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CHOICE BASED CREDIT SYSTEM

M.Sc. CHEMISTRY SECOND SEMESTER DEGREE EXAMINATION MAY 2024

Inorganic Chemistry -II

Duration:3 Hours   Max Marks:70

PART - A

1. Answer any TEN of the following :   (10×2= 20 Marks)

   a) What is a metal cluster? Give an example.

   b) Calculate the number of framework electron pairs in B_6H_{10}.

   c) Classify the following based on Wade's rule

   i) $C_2B_3H_9^{2-}$ ii) $C_2B_2H_5$

   d) What prompted Bartlett to conjecture that it is possible to prepare the fluorides of xenon?

   e) Give the structure of Caro's acid. Mention the hybridization in it.

   f) Give the structure of $FClO_3$ and explain.

   g) Cu shows positive standard electrode potential value. Justify.

   h) What is optical isomerism? Give an example.

   i) What is lanthanide contraction? Give any two properties of lanthanide elements.

   j) Mention any two difference between nuclear fusion and nuclear fission.

   k) How organic polymers are different from inorganic polymers?

   l) Mention any two differences between silicon oil and silicon resin.

PART - B

Answer any Five questions selecting at least one question from each unit (5×10= 50 Marks)

UNIT - I

2. a) Write a note on isopolymolybdates.
   b) Explain 'Keggin structure'.   (6+4)

3. a) How do you explain the structure of Borazole? Explain the types of hybridisation in B and N.
   b) Write a note 1:6 octahedral heteropolyanions.
   c) Distinguish isopoly and heteropoly acids with examples.   (4+3+3)

UNIT - II

4. a) How do you prepare hypohalous acid and its salt? Give an equation.

   b) Explain the preparation and properties of perchloric acid.

   c) Describe any two properties of dichlorine oxide. (4+3+3)

5. a) Give the structures of SO_2 and SO_3 molecules.

   b) Arrange H_2X (X=O, S, Se, Te, Po) compounds in the order of increasing

   i) acidity ii) stability iii) boiling point iv) reducing character   (6+4)

UNIT - III

6. a) Discuss the following properties of 3d transition elements:

   i) Colour   ii) Interstitial compound   iii) Complex compound

   b) Give a brief account on atomic radii of lanthanide elements.   (6+4)

7. a) Explain the trends in variation of atomic radii and ionization energies in d-block elements.

   b) Describe the classification of d-block elements.   (6+4)

UNIT - IV

8. a) Explain the following interactions used for molecular recognization:

   i) Electrostatic ii) Hydrogen bonding iii) Vanderwaals

   b) Write a note on spherical recognization.   (6+4)

9. a) Discuss the factor affecting the stability of nuclei.

   b) Explain the classification of the nucleus.   (6+4)

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M.Sc. CHEMISTRY SECOND SEMESTER DEGREE EXAMINATION MAY 2024

Organic Chemistry -II

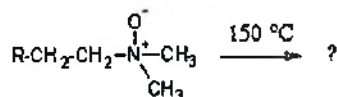**Duration:3 Hours**   **Max Marks:70**

PART - A

1. Answer any TEN of the following :   **(10×2= 20 Marks)**

a) Distinguish between π and σ complexes.

b) Predict the product in the following:

$$R\text{-}CH_2\text{-}CH_2\text{-}\overset{\overset{O^-}{|}}{\underset{\underset{CH_3}{|}}{N^+}}\text{-}CH_3 \xrightarrow{150\ °C} \ ?$$

c) Halogen is ortho, para directing and deactivating group. Justify.

d) Taking suitable example, illustrate $A_{AL}1$ mechanism.

e) Write the aldehydes/ketones from which following aldols are formed:
    i) 4-Hydroxy-4-methyl-2-pentanone
    ii) 2-Ethyl-3-hydroxy hexanal

f) State Markovnikov's rule with suitable example.

g) Write the reaction for nitration and sulphonation of pyrrole.

h) Give the reaction for alkylation and acylation of furan.

i) Give any four applications of thirane.

j) Define cycloaddition reaction. Give an example.

k) What is the atom economy of rearrangement reaction?

l) Mention any four advantages of microwave organic synthesis.

PART - B

Answer any Five questions selecting at least one question from each unit   (5×10= 50 Marks)

UNIT - I

2. a) Explain the mechanism of E1, E2 and E1cb mechanism. Give example for each.

    b) Discuss the effect of substrate and solvent on elimination reactions.   (6+4)

3. a) Write a note on the following:
        i) Smiles rearrangement ii) Sommelet-Hauser rearrangement
    b) Write a note on benzyne mechanism.

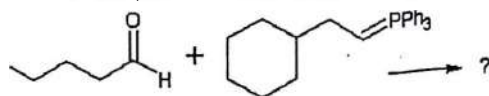   (6+4)

UNIT - II

4. a) Discuss the mechanism of addition of halogen to carbon- carbon multiple bond. Give any two evidences which support the mechanism.

   b) What is meant by Michael Addition? Explain taking suitable example. (6+4)

5. a) Illustrate the mechanism and synthetic applications of Knoevenagal condensation.

   b) Predict the product and discuss the mechanism: (6+4)

UNIT - III

6. a) Write the mechanism for the following synthetic methods of Indole:

   i) Fischer Indole ii) Madelung

   b) Explain the important methods for the synthesis of quinoline. (6+4)

7. a) Describe the important synthetic methods for the preparation of pyrazole.

   b) Write the mechanism for the following reaction of thiazole

   i) Sulphonation   ii) Nitration

   c) How thiazole is prepared using Cook Heilb synthesis? (4+3+3)

UNIT - IV

8. a) Enumerate the green reactions using light.

   b) Explain the preparation of 1-cyanooctane using Phase transfer catalyst?

   c) Discuss the preparation of 1-acetylnaphthalene using ionic liquids. (4+3+3)

9. a) Predict the product and write the mechanism for the following.

