

SARDAR PATEL UNIVERSITY
M. Sc. FOURTH SEMESTER Examination 2017

Saturday, 15th April 2017,

Time: 2.00 p.m. to 5.00 p.m.

PS04CANC02,

ELECTRO ANALYTICAL METHODS

N.B. Figures to the right indicate marks.

Total Marks : 70

Q-1 Choose appropriate answers. (only code)

[08]

- To minimize the electrostatic force one of the following is added into the solution
(a) Carpenter Glue (b) Fevicol
(c) salt (d) Inactive electrolyte
- Which one of the following is a weak acid,
(a) HNO₃ (b) HI
(c) HBr (d) HF
- The half reaction that occurs at the anode during electrolysis of molten NaBr is
(a) $2\text{Br}^- \rightarrow \text{Br}_2 + 2e^-$ (b) $\text{Br}_2 + 2e^- \rightarrow 2\text{Br}^-$
(c) $\text{Na}^+ + e^- \rightarrow \text{Na}$ (d) $2\text{H}_2\text{O} + 2e^- \rightarrow 2\text{OH}^- + \text{H}_2$
- Unit of electrical conductance is
(a) Volt (b) Ampere (c) Coulomb (d) Siemens
- If K_w is 2.9×10^{-15} at 10°C. What is the P^H of pure water at 10°C
(a) 6.72 (b) 7.00
(c) 7.27 (d) 7.53
- The P^{OH} of a solution of NaOH is 11.30. What is the [H⁺] for this solution
(a) 2.0×10^{-3} (b) 2.5×10^{-3}
(c) 5.9×10^{-3} (d) 2.9×10^{-3}
- In a sample of pure water which one is always true at all temperature and pressure?
(a) P^H = 7 (b) P^{OH} = 7 (c) [H₃O⁺] = 1×10^{-7} (d) [H₃O⁺] = [OH⁻]
- For monobasic weak acids P^H equals to
(a) log K_a (b) <log K_a (c) >log K_a (d) — log K_a

Q-2 Answer **any seven** of the following [14]

1. Calculate equilibrium constant for the reaction:
$$\text{Cu}_{(s)} + 2\text{Ag}^+_{(aq)} \rightarrow \text{Cu}^{+2} + 2\text{Ag}_{(s)}$$

(Given : ($E^0_{\text{cell}} = 0.46$ v and $E_{\text{cell}} = 0.0$ v))
2. Calculate the P^H of N/100 H_2SO_4 solution and N/10 NaOH solution.
3. State relationships of electro analytical methods.
4. State sources of emf observed in glass electrode.
5. Why aqueous solutions are generally used in electro analytical methods.
6. State applications of P^H measurements.
7. Derive $E^0 = RT / nF \ln K$.
8. How basicity of an acid is determined by conductometry measurement.
9. Write down Ilkovic equation. Explain terms involved in it.

Q-3

(a) Differentiate between working and reference electrodes. Discuss Quinhydrone electrodes. [06]

(b) (i) State advantages and disadvantages of antimony electrode. [03]

(ii) write a note on solid state sensors and precipitate electrodes. [03]

OR

(b) (i) Calculate P^H of a solution after mixing 0.1M acetic acid with ~~200~~²⁰ ml 0.1M NaOH. ($K_a = 1.8 \times 10^{-5}$) [03]

(ii) Write down errors with glass electrodes in P^H measurement. [03]

Q-4

(a) Discuss First kind, second kind and third kind of electrodes in potentiometry. [06]

(b) (i) Explain chemical cell without transference. [03]

(ii) Write a note on amalgam electrodes. [03]

OR

(b) For the cell,



Calculate E^0 for Ag/AgCl/Cl electrode. ($E_{\text{cell}} = -1.1369\text{V}$, $E^0_{\text{Cl}^-/\text{Cl}} = 1.35\text{V}$) [06]

(2)

Q-5

- (a) Calculate the equivalent conductance of acetic acid at infinite dilution at 25 °C. ($H^+ = 349.8$, $Na^+ = 50.11$, $Cl^- = 26.34$ and $CH_3COO^- = 40.9$) [06]
- (b) Compare between low frequency and high frequency conductance techniques. [06]

OR

- (b) The equivalent conductance of 0.1 N solution of $MgCl_2$ is $97.1 \text{ ohm}^{-1} \text{ cm}^2/\text{eq}$. at 25 °C. A cell with electrodes that are 150 cm^2 in area and 0.5 cm apart filled with 0.1 N $MgCl_2$. How much current will flow when the potential difference between electrodes is 5 Volt? [06]

Q-6

- (a) (i) Write down the advantages and disadvantages of dropping mercury electrode. [03]
- (ii) What do you mean by Polarographic hump? How this hump can be removed? [03]
- (b) Discuss current sampled and pulse polarography. [06]

OR

- (b) How much is the transition time of Cd^{+2} increases if solution of $1 \times 10^{-4} \text{ M}$ Cd^{+2} is added to $1.00 \times 10^{-4} \text{ M}$ Pb^{+2} solution? [06]

SARDAR PATEL UNIVERSITY

(CBCS) M. Sc. Examination, Semester - IV
 PS04CINC01: MEDICAL IMAGING SYSTEMS AND THERAPEUTIC EQUIPMENTS
 Monday, 10th April, 2017, Time: 2:00 pm – 5:00 pm

Total Marks: 70

Note: The figures to the right indicate maximum marks.

- Q-1.
1. Superposition of the three dimensional information onto single plane makes diagnosis confusing and difficult, This is the limitation of.....
 (a) X-ray CT (b) Ultrasonic (c) X-ray (d) NMR 1
 2. Stationary anodes are used in x-rays. 1
 (a) arm (b) foot (c) thigh (d) dental
 3. atoms are best for MRI of body. 1
 (a) Carbon (b) Oxygen (c) Nitrogen (d) Hydrogen
 4. Lateral Resolution is dependent on....., depth and focusing. 1
 (a) beam width (b) voltage (c) attenuation coefficient (d) frequency
 5. If R < 60 bpm then it is known as 1
 (a) tachycardia (b) bradycardia (c) flutter (d) fibrillation
 6. is a procedure to destroy tissue using a high-frequency electric current applied with a needle like electrode. 1
 (a) Desiccation (b) Fulguration (c) Cut (d) Coagulation
 7. In therapy, shortwave and microwave are types of 1
 (a) diathermy (b) thermal imaging (c) lithotripter (d) ventilator
 8. Lamp that acts as an energy source by emitting white light, which excites ruby atoms and causes them to emit photon is 1
 (a) reflecting cylinder (b) cooling cylinder (c) laser beam (d) flash tube

Q-2. **Write in brief (Attempt any 7)**

- (1) Why Tungsten is used as target material in X-ray? 2
- (2) What is the limitation of Single phase supply for X-ray circuits? 2
- (3) Which factors are responsible for thermal damage? 2
- (4) Which atoms are best suited for MRI? Why? 2
- (5) Write the equation of Larmor Frequency with interpretation. 2
- (6) Why AEDs require self-adhesive electrodes instead of hand held paddles? 2
- (7) Which problems are associated with Pacemaker leads? 2
- (8) When should Diathermy be used? 2
- (9) List applications of Argon LASER. 2

- Q-3. (a) Draw the block diagram of X-ray machine and explain automatic exposure control (AEC). 6
 (b) Discuss high voltage and high frequency generator with necessary figures. 6
OR
 (b) Discuss different components of X-ray computed tomography in brief. 6
- Q-4. (a) Write basic equation of Ultrasound. Draw block diagram of Pulse echo system and explain its working. 6
 (b) Explain basic principle of Thermal imaging and explain Thermo graphic equipment. 6
OR
 (b) With neat block diagram explain NMR components. 6
- Q-5. (a) Discuss types of external Pacemaker. 6
 (b) Write the basic principle of Electro surgery and discuss its types. 6
OR
 (b) List types of electrodes used for Defibrillation and explain DC defibrillator. 6
- Q-6 (a) Write a note on Pulsed Ruby LASER. 6
 (b) Explain microprocessor controlled Ventilator. 6
OR
 (b) What is the use of Lithotripter? Explain with neat diagram Lithotripter system. 6

[91]

SEAT No. _____

No. of Printed pages: 3

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

2017

Saturday, 15th April
2.00 p.m. to 5.00 p.m.

