

SEAT No. _____

[14]

SC

No. of Printed Pages 03

SARDAR PATEL UNIVERSITY
M.Sc. (SEMESTER-II) (NC) EXAMINATION
Thursday, 2nd November, 2017
Time: 10:00 a.m. to 1:00 p.m.
CHEMISTRY: PS02CCHE01
(INORGANIC CHEMISTRY-II)

Note:-Figures to the right indicate full marks:

Total marks: 70

Q.1. Answer the following:

[8]

1. According to MO diagram, the number of antibonding electrons in $[\text{Co}(\text{NH}_3)_6]^{+3}$ complex is _____.
(a) 2 (b) 0 (c) 5 (d) 4
2. Above Curie's temperature ferromagnetic substance behaves like _____ substance.
(a) Paramagnetic (b) Antiferromagnetic (c) Diamagnetic (d) Ferrimagnetic
3. The ground state of $[\text{Ti}(\text{H}_2\text{O})_6]^{+2}$ complex is _____.
(a) $3T_{1g}$ (b) $4T_{1g}$ (c) $3T_{2g}$ (d) $4T_{2g}$
4. Which one of the following compounds is diamagnetic?
(a) $\text{K}_3[\text{Fe}(\text{CN})_6]$ (b) $[\text{Ti}(\text{H}_2\text{O})_6]\text{Cl}_3$ (c) $\text{K}_2[\text{Fe}(\text{CN})_6]$ (d) $[\text{Fe}(\text{H}_2\text{O})_6]\text{Cl}_3$
5. No of revolution per second is known as:
(a) Angular velocity (b) Angular Frequency (c) Velocity (d) None of these.
6. The Critical $10 Dq$ value is equal to $-8Dq + 2P$ for the complex _____.
(a) $[\text{Ni}(\text{H}_2\text{O})_6]^{2+}$ (b) $[\text{Mn}(\text{H}_2\text{O})_6]^{2+}$ (c) $[\text{Fe}(\text{CN})_6]^{4-}$ (d) $[\text{Co}(\text{H}_2\text{O})_6]^{2+}$
7. When _____, the low spin form becomes ground state.
(a) $\Delta > P$ (b) $\Delta < P$ (c) $\Delta = P$ (d) $\Delta \leq P$
8. In Octahedral complexes the energy of t_{2g} orbital is decreased by.....
(a) $6 Dq$ (b) $4 Dq$ (c) $3 Dq$ (d) $2 Dq$

Q.2. Attempt any SEVEN of the following:

[14]

1. The term symbols for d^4 and d^6 - configuration is 5D . Explain.
2. Orgel diagram for d^3 & d^8 system are identical. Explain
3. Explain: Ligand field theory is a mixing of CFT and MOT.
4. The energy of dz^2 orbital is most destabilized in TBP geometry.....Explain.
5. Explain 90° super exchange for Cr(III).
6. Enlist important characteristics of diamagnetic susceptibility.

7. Define the term hyper sensitive transition and discuss absorption spectra of Lanthanide complexes.
8. Give the difference between ξ & λ . Calculate λ value for high spin d^1 to d^6 configuration.
9. Define magnetic susceptibility and Volume susceptibility.

Q.3.A. Explain the splitting of d-orbital in TBP & tetrahedral stereochemistry. [6]

B. Explain the series, which is based on Racah parameter. [6]

Or

B. Derive the microstates for the p^2 configuration. Find out the terms arising from it and indicate the ascending order of energy. [6]

Q.4.A. Draw and explain the correlation diagram for $[V(H_2O)_6]Cl_3$ complex and show that ${}^3T_{2g(g)}$ state is lower energy state. [6]

B. Explain T.S. diagram for $[Co(H_2O)_6]^{2+}$ complex and calculate the value of electronic parameters, Dq , $\% \beta$, β and Configuration interaction (x). [6]

[Given: $\nu_1 = 8,100 \text{ cm}^{-1}$, $\nu_2 = 16,000 \text{ cm}^{-1}$, $\nu_3 = 20,000 \text{ cm}^{-1}$ and B_0 for $Co(II) = 971 \text{ cm}^{-1}$]

