

B.E. FOOD TECHNOLOGY AND BIO-CHEMICAL ENGINEERING FIRST YEAR SECOND SEMESTER (Old)-2019

Subject: ORGANIC CHEMISTRY

Time: Three hours

Full Marks: 100

Different parts of the same question should be answered together

Q.1. Answer any one from (a) and (b)

- a) i) Draw the Fischer projection formula of Meso-HOOCCHOHCHOHCOOH.
ii) Show the symmetry element present in methane molecule.
iii) Draw the Fischer projection formula of $\text{CH}_3\text{CH}(\text{OH})\text{COOH}$
iv) Draw the Newman projection formula of ethane.

- b) i) Give an example of i) allene ii) alkyne
ii) Write down the Sawhorse formula of ethane.
iii) Draw the flying-wedge formula of chloroform.
iv) Write down the common (or IUPAC) name of the following compounds



4x2.5=10

Q2. Answer both (a) and (b)

- a) i) Explain cis-trans isomerism with example ?
ii) Explain the term "Enantiomer" and "Diastereomer" with appropriate example.
iii) Specific rotation of an enantiomeric mixture is (+) 15.90 and the specific rotation of the R-enantiomer is -38.90, determine the percentage of each isomer in the mixture.

- iv) How many chiral carbon atoms are there in 2,3-dichlorobutane ?

4+4+2+2=12

- b) i) Draw the energy diagram for the conformations of ethane arising out of rotation around C(1)-C(2) bond and label maxima, minima with appropriate conformation in Newman projection formula.
ii) Draw the orbital picture of $\text{CH}_2=\text{C}=\text{CH}_2$. Indicate the state of hybridization of each carbon atom.

4+4=8

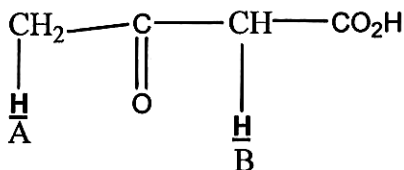
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Q3. Answer any two from (a), (b) and (c)

a) i) Arrange the following compounds with increasing order of acidity and give reason.



ii) Which hydrogen (A or B) in the following compounds is more acidic and why?

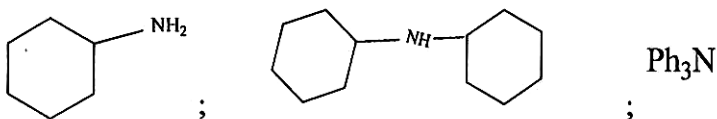


iii) Write down the structure of the following compounds (any four)

p-toluidine, β -naphthol, benzoic acid and acetone, nitrobenzene, aniline

4+2+4=10

b) i) Arrange the following compounds with decreasing order of basicity. Justify your answer.



ii) Why phenol is more acidic than ethanol?

iii) Primary aromatic amine is less basic than primary aliphatic amine. Explain.

5+2.5+2.5=10

c) i) 2,4,6-trinitro phenol (picric acid) is more acidic than phenol. Explain.

ii) Explain why PK_{a1} for cis-butenedioic acid is 1.92 but PK_{a1} for trans-butenedioic acid is 3.02

iii) What product will you get if benzoic acid is treated with aqueous potassium hydroxide? Give reasons in support of your answer.

iv) Which one of the following pair is more stable and why?

Formate and acetate

3+3+2+2=10

Q.4. Answer any one from a and b

a) i) Write a short note on heat of hydrogenation (ΔH_{hyd}^0).

ii) Which one of the following pair is more stable and why?.

a) cis-2-butene and trans-2-butene

b) 1-butene and isobutene,

- iii) Is it possible to compare the stability of but-2-ene and 1-pentene by heat of hydrogenation? If not, why?
 What method could you use? 3+(2.5+2.5)+2=10