INORGANIC CHEMISTRY: PS04CINC03
(INORGANIC POLYMERS AND INORGANIC SPECTROSCOPY)

Note: Numbers at the right show full marks.

TOTAL MARKS: 70

Q.1. Answer the followings:

8

- Polysiloxanes have connectivity of _____.
(a) One, (b) Two,
(c) Three, (d) Four
- When $(\text{NPCl}_2)_3$ is heated at 250°C , it undergoes _____.
(a) decomposition reaction, (b) elimination reaction,
(c) polymerization reaction, (d) addition reaction
- On increasing the strain in a ferrocenophane, the ring opening polymerization will take place at _____.
(a) lower temperature, (b) higher temperature,
(c) lower pressure, (d) higher pressure
- The void/ pore size in MOFs can be varied by varying _____.
(a) the size of metal ion, (b) the size of linker,
(c) the solvent polarity, (d) the reaction temperature
- In EPR, the transition between electron's spin energy levels takes place by absorbing radiation of _____.
(a) radio frequency region, (b) infra-red region,
(c) microwave region, (d) X-ray region
- The EPR spectrum of H_2^+ ion radical shows _____ line(s).
(a) one, (b) two,
(c) three, (d) four
- The most extensively studied element in Mössbauer spectroscopy is _____.
(a) Fe^{57} , (b) Co^{57} ,
(c) Sn^{119} , (d) Ni^{61}

Q.5.A. Explain the theory of EPR spectroscopy and discuss the differences between EPR and NMR spectroscopy. **6**

B. Discuss the electron-nuclear hyperfine interactions in EPR spectroscopy. **6**

Or

B. Discuss the various applications of EPR spectroscopic technique.

Q.6.A. Discuss the principle of Mössbauer spectroscopy. **6**

B. Explain the Quadrupole and Magnetic splittings in Mössbauer spectroscopy. **6**

Or

B. Discuss the instrumentation and applications of Mössbauer spectroscopy.

————— × —————

8. In Mössbauer spectroscopy, Quadrupole splitting reflects the interaction between the nuclear energy levels and _____.

- (a) external magnetic field, (b) surrounding electric field gradient,
(c) magnetic moment of un-paired electron, (d) none of these

Q.2. Answer any SEVEN of the followings:

14

1. Define isotactic, syndiotactic and atactic polymers giving examples of polysilanes.
2. Write a short note on solubility parameter and its importance in polymer chemistry.
3. Write about the Phyllosilicates and Tectosilicates giving examples.
4. What are ferrocenophanes? Give some examples of ferrocenophanes.
5. Write the mechanism of ring opening polymerization of a strained ferrocenophane.
6. Explain the electron Zeeman Effect.
7. Predict the EPR spectrum of $\cdot\text{CH}_3$ radical.
8. Define the Mössbauer effect.
9. Explain the isomer shift (δ) in Mössbauer spectroscopy.

Q.3.A. Discuss the classifications of inorganic polymers based on connectivity and dimensionality.

6

B. Answer the following:

6

1. Write the various methods for the synthesis of linear polyphosphazenes.
2. Write the synthesis of polysiloxanes.

Or

B. Discuss about various sulfur based polymers.

Q.4.A. What are Coordination Polymers? Discuss about the classifications of the Coordination Polymers.

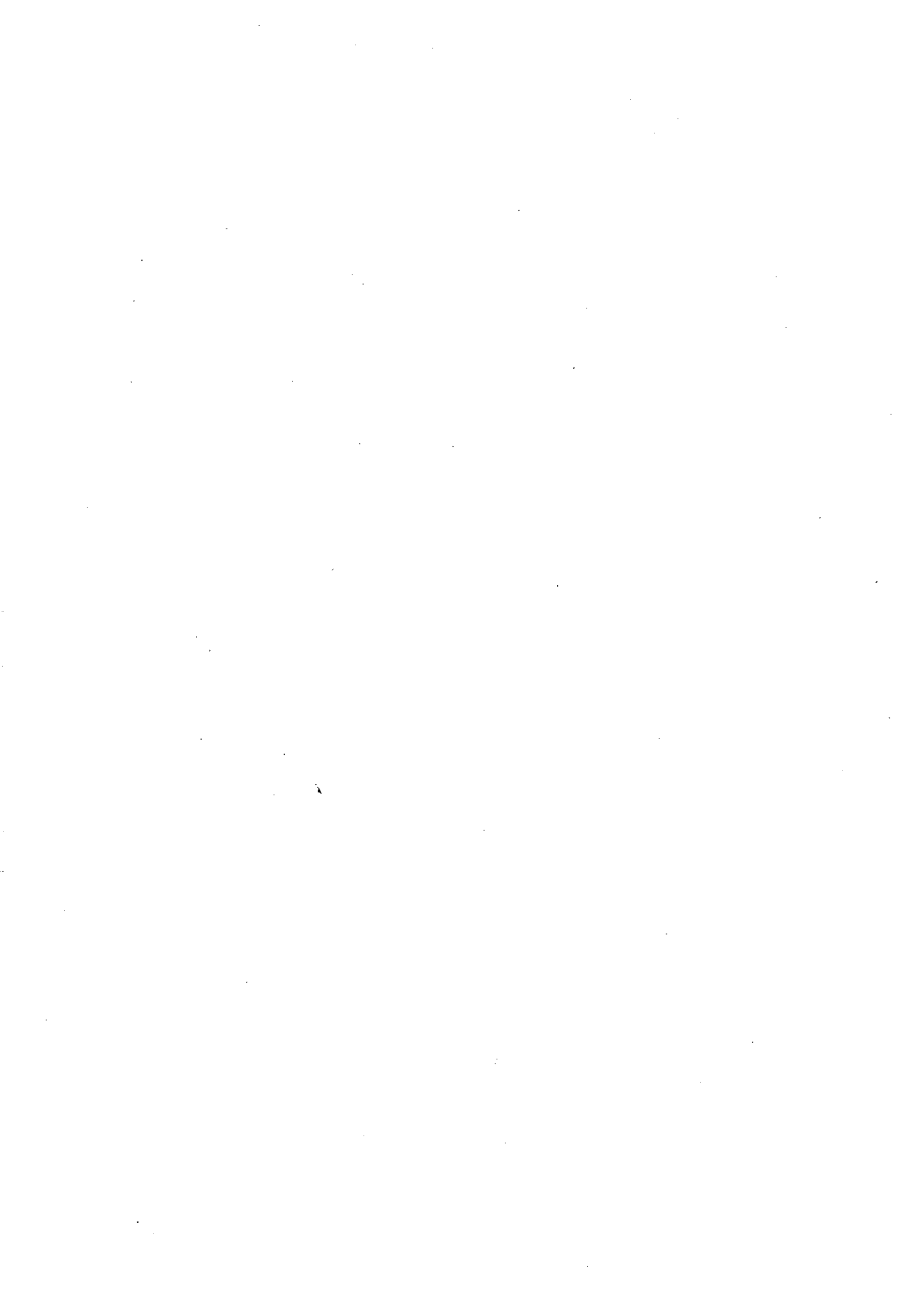
6

B. Discuss the various methods for the synthesis of ferrocene based polymers.

6

Or

B. What are Metal Organic Frameworks (MOFs)? Discuss the synthesis and the applications of MOFs.



SEAT No. _____

No. of printed pages = 4

[97]