Or

B. Predict the type of transition in the following complexes giving proper examples.

1. $[Cu(NH_3)_6]^{2+}$
 2. $[Co(NH_3)_6]^{3+}$
 3. $[Co(NH_3)_6]^{2+}$
 4. $[Ni(Ox)_3]^{4-}$
 5. $[Ti(SCN)_6]^{4-}$
 6. $[MnF_6]^{4-}$
- [6]

Q.5.A. Explain first order Zeeman effect and second order Zeeman effect. Derive Van-Vleck equation for the magnetic susceptibility of the coordination compounds. [6]

B. What are the sources of Paramagnetism? Derive the orbital magnetic moment equation. Find out the diamagnetic correction for 1,10 phenanthroline. [6]

Given: $\chi_c = -6.6 \times 10^{-6} \text{ cgs}$, $\chi_H = -2.93 \times 10^{-6} \text{ cgs}$, $\chi_{\text{Ring}} = -4.61 \times 10^{-6} \text{ cgs}$ and $\lambda_c = -0.24 \times 10^{-6} \text{ cgs}$.

Or

B. Answers the following:

1. Explain the Antiferromagnetic exchange pathways. [6]
2. Explain the Laporte orbital and spin selection rule.

Q.6.A. Derive Curie's-Weiss equation.

[6]

B. Explain spin orbit coupling on A, E and T terms. Calculate the effect of spin-orbit coupling on effective magnetic moment value of hexa aqua nickel (II) complex ion. [Given: $\lambda = -315\text{cm}^{-1}$ & $Dq = 900\text{cm}^{-1}$]

Or

B. Answers the following:

[6]

1. Explain the spin pairing in octahedral complexes.
2. Explain the use of tris(2,2,6,6-tetramethyl,3,5-heptadione)Ln(III) chelate in NMR spectra of compounds.

— X —

SEAT No. _____

No. of Printed Pages : 04

[10]

SARDAR PATEL UNIVERSITY

M.Sc. (Chemistry), Semester – II

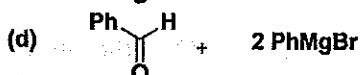
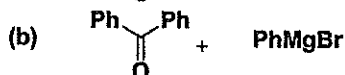
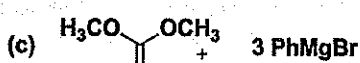
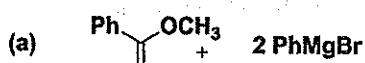
November 6, 2017 :: Monday

Time: 10:00 A.M. – 1:00 P.M.

ORGANIC CHEMISTRY-II [PS02CCHE02]

Q-1 Select the correct answer and mention only the code of correct answer against their question numbers. [08]

1. Which pair of the Grignard reactants does *not* give triphenylmethanol after an aqueous workup ?



2. Which of the following statements regarding hydroboration is wrong ?

(a) hydride ion is bonded to more substituted carbon

(b) "H" is the electropositive portion of the reagent

(c) Borane adds to a double bond in cis manner

(d) It follows markonicov addition

3. Green chemistry synthesis could involve _____

(a) high temperature

(c) microwave

(b) dichloromethane

(d) petrochemicals

4. Which radical is not involved as an intermediate in the following reaction ?



(a) Br^\bullet

(b) $\text{Ph}-\text{CH}_2^\bullet$

(c) $\text{Bu}_3\text{Sn}^\bullet$

(d) $\text{Ph}-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{CN}^\bullet$

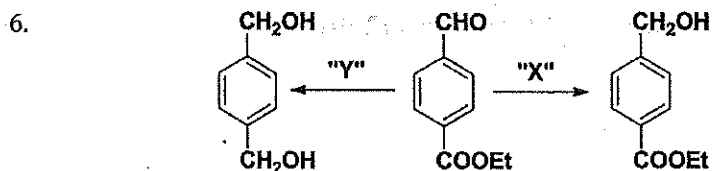
5. _____ is often referred as the universal and green solvent.

