Organic Chemistry I, CHM 3140
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Exam I Review (Chapters 1/2/3) – Practice Problems

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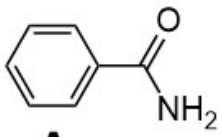
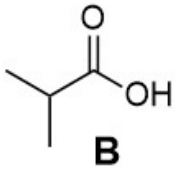
1

Which is the stronger acid? Explain briefly.



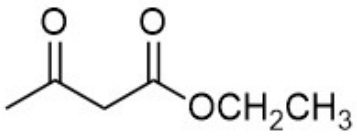
A



B

2

Identify the most acidic proton(s) in the following compound. Explain briefly.



3

Complete the given Lewis structures and provide curved arrows for the proton-transfer reaction that occurs. Predict the products and determine the direction of the equilibrium (forward or reverse favored?). Explain briefly.

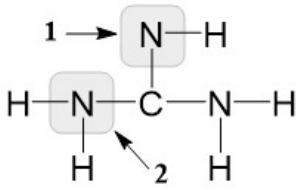
4 Draw the **conjugate acid** for each (complete Lewis structure):

$H^{\ominus}$ H_2O $^{\ominus}CH_2NO_2$ CH_3OCH_3 $H_2C{=}CH_2$

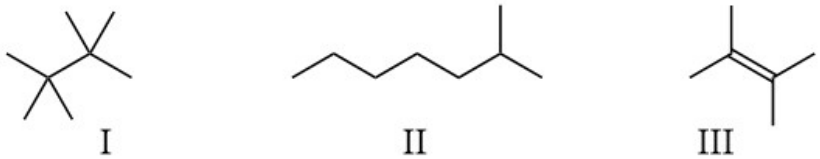
5 Draw the **conjugate base** for each (complete Lewis structure):

H_2O $CH_3\overset{\oplus}{N}H_3$ CH_3NH_2 $HC{\equiv}CH$

6 a) Complete the Lewis structure for guanidine (σ bonds shown)
b) Draw all resonance contributors, rank them & explain.
c) Which is the more basic Nitrogen atom (**1** or **2**)? Explain.



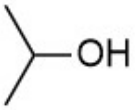
7 Arrange the given compounds in the order of INCREASING boiling point (from lowest bp to highest bp).



I II III

8 Two of the following compounds are miscible in water. Identify the one that is not, and briefly explain.

I



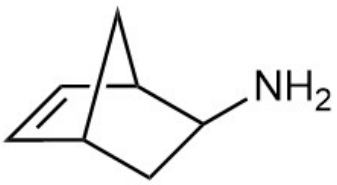
II

III

9 Draw a complete Lewis structure, and provide a 3D sketch.

$NaOCHC(CH_3)_2$

10



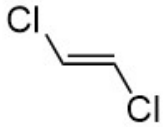
Draw in missing H atoms.

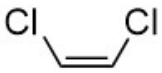
Formula?_____

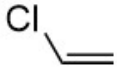
Nitrogen lone pair is: localized / delocalized

Hybridization of N atom?_____

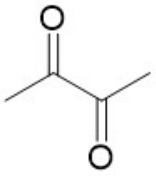
11 Match the following compounds with the given boiling points: 60°C, 49°C, -13°C.





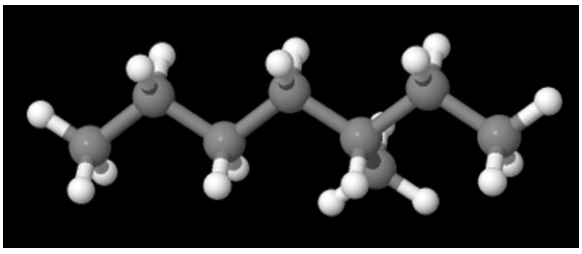


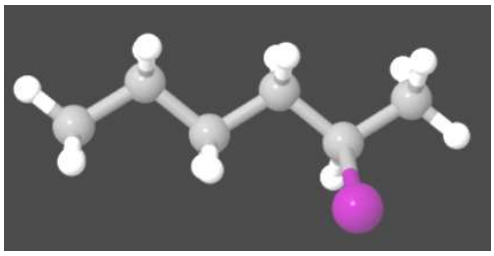
12 Diacetyl occurs naturally in many foods and alcoholic beverages, and it has a buttery flavor. Does pure diacetyl exhibit hydrogen bonding? Explain. Demonstrate the hydrogen bonding that occurs in an aqueous solution of diacetyl.



