Time: 60 min

Feb 27, 2015

Chemistry 208
Exam 1

Family Name: _____

First Name : _____

I.D. # :

Please circle your recitation section

Section 1	9 M	Randa Jaber
Section 2	11 W	Hana Deeb
Section 3	10 W	Randa Jaber

Kindly read and understand the following points:

- Make sure you write your **name**, **ID #** and **section**.
- The penalty for **Cheating** is a grade of **zero** on the exam.
- Cellular phones should be turned off.
- Total number of pages including this cover is 6

1.	13 / 20
2.	12 / 18
3.	11 / 15
4.	12 / 12
5.	20 / 35
6.	0 / 05
Total:	66 /105

Good Luck! ☺

1. Answer the following questions:

a) The formal charges on the nitrogen and oxygen in the following structure are, respectively

5-4=1

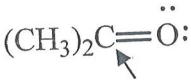
6-6-1=-1

Answer 1, -1

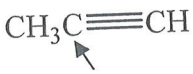
Show your work (-1)

b) What is the hybridization of the indicated carbon (by arrow) in each of the following compounds:

Answer sp_3



Answer sp_2



Answer sp

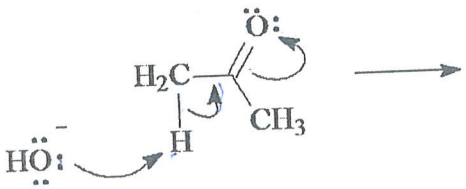
c) How many ***sigma*** **(σ)** and how many ***pi*** **(π)** bonds are present in the following structure?

3 (π)

6 (σ)

Answer 2(σ) and 1(π) -4

d) Identify the species which results from the following movement of electron pairs



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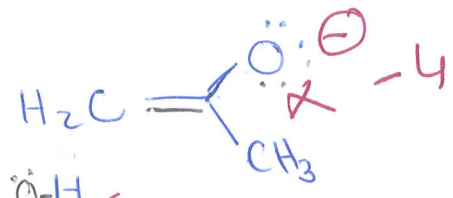
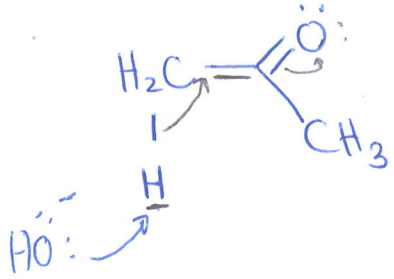
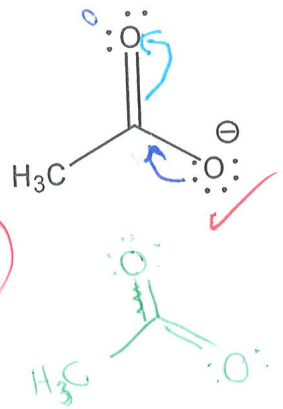




12

2. Using curved arrows show how each of the following could be generated and give the structure of the product. Specify formal charges if any.

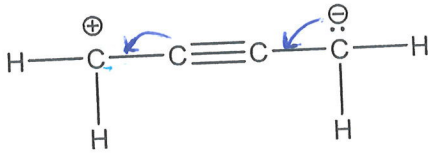
a) An equally stable resonance structure of:



(2)

Answer

b) The most stable resonance contributing structure of:



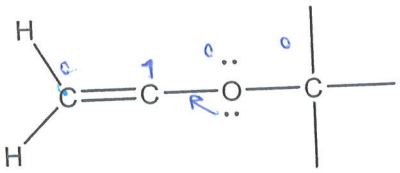
(6)

Answer

the - is one the more electronegative and C has a complete octet rule.

c) A less stable resonance contributing structure of:

review



(4)

Answer

3. Consider the following acid base reaction: (11)

$$CH_3CH_2O^- + NH_3 \rightleftharpoons CH_3CH_2OH + NH_2^-$$

a) Give the products of the reaction and identify the acid, base, conjugate acid and comjugate base

$CH_3CH_2O^-$ + NH_3 ⇌ CH_3CH_2OH + NH_2^-

Base — Acid — Conjugate Acid — Conjugate Base

b) Label the stronger and weaker acids and bases in the above reaction

here O is more electronegative than N.

