

[39/A-19]

SEAT No. _____

No. Printed pages: 3

SARDAR PATEL UNIVERSITY
M.Sc. (SEMESTER-II) EXAMINATION
2017

Monday, 10th April
10.00 a.m. to 01.00 p.m.

CHEMISTRY: PS02CCHE01
(INORGANIC CHEMISTRY-II)

Note:-figures to the right indicate full marks.

Total marks: 70

Q.1. Answer the following:

[8]

- The number of way in which electron spin can be arranged for the spin multiplicity $2S + 1 = 6$ is :
 - Six
 - Three
 - Two
 - Zero
- According to molecular orbital diagram, the number of antibonding electrons in $[\text{Co}(\text{F})_6]^{3-}$ complex is:
 - Two
 - Zero
 - Six
 - Twelve
- The ground state for the $[\text{Fe}(\text{CN})_6]^{4-}$ is:
 - ${}^2\text{T}_{2g}$
 - ${}^1\text{A}_{1g}$
 - ${}^3\text{T}_{1g}$
 - ${}^2\text{E}_g$
- Which of the following is correct order of decreasing number of the microstate present in the terms?
 - ${}^3\text{F}$
 - ${}^2\text{G}$
 - ${}^1\text{I}$
 - ${}^3\text{H}$
 - (iv) > (i) > (ii) > (iii)
 - (iii) > (ii) > (i) > (iv)
 - (iv) > (i) > (iii) > (ii)
 - (iv) > (ii) > (iii) > (i)

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5. Above Curie temperature substance behave like :
 - a. Paramagnetic
 - b. Antiferromagnetic
 - c. Ferromagnetic
 - d. Ferrimagnetic

6. Which of the following compounds is paramagnetic?
 - a. $[\text{Ni}(\text{CN})_4]^{2-}$
 - b. $[\text{Ni}(\text{DMG})_2]$
 - c. $[\text{Fe}(\text{H}_2\text{O})_6]^{2+}$
 - d. $\text{K}_4[\text{Fe}(\text{CN})_6]$

7. Which of the following actinides exhibits lowest magnetic moments value?
 - a. Cm(III)
 - b. Am(III)
 - c. Bk(III)
 - d. Pu(III)

8. Which of the following lanthanides produce largest up-field shift?
 - a. Gd(III)
 - b. Dy(III)
 - c. Tm(III)
 - d. Eu(III)

Q.2. Attempt any **SEVEN** of the following:

[14]

1. Define the term barycenter and Dq .
2. The term symbols for d^3 and d^7 - configuration is 4F . Explain.
3. Define the microstate and calculate the number of microstate for $[\text{Fe}(\text{SCN})_6]^{3-}$ complex.
4. Determine the M_L , M_S and term symbols of the $(1^+, 3^+)$ and $(2^+, 0^+)$ microstates.
5. A slight variation in diamagnetic susceptibility value with change in a temperature. Explain.
6. Diamagnetism is negative. Explain.
7. Calculate the electron exchange energy for low-spin d^4 to d^7 - configurations.
8. Calculate the number of pair of parallel spin for high-spin d^4 to d^7 -configurations.
9. Spin pairing is unfavorable process. Explain.

Q.3.A. Explain the splitting of d-orbitals in trigonal bipyramidal, pentagonal bipyramidal and trigonal prismatic stereochemistries.

[6]

- B. Answer the following: [6]
1. Differentiate tetragonal elongation and tetragonal compression.
 2. Explain the structure of $[\text{Mn}(\text{CN})_6]^{4-}$ and $[\text{Cr}(\text{H}_2\text{O})_6]^{3+}$ complexes.

OR

- B. Derive the terms arising out of $[\text{Ti}(\text{H}_2\text{O})_6]^{2+}$ complex and indicate the order of increasing energy of these terms.

- Q.4.A. Explain the Orgel and TS-diagram for $[\text{Co}(\text{NH}_3)_6]\cdot\text{Cl}_3$ complex. [6]
- B. Explain the correlation diagram for $[\text{V}(\text{H}_2\text{O})_6]^{3+}$ complex. [6]

OR

- B. Differentiate forbidden and allowed transitions giving suitable examples. Calculate Nephelauxetic ratio, Racah parameter, covalent character, ionic character, crystal field splitting energy and configuration interaction term for the $[\text{Ni}(\text{H}_2\text{O})_6]^{2+}$ complex. Given: $\nu_1 = 7,920 \text{ cm}^{-1}$, $\nu_2 = 11,920 \text{ cm}^{-1}$, $\nu_3 = 23,550 \text{ cm}^{-1}$ and B_0 for Ni(II) = 1040 cm^{-1} .

