Benha University **Time : 2 hrs.**

Faculty of Science **1st Term (2014/2015)**

Chemistry Department **Date : 1 /1/2015 (Jun.2014)**

Organic photo and Stereochemistry Final Exam. (415 Ch.) ; for 4th level (Spec. Chem.). Students.

Answer the following questions –

1. Define the following : **[(6x2) + (2x4)= 20 marK]**

- Enantiomers
- Stereoisomers
- Diastereomers
- Conformation of Alkane
- Meso forms
- Optical activity
- Racemic mixture
- Photochemistry

- **Enantiomers** - Nonsuperposable mirror images, or chiral molecules which are mirror images.
- **Diastereomers -** Stereoisomers which are not enantiomers (or mirror images).

-Stereoisomers - Compounds that have the same molecular formula and the same connectivity,but different arrangement of the atoms in 3-dimensional space. Stereoisomers can not be converted into each other without breaking bonds.

-Meso compounds, or meso forms - Symmetric, or achiral molecules that contain stereocenterse half mirror image for the another . But the Meso compounds and their mirror images are not stereoisomers, since they are identical.

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Racemic mixture, racemic modification, or racemate – A mixture consisting of equal amounts of enantiomers. A racemic mixture exhibits no optical activity because the activities of the individual enantiomers are equal and opposite in value, there by canceling each other out.

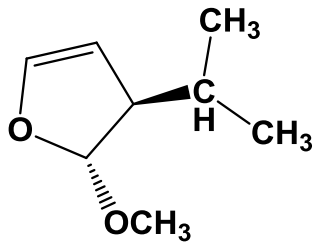
- **Conformation of Alkane:** Free rotation around single bond.

- **Optical activity:** The ability of chiral substances to rotate the plane of polarized light by a specific angle.

- **Photochemistry:** is the branch of science which deals with chemical reactions which occurred by the absorption of light waves which are called photons of energy.

- _____

2.a. For the structure below, answer the following questions :(**6 mark**)



- **How many stereoisomers exist for this compound ?** **2**
- **Assign (R) and (S) for each chiral carbon?** 2 S , 3 R

b. How can you convert wedge formula to fisher formula for the following compounds : **(6 mark)**

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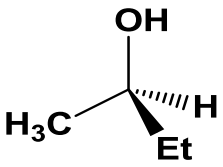
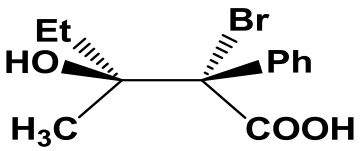
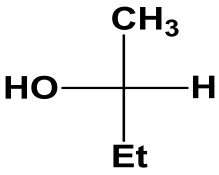
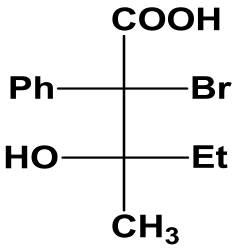
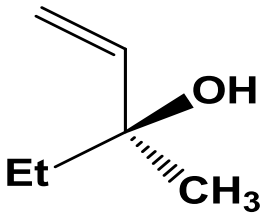




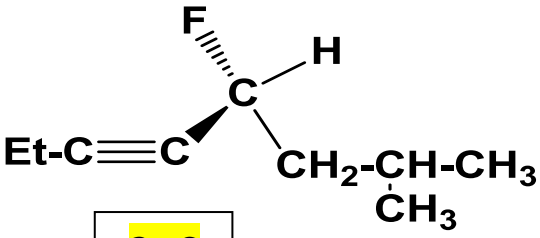




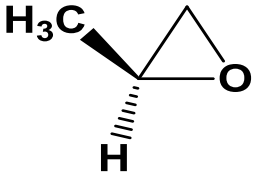
c. Assign a R or S configuration for each stereo-center: (8 mark)



1 S

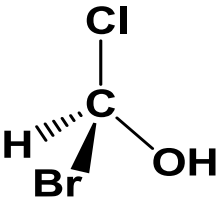


2 S



3 S

4 R



3.Encircle only one correct answer for each of the following:

a. Enantiomers have identical physical properties with the exception that

(3 mark)

i. Melting or boiling point are differ.

ii. Rotate the plane of polarized light in opposite directions although [α] is identical.