$CH_3CH_2O^-$ + NH_3 ⇌ CH_3CH_2OH + NH_2^-

W.B — W.A — S.A — S.B

c) Is the value of the equilibrium constant K greater or less than 1?

review

$K < 1$

d) Which is a stronger base $CH_3CH_2O^-$ or $CH_3CH_2S^-$? Explain briefly

(-4)

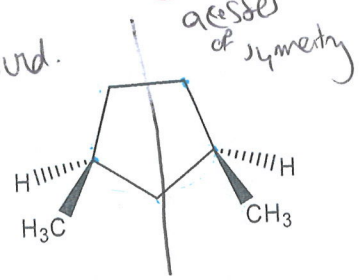
$CH_3CH_2O^-$ → CH_3CH_2OH

$CH_3CH_2S^-$ → CH_3CH_2SH

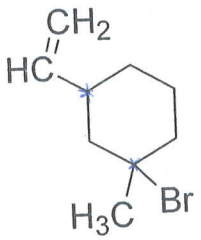
this is more acid ∴ $CH_3CH_2O^-$ is the weaker base and $CH_3CH_2S^-$ is the strongest base

4. Identify the following as chiral or achiral, if chiral specify the number of stereogenic centers (12)

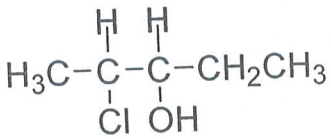
Meso compound.



Achiral



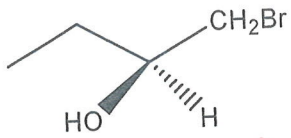
Chiral, 2



Chiral, 2

5. Identify the relationship in each of the following pairs. Do the drawings represent: constitutional isomers, or stereoisomers, or they are just different ways of drawing the same compound (identical). If they are stereoisomers are they enantiomers or diastereomers? Show your work, NO credit for guessing!

a)



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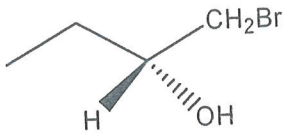
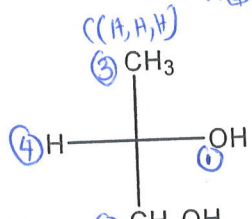


Answer: stereoisomers, diastereomers enantiomers

b)



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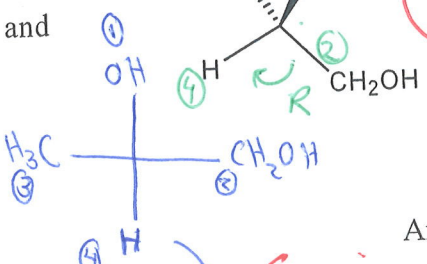
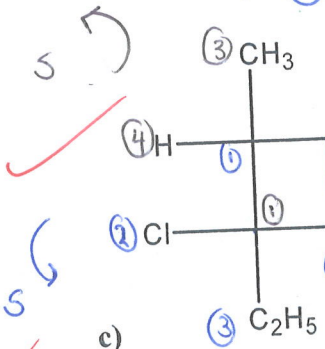


Answer: stereoisomers, enantiomers

c)



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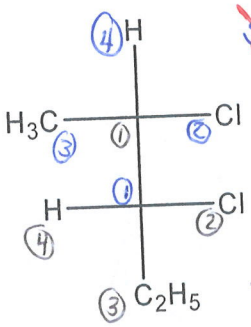
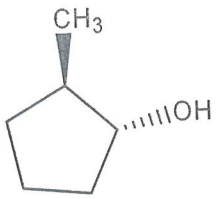


Answer: stereoisomers, diastereomers

d)



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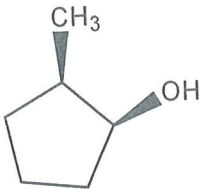
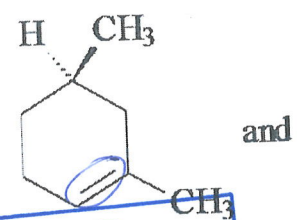


Answer: ~~identical~~ same compound.

diastereomers.

e)



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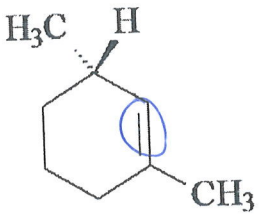

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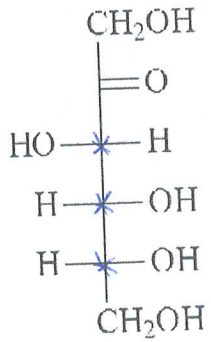
Answer: constitutional isomers.

Bonus question (5pts)

How many stereoisomers are there of D-fructose (including D-fructose), shown below?

0



3 stereoisomers

8

2^n

$2^3 = 8$