- Q.5.A. Discuss the antiferromagnetic exchange pathways. [6]
- B. Derive the orbital magnetic moment and spin magnetic moment equations. Calculate the effective magnetic moment value of $[\text{Co}(\text{NH}_3)_6]\cdot\text{Cl}_2$, $[\text{Co}(\text{H}_2\text{O})_6]\cdot\text{Cl}_3$ and $[\text{Co}(\text{NH}_3)_6]\cdot\text{Cl}_3$ coordination compounds. [6]

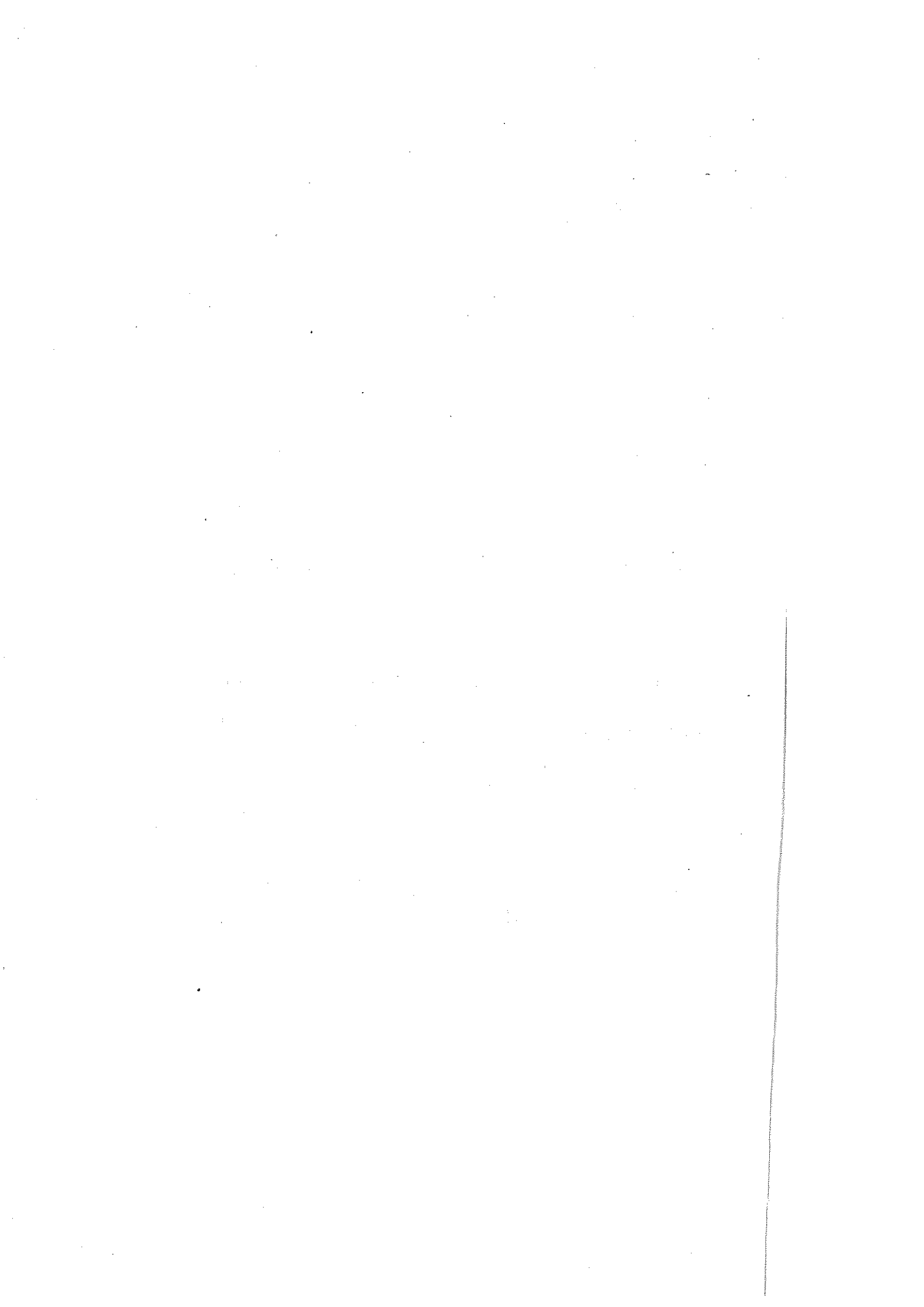
OR

- B. Derive the Van Vleck equation for calculating magnetic susceptibility.