(a) methanol

(c) ethyl acetate

(b) water

(d) benzene



"X" and "Y" is _____

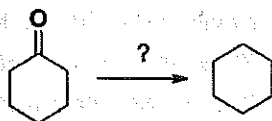
(a) X = NaBH_4 & Y = NaBH_4

(c) X = NaBH_4 & Y = LiAlH_4

(b) X = LiAlH_4 & Y = LiAlH_4

(d) X = LiAlH_4 & Y = NaBH_4

7. Which of the following reaction conditions is not appropriate for the following transformation?



- (a) Zn(Hg)/HCl
 (b) NH₂NH₂/NaOH
 (c) LiAlH₄/Et₂O
 (d) HSCH₂CH₂CH₂SH/H⁺ then H₂/Ni

8. All of the following are characteristics of a Wittig reaction except _____

- (a) it results in the exclusive trans double bond
 (b) it involves the reaction of phosphonium ylide with carbonyl compound
 (c) it results formation of C-C double bond
 (d) it proceeds through phosphaoxetane intermediate

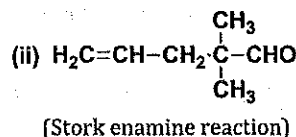
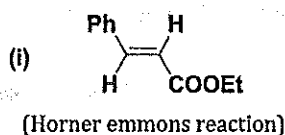
Q-2 Answer ANY SEVEN of the following in short.

[14]

- Wittig reaction should be performed under dry and inert condition. Explain.
- Why microwave heating is better than conventional heating?
- Describe the differences between Shapiro and Bamford-Stevens reaction.
- Reaction of *trans*-2-butene with neu.KMnO₄ is stereoselective. Explain.
- Write the characteristics of good oxidizing agent.
- Explain the role of K₂CO₃ in Stork enamine reaction.
- Write the synthesis of 9-BBN and Thexyl borane
- Define the term: i) atom economy ii) E-factor
- How do terminal and internal alkynes differ in their reactivity towards hydroboration followed by Alk. H₂O₂ oxidation?

Q-3 [A] Give the synthesis of following molecule.

[06]



Q-3 [B] Explain in detail.

[06]

- Secondary amine is used for the synthesis of enamine in Stork enamine reaction.
- Non stabilized ylide gives Z-alkene as a major product.

OR

Q-3 [B] Complete the following transformation with detail mechanism

[06]

- $$\text{HO-CH}_2\text{-CH}_2\text{-CH}_2\text{-COOH} \xrightarrow{\text{DCC}} ?$$
- $$\text{Ph-C(=O)-CH}_2\text{-CH}_2\text{-CH}_2\text{-CH}_2\text{-Br} \xrightarrow[\text{ii) NaOEt}]{\text{i) Ph}_3\text{P}} ?$$

Q-4 [A] Do as directed [06]

1. Give the detail mechanism of Shapiro reaction.
2. How isomerisation of 3-hexene to 1-hexene is possible via hydroboration?

Q-4 [B] Answer the following. [06]

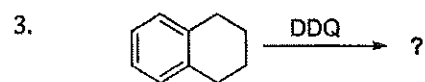
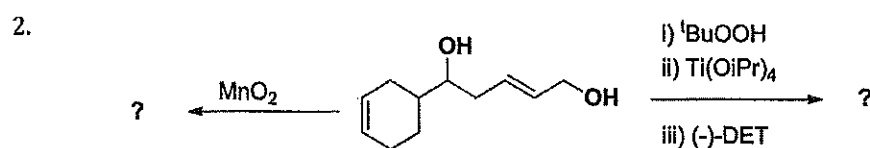
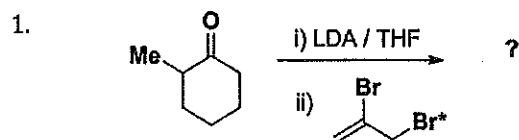
1. In Peterson olefination reaction, acid catalysed decomposition of erythro- β -hydroxy silane gives E-alkene, Justify.
2. Explain the reactivity of 1-butene towards 9-BBN and H^+ / H_2O .

OR

Q-4 [B] Explain in brief. [06]

1. Reaction of dithiane with epoxy compound is regioselective.
2. Importance of carbonylation of organoborane compound.

Q-5 [A] Complete the following transformation. [06]



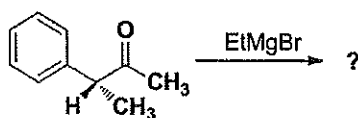
Q-5 [B] Explain the following [06]

1. Gilman & Grignard reagents differ in their reactivity towards α,β -unsaturated aldehyde.
2. Hydroxylation of *trans*-2-butene using iodine/silverbenzoate in dry condition is stereoselective.