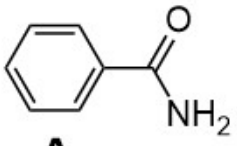
Diacetyl
(2,3-butanedione)

13 Provide a line drawing for each of the given 3D models (gray = carbon, white = hydrogen, purple = iodine.

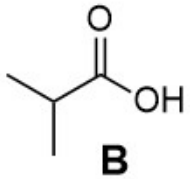




1 Which is the stronger acid? Explain briefly.

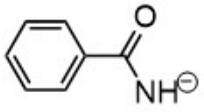


A

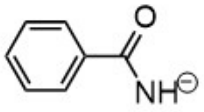


B

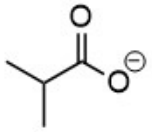
A) **A** is the stronger acid because this is the **less** stable conj. base:



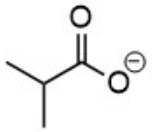
B) **A** is the stronger acid because this is the **more** stable conj. base.



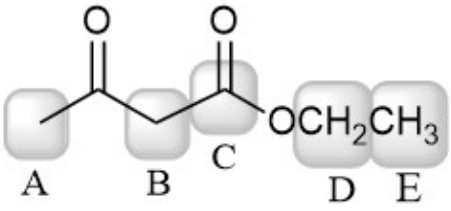
C) **B** is the stronger acid because this is the **less** stable conj. base.



D) **B** is the stronger acid because this is the **more** stable conj. base.



2 Identify the most acidic proton(s) in the following compound.



Provide an explanation for your answer.

I. The conj. base is stabilized by inductive effects.
II. The negative charge in conj. base is on an electronegative atom.
III. The conj. base is stabilized by a large amount of resonance.

A) I only
B) II only
C) III only
D) Both I and II
E) Both II and III

3 Complete the given Lewis structures and provide curved arrows for the proton-transfer reaction that occurs. Predict the products and determine the direction of the equilibrium (forward or reverse favored?). Explain briefly.

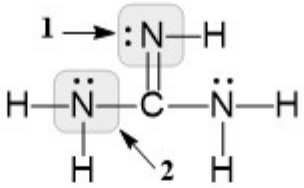
A) **Reverse** reaction is favored. (-) charge on electronegative fluorine atom is more stable, making F^- a **weaker base** than Br^-.

B) **Forward** reaction is favored. (-) charge on electronegative fluorine atom is more stable, making F^- a **weaker base** than Br^-.

C) **Reverse** reaction is favored. (-) charge on larger bromine atom is more stable, making Br^- a **weaker base** than F^-.

D) **Forward** reaction is favored. (-) charge on larger bromine atom is more stable, making Br^- a **weaker base** than F^-.

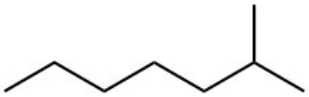
6



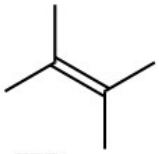
	Lone pair on N #1 is...	Lone pair on N #2 is...	More basic Nitrogen?
A)	localized	delocalized	#1
B)	localized	delocalized	#2
C)	delocalized	delocalized	#1
D)	delocalized	delocalized	#2

7 Arrange the given compounds in the order of INCREASING boiling point (from lowest bp to highest bp).

I



II



III

A) I < II < III

B) II < I < III

C) I < III < II

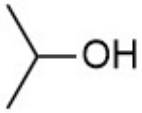
D) III < I < II

E) III < II < I

8 Two of the following compounds are miscible in water. Identify the one that is not, and briefly explain.

I

II



III

A) I is not miscible because it is too large.

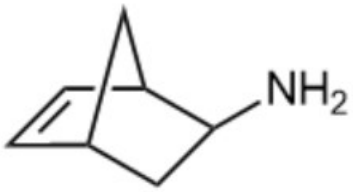
B) I is not miscible because it is the least polar.

C) II is not miscible because it is the least polar.

D) II is not miscible because it is branched.