- Q.6.A. Explain the spin pairing in non- octahedral complexes and discuss the aspects of spin pairing and cross over region. [6]
- B. Answer the following: [6]
1. Explain the spin- orbit coupling on T-term.
 2. State and prove Lande's interval rule and calculate the energies of J-levels for d^2 -system.

OR

- B. Derive the L, S, J, g, μ_J and term symbols for lanthanides.
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[27/A-16]

SEAT No. _____

No. of Printed pages: 03

SARDAR PATEL UNIVERSITY

M. Sc. SECOND SEMESTER Examination 2017

Saturday, 15th April 2017

10.00 a.m. to 1.00 p.m.

Course – PS02CCHE03, Physical Chemistry – II, Selected Topics

N.B. Figures to the right of each of the question indicate marks Total Marks: 70

1. Choose an appropriate answer for the following: [08]

- (i) Which of the following is not a fibrous protein?
(a) Carbonic anhydrase (b) Collagen
(c) Fibrinogen (d) Keratin
- (ii) Which of the following species possesses both C_3 and C_2 axes?
(a) SO_3 (b) NH_3 (c) PCl_3 (d) $[H_3O^+]$
- (iii) $SnCl_2$ molecule belongs to _____ point group
(a) C_{2v} (b) C_{3v} (c) D_{3h} (d) C_s
- (iv) In electrophoresis, DNA will migrate towards
(a) Cathode or positive electrode (b) Anode and negative electrode
(c) Cathode or negative electrode (d) Anode or positive electrode
- (v) Which of the following is true for the reaction: $H_2 + I_2 \rightarrow 2HI$:
(a) It is first order over all
(b) It is second order over all
(c) It is first order with respect to H_2 and I_2 and second order over all
(d) It is second order with respect to H_2 and I_2 and first order over all
- (vi) A reversible parallel reaction is under thermodynamic control, then the concentration of the products is determined by:
(a) Rate constants (b) Equilibrium constants
(c) Ratio of rate to equilibrium constants (d) Ratio of equilibrium to rate constants

(vii) The speed of migration of ions in an electric field depends on:

- (a) Magnitude of charge and mass of molecules
- (b) Magnitude of charge and shape of molecules
- (c) Shape and size of molecules
- (d) Magnitude of charge, shape and mass of molecules

(viii) The primary structure of protein represents:

- (a) Linear sequence of amino acids joined by peptide bond
- (b) Three dimensional structure of protein
- (c) Helical structure of protein
- (d) Sub unit structure of protein

2. **Attempt any SEVEN** [14]

- (i) How rotational symmetry elements in H_2O and BF_3 differ from each other ?
- (ii) Discuss the symmetry elements in cyclopentadiene.
- (iii) Prove through Lindemann – Hinshellwood mechanism that unimolecular reactions switch to second order under low pressure.
- (iv) What is the role of carrier gas M in a chain reaction.
- (v) Discuss the conformational features of a peptide bond.
- (vi) What are exergonic reactions ? How they are characterized by K_{eq} and ΔG ?
- (vii) Depict the h-bonding of T-A, C-G, G-C and A-T base pairs in a DNA molecule.
- (viii) How stability of a colloid can be assessed ?
- (ix) Explain in brief orthogonality theorem.

3. (a) Construct the matrix for $C_n(z)$ rotation and explain how it is different for anticlockwise and clock wise rotations. [06]
- (b) Derive matrix for σ_v and σ_v' [06]

OR

- (b) (i) By taking an example of square planar complex (point group D_{4h}) depict all the symmetry elements. [03]
- (ii) Explain the general notations that constitute a character table ? [03]

4. (a) Show that for the first order reaction the time required for 75 % conversion is twice the time required for its 50 % conversion [06]
- (b) (i) Trimolecular reactions have negative activation energy – Justify [06]
(ii) Give three examples of ionic reactions with different ionic products of 0, 1 and 2

OR

- (b) Consider a reversible first order reaction of type $A \rightleftharpoons B$, given that $k_1 = 3 \text{ s}^{-1}$ and $k_2 = 1 \text{ s}^{-1}$ and $[A]_0 = 0.01 \text{ mol.dm}^{-3}$. [06]
- (i) Calculate the time at which half of the A and B are consumed
(ii) How much would be the concentrations of A and B at half life time ?
(iii) Determine $[A] - [A]_0$ after one second of time.

