Mid-West University

Candidates are required to give their answer in their own words as far as practicable. The figures in the margin indicate full marks

Inorganic Chemistry
Group A

Attempt any SEVEN questions   [7x2=14]

1. Write the electronic configurations of lanthanides and actinides. Define lanthanide contraction.
2. Compare the chemical compositions of Portland cement and high alumina cement.
3. What is glazing of earthen wares? Write the process of glazing.
4. Write the applications of Nepali (Lokta) paper.
5. Why is optical fibre better than metallic fibre in communication system?
6. How do you prepare potassium dichromate?
7. Mention the oxidizing properties of potassium permanganate.
8. How can you prove that hydroxylamine acts both as an acid and a base?
9. Write about the structure of hydrogen peroxide.

Group B

10. Write about the traditional methods of separation of lanthanides. Describe the ion-exchange method for the separation of lanthanides.
                                                              [1+5]

11. Differentiate among kraft pulp, soda pulp and rag pulp for the manufacture of papers. Write the name of some chemicals used for the bleaching of papers.
                                                              [5+1]

12. Explain the processes of manufacture of cement.   [7]
                              OR
Write short notes on (any two):
a) Back bonding in phosphorus pentoxide   b) Siemon's Ozoniser
c) Marshall's acid.

Organic Chemistry
Group A

Attempt any SEVEN questions   [7x2=14]

1. What is organic synthesis?
2. Name any two metal hydride and actings reducing agents. What are their roles?
3. Differentiate between linear and convergent synthesis.
4. What synthons and synthetic equivalent exists for the following molecules?
   a) CH_3CH_2OH b) CH_3COOH
5. Show your acquaintance with stereospecific and stereoselective control elements.
6. What is Functional Group Interconversion (FGI)?
7. Define retron with example.
8. Write the main purpose of lead tetra acetate in chemical reactions.
9. What is wolf Kishner reduction?

Group B

10. What are the main purposes to introduce combinatorial chemistry? How can functional group be modified during synthetic planning? Write the characteristics of a good synthetic plan.   [3+1+2=6]

11. Define protection and deprotection. What are the criteria for a good protecting group? How can you protect and deprotect alcoholic and carboxylic group?   [2+1+3=6]

12. Discuss green chemistry and explain any seven basic principles of green chemistry.   [7]
                              OR
Discuss the oxidation of organic compounds using Mn (VII). Also give as many examples as possible.

Physical Chemistry
Group A

Attempt any SEVEN questions [7x2=14]
1. Classify the molecular spectra on the basis of their property.
2. Define transitional probability and population states with examples.
3. Diatomic molecules like CO and HCl shows rotational spectra where as N_2 and O_2 do not. Why? How can you explain rotational spectra of $^{16}OC^{18}O$?
4. What is Zero-point energy? Explain.
5. Explain Franck-Condon Principle for intensity distribution of Vibrational-electronic spectra.
6. State Born-Oppenheimer approximation. How can you obtain vibrational frequency of homonuclear diatomic molecules?
7. In the photochemical combination of $H_2(g)$ and $Cl_2(g)$ a quantum efficiency of about 1×10^6 is obtained with a wavelength of $4800A°$. How many moles of HCl(g) would be produced under these conditions per calorie of radiant energy absorbed?
8. Explain the photochemical reaction of Hydrogen and Bromine.
9. The molecular diameter of O_2 and H_2 are 3.39×10^{-8}cm & 2.27×10^{-8}cm. When 1 gm of O_2 and 0.1gm of H_2 are mixed in 1-liter flask at 27°C, what will be the number of collisions per cubic centimeter per second?

Group B

10. Explain quantitative approach of non-rigid rotator. Derive $E_{j+1} - E_j = 2B(J+1) - 4D(j+1)^3$ Where symbols have their usual meaning. HCl has a "B" value of 10.593 Cm^{-1} and centrifugal distortion constant 5.3×10^{-4} Cm^{-1}. Estimate the vibrational frequency and force constant of the molecule. [2+2+2]
11. Describe the collision theory of Unimolecular reaction. Calculate the rate constant for bimolecular Hydrogen Iodide decomposition at 556K for which the observed value of rate constant is 3.5×10^{-7}Sec $(mole/litre)^{-1}$, energy of activation is 44000 Cal. For Hydrogen Iodide collision diameter is 3.5×10^{-8} cm and molecular mass is 127.9. [3+3]

12. Describe the classical theory of Raman effect based on molecular polarizability. Explain Vibration-Rotation Raman spectra with well labelled diagram. A sample was excited by the $4.358A°$ line of Mercury. A Raman line was observed at $4447A°$. Calculate the Raman shift in Cm^{-1}. [3+3+2]

OR

Describe with spectral diagram for the Vibrational frequencies of different functional group with their approximate frequency range. [8]

THE END