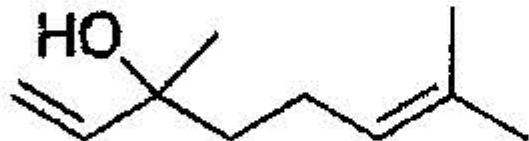


Organic Chemistry I first mid-term exam

Name _____ Class _____ Student ID _____

(60%) I. SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

- 1) Provide the mathematical equation for the dipole moment of a bond, and identify the variables. 1) _____
- 2) Draw condensed structures for the four compounds with formula C_3H_9N . 2) _____
- 3) Draw a Lewis structure for the molecule given and show all formal charges.
 CH_2CO 3) _____
- 4) Draw the Lewis structure for $CH_3N_2^+$. 4) _____
- 5) In 2015, the European Space Agency's Philae Lander detected the presence of methylisocyanate CH_3NCO on the comet 67P. Draw the Lewis structure of this compound, showing all lone pairs. 5) _____
- 6) Several volatile compounds are responsible for the aroma of plums. One of these compounds is linalool whose skeletal structure is shown below. Convert it into Kekulé structure. 6) _____

- 7) Explain why : NF_3 is a weaker base than : NH_3 . 7) _____
- 8) Would you predict trifluoromethanesulfonic acid, CF_3SO_3H , to be a stronger or weaker acid than methanesulfonic acid, CH_3SO_3H ? Explain your reasoning. 8) _____
- 9) Which of the following anions, $CH_3CHBrCO_2^-$ or $CH_3CHFCO_2^-$ is the stronger base? Explain your choice. 9) _____
- 10) At what pH will the concentration of a compound with a pK_a of 5.7 be 100 times greater in its acidic form than in its basic form? 10) _____

11) Explain why AlCl_3 is a Lewis acid.

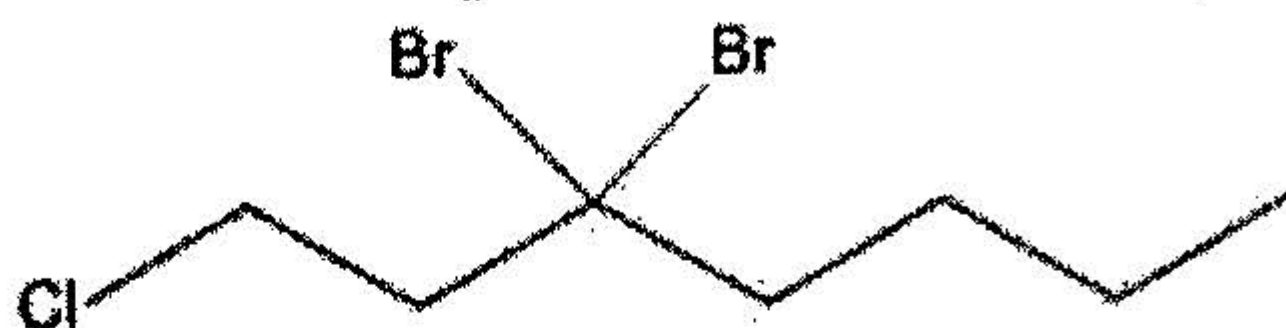
11) _____

12) Draw an acceptable structure for 6-ethyl-2,6,7-trimethyl-5-propylnonane.