SARDAR PATEL UNIVERSITY
Vallabh Vidyanagar 388 120

(CBCS) M. Sc. Examination, Semester - IV
PS04CINC03: ROBOTICS & FUZZY LOGIC

Saturday, 15th April, 2017, Time: 2:00 pm – 5:00 pm

Total Marks: 70

Note:- Figures to the right indicate maximum marks.

- Assume suitable data wherever required and clearly mention the same.
- Answer to the point.
- Neat sketches can replace a good amount of words

Q-1 Multiple Choice Questions.

- (1) Which equation is used to find out gripper force? (01)
(a) $\mu \times n_f \times F_g = W$ (b) $\mu \times n_f = W \times F_g$ (c) $\mu \times n_f \times W = F_g$ (d) $\mu \times n_f \times F_g = Wg$
- (2) Which of the following is found using forward kinematics? (01)
(a) length (b) joint angle (c) end position (d) twist angle
- (3) In which year Programmable Universal Machine for Assembly (PUMA) Robot was developed? (01)
(a) 1971 (b) 1978 (c) 1966 (d) 1981
- (4) What is the full form of SCARA Robot? (01)
(a) Selective Compliance Authority Robot arm
(b) Selective Complex Assembly Robot arm
(c) Selective Compliance Assembly Robot arm
(d) Selective Compliance Adjusted Robot arm
- (5) Which is not the part of robot anatomy? (01)
(a) arm (b) End effector (c) wrist (d) all of the above
- (6) Jacobian matrix is related to (01)
(a) velocity (b) distance (c) time (d) all of the above
- (7) $P \vee P = P$ and $P \wedge P = P$ is property. (01)
(a) negation (b) associativity (c) absorption (d) idempotence
- (8) A logical formula comprising n propositions will have interpretations in its truth table. (01)
(a) 2 (b) n (c) 2^n (d) n^2

Q-2

Short answer type questions- attempt any 7

- (1) What are the basic components of an industrial robot? (02)
- (2) Draw TRL and TRR configuration. (02)
- (3) Define work volume and load carrying capacity of robot. (02)
- (4) Explain the different types of joints used in robots. (02)
- (5) Write down D-H matrix. (02)
- (6) Explain degeneracy and dexterity. (02)
- (7) Define the terms Dilation and Normalization. (02)
- (8) What is Fuzzy logic? What are its advantages? (02)
- (9) Define the terms Dilation and Normalization. (02)

Q-3

- (a) Discuss the difference between fixed, flexible and programmable automation. (06)
- (b) Illustrate the geometric interpretation of the rotation transformations. (06)

OR

- (b) A frame T is rotated 90° about Z- axis, then translated 3 and 5 units relative to n- and o- axes respectively, then rotated another 90° about y-axis. Find the new location and orientation of the frame. (06)

$$T = \begin{pmatrix} 1 & 0 & 0 & 1 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & -1 & 1 \\ 0 & 0 & 0 & 1 \end{pmatrix}$$

Q-4

- (a) Consider robot shown in figure 1. Using D-H notation Construct (06)
 1. Set of robotic coordinate frame
 2. A table for joint parameter
 3. Each joint individual matrix

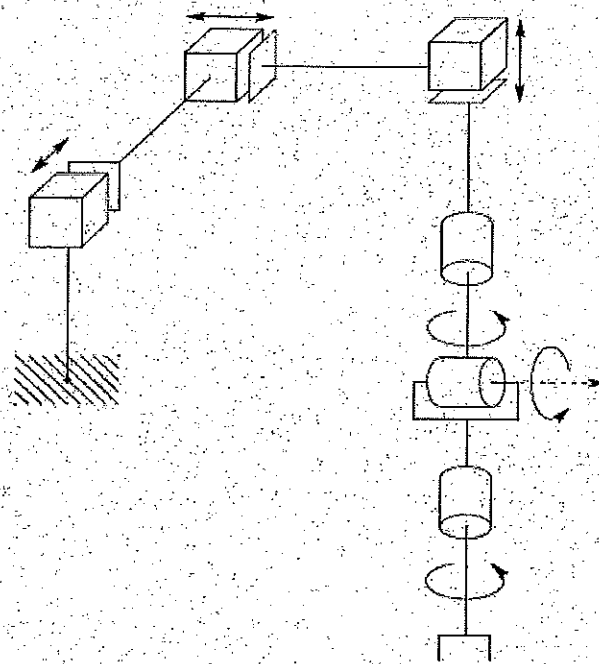


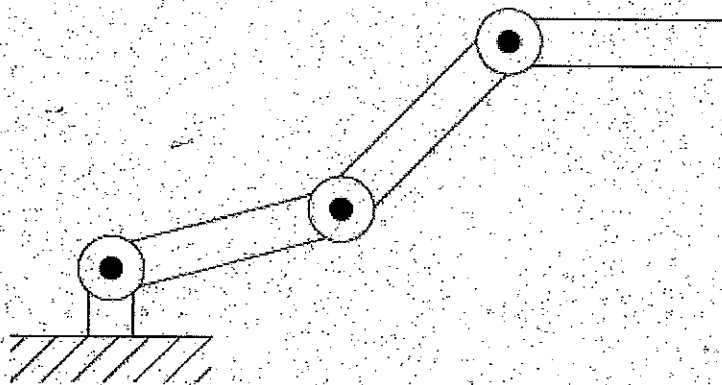
Figure 1. Cartesian manipulator with spherical wrist.

- (b) A point $P(8,5,7)^T$ is attached to a frame (n,o,a) and is subjected to the transformations described. Find the coordinates of the point relative to the reference frame at the conclusion of transformations. (06)
- (1) Rotation of 90° about the n -axis,
 - (2) Followed by a rotation of 90° about the o -axis,
 - (3) Followed by a translation of $[4,-3,5]$

OR

- (b) Explain the vacuum cups gripper with advantage and disadvantage. (06)

- Q-5 (a) Write down forward and inverse kinematics equation for three link robot. Consider link length L_1, L_2 and L_3 and also link angle θ_1, θ_2 and θ_3 (06)



- (b) Explain in details vacuum and magnetic gripper. (06)

OR

- (b) Suppose the following frame was subjected to the differential translation of $d = [1 \ 0 \ 0.5]$ units and differential rotation of $\delta = [0 \ 0.1 \ 0]$ (06)

- (a) What is differential operator relative to the reference frame?
 (b) What is differential operator relative to the frame A?

$$A = \begin{pmatrix} 1 & 0 & 0 & 8 \\ 0 & 0 & 1 & 4 \\ 0 & -1 & 0 & 14 \\ 0 & 0 & 0 & 1 \end{pmatrix}$$

- Q-6 (a) Let A and B be the fuzzy sets for $x_1, x_2, x_3, x_4, x_5, x_6$, If (06)

$A = \{(x_1, 0.4), (x_2, 0.2), (x_3, 0.4), (x_4, 0.1), (x_5, 0.8), (x_6, 0.9)\}$ and

$B = \{(x_1, 0.3), (x_2, 0.8), (x_3, 0.5), (x_4, 0.2), (x_5, 0.6), (x_6, 0.5)\}$

Find (i) $A - B$ and $B \cup B^c$,

(ii) $A \cup B$ and $A \cap B$

(iii) prove that: $(A \cup B)^c = A^c \cap B^c$

- (b) Discuss methods for determining membership functions in detail. (06)

OR

- (b) (i) Define the terms Tautology and Contradiction. (06)

Is $(P \Rightarrow Q) \wedge (Q \Rightarrow P) = (P = Q)$ a Tautology? Justify

(ii) Verify De Morgan's laws.

