B.Sc. (Part-III) Semester-VI Examination

CHEMISTRY (NEW)

Time—Three Hours] [Maximum Marks—80

Note :— (1) **All** questions are compulsory.

(2) Question number **1** carries **8** marks while each of the remaining questions carry **12** marks.

(3) Draw diagrams and write equations wherever necessary.

(4) Use of scientific calculator is allowed.

1. (A) Fill in the blanks : 2

(i) The hypothesis of wave particle duality is proposed by _____.

(ii) The last peak in the mass spectrum is called as _____.

(iii) Ferrocene is an example of _____.

(iv) The shift of absorption wavelength towards the shorter wavelength side is called as _____.

Given :

Mass of $^{235}_{92}U$ = 235.044 amu

Mass of $^{1}_{0}n$ = 1.009 amu

Mass of $^{98}_{42}Mo$ = 97.905 amu

Mass of $^{136}_{54}Xe$ = 135.917 amu 4

(B) Select the correct alternative : 2

(i) The geometry of $Ni(Co)_4$ is :

(a) Linear

(b) Tetrahedral

(c) Trigonal bipyramidal

(d) Square planar

(ii) In which region of electromagnetic spectrum the vibrationals transitions are observed ?

(a) U.V.

(b) Microwave

(c) IR

(d) Visible

(iii) The deficiency of which of the following causes the improper growth of bones ?

(a) K^+

(b) Ca^{2+}

(c) Na^+

(d) Mg^{2+}

(iv) Which of the following would give only singlet in NMR ?

(a) CH_3CH_2–Cl

(b) CH_3–CH_2–CH_3

(c) CH_3–O–CH_3

(d) CH_2=CH–Cl

(C) State and explain deBroglie's hypothesis. 4

OR

11. (P) Derive Schrondinger's wave equation in one dimension. 4

(Q) Define :

(i) Threshold frequency

(ii) Atomic orbital. 4

(R) Explain the physical significance of wave function ψ and ψ^2. 4

UNIT—VI

12. (A) Explain how the pH is determined by using hydrogen electrode. 4

(B) Discuss the liquid drop model. 4

(C) Define :

(i) Nuclear fusion

(ii) Reference electrode. 2×2=4

OR

13. (P) Differentiate between chemical reactions and nuclear reactions. 4

(Q) What are the advanatages and disadvantages of Quinhydrone electrode ? 4

(R) Calculate the Q value of following nuclear reaction :

$$\underset{92}{\overset{235}{U}} + \underset{0}{\overset{1}{n}} \rightarrow \underset{42}{\overset{98}{Mo}} + \underset{54}{\overset{136}{Xe}} + \underset{0}{\overset{1}{Zn}} + Q$$

(C) Answer in one sentence : 4

(i) Define the term chemical shift.

(ii) State Lambert's law.

(iii) What is meant by bathochromic shift ?

(iv) Define the term Rf value.

UNIT—I

2. (A) Draw the block diagram of colorimeter and explain its components. 4

(B) Discuss the mechanism of substitution reaction in square planar complexes. 4

(C) Discuss the process of ascending paper chromatography. 4

OR

3. (P) Discuss the SN2 associative mechanism of substitution in octahedral complexes. 4

(Q) State and explain Beer-Lambert's Law. 4

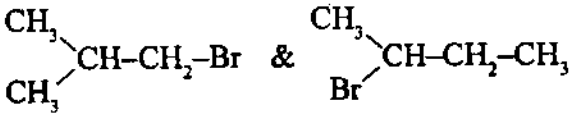
(R) Explain the method of determination of concentration of unknown solution of metal ion by colorimetry. 4

UNIT—II

4. (A) Give any two methods of preparation of Nickel tetra carbonyls. 4

(B) Discuss the role of K^+ in biological activities. 4

(B) How will you distinguish the following pairs by NMR :

(i)  &

(ii) CH_3COCH_3 and CH_3CHO 4

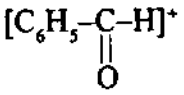
(C) Explain the terms :

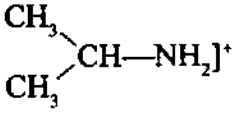
(i) Fragmentation

(ii) Molecular ion. 4

OR

9. (P) Calculate m/z value for each of the following :

(i) 

(ii)  4

(Q) How many peaks observed in high resolution NMR for 1-bromopropane ($CH_3CH_2CH_2$–Br) ? 4

(R) Explain equivalent and non-equivalent protons with suitable example. 4

UNIT—V

10. (A) State and explain Compton effect. 4

(B) Give the comparison between Classical mechanics with Quantum mechanics. 4

(C) What are silicones ? How will you prepare cross linked silicone polymer ? 4

OR

5. (P) What is the action of (i) Heat and (ii) HCl on iron pentacarbonyl ? 4

(Q) Discuss the nature of metal-carbon bond in carbonyls. 4

(R) What are phosphonitrilic polymers ? Give any two methods of preparation of phosphonitrilic halides. 4

UNIT—III

6. (A) What types of electronic transitions do you expect in each of the following :

(i) $CH_3–CH_2–NH_2$

(ii) $CH_3–\overset{\overset{O}{\|}}{C}–CH_2–CH_3$

(iii) 

(iv) $CH_3–CH = CH_2$ 4

(B) Differentiate following pairs on the basis of IR spectra :

(i) $CH_3–\overset{\overset{O}{\|}}{C}–CH_3$ and CH_3CH_2OH

(ii) $CH_3–\overset{\overset{O}{\|}}{C}–H$ and $CH_3–\overset{\overset{O}{\|}}{C}–OH$ 4

(C) Define the terms with suitable examples :

(i) Chromophore

(ii) Auxochrome. 4

OR

7. (P) Discuss the types of electronic transitions that occur in U.V. region with suitable diagram. 4

(Q) Explain the terms :

(i) Bathochromic shift

(ii) Hypsochromic shift. 4

(R) Calculate the fundamental modes of vibrations in each of the following molecules :

(i) NO

(ii) CO_2

(iii) CH_4

(iv)  4

UNIT—IV

8. (A) How many signals do you expect in each of the following in NMR :

(i) $CH_3–CH_2–CH_2–\overset{\overset{H}{|}}{\underset{\underset{Br}{|}}{C}}–CH_3$

(ii) $CH_2 = CH–Br$ 4