12) _____

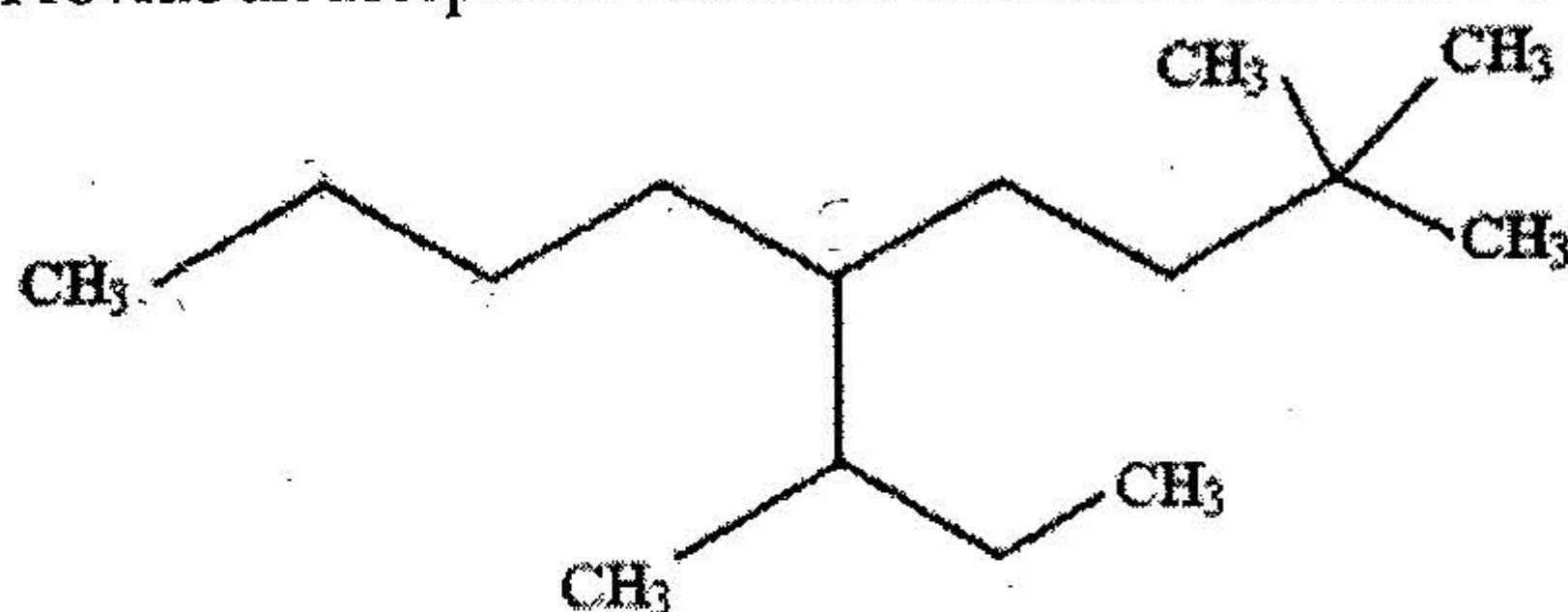
13) Provide an acceptable name for the compound shown below.

13) _____



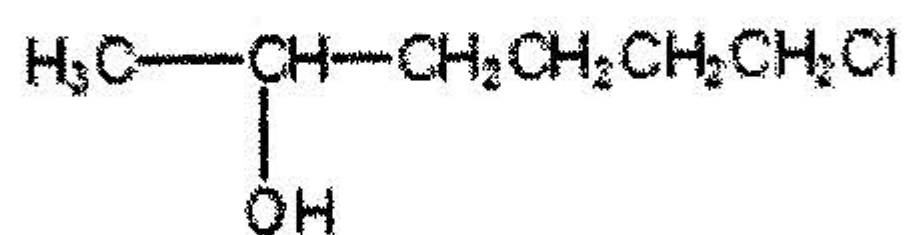
14) Provide an acceptable name for the alkane shown below.

14) _____



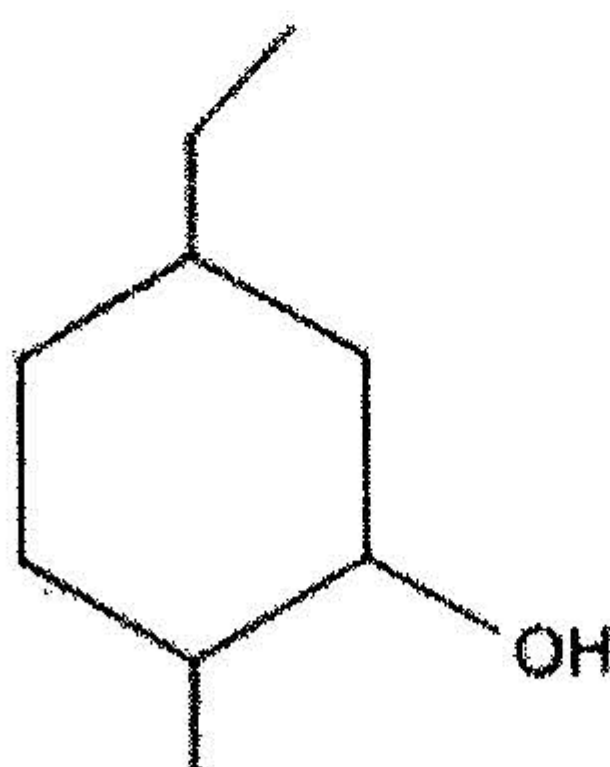
15) Name the structure.

15) _____

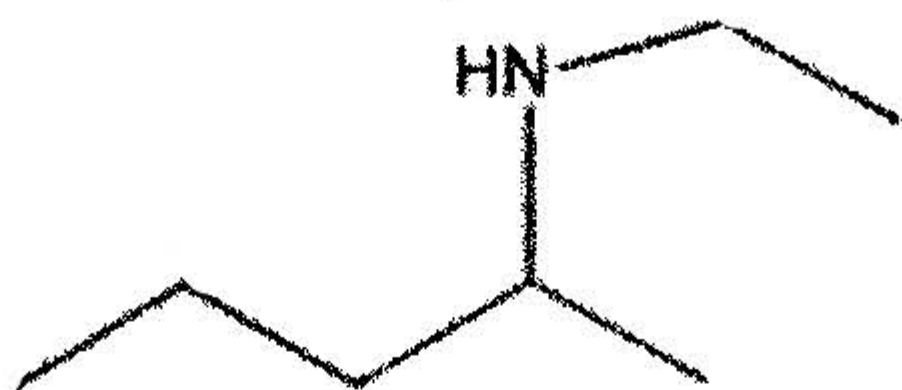


16) Provide an acceptable name for the compound shown below.