$\sim(P \vee Q) = (\sim P \wedge \sim Q)$ & $\sim(P \wedge Q) = (\sim P \vee \sim Q)$

SEAT No. _____

No of Printed Pages: 03

[92]

SARDAR PATEL UNIVERSITY

M. Sc. (Semester-IV) Examination

Saturday, 15th April 2017

2.00 PM to 5:00 PM

Industrial Polymer Chemistry, PS04CIPC03

(Processing of Polymers)

Total Marks : 70

Q-1

Answer the followings:

[8]

1. State with low viscous character and high elastic character is called
 - (a) viscoelastic
 - (b) elastoviscous
 - (c) elastoplastic
 - (d) viscous
2. Tumbling blenders are suitable only for
 - (a) batch mixing
 - (b) continuous mixing
 - (c) batch mixing and continuous mixing
 - (d) none of the above
3. The zone of a screw that follows the feed zone is called the
 - (a) compression zone
 - (b) die zone
 - (c) head zone
 - (d) metering zone
4. When some resins are used in extrusion, the resins are removed from the extruder before shut down, this process is called
 - (a) blending
 - (b) premix
 - (c) purging
 - (d) compounding
5. Which of the following polymers need special pre-treatment without which the adhesive could not perform the expected role.
 - (a) fluorocarbons
 - (b) silicones
 - (c) epoxies
 - (d) urethanes
6. In which of the following foam methods, the foaming results by the formation of a gas through the breakdown of foaming agents or blowing agents.
 - (a) chemical foaming
 - (b) physical foaming
 - (c) an addition of hollow glass spheres
 - (d) chemical foaming

(P.T.O)

7. Density Gradient Column method is performed according to the
(a) ASTM D-238
(b) ASTM D-1238
(c) ASTM D-1505
(d) ASTM D-1895
8. The final choice for any product is based on the most favourable balance of
(a) design
(b) fabrication
(c) total cost or selling price of the finished product
(d) all of the above

Q-2 Answer the followings (Any SEVEN)

[14]

- (i) List out the important features of the banbury mixer.
- (ii) Differentiate internal lubricants and external lubricants.
- (iii) Give schematic representation of hand lay-up process.
- (iv) List out the various coating methods.
- (v) Write the advantages and disadvantages of transfer molding process.
- (vi) What is the appropriate short size range in injection molding?
- (vii) Give basic difference between injection blow molding process and extrusion blow molding process.
- (viii) Classify the calenderers.
- (ix) Define the term: Bulk factor and give its importance.

Q-3 (a) Describe briefly about two roll mill mixer.

[6]

(b) What is the importance of thermal properties of polymers in melt processing?

[6]

OR

(b) Write about the following:

[6]

- (i) High Speed Mixer
- (ii) Paddle Mixers

Q-4 (a) Give a suitable sketch and explain the process of wires and cable coating.

[6]

(b) Describe the manufacturing process of parquet flooring blocks.

[6]

OR

(b) With a neat sketch diagram explain the filament winding process,

[6]



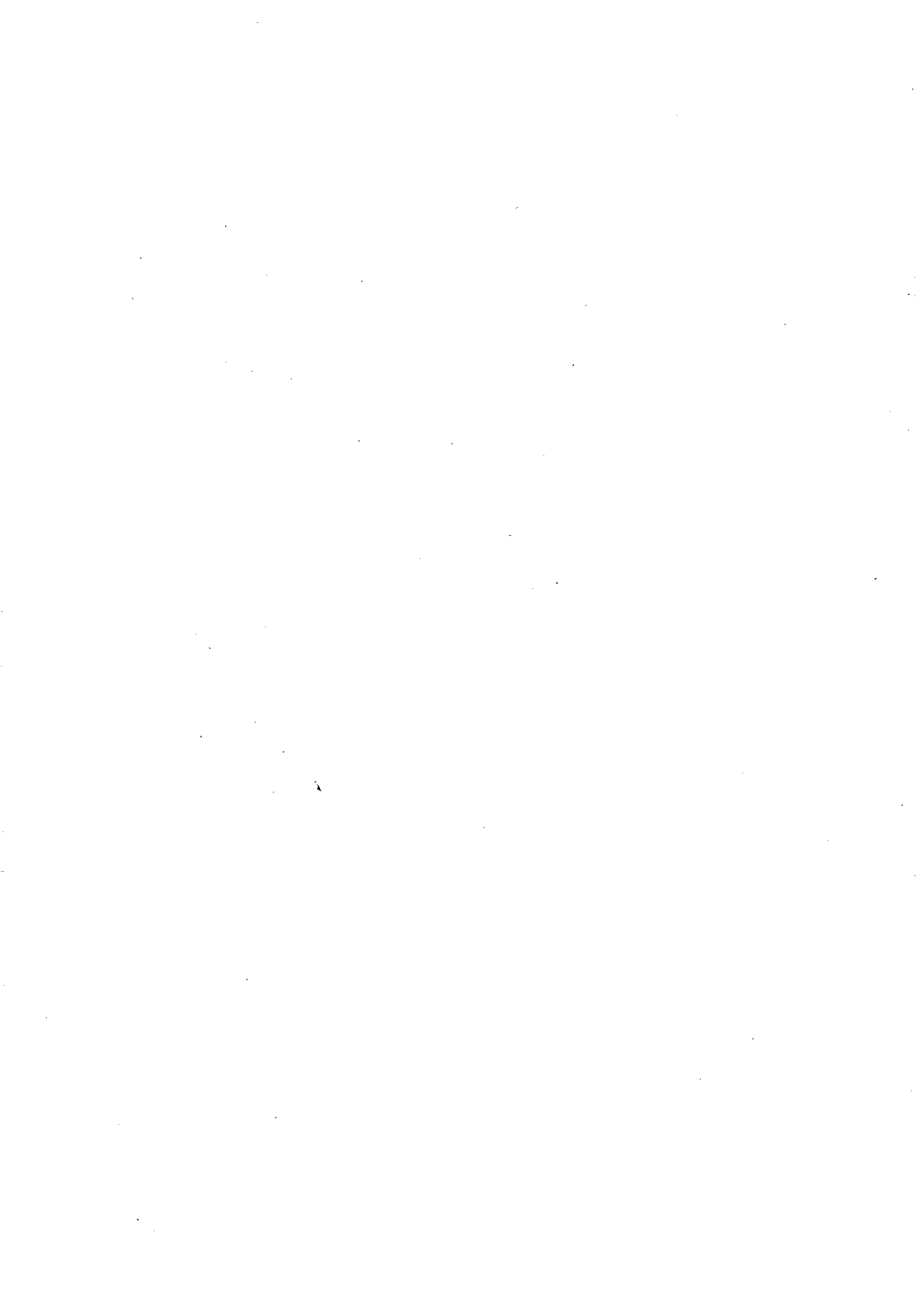
- Q-5** (a) Name the different techniques of thermoforming and describe the vacuum forming process in detail. [6]
- (b) What is meant by gas assist injection molding? With a neat sketch diagram explain the five stages needed to make an automotive grab handle. [6]