E) III is not miscible because it is the least polar.

10



Draw in missing H atoms.

Formula?_____

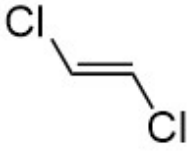
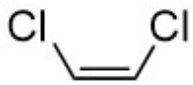
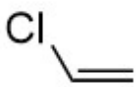
Nitrogen lone pair is: localized / delocalized

Hybridization of N atom?_____

A) localized, sp^2
B) localized, sp^3
C) delocalized, sp^2
D) delocalized, sp^3

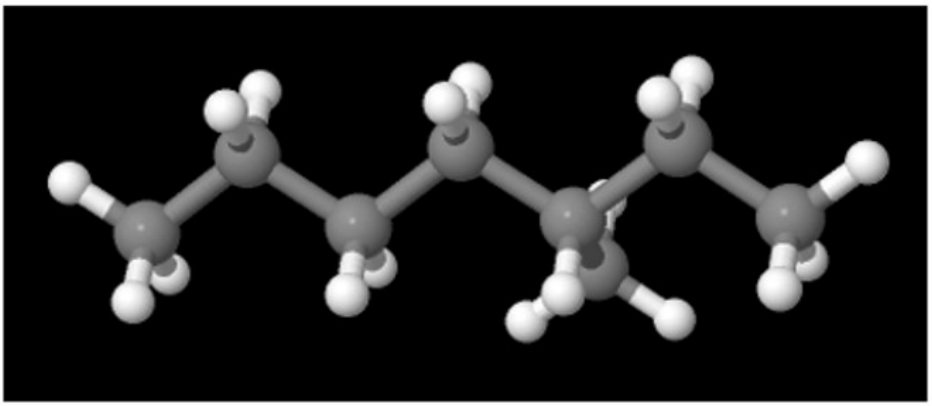
11

Match the following compounds with the given boiling points: 60°C, 49°C, -13°C.

			
A)	60	49	-13
B)	49	60	-13
C)	60	-13	49
D)	49	-13	60
E)	-13	60	49

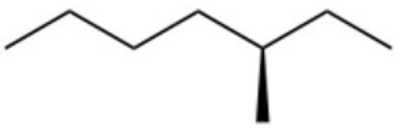
13a

Which bond-line drawing best matches the given 3D representation?

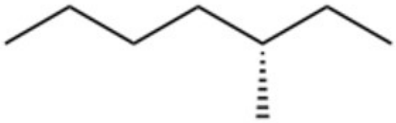


A

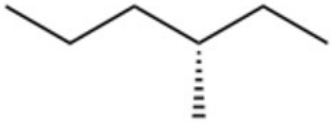
B



C

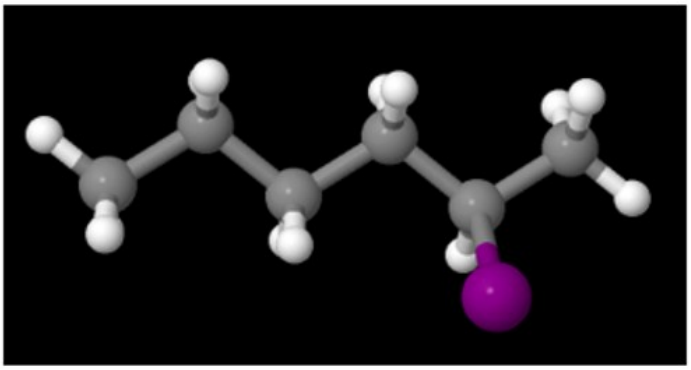


D

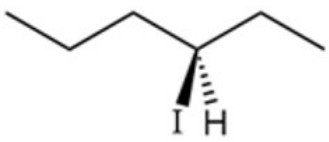


13b

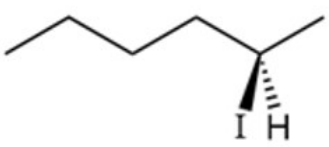
Which bond-line drawing best matches the given 3D representation?



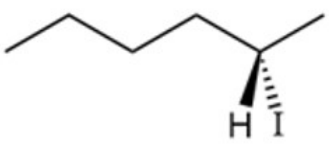
A



B



C



D