CSM : 24

CHEMISTRY PAPER - II

Time Allowed : 3 hours   Maximum Marks : 100

QUESTION PAPER SPECIFIC INSTRUCTIONS

(Please read each of the following instruction carefully before attempting questions)

There are eight (8) questions - four (4) questions each in Part A & B. Each question carries 20 marks.

Marks for each question is indicated against it.

Compulsory questions :

  (a) Question No. 1 from Part-A and

  (b) Question No. 5 from Part-B

  [Compulsory questions No. 1 & 5 have 4 (four) Sub-questions carrying 5 marks each.]

Total No. of questions to be attempted :

  5 (five) questions.

  [A candidate shall attempt 2 (two) compulsory questions from Part A and B. Out of the remaining 6 (six) questions, 3 (three) are to be attempted taking at least 1 (one) but not more than 2 (two) questions from each Part]

Word Limit:

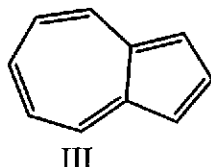 (a) Compulsory questions carrying 5 marks shall have a limit of 150 words.

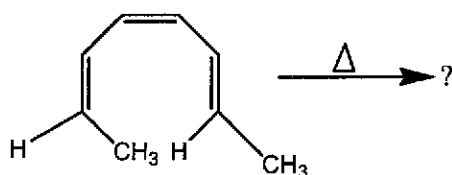 (b) There shall be no word limit for the remaining questions.

PART - A

1. Answer the following questions: (4×5=20)

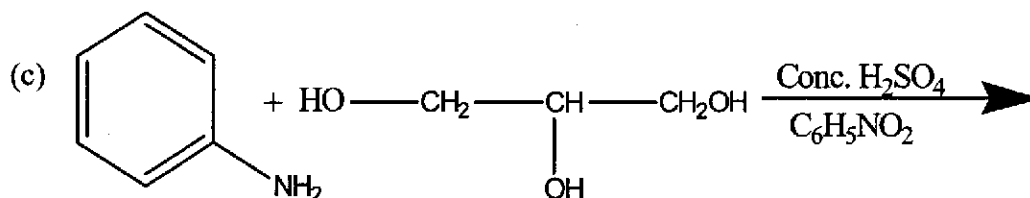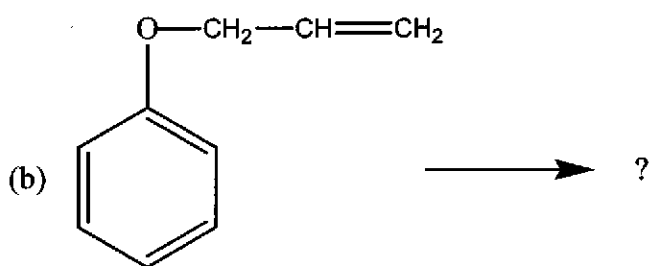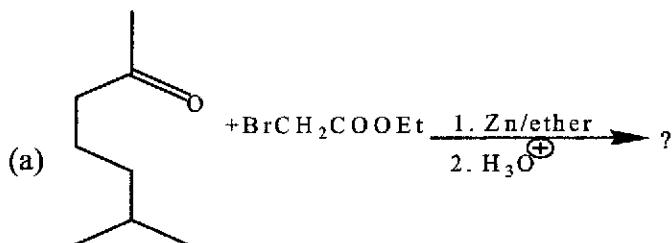   (a) State Huckel's rule of aromaticity. Predict whether the following compounds are aromatic or not. Explain.

   I   II   III

   (b) Explain the effect of solvent on S_N1 an S_N2 reactions.

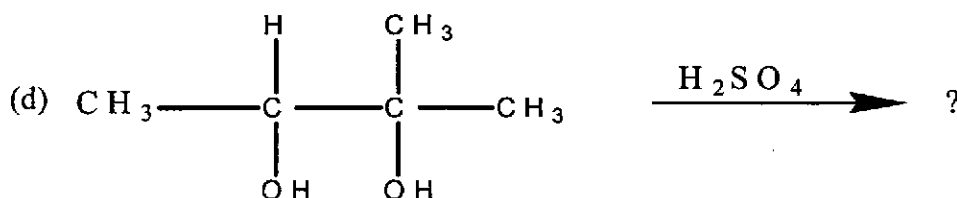   (c) Based on FMO approach, predict the product and stereochemistry of the given reaction:

   (d) Draw the van der Waals interaction and disulfide bond in tertiary structure of protein.

2. Complete the reactions giving suitable mechanisms: (4×5=20)

   (a)

   $+BrCH_2COOEt$ $\xrightarrow[2.\ H_3O^{\oplus}]{1.\ Zn/ether}$?

   (b)

   $\longrightarrow$?