OR

- (b) Write about stretch blow molding process. [6]
- Q-6** (a) Write briefly on the following finishing operations: [6]
- (i) Filling
 - (ii) Scrapping
- (b) Explain briefly about the design limitations of plastic materials. [6]

OR

- (b) Describe the following scratch resistance tests: [6]
- (i) Bierbaum test
 - (ii) Kohinoor pencil test



SEAT No. _____

No. of Pages: 03 + 06

[103/104/105/106/107

SARDAR PATEL UNIVERSITY

M. Sc. - Semester-IV

A-45/A-46] (Organic/Analytical/Inorganic/Physical/Industrial polymer Chemistry)

Examination

Monday, 10th April, 2017

(PS04CORC01/PS04CANC01/PS04CINC01/PS04CPHC01/PS04CIPC01)

Spectroscopy - II

Time: 02:00 P.m. to 5:00 p.m.

Marks: 70

Q. 1 Answer the following multiple choice question.

[8]

- Which of the following organic compound shows 4 diagonal peaks in $^1\text{H}-^1\text{H}$ COSY experiment?
(a) neopentane (b) isobutane (c) cyclobutane (d) n-butane
- Which of the following NMR experiment shows signal for only tertiary carbon?
(a) DEPT-45° (b) DEPT-90° (c) DEPT-135° (d) DEPT-180°
- The Spin-lattice relaxation is designated by,
(a) T_1 (b) T_2 (c) R_1 (d) R_2
- The value of geminal coupling constant is zero at _____ angle.
(a) 90° (b) 180° (c) 125° (d) 160°
- Non-integral m/z value indicates presence of
(a) fragment ions (b) meta stable ions (c) impurity ions (d) molecular ions
- The number of fundamental vibrations of CO_2 molecule is
(a) 4 (b) 5 (c) 3 (d) 6
- Which of the transition is not possible in UV spectroscopy?
(a) $n \rightarrow \sigma^*$ (b) $\sigma \rightarrow \sigma^*$ (c) $\pi \rightarrow \sigma^*$ (d) $\pi^* \rightarrow \sigma^*$
- In Mass spectra the pattern of $M : M+2 :: 100 : 98$ indicates the presence of
(a) 2 Br (b) 1 Cl (c) 2Cl (d) 1 Br

Q. 2. Explain the following. (Any Seven)

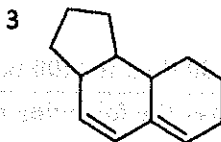
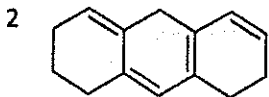
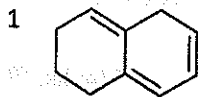
[14]

- In IR, the $\text{C}=\text{C}$ stretching band is observed in fluoroacetylene while it is absent in difluoroacetylene. Explain.
- Draw the energy diagram for various electronic transitions observed in UV.
- Sketch the proton coupled and decoupled ^{13}C NMR spectra for n-hexane.
- Explain why the ^{13}C NMR spectra are usually studied as a proton decoupled spectra.
- Sketch the PMR spectrum for m-dinitrobenzene by taking approximate δ value for each signal and showing appropriate multiplicity.
- In PMR, at room temperature cyclohexane gives one signal while at -70°C it gives two signals. Explain.
- How will you explain the formation of an ion at m/z-94 in the mass spectrum of phenetol.
- Do the mass fragmentation of 2-pentanone based on McLafferty rearrangement.
- Sketch $^1\text{H}-^{13}\text{C}$ HETCOR spectrum for ethyl chloride by taking approximate δ value for each signal.

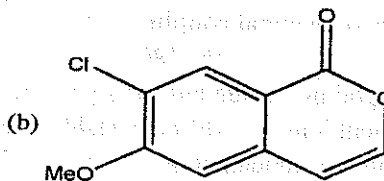
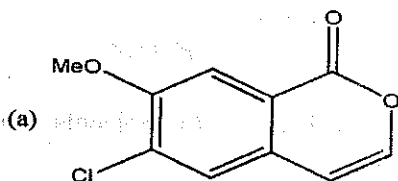
- Q. 3. A. (i) Calculate the stretching frequency for C-H bond. [3]
 (ii) Write the short note on auxochromes and chromophores. [3]
 B. Discuss the important characteristic vibrations observed in the IR spectra of ketons and ester. [6]

OR

- B. Calculate λ_{\max} for the following compounds. [6]



- Q. 4. A. (i) List the methods used for simplification of PMR spectra. Discuss any one of them. [3]
 (ii) What is spin-spin coupling in PMR? Discuss vicinal and geminal coupling in details. [3]
 B. (i) Explain nuclear overhauser effect in PMR. How will you distinguish following isomers using NOE-PMR spectra? [3]

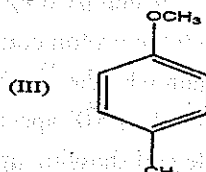
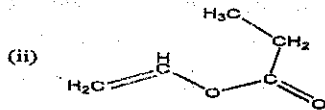
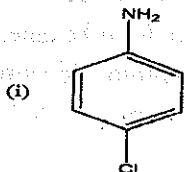


- (ii) Sketch the expected PMR spectrum for pure ethanol and show that it is an AMX system with two different coupling constants. [3]

OR

- B. (i) Write a short note on D₂O exchange in PMR. [3]
 (ii) Draw the structure for all the three isomers for difluoroethylene and show that in each isomer the protons are chemically equivalent but magnetically non equivalent. [3]

- Q. 5. A. Do the ¹³C NMR chemical shift calculation for the following molecules. [6]



- B. Answer the following.

- (i) Calculate the chemical shift value for carbon signals and sketch the proton coupled and decoupled ¹³C NMR spectra for phenyl acetate. [3]
 (ii) Indicate the signals (with approximate δ value and multiplicity) observed for the following solvents in their ¹³C NMR spectra. [3]

(i) Methanol-*d*₄

(ii) Acetone-*d*₆

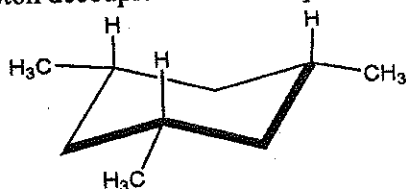
(iii) Benzene-*d*₆

OR

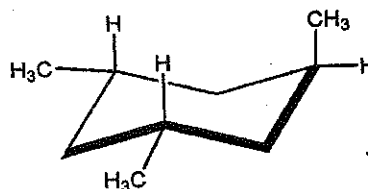
B. Answer the following.