OR

Q-5 [B] Attempt as suggested [06]

1. Using Cram's rule, suggest the major product in following reaction.



2. Describe Moffatt oxidation giving suitable example.

Q-6 [A] Do as directed.

[06]

1. What are phase transfer catalysts? Give their advantages.
2. Give the detail mechanism of allylic bromination using NBS.

Q-6 [B] Explain in detail.

[06]

1. Low concentration of TBTH leads to cyclization while high concentration of TBTH leads to substitution.
2. Ionic liquids are best solvent for Microwave Assisted Organic Reaction.

OR

Q-6 [B] Answer the following.

[06]

1. Describe the difference between LiAlH_4 and NaBH_4 .
2. Write any three principles of green chemistry.

Best of luck

SC

[48]

No. of printed pages:02

SARDAR PATEL UNIVERSITY

M.Sc SECOND SEMESTER EXAMINATION 2017

Wednesday, 8th November 2017, 10.00 am to 1.00 p.m.

PS02CCHE03 , PHYSICAL CHEMISTRY II selected topics

N.B. figures to the right indicates full marks.

Q.1 Choose appropriate answer from the followings. 08

- 1 In RNA pyrimidine base is ...
(a) Guanine (b) Thymine
(c) Adanine (d) Uracile
- 2 What is the unit of the rate constant for the 5/2 order reaction?
(a) $\text{dm}^{-3} \text{mol s}^{-1}$ (b) $(\text{dm}^3)^{3/2} \text{mol}^{-3/2} \text{s}^{-1}$
(c) $(\text{dm}^3)^{-1/2} \text{mol}^{1/2} \text{s}^{-1}$ (d) s^{-1}
- 3 Which of the following pairs of molecules contains centre of inversion?
(a) $\text{CO}_2, \text{SO}_4^{2-}$ (b) CO_2, BF_3
(c) $\text{CO}_2, \text{C}_2\text{H}_2$ (d) $\text{C}_2\text{H}_2, \text{BF}_3$
- 4 Electrokinetic effect leads to ...
(a) Electrophoresis (b) Electroosmosis
(c) Streaming potential (d) All
- 5 Zeta potential is inversely proportional to
(a) Current (b) Viscosity
(c) Dielectric constant (d) Both a & c
- 6 Biological functions of proteins are determined by their ...
(a) Tertiary structure (b) secondary structure
(c) primary structure (d) Quaternary structure
- 7 Which of the following molecules shows square pyramidal geometry?
(a) SF_6 (b) XeF_4
(c) BrF_5 (d) NH_3
- 8 Which of the following is the example of consecutive reaction?
(a) polymerisation (b) Thermal craking
(c) Chlorination of hydrocarbans (d) All

Q-2 Answer the following. (ANY SEVEN) 14

- (i) How are the irreducible representation arranged in C_{3v} ?
- (ii) Show that $\text{C}_4^3 \text{C}_4 \text{C}_4 = \text{E C}_4$
- (iii) Give two differences between parallal and consecutive reaction.
- (iv) Zeta potential varies with the pH of the medium. Explain.
- (v) What are parallel reactions? Give the relation for determining the concentration of a reactant in the cause of reaction.
- (vi) What is acyl phosphate ? How is it formed?
- (vii) What is Electroosmosis?
- (viii) Explain the peptide bond with example.
- (ix) ATP is energy currency in biological reaction. Elaborate.

(7)

(P.T.O.)

Q.3 A The character table for D_5 point group is

06

D_5	E	$2C_2(Z)$	$2[C_5]^2$	$5C_2$
$\bar{1}_1$	1	1	1	1
$\bar{1}_2$	1	1	1	-1
$\bar{1}_3$	2	a	b	c
$\bar{1}_4$	2	d	e	f

Deduce the values for a to f.

B (i) Write rules for constructing of character table. 03

B(ii) Show that under orthogonal transformation the length of the vector remains constant. 03

OR

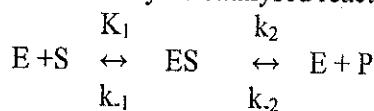
B (i) Draw the neat sketch of ethylene and show that it belongs to D_{2h} point group. 03

B(ii) Show that for a rotation about x axis, the transformation matrix is 03

$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & \cos\theta & \sin\theta \\ 0 & -\sin\theta & \cos\theta \end{bmatrix}$$

Q.4 A For the enzyme catalysed reaction of type:

06



Derive a relation for maximum rate of reaction and explain how it varies under the low and high substrate concentrations.