   (c)

   $+ HO—CH_2—CH—CH_2OH$ $\xrightarrow[C_6H_5NO_2]{Conc.\ H_2SO_4}$

(d)

$$CH_3 - \overset{\overset{\displaystyle H}{|}}{\underset{\underset{\displaystyle OH}{|}}{C}} - \overset{\overset{\displaystyle CH_3}{|}}{\underset{\underset{\displaystyle OH}{|}}{C}} - CH_3 \xrightarrow{H_2SO_4} \ ?$$

3. (a) Differentiate between transition state and intermediate with the help of energy profile diagram. **(7)**

(b) Explain regioselectivity of E2 reaction based on Saytzeff rule. **(7)**

(c) How does inductive effect play a role in the stabilization of primary, secondary and tertiary carbocations? **(6)**

4. (a) Based on Woodward-Hoffmann rule, explain the [4+2] cycloaddition reaction. **(7)**

(b) Give the preparation, properties and uses of HDPE and LDPE. **(7)**

(c) Explain how Isotope labelling can ascertain reaction mechanism by taking suitable examples. **(6)**
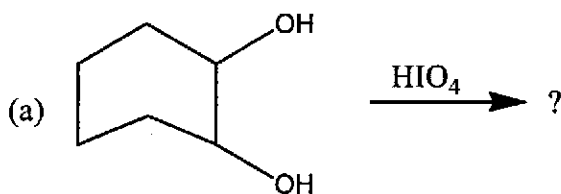
PART - B

5. Answer the following questions: **(4×5=20)**

(a) Give the products of the given reaction with suitable mechanism:

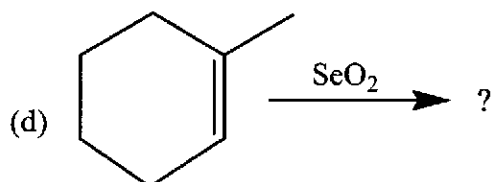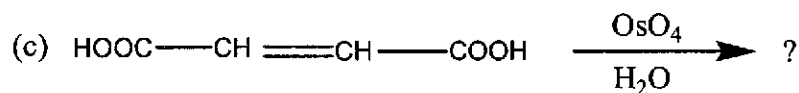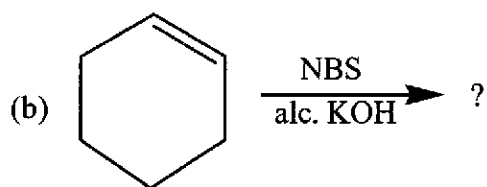$$H_3C - CH = CH_2 \xrightarrow[H_2O_2,\ NaOH]{B_2H_6} \ ?$$
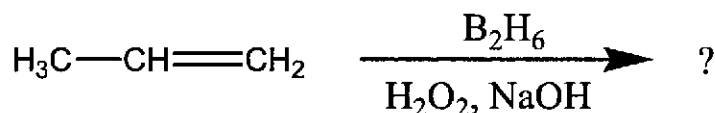
(b) Write short notes on Internal conversion and Inter system crossing in photophysical processes.

(c) Using the model of a water molecule, explain the terms 'symmetric' and 'asymmetric vibrations'.

(d) Discuss the fragmentation pattern of pent-2-ene in mass spectrometry.

6. Give the product(s) with suitable mechanisms of the following reactions: **(4×5=20)**

(a)

$$\xrightarrow{HIO_4} \ ?$$

(b) $\xrightarrow[\text{alc. KOH}]{\text{NBS}}$?

(c) HOOC——CH $\equiv\!\equiv$ CH——COOH $\xrightarrow[\text{H}_2\text{O}]{\text{OsO}_4}$?

(d) $\xrightarrow{\text{SeO}_2}$?

7. (a) What do you understand by Raman shifts? **(6)**

    (b) Differentiate between Stokes lines and anti-Stokes lines. **(7)**

    (c) What are the fundamental vibrations of CO_2 molecule? Indicate whether they are IR or Raman active. **(7)**

8. (a) How can you distinguished 3-pentanone and 2-pentanone from their mass spectra? **(7)**

    (b) Calculate λ_{max} for the given molecule. **(6)**
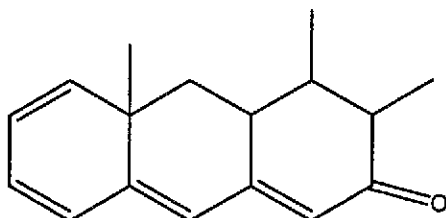
    (c) An organic compound having molecular formula $C_{10}H_{12}O_2$ gave IR band at $1740cm^{-1}$. The H_{NMR} shows triplet at $\delta = 1.2(3H)$; Singlet at $\delta = 3.5(2H)$; quartet at $\delta = 4.1$ (2H) and a multiplet at $\delta = 7.3(5H)$. Predict the structure with proper explanation. **(7)**

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