(i) Sketch the ^1H - ^1H COSY spectrum for 3-heptanone by taking approximate δ value for each signal. [3]

(ii) Show how will you differentiate the following stereoisomers (A and B) using proton decoupled ^{13}C NMR spectra. [3]

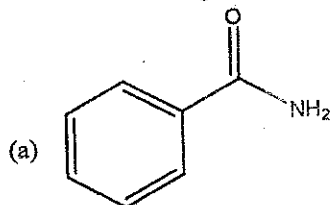


(A)

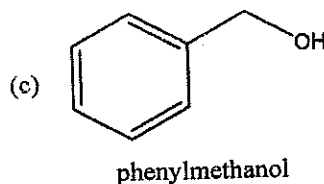


(B)

Q. 6. A. Do the mass fragmentation for the following molecules. [6]



(b) 2-hexanone



B. Answer the following.

(i) Write a short note on McLafferty rearrangement. [3]

(ii) Discuss Field desorption (FD) and fast atomic bombardment (FAB) techniques in mass spectroscopy. [3]

OR

B. A compound has molecular formula $\text{C}_{11}\text{H}_{12}\text{O}_2$. It gives the following spectral data. [6]

Interpret the spectral data determine the structure of the compound.

IR: 3030, 2940, 1712, 1639, 1585, 1200, 770 and 710 cm^{-1}

^1H NMR

Signal (δ)	Multiplicity	Protons
1.31	Triplet ($J=7.1 \text{ Hz}$)	3H
4.20	Quartet ($J=7.1 \text{ Hz}$)	2H
6.43	Doublet ($J=15.8 \text{ Hz}$)	1H
7.24-7.57	Multiplet ($J=7.1 \text{ Hz}$)	5H
7.67	Doublet ($J=15.8 \text{ Hz}$)	1H

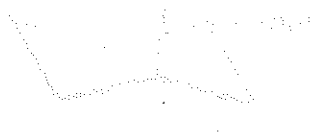
^{13}C NMR

^{13}C (δ)	DEPT 135
14.3	+ Ve
60.4	- Ve
118.4	+ Ve
128.4	+ Ve
128.1	+ Ve
128.9	+ Ve
130.2	+ Ve
134.5	--
144.5	+ Ve
166.8	--

Mass(m/z): 176,131 (base peak), 103, 77, 51

— X —

(a) The first part of the question asks for the value of $\frac{dy}{dx}$ at the point where the curve crosses the x-axis. This is found by setting $y=0$ in the equation of the curve and solving for x .



(b) The second part of the question asks for the value of $\frac{dy}{dx}$ at the point where the curve crosses the y-axis. This is found by setting $x=0$ in the equation of the curve and solving for y .

(c) The third part of the question asks for the value of $\frac{dy}{dx}$ at the point where the curve crosses the x-axis a second time. This is found by setting $y=0$ in the equation of the curve and solving for x .

x	y
0	1
1	0
2	1
3	0
4	1
5	0
6	1
7	0
8	1
9	0
10	1

The final part of the question asks for the value of $\frac{dy}{dx}$ at the point where the curve crosses the x-axis a third time. This is found by setting $y=0$ in the equation of the curve and solving for x .

CHARACTERISTIC PROTON CHEMICAL SHIFTS

Type of proton	Chemical shift, ppm
Cyclopropane	δ 0.2
Primary	RCH_3 0.9
Secondary	R_2CH_2 1.3
Tertiary	R_3CH 1.5
Vinyllic	$C=C-H$ 4.6-5.9
Acetylenic	$C\equiv C-H$ 2-3
Aromatic	$Ar-H$ 6-8.5
Benzylic	$Ar-CH_2$ 2.2-3
Allylic	$C=C-CH_2$ 1.7
Fluorides	$HC-F$ 4-6.5
Chlorides	$HC-Cl$ 3-4
Bromides	$HC-Br$ 2.3-4
Iodides	$HC-I$ 2-4
Alcohols	$HC-OH$ 3.4-4
Ethers	$HC-OR$ 3.3-4
Esters	$RCOO-CH$ 3.7-4.1
Esters	$HC-COOR$ 2-2.2
Acids	$HC-COOH$ 2-2.6
Carbonyl compounds	$HC-C=O$ 2-2.7
Aldehydic	$R-CHO$ 9-10
Hydroxylic	$R-OH$ 1-5.5
Phenolic	$Ar-OH$ 4-12
Enolic	$C=C-OH$ 15-17
Carboxylic	$RCOOH$ 10.5-12
Amino	RNH_2 1-5

Characteristic Infrared Absorption Frequencies

Bond	Compound type	Frequency range, cm^{-1}
C-H	Alkanes	2850-2960
		1350-1470
C-H	Alkenes	3020-3080 (m)
		675-1000
C-H	Aromatic rings	3000-3100 (m)
		675-870
C-H	Alkynes	3300
C=C	Alkenes	1640-1680 (v)
C=C	Alkynes	2100-2260 (v)
C=C	Aromatic rings	1500, 1600 (v)
C-O	Alcohols, ethers, carboxylic acids, esters	1080-1300
C=O	Aldehydes, ketones, carboxylic acids, esters	1690-1760
O-H	Monomeric alcohols, phenols	3610-3640 (v)
	Hydrogen bonded alcohols, phenols	3200-3600 (broad)
	Carboxylic acids	2500-3000 (broad)
N-H	Amines	3300-3500 (m)
C-N	Amines	1180-1360
C=N	Nitriles	2210-2260 (v)
-NO ₂	Nitro compounds	1515-1560
		1345-1385

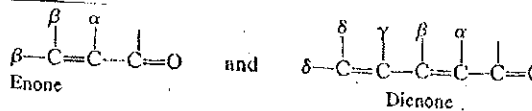
Characteristic absorption for dienes

Base value for heteroannular diene	214
Base value for homoannular diene	253
Increments for	
Double bond extending conjugation	+30
Alkyl substituent or ring residue	+5
Exocyclic double bond	+5
Polar groupings: OAc	
OAlk	+0
SAlk	+6
Cl, Br	+30
N(Alk) ₂	+5
	+60
Solvent correction*	+0
$\lambda_{calc} = \text{Total}$	

Characteristic absorption for substituted benzene derivatives

ArCOR/ArCHO/ArCO ₂ H/ArCO ₂ R	λ_{max}^{EtOH} (nm)
Parent chromophore: Ar = C ₆ H ₅	
G = Alkyl or ring residue, (e.g., ArCOR)	246
G = H, (ArCHO)	250
G = OH, OAlk, (ArCO ₂ H and ArCO ₂ R)	230
Increment for each substituent on Ar:	
—Alkyl or ring residue	o-, m- +3
	p- +10
—OH, —OCH ₃ , —OAlk	o-, m- +7
	p- +25
—O ⁻ (oxyanion)	o- +11
	m- +20
	p- +78 ^b
—Cl	o-, m- +0
	p- +10
—Br	o-, m- +2
	p- +15
—NH ₂	o-, m- +13
	p- +58
—NHCOCH ₃	o-, m- +20
	p- +45
—NHCH ₃	p- +73
—N(CH ₃) ₂	o-, m- +20
	p- +85

Characteristic absorption for α, β -unsaturated carbonyl compounds



Base values		(nm)
Acyclic α, β -unsaturated ketones		215
Six-membered cyclic α, β -unsaturated ketones		215
Five-membered cyclic α, β -unsaturated ketones		202
α, β -Unsaturated aldehydes		210
α, β -Unsaturated carboxylic acids and esters		195