5. (a) Describe the detailed features of Stern model for an electrical double layer [06]
(b) Addition of electrolytes leads to reversal of charge on a surface – Elaborate [06]

OR

- (b) (i) Which are the transport proteins ? and list their functions. [03]
(ii) Derive the relation: $\Delta G_0 = - R T \ln K_{eq}$, for a typical biochemical reaction. [03]

6. (a) Give the reaction steps involved in the calculation of standard free energy change of hydrolysis of ATP. Calculate the ΔG_{ATP} given that the ΔG for formation of G-6-P is $-4.0 \text{ kcal mol}^{-1}$ and K_{eq} for its hydrolysis is 171 at 25 °C ($R = 1.98 \text{ cal deg}^{-1} \text{ mole}^{-1}$). [06]
(b) What are coupled reactions ? and how the energy is conserved in them ? [06]

OR

- (b) (i) Which phosphate forms are useful as energy currency ? and discuss their physico-chemical features. [03]
(ii) Discuss how active and passive transport processes occur across a lipid membrane ? [03]

SEAT No. _____

No. of Printed Pages: 3

[32/A-17]

[] SARDAR PATEL UNIVERSITY

M.Sc. (Chemistry) Examination IInd Semester

Tuesday,

Date: 18-04-2017

Time: 10.00 a.m. to 01.00 p.m.

Subject: Analytical Chemistry Paper: PS02ECHE01

[Total Marks: 70]

N.B. (1) Figures to the right indicate full marks.

(2) Attempt all questions.

Q. 1 Select the correct answer from each of the following: (08)

- Which of the following is the range of semi-micro analytical techniques?
(a) 0.01- 0.1 gm (b) 1.0 – 10 mg (c) 10-100 mg (d) $10^2 - 10^3 \mu\text{g}$
- Principle of gas chromatography separation: $X/M = K \cdot C^{1/n}$ is _____.
(a) Law of Freundlich (c) Nernst distribution Law
(b) Henry's Law of partition (d) Law of Langmuir
- A _____ is an instrument that can isolate a selected narrow band of wavelengths anywhere within a comparatively wide range of spectrum.
(a) signal indicator (c) line sources
(b) monochromator (d) radiation detector
- Adsorption chromatography is preferred for the separation of mixtures whose components _____.
(a) are very close in polarity (c) have almost similar structures
(b) differ in polarity (d) All of above
- The "Journal" cover information in the form of _____.
(a) General method of preparation, use and references of substance
(b) Comprehensive work with authors name, journal name etc.
(c) Describe research work done by scientist
(d) All of above
- 10^{-18} liter of solution is SI prefixed as:
(a) Zeptoliter (b) Attoliter (c) Exaliter (d) Femtoliter
- The phenomenon of emission of electrons from metal surfaces when exposed to radiation of suitable wavelength is known as:
(a) photoelectrons (c) phototubes
(b) photocell detector (d) photoelectric effect
- How will the reaction rate change in $3A + 3B \rightleftharpoons 2C + D$, if the concentration of substance A and B increase three times?
(a) 27 (b) 81 (c) 243 (d) 729

Q. 2 Answer the following: (Any Seven) (14)

- (i) Classify the analytical techniques based on purpose of analysis.
- (ii) Define the terms: (1) Standard error (2) Determinant error.
- (iii) What is electromagnetic radiation? Explain electromagnetic spectrum.
- (iv) Discuss the principle of gel permeation chromatography.
- (v) What are the essential elements of quality system (Q.S)?
- [vi] Differentiate accuracy and precision.
- [vii] Enlist development of chromatogram in paper chromatography.
- [viii] Give the full name of FDA, ASTM, PLA and GTP.
- [ix] Draw labeled block diagram of typical absorption spectrometer.

3 [a] What do you mean of verification and validation? Explain the categories of validation. (6)

[b] Define the cGMP and components of GMP. (6)

OR

[b] Answer the following: (6)

- (i) Explain in brief on quality management system (QMS).
- (ii) What is sampling? Discuss on preparing laboratory sample.

4 [a] Calculate (a) the standard deviation of the mean (b) the relative standard deviation of the mean (c) co-efficient of variation for following sets of data: 124.5, 119.7, 137.5, 125.9, 124.8. (6)

[b] Answer the following: (6)

- [i] Explain the term statistical analysis and give its applications.
- [ii] Describe basic requirements of primary standard.