   Ethylacetoacetate + Chalcone ────➤ ?

   b) How will you obtain Vanillidineacetone by Claisen Schmidt reaction?

   c) Describe the synthesis of 3-pyridyl-4(3H) quinazolinone by solid state reaction.

   (4+3+3)

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CHOICE BASED CREDIT SYSTEM

M.Sc. CHEMISTRY SECOND SEMESTER DEGREE EXAMINATION MAY 2024
Spectroscopy-I

Duration:3 Hours   **Max Marks:70**

PART - A

1. **Answer any SEVEN of the following :**   **(7×2= 14)**

     a)   Write the selection rules for rotational and vibrational transitions in a simple harmonic oscillator.

     b)   Write the working mechanism of microwave oven.

     c)   Sketch the P, Q and R branches of rotation-vibration spectrum.

     d)   Justify: v_{co} values for $[V(CO)_6]^-$, $Cr(CO)_6]$ and $Mn(CO)_6]^+$ are 1860, 2000 and 2090 cm^{-1} respectively.

     e)   How do you distinguish the type of hydrogen bonding by infrared spectroscopy? Explain.

     f)   Acetaldehyde undergo different types of transitions: Justify.

     g)   How do you calculate the nuclear quadrupole coupling constant (eQq) from NQR transitions?

     h)   Write the significance of isomer shift in Mossbauer spectroscopy.

     i)   Write the process of sample preparation for Mossbauer spectroscopy.

PART - B

II Answer any Four questions selecting at least one question from each unit.

                                             (4×14 = 56)

UNIT - I

2.   a) Discuss the applications of Raman spectroscopy. Mention any two merits and demerits of Raman spectroscopy.

       b) Write a note on resonance Raman spectroscope and Raman optical activity.

       c) Explain the working mechanism of LASER Raman spectroscope.   (5+5+4)

3.   a) Why diatomic molecules should be considered as anharmonic oscillators? Write a Morse equation for the energy of anharmonic oscillators.

b) Derive an expression for the vibrational energy of a diatomic molecule taking It as a simple harmonic oscillator. Sketch the vibrational energy levels of such a molecule.

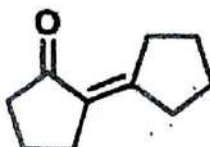c) Outline the fundamental modes of vibration. (5+5+4)

UNIT - II

4. a) Following the Woodward - Fieser rules, calculate the absorption maximum for each of the following compounds :
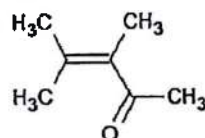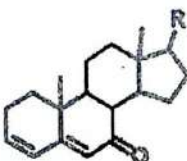
i)
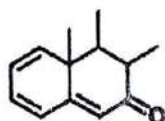
ii)

iii)

iv)

v)

b) Explain any four applications of IR spectroscopy. (10+4)

5 a) Explain Fieser-Kuhn rule for polyenes.

b) Describe the Woodward - Fieser rules for calculating the absorption Maximum in dienes.

c) How UV-visible spectroscopy is useful in determining the strength of hydrogen bonding? Explain. (5+5+4)

UNIT - III

6 a) Distinguish between NMR and EPR spectroscopy. Mention any two merits And demerits of EPR spectroscopy.

b) Explain the terms; i) spin-orbit coupling ii) super hyperfine splitting

c) Predict the number of ESR lines for radical anion of benzene and methyl radical. (5+5+4)

7 a) Discuss the theory and selection rules of ESR spectroscopy.

b) Write a note on relative intensities and width of ESR spectrum.

c) Describe how the g value is determined. (5+5+4)

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CHOICE BASED CREDIT SYSTEM
M.Sc. SECOND SEMESTER DEGREE EXAMINATION MAY 2024
Chemistry in Everyday Life

Duration:3 Hours   **Max Marks:70**

PART - A

1. Answer any SEVEN of the following :   **(7×2= 14)**

a)   Give examples of odourous substances.

b)   State the moods listed by Aristotle on which every perfume is based.

c)   What do you understand by food additives?

d)   Mention any two applications of lactose.

e)   What is hydrogenation of lipid?

f)   How vitamins are classified?

g)   What are the ingredients used for the manufacture of lotion?

h)   Distinguish between paint and varnishes.

i)   Mention any two difference between soap and detergent.

PART - B

Answer any Four questions selecting at least one question from each unit.

(4×14 = 56)

UNIT - I

2)   a) Write a short note on the following: i) Carotenoids   ii) betalain
     b) Write a note on artificial colours.   (7+7)

3)   a) Explain caramelisation.
     b) Write a note on the following tastes:
        i) Sweetness   ii) Acidity and sourness   (7+7)

UNIT - II

4)   How are proteins classified? Explain with examples for each classes.   (14)

5)   a) Explain the structure of D-glucose.
     b) Briefly explain the classification of monosaccharides and disaccharides.
                                                               (7+7)

UNIT - III

6) a) Discuss the chemical composition and manufacture of shampoos.

   b) Write a note on formulations and manufacturing of toothpaste.

   c) Give the detailed study on formulation of hair dyes. (5+5+4)

7) Write a note on manufacture and application of fatty acid, glycerol, turkey red oil and greases. (14)

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