Increments for

Double bond extending conjugation		+30
Alkyl group, ring residue		
	α	+10
	β	+12
	γ and higher	+18
Polar groupings: —OH		
	α	+35
	β	+30
	δ	+50
	—OAc α, β, δ	+6
—OMe		
	α	+35
	β	+30
	γ	+17
	δ	+31
	—SAlk β	+85
	—Cl α	+15
	β	+12
	—Br α	+25
	β	+30
	—NR ₂ β	+95

Exocyclic double bond	+5
Homodiene component*	+39

¹³C shifts for terminal and internal systems

Y	α		β		γ
	Terminal	Internal	Terminal	Internal	
	CH ₃	+ 9	+ 6	+10	
CH=CH ₂	+20		+ 6		-0.5
C≡CH	+ 4.5		+ 5.5		-3.5
COOH	+21	+16	+ 3	+ 2	-2
COO ⁻	+25	+20	+ 5	+ 3	-2
COOR	+20	+17	+ 3	+ 2	-2
COCl	+33	+28		+ 2	
CONH ₂	+22		+ 2.5		-0.5
COR	+30	+24	+ 1	+ 1	-2
CHO	+31		0		-2
Phenyl	+23	+17	+ 9	+ 7	-2
OH	+48	+41	+10	+ 8	-5
OR	+58	+51	+ 8	+ 5	-4
OCOR	+51	+45	+ 6	+ 5	-3
NH ₂	+29	+24	+11	+10	-5
NH ₃ ⁺	+26	+24	+ 8	+ 6	-5
NHR	+37	+31	+ 8	+ 6	-4
NR ₂	+42		+ 6		-3
NR ₃ ⁺	+31		+ 5		-7
NO ₂	+63	+57	+ 4	+ 4	
CN	+ 4	+ 1	+ 3	+ 3	-3
SH	+11	+11	+12	+11	-4
SR	+20		+ 7		-3
F	+68	+63	+ 9	+ 6	-4
Cl	+31	+32	+11	+10	-4
Br	+20	+25	+11	+10	-3
I	- 6	+ 4	+11	+12	-1

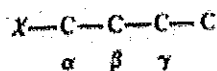
¹³C Shifts for some linear and branched chain alkanes

Compound	C-1	C-2	C-3	C-4	C-5
Methane	-2.3				
Ethane	5.7				
Propane	15.8	16.3	15.8		
Butane	13.4	25.2	25.2		
Pentane	13.9	22.8	34.7	22.8	13.9
Hexane	14.1	23.1	32.2	32.2	23.1
Heptane	14.1	23.2	32.6	29.7	32.6
Octane	14.2	23.2	32.6	29.9	29.9
Nonane	14.2	23.3	32.6	30.0	30.3
Decane	14.2	23.2	32.6	31.1	30.5
Isobutane	24.5	25.4			
Isopentane	22.2	31.1	32.0	11.7	
Isohexane	22.7	28.0	42.0	20.9	14.3
Neopentane	31.7	28.1			
2,2-Dimethylbutane	29.1	30.6	36.9	8.9	
3-Methylpentane	11.5	29.5	36.9	(18.8, 3-CH ₃)	
2,3-Dimethylbutane	19.5	34.3			
2,2,3-Trimethylbutane	27.4	33.1	38.3	16.1	
2,3-Dimethylpentane	7.0	25.3	36.3	(14.6, 3-CH ₃)	

¹³C shifts for substituted benzenes
Base value for benzene is 128.5 ppm

Substituent	C-1 (Attachment)	C-2	C-3	C-4	C of Substituent (ppm from TMS)
H	0.0	0.0	0.0	0.0	
CH ₃	+9.3	+0.7	-0.1	-2.9	21.3
CH ₂ CH ₃	+15.6	-0.5	0.0	-2.6	29.2 (CH ₂), 15.8 (CH ₃)
CH(CH ₃) ₂	+20.1	-2.0	0.0	-2.5	34.4 (CH), 24.1 (CH ₃)
C(CH ₃) ₃	+22.2	-3.4	-0.4	-3.1	34.5 (C), 31.4 (CH ₃)
CH=CH ₂	+9.1	-2.4	+0.2	-0.5	137.1 (CH), 113.3 (CH ₂)
C≡CH	-5.8	+6.9	+0.1	+0.4	84.0 (C), 77.8 (CH)
C ₆ H ₅	+12.1	-1.8	-0.1	-1.6	
CH ₂ OH	+13.3	-0.8	-0.6	-0.4	64.5
CH ₂ OCH ₃	+7.7	-0.0	-0.0	-0.0	20.7 (CH ₂), 66.1 (CH ₃), 170.5 (C=O)
OH	+26.6	-12.7	+1.6	-7.3	
OCH ₃	+31.4	-14.4	+1.0	-7.7	54.1
OC ₂ H ₅	+29.0	-9.4	+1.6	-5.3	
COOCH ₃	+22.4	-7.1	-0.4	-3.2	23.9 (CH ₃), 169.7 (C=O)
CHO	+8.2	+1.2	+0.6	+5.8	192.0
COCH ₃	+7.8	-0.4	-0.4	+2.8	24.6 (CH ₃), 195.7 (C=O)
CO ₂ H	+9.1	+1.5	-0.2	+3.8	196.4 (C=O)
COF ₃	-5.6	+1.8	+0.7	+6.7	
COOH	+2.9	+1.3	+0.4	+4.3	168.0
COCH ₂ CH ₃	+2.0	+1.2	-0.1	+4.8	51.0 (CH ₂), 166.8 (C=O), 168.5
COCl	+4.6	+2.9	+0.6	+7.0	
CNH ₂	+5.0	-1.2	0.0	+3.4	
C≡N	-16.0	+3.6	+0.6	+4.3	119.5
NH ₂	+19.2	-12.4	+1.3	-9.5	
N(CH ₃) ₂	+22.4	-15.7	+0.8	-11.8	40.3
NHCOCH ₃	+11.1	-9.9	+0.2	-5.6	
NO ₂	+19.6	-5.3	+0.9	+6.0	
N=C=O	+5.7	-3.6	+1.2	-2.8	129.5
F	+35.1	-14.3	+0.9	-4.5	
Cl	+6.4	+0.2	+1.0	-2.0	
Br	-5.4	+3.4	+2.2	-1.0	
I	-32.2	+9.9	+2.6	-7.3	
CF ₃	+2.6	-3.1	+0.4	+3.4	
SH	+2.3	+0.6	+0.2	-3.3	
SCH ₃	+10.2	-1.8	+0.4	-3.6	15.9
SO ₂ NH ₂	+15.3	-2.9	+0.4	+3.3	
Si(CH ₃) ₃	+13.4	+4.4	-1.1	-1.1	

Influence of functional group X on the chemical shift position (δ) of nearby carbons in alkane chains'



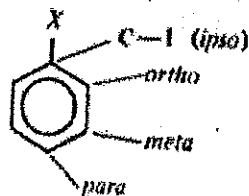
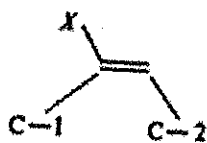
X	1°		2°		3°	α -shift	β -shift	γ -shift
	or	or	or	or				
-CH ₃	9		6		3	9		-3
-R: see table 3.11								
axial -CH ₃	1					5		-6
equatorial -CH ₃	6					9		0
(in cyclohexanes)								
-CH=CH ₂	22		16		12	7		-2
-C≡CH	4					3		-3
-C ₆ H ₅ , -Ar	23		17		11	10		-3
-F	70					8		-7
-Cl	31		35		42	10		-5
-Br	19		28		37	11		-4
-I	-7 to 20					11		-2
-NH ₂ , -NHR, -NR ₂	29		24		18	11		-4
-NO ₂	62					3		-5
-NHCOR, -NRCOR	10					0		0
-NH ₃ ⁺	25					7		-3
-CN	3		4			2		-3
-SH	2					2		-2
-OH	50		45		40	9		-3
-OR	50		24		17	10		-6
-OCOR	52		50		45	7		-6
-COOH, -COOR, -CON<	20		16		13	2		-3
-COR, -CHO	30		24		17	2		-3
-SO ₃ H, -SO ₂ N<	50					3		0