OR

[b] Answer the following:

[i] A 0.2025 N solution of Na_2CO_3 (Mol. Wt. 106 g/mol) is prepared in a 500-ml volumetric flask, its 50.0 ml are withdrawn. Next 6.045 g of the same anhydrous reagent and water are added to the mark. Determine the normality of the resultant solution. (6)

[ii] If 1 liter of a 3 M solution of substance A and 2 liter of 6 M solution of substance B take part in the reaction $\text{A} + \text{B} \rightleftharpoons \text{C} + \text{D}$. Determiner the % yield of product D. (Consider $K = 9$).

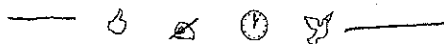
- 5 [a] Discuss in detail on radiation sources and monochromator used in optical instruments. (8)
- [b] Explain in brief on typical absorption and emission spectrometer. (4)

OR

- [b] Explain in brief on detectors used in optical instruments. (4)
- 6 [a] Classify the chromatographic techniques on the basis of phenomenon and principle. (6)
- [b] Discuss in brief on following: (6)
- [i] Describe the significance and factors affecting on R_f value in paper chromatography (PC).
- [ii] Discuss in brief on detection methods used in paper chromatography.

OR

- [b] Give the basic principle of gas chromatography and discuss in detail on the components of gas chromatograph. (6)



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[33]

SEAT No. _____

No. of Printed Pages : 2

SARDAR PATEL UNIVERSITY
M.Sc. (SEMESTER-I) EXAMINATION

Tuesday, 18th April 2017

M.Sc (Chemistry)

TIME: 10.00 A.M. to 01.00 P.M.

INTRODUCTION TO BIOCHEMISTRY: PS02ECHE02

Note: Figure to the right indicate full marks.

Total marks: 70

Q. 1. Choose the correct answers from the options given below.

[8]

1. The folic acid is first reduced to _____ and further to _____.
(a) DHFA - THFA (b) THFA-DHFR (c) AOR - PPR (d) DHTR-THFR
2. Vitamin B₁₂ is also known as _____ Vitamin.
(a) Anticonvulsant (b) Antimetabolites (c) Anti-pernicious anemia (d) Antineoplastic
3. _____ base is not present in the structure of RNA?
(a) Guanine (b) Adenine (c) Thymine (d) Uracil
4. In arachidonic acid _____ number of double bond are present.
(a) 1 (b) 2 (c) 3 (d) 4
5. Esterification of cholesterol occurs at _____ carbon position.
(a) 1 (b) 2 (c) 3 (d) 4
6. Pepsin is an example for _____ class of enzyme.
(a) Oxidoreductases (b) Transferases (c) Hydrolases (d) Ligases
7. The backbone of nucleic acid structure is constructed by _____ linkage.
(a) Peptide (b) phosphodiester (c) oxygen (d) peptidoglycane
8. The metabolic (endogenous) water is delivered by the oxidation of _____.
(a) Carbohydrate (b) Protein (c) Fats (d) All of them

Q. 2. Answer the following. [Any seven]

[14]

- (1) Justify that vitamin D is a hormone.
- (2) Write the deficiency manifestation of vitamin - C.
- (3) Describe the isomerism in unsaturated fatty acid.
- (4) Write the functions of proteins.
- (5) Write a note on globular or corpuscular proteins.
- (6) List down the biological functions of carbohydrates?
- (7) Write the Chargaff's rule of DNA composition.
- (8) Write the types of RNA with their biological functions.
- (9) Define Osmosis and buffer solution.

- Q. 3.** [A] Describe the biochemical function of vitamin – A. [6]
[B] Write the difference between fat soluble and water soluble vitamin. Give only the synthesis of 1,25-DHCC. [6]
- OR**
- [B] (i) Explain the folic acid metabolism. [3]
(ii) Write a note on glycolipid. [3]
- Q. 4.** [A] Classify amino acids based on their polarity & nutritional value. [6]
[B] Write a note on, (i) Denaturation (ii) Zwitterion [6]
- OR**
- [B] Give an account of the Primary structure of Protein. [6]
- Q. 5.** [A] Give the classification of carbohydrates and explain the biological importance of any one carbohydrate [6]
[B] Explain the role of homo and hetero polysaccharides with their structure. [6]
- OR**
- [B] Explain the role of water in the biological system. [6]
- Q. 6.** [A] Explain Watson & Crick model of DNA. [6]
[B] Write a note on the enzyme inhibition. [6]
- OR**
- [B] Write a short note on composition of Nucleic acid. [6]