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iii. Rotate the plane of polarized light in opposite directions but [α] is not identical.

iv. Solubility in water.

b. Hexane and 3-methyl pentane are examples of (3 mark)

i. Enantiomers iii. Constitutional isomers

ii. .Stereoisomers iv. Conformation isomers.

c. How many asymmetric carbons atom are present in

3-ethyl-2,2,4-trimethylpentane **(3 mark)**

i. One ii. Two iii. Three iv. Four

d. Methylpropylether and diethylether are examples of: (2 mark)

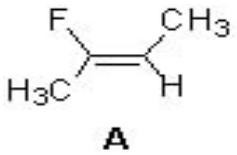
i. Chain isomers ii. Position isomers

iii. Metamersim iv. **Functional** isomers

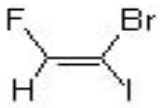
e. **(3R,4S)-3,4-dibromohexane is (3mark)**

i. Optical active ii. Meso compound iii. Racemic mixture

f. . Determine the double bond stereochemistry (*E* or *Z*) for the following molecules**. (2 mark)**



A

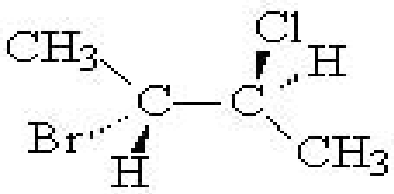


B

i.. **A**: *E*; **B**: *E* ii **A**: *Z*; **B**: *Z*

iii.**A**: *E*; **B**: *Z* iv.. **A**: *Z*; **B**: *E*

g. . What is the correct name for this molecule? **(2 mark)**



i.(2*R*,3*R*)-2-bromo-3-chlorobutane ii. (2*S*,3*R*)-2-bromo-3-chlorobutane

iii.(2*S*,3*S*)-2-bromo-3-chlorobutane iv. (2*R*,3*S*)-2-bromo-3-chlorobutane

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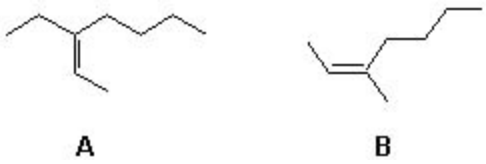
h. Determine the double bond stereochemistry (*E* or *Z*) for the following molecules. (**2 mark)**



i.. **A**: *E*; **B**: *E*
ii.**A**: *E*; **B**: *Z*
ii.. **A**: *Z*; **B**: *Z*
iv. **A**: *Z*; **B**: *E*

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4.a. **Compared between each of the pairing**: (**Collect 20 mark**)

i. Conformation of cyclopropane & conformation of cyclohexane

(**Stability , Types of strain**) (3 mark)

i. Thermal reaction & photochemical reaction: (2 mark)

Difference between thermal and photochemical reactions:-

Thermal reaction	Photochemical reaction
1.These reactions involve absorption or evolution of heat.	1.These reactions involve absorption of light.
2. They can take place even in absence of light.dark.	2.The presence of light is the primary requisite for reaction to

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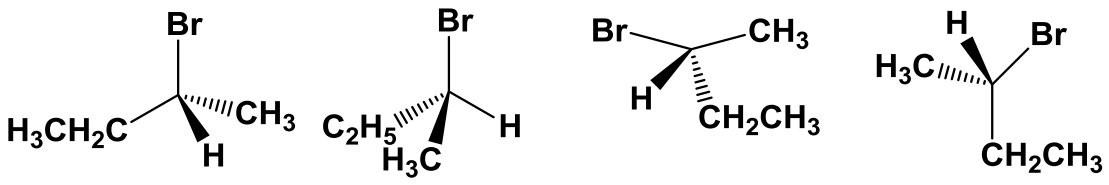
	take place.
3.Temperature has significant effect on the rate of thermo-chemical reaction.	**3.**Temperature has very little effect on the rate of photochemical reaction. Instead, the intensity Of light has a marked effect on the rate of a photochemical reaction.
4.The free energy change **ΔG** of thermochemical reaction is always negative.	**4.**The free energy change ΔG of a photochemical reaction may not be negative. They are accelerated by the presence of a catalyst. Some of these are initiated by the presence of a photosensitizer. However a photosensitizer acts in a different way than a catalyst.

b. Which of the following structures is different form the other three ?

