has the structure shown below but with the (1*R*, 2*S*) configuration.
    a. Draw its structure with the correct configurations at the stereocentres. The priorities given to each group to determine the correct structure must be indicated (redrawing the structure for each chiral centre helps). **(4 points)**
    b. Draw a diastereomer of ephedrine. **(2 points)**