16) _____



17) Provide an acceptable name for the compound shown below.



17) _____

18) Draw the structure of 3-chloro-N-ethyl-2-hexanamine.

18) _____

19) Give the structure of tetramethylammonium chloride.

19) _____

20) Which compound is more soluble in water? Briefly explain your choice.
 CH_3OCH_3 or $\text{CH}_3\text{CH}_2\text{OH}$

20) _____

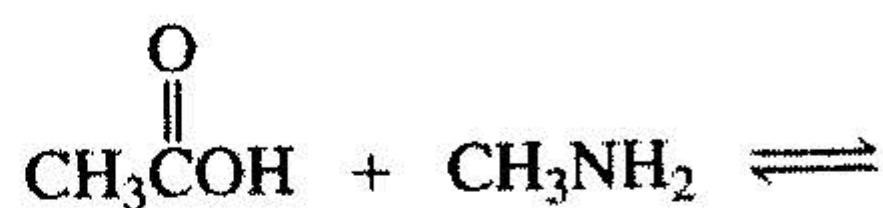
(II) Draw a Lewis structure for each of the following species (specify the formal charge clearly) :



4% (III) For the following compound, $\text{H}_2\text{NCH}_2\text{COOH}$

(a) draw its conjugate acid. (b) draw its conjugate base.

6% (IV) Give the products of the following acid-base reactions and indicate whether reactants or products are favored at equilibrium. Write down the $\text{p}K_a$ values for the acids given in both sides.

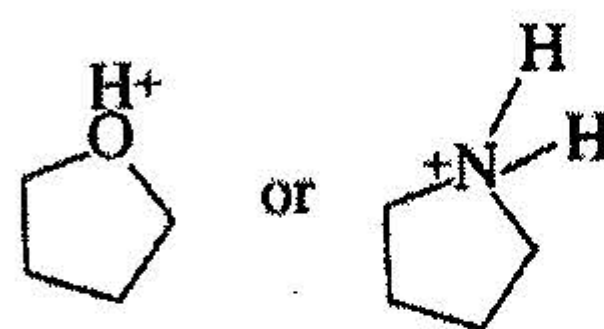


6% (V) Which is a stronger acid? Why?

(a)



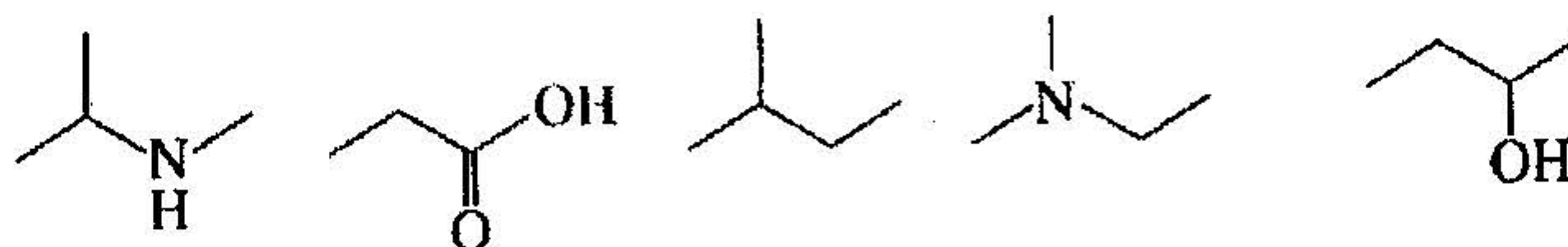
(b)



6% (VI) List the following compounds in order from strongest acid to weakest acid. Explain the reasons.



8% (VII) List the following compounds from highest boiling to lowest boiling. Explain your reasons.



4% (VIII) Show the direction of the dipole moment in each of the following bonds (use the electronegativities given in Table 1.3):



4% (IX) Rank the following compounds from highest dipole moment to lowest dipole moment. Explain your reasons.



- 10% (X)** (a) Which of the species have bond angles of 109.5° ?
(b) Which of the species have bond angles of 120° ?



4% (XI) (a) Draw the structures for the following compound names (b) Re-name the compound with a correct IUPAC systematic name if the nomenclature was incorrect.

(a) 4-bromo-3-pentanol

(b) 2-methyl-*N, N*-dimethyl-4-hexanamine

6% (XII) Draw the staggered conformer and eclipsed conformer of ethane, using Perspective Formulas, Sawhorse Projections, and Newman Projections.