B What is relaxation time? Considering the following reaction $2A \leftrightarrow B$, derive an equation for relaxation time. 06

OR

B Derive the following equation for primary equation for primary kinetics salt effect. 06

$$\log K = \log K^0 + 2 Z_A Z_B A I^{1/2}$$

Q.5 A Explain quantitative treatment of electrical double layer. 06

B Write short notes on (1) Guoy chapman model (2) Electrophoresis. 06

OR

B Give classification of proteins and describe 3^o structure of protein. 06

Q.6 A Discuss how many ways one can express the free energy change for an acid catalysed hydrolysis of ethyl acetate. 06

B The concentration of chloride ion in blood is about 0.10 mole dm^{-3} and that of urine is 0.16 mole dm^{-3} . Calculate the energy expended by the kidneys in transporting chloride from plasma to urine. How many moles of chloride ions can be transported per mole of ATP hydrolysed? 06

OR

B (i) How DNA and RNA differ from each other? 03

B(ii) For a general reaction : $cS_1 + dS_2 \leftrightarrow aP_1 + bP_2$ define free energy change ΔG and equilibrium constant K_{eq} and show that $\Delta G^0 = -1364 \log K_{eq}$ at 25^oc. 03

----- END -----

(54)

SEAT No. _____

No. of Printed Pages: 2

[54] SARDAR PATEL UNIVERSITY

M.Sc. (Chemistry) Semester-2 Examination

Friday,

Date: 10-11-2017

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)

1. Answer of $\log_{10} 8.72 \times 10^2$ expressed in significant figure is _____
(a) 2.94051 (b) 2.9 (c) 2.940 (d) 2.9405
2. If desired component is present in between 1 - 0.1 %, analysis is called _____ analysis.
(a) Trace (b) Minor (c) Major (d) Complete
3. 2^{40} Bytes is SI prefixed as:
(a) Terabytes (b) Gigabytes (c) Petabytes (d) Exabyte
4. In chromatography, _____ on the time axis may serve to identify the components of the sample.
(a) number of peaks (c) area under the peaks
(b) position of peaks (d) height of peaks
5. Photon of wavelength 555 nm corresponds to _____ cm^{-1} .
(a) 15000 (b) 16000 (c) 17000 (d) 18000
6. _____ is required as the material for the cell for work in the ultraviolet region.
(a) Fused silica (b) Glass (c) KBr (d) all of above.
7. ISI means:
(a) Institutional Standards for Industries (c) Indian Standard Institution
(b) Institute for Standard of International (d) Industrial Standard Institute
8. Adsorption chromatography is preferred for the separation of mixtures whose components _____.
(a) differ in polarity (c) have almost similar structures
(b) are very close in polarity (d) All of above

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

- (i) Write the aspects of validation.
- (ii) Discuss the principle of thin layer chromatography.
- (iii) Differentiate classical and instrumental techniques.
- (iv) Classify the analytical techniques based on principle and phenomenon.
- (v) Write the five forms of electromagnetic radiations.
- (vi) Explain the term periodic validation.

(1)

(P.T.O)

[vii] How will the reaction rate change in $A + 2B \leftrightarrow 2D + E$, if the concentrations of substance A increase three and of substance B four times?

[viii] Enlist the five basic components of optical instruments.

[ix] Explain principle of gas chromatography according to Henry's law.

3 [a] Discuss in detail on good manufacturing practices and its components. (6)

[b] Answer the following: (6)

[i] Write a note on quality management system (QMS).

[ii] Differentiate validation and verification. Explain the various aspect of validation.

OR

[b] Discuss the steps involved in typical quantitative analysis with suitable example. (6)

4 [a] Answer the following: (6)

[i] Define and distinguish determinate error and Indeterminate error.

[ii] Discuss the rules for representing SI units.

[b] Attempt the following: (6)

(i) If 30 mg of CuSO_4 (Mol. Wt. 159.5 g/mol) are contained in 2 ml of solution, determine the molarity and normality of the solution (For exchange reaction).

