AU–162

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

CHEMISTRY (New)

Time : Three Hours]   [Maximum Marks : 80

Note :— (1) ALL questions are compulsory.

(2) Question No. **1** carries **8** marks while each of the remaining questions carry **12** marks each.

(3) Draw diagrams and write questions wherever necessary.

(4) Use of Scientific calculator is allowed.

1.   (A) Fill in the blanks :   2

(i) As the charge on central metal ion increases, the stability of the complex _____.

(ii) Energy associated with each quantum or photon is proportional to _____.

(iii) Highest energy is required for _____ transition in UV spectroscopy.

(iv) Saturated Calomel electrode is commonly used as a _____.

(B) Select the correct alternative :   2

(i) Which of the following would not give singlet signal in NMR ?

(a) CH_3CH_3 (b) CH_3OCH_3

(c) CH_3COCH_3 (d) $CH_3CH_2OCH_2CH_3$

(ii) Which of the following spectroscopy would determine molecular weight of a compound ?

(a) UV-visible   (b) NMR

(c) IR   (d) Mass spectroscopy

(iii) Effective atomic number of Ni in $Ni(CO)_4$ is :

(a) 36   (b) 54

(c) 86   (d) 63

(iv) A nuclear reaction in which two or more lighter nuclei fuse together to form a heavier nucleus is called as :

(a) Nuclear fission reaction   (b) Nuclear fusion reaction

(c) Thermonuclear reaction   (d) Nuclear reaction

(C) Answer in **one** sentence : 4

    (i)   Define organometallic compounds.

    (ii) What is coupling constant ?

    (iii) Define hypsochromic shift.

    (iv) What is endoergic reaction ?

UNIT—I

2. (A) Explain the term labile and inert complexes with suitable examples. 4

    (B) How do charge and size of central metal ion affect the liability of complexes ? 4

    (C) Differentiate between colorimeter and spectrophotometer. 4

OR

3. (P) Draw the block diagram of colorimeter and explain its components in brief. 4

    (Q) How Cu^2 ion concentration is determined colorimetrically ? 4

    (R) Explain the terms : 4

        (i) Beer-Lambert's Law

        (ii) Effect of size of ligands on stability of complexes.

UNIT—II

4. (A) Discuss the role of hemoglobin and myoglobin in oxygen transport process. 4

    (B) What are silicones ? Give preparation of linear silicone polymer. 4

    (C) Give one method of preparation of $Cr(CO)_6$. Explain its structure. 4

OR

5. (P) Explain how organometallic compounds are classified. 4

    (Q) What happens when $(PNCl_2)_3$ reacts with (i) Ammonia, (ii) Methanol in presence of pyridine ? 4

    (R) Explain the role of Mg^{2+} in biological process. What are its toxic effects ? 4

UNIT—III

6. (A) Identify the types of transitions in each of the following : 4

    (i) $CH_3 - CH - Cl$

    (ii) CH_3NH_2

    (iii) $CH \equiv CH$

    (iv) $CH_3CH_2CH_3$

VOX—35827   2   (Contd.)

(B) Calculate the number of vibrational modes in CO_2. Discuss it on the basis of IR spectrum.   4

(C) Define the following terms :   4

    (i) Finger print region

    (ii) Blue shift.

OR

7. (P) Which of the following vibrational modes are IR active or inactive ?   4

    (i) Symmetric CO_2 stretching

    (ii) Antisymmetric CO_2 stretching

    (iii) Symmetric H_2O stretching

    (iv) H_2O bending.

(Q) Distinguish the following molecule on the basis of U.V. spectroscopy :

Ethene and 1, 3-butadiene.   4

(R) Explain the following :   4

    (i) Hypsochromic effect

    (ii) Aromatic region in IR spectroscopy.

UNIT—IV

8. (A) Give the ideal relative intensities ratio for :   4

    (i) a triplet

    (ii) a quartet

    (iii) a quintet

    (iv) a doublet.

(B) Why is TMS selected as an internal standard reference in NMR spectroscopy ?   4

(C) Discuss the fragmentation of acetone.   4

OR

9. (P) How will you distinguish following pairs by their NMR spectra ?   4

    (i) CH_3COCH_3 and CH_3COOH

    (ii) $CH_3CH_2CH_2Br$ and $CH_3CHBrCH_3$

(Q) Give the structure of a compound C_2H_6O, whose mass spectrum shows m/z values of 15, 29, 31 and 46.   4

(R) Explain the following terms :   4

    (i) Base peak

    (ii) Shielding effect.

UNIT—V

10. (A) Explain photoelectric effect. 4

    (B) Explain the postulates of Planck's quantum theory. 4

    (C) Derive an expression for the energy of a free particle in one dimensional box. 4

OR

11. (P) Write note on deBroglie's hypothesis. 4

    (Q) Define : 4

        (i) Threshold frequency

        (ii) Atomic orbital.

    (R) What is the ground state energy of an electron in one dimensional box of width 1.0×10^{10} m ? 4

UNIT—VI

12. (A) What are the advantages and disadvantages of Quinhydrone electrode ? 4

    (B) Give any two applications of radioisotopes in (i) Bio-sciences, (ii) Industry. 2+2

    (C) Define :

        (i) Nuclear fusion

        (ii) Indicator electrode. 4

OR

13. (P) Give the advantages and limitations of liquid drop model. 4

    (Q) What is potentiometric titration ? How precipitation titration is performed potentiometrically ? 4

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

$$^{27}_{13}Al + {}^{4}_{2}He \longrightarrow {}^{30}_{14}Si + {}^{1}_{1}H$$

    Given : mass of ^{27}Al 26.9815 amu, mass of $^{4}He = 4.0026$ amu,

        mass of $^{30}Si = 29.9738$ amu and mass of $^{1}H = 1.0078$ amu 4