(3mark)



1 2 3 4

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C. Write short note on distereomers properties **with a suitable example? (4 mark)**

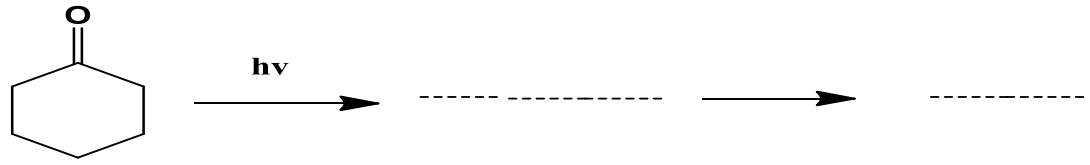
d. Resolution of racemic , Clarify your answer with suitable example?(4 mark)

e. Complete the following reaction or statements [(1x6) + (2x3)= 12 mark)]

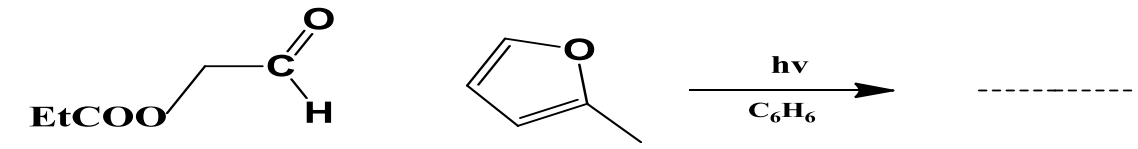
i - $CH_3CH=CH-CH_3$ + Cl-Br ⟶ ……

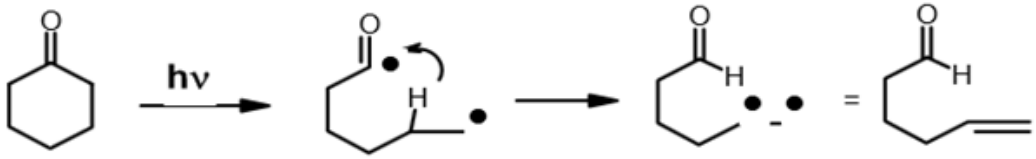
(<u>For the above reaction give the relationships between molecules products with two or more chiral centers</u>).

ii. -



iii. -





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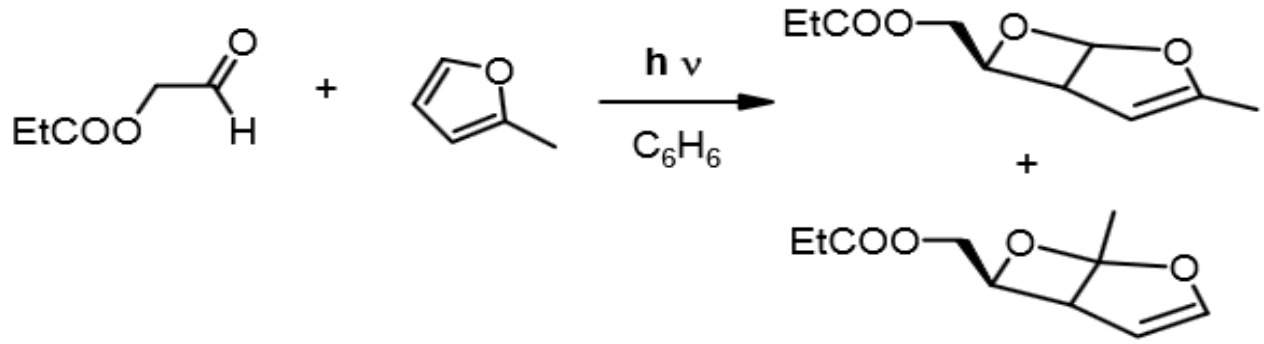
Examples:



R. Hambalek, G. Just, *Tetrahedron Lett*. **1990**, *31*, 5444 – 5448.

With my Best Regard

Prof. Dr. Wagdy I. El-Dougdoug

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