(ii) How many mL of water should be added to 100 ml of 24% solution of ammonia to prepare 5% solution. (Density NH_3 (24%) = 0.910 gm/cc)

OR

[b] Define the term: Standard Deviation, Relative standard Deviation of mean and discuss in brief on outlier and methods of its rejection. (6)

5 [a] Answer the following: (8)

[i] Write a note on radiation sources used in optical instruments.

[ii] Explain in brief on typical absorption and emission spectrometer.

[b] Discuss in detail on various detectors used in optical instruments. (4)

OR

[b] Explain the importance of wavelength selection in quantitative techniques and methods used for the selection of wavelength. (4)

6 [a] Classify the chromatography. Briefly explain the instrumentation of GC. (6)

[b] Write the principle of paper chromatography and discuss the methods used for development of chromatogram and detection of spot in paper chromatography. (6)

OR

[b] What is Gel permeation chromatography? Explain its principle of working. (6)

Note: Answer to all questions (including multiple choice questions) should be written in the provided answer book only.

SARDAR PATEL UNIVERSITY
M.Sc (II Semester) Examination
Friday, 10th Nov, 2017
10:00 am to 1:00 pm
Organic Chemistry
PS02ECHE02 – Introduction to Biochemistry

TOTAL MARKS: 70

Q.1 Tick mark / select the correct answer for the following. (Only correct option against given question number needs to be written in provided answer book) (08 Marks)

- 1) Under the influence of sunlight is synthesized in our skin from
 - a) Vitamin D, cholesterol
 - b) Vitamin E, starch
 - c) Vitamin C, glucose
 - d) Vitamin B1, protein
- 2) Proteins are the polymers of
 - a) D-amino acids
 - b) D-glyceraldehydes
 - c) L-amino acids
 - d) L-glyceraldehydes
- 3) The phospholipid that prevents the adherence of inner surface of lungs is
 - a) Cardiolipin
 - b) Dipalmitoyl lecithin
 - c) Lysolecithin
 - d) Plasmalogens
- 4) sugar is present in the milk:
 - a) Lactose
 - b) Maltose
 - c) Sucrose
 - d) Fructose
- 5) Feedback inhibition is a specialized form of:
 - a) Reversible inhibition
 - b) Irreversible inhibition
 - c) Allosteric inhibition
 - d) Competitive inhibition
- 6) Which base is not present in the structure of RNA?
 - a) Adenine
 - b) Guanine
 - c) Uracil
 - d) Thymine
- 7) The bonds forming the backbone of protein structure are
 - a) Hydrogen bonds
 - b) Disulfide bonds
 - c) Ionic bonds
 - d) Peptide bonds
- 8) The functional unit of enzyme is known as....
 - a) Apoenzyme
 - b) Coenzyme
 - c) Holoenzyme
 - d) Isoenzyme

- Q.2 Answer any seven from the following: 14
- a) Justify: Vitamin D is a hormone.
 - b) What are the functions of lipids?
Draw the structure of following:
 - c) (a) Plasmalogens
(b) Cardiolipin
 - d) Define the following terms (i) Hypertonic solution (ii) Hypotonic solution
 - e) Write a note on "Inversion of sucrose".
 - f) Write a short note on activation of latent enzymes.
 - g) What are induction and repression? Explain by suitable example of each.
 - h) What are the functions of nucleic acids?
 - i) Draw the structure of fructose.
- Q.3 (A) Give an account of absorption, transport and storage of vitamin A. 6
- (B) Write an account on properties of triacylglycerols.. 6
- OR
- (B) Describe the structure and functions of cholesterol 6
- Q.4 (A) Describe the various structures of proteins.. 6
- (B) Classify protein molecule on the basis of their shape 6
- OR
- (B) Write brief account on the following 6
- (i) Fibrous protein
 - (ii) Globular protein
- Q.5 (A) Define isomers. Draw the possible isomers of glucose. 6
- (B) Define monosaccharides and explain its reactions. 6
- OR
- (B) Describe the ionization of water. 6
- Q.6 (A) Explain the enzyme inhibition. 6
- (B) What is RNA? Explain the type of RNA. 6
- OR
- (B) Explain the mechanism of action of enolase enzyme. 6

— X —
(2)