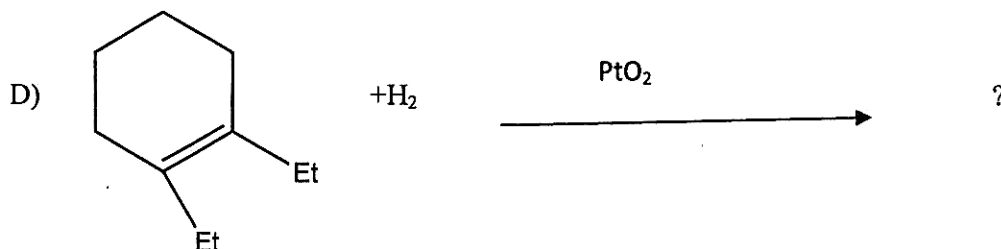
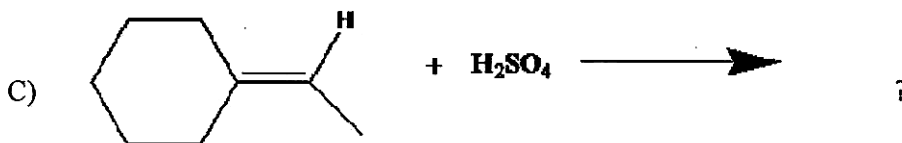
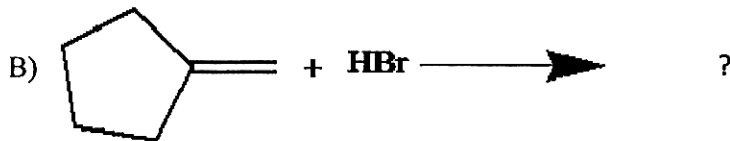
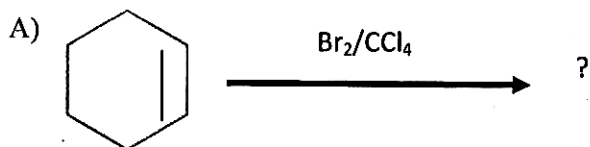
b) i) Write down the product(s) with mechanism of addition of HBr into A) ethylene and B) propene

ii) Draw the energy profile for the hydration of 1-butene and 2-methyl propene. Explain your diagram.

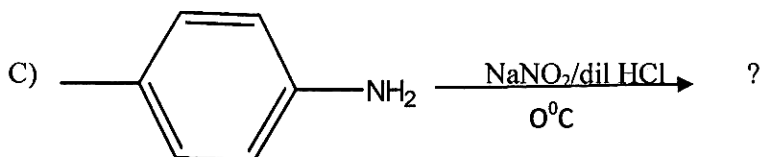
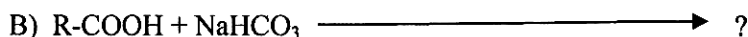
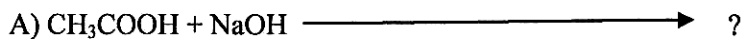
- iii) Predict the product(s) (with stereo chemistry) of the reaction between trans-1-phenyl propene ($C_6H_5CH=CHMe$) and bromine (Br_2) in a solvent which has low dielectric constant (less than 35). Explain your result in the light of reaction mechanism. (2.5+2.5)+4+3=10

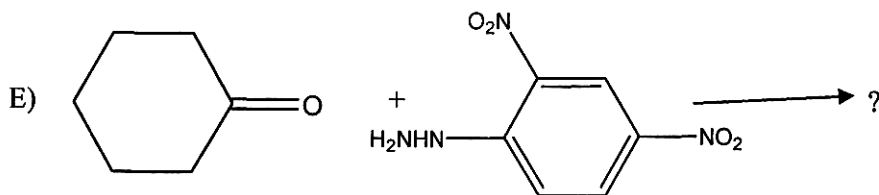
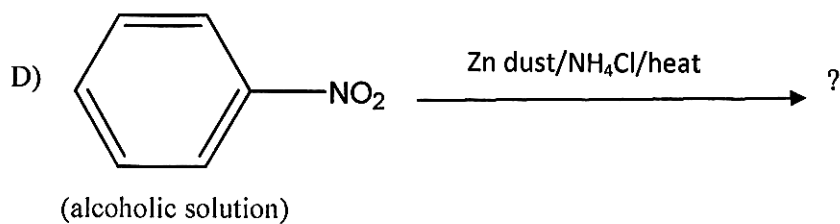
Q. 5. Answer all the questions

i) Predict the product (s) in following transformations



ii) Write down the product(s) of the following reactions:





iii) The dehydration of butane -2-ol with acid gives a mixture of 1 and 2-butenes. State which predominates, and give your reasons.

iv) Write down the structure of different isomers of pentane ?

v) Give approximate alcohol percentage of beer, wine and spirit.

vi) What are the major differences between fats and oils? Give an example of a) saturated fatty acid and b) unsaturated fatty acid.

vii) Water, dil HCl, dil NaOH, dil NaHCO₃ are given as a solvent in the laboratory. Mention the solubility of the following compounds in each of the above solvent. Give reason in support of your answer.

a) benzoic acid, b) phenol, c) aniline, d) Benzophenone

viii) What is vinegar?

10+10+3+3+2+4+6+2=40