Influence of functional group X on the chemical shift positions (δ) of nearby carbons in alkene groups and benzene rings

Base values: ethylene (δ 123)

and

benzene (δ 126)



Alkenes		Benzenes			
C-1	C-2	C-1 (ipso)	ortho	meta	para

-CH ₃	10	-8	9	0	0	-2
R,	16	-8	15	0	0	-2
R,	23	-8	21	0	0	-2
-CH=CH ₂	15	-6	9	0	0	-2
-CH≡CH	-	-	-6	4	0	0
-C ₆ H ₅ , -Ar	13	-11	13	-1	1	-1
-F	25	-34	35	-14	1	-5
-Cl	3	-6	6	0	1	-2
-Br	-8	-1	-5	3	2	-2
-I	-38	7	-32	10	3	-1
-NH ₂	-	-	18	-13	1	-10
-NHR	-	-	20	-14	1	-10
-NR ₂	-	-	22	-16	1	-10
-NO ₂	22	-1	20	-5	1	6
-NHCOR, -NRCOR	-	-	10	-7	1	-4
-CN	-15	15	-16	4	1	6
-SH	-	-	4	1	1	-3
-OH	-	-	27	-13	1	-7
-OR	29	-39	30	-15	1	-8
-OCOR	18	-27	23	-6	1	-2
-COOH, -COOR, -CON<	4	9	2	2	0	5
-COR, -CHO	14	13	9	1	1	6
-SO ₃ H, -SO ₂ N<	-	-	16	0	0	4
-PMe ₂	-	-	14	1.6	0	-1
-PAF ₂	-	-	9	5	0	0

[93/A-43]

SEAT No. _____

No. of pages: 02

SARDAR PATEL UNIVERSITY
M.Sc. Semester-IV (Organic Chemistry) Examination
Saturday, 15th April -2017
PS04CORCO3-Stereochemistry of Organic Compounds

Time: 02:00pm to 05:00pm

Marks: 70

-
- Q.1 Select the correct answer. 08
- The characteristic must be required for resolving agent....
(a) Pure form (b) Unstable
(c) High Molecular weight (d) High toxicity
 - In axial haloketone rule, Vertical plane 'A' passing through Carbone number.....
(a) 1 & 4 (b) 2
(c) 4 (d) 6
 - Isomers that are mirror images of each other are called...
(a) Enantiomers (b) Resolution
(c) Diastereomers (d) Free radical
 - The Enzymes are With molecular weight of 12000 – 100000 Daltons.
(a) vitamins (b) Proteins
(c) Carbohydrates (d) Lipid
 - CD and ORD spectrum provide important information regarding the secondary structures of
(a) Proteins (b) RNA
(c) DNA (d) Above all
 - In Cram's rule, the incoming group preferentially attacks on the side of plane containing the..... group.
(a) Medium (b) Large
(c) Small (d) Above All
 - Absolute chiral synthesis involve the formation of compound.
(a) Optically inactive (b) Optically active
(c) Resolving agents (d) None of these
 - In case of formation of double helix, approximate stabilization energy of $G \equiv C$ is...
(a) 30 KJ/mole (b) 70 KJ/mole
(c) 50 KJ/mole (d) 60 KJ/mole

- Q.2 Answer the following(Any Seven) 14
- 1 Define the terms: (i) Meso Compound (ii) Racemic Mixture.
 - 2 Discuss the reaction for generation of first chiral center.
 - 3 Draw the structure of bicycle [2.2.0] hexane and bicycle [2.2.1] heptane.
 - 4 Discuss about the Prelog's Rule.
 - 5 Discuss the Conrotatory motion in electrocyclic reaction with example
 - 6 Discuss the Resolution of Aldehyde and ketone.
 - 7 Draw the all conformation of cyclononane as monocyclic compound.
 - 8 Define the term "cotton effect" and give it's importance.
 - 9 What is Stereo Selective Reaction? Give suitable example.
- Q.3 A Write short note on Asymmetric Synthesis by 06
- (A) Wilkinson as catalysts
 - (B) Sharpless epoxidation
- B Describe in detail: 06
- (A) Resolution through formation of diastereomers.
 - (B) Resolution by chromatography
- OR
- B Give the experimental procedure for resolution of (\pm) 2-Octanal. 06
- Q.4 A Draw the potential energy diagram of n-butane, on the bases of different conformers. 06
- B Write a note on conformational features of six member heterocyclic's 06
- OR
- B Draw the conformations of cycloheptane and cyclooctane under monocyclic compound 06
- Q.5 A Discuss the correlation diagram of [2+2] cycloaddition reaction for ethene to cyclobutane. 06
- B Write a note on suprafacial and antarafacial in cycloaddition reaction. 06
- OR
- B State in brief 1,3 and 1,5 sigmatropic rearrangement, with suitable examples. 06
- Q.6 A Write a note on: ORD and CD curves. 06
- B Draw the Structure of DNAs and discuss in detail. 06
- OR
- B Discuss the octant rule in cyclohexanone 06

[75/A-25]

SEAT No. _____

Sardar Patel University
M.Sc. Chemistry (Fourth Semester) Examination
Tuesday, 18th April 2017
Medicinal Chemistry (PS04ECHE01)

Time: 2:00 pm to 5:00 pm

Total marks: 70

Note: (i) Figure to the right indicates Marks

(ii) Attempt all Questions

Que:1 Choose the correct answer from the following multiple choice of questions.**[8]**

- (i) Determination of drug efficacy is based on...
 - (a) Only effective level
 - (b) Only toxic level
 - (c) Both effective and toxic level
 - (d) Only inactive level
- (ii) Which of the following prodrug gives metabolism process in Blood circulatory systems?
 - (a) Antiviral nucleoside analogs
 - (b) Extracellular
 - (c) Intracellular
 - (d) None of these
- (iii) Which of the following receptor gives response to a stimulus in internal or external environment of an organ?
 - (a) Channel linked
 - (b) Enzyme linked
 - (c) Sensory
 - (d) Intracellular
- (iv) Which of the following antagonist binds to an allosteric site of receptor?
 - (a) None Competitive
 - (b) Uncompetitive
 - (c) Competitive
 - (d) Silent
- (v) Antidepressants increase the availability of
 - (a) Catecholamine at the appropriate receptor sites of the brain.
 - (b) Catecholamine at the appropriate receptor sites of the heart.
 - (c) Catechol at the appropriate receptor sites of the heart.
 - (d) None of the above
- (vi) Excessive amount of thyroid hormones in the circulation are associated with a number of disease like....
 - (a) Hypertension
 - (b) Anxiety
 - (c) Goitre and Thyroidities
 - (d) Depression
- (vii) Which of the following antibiotic was used for inhibition of translation?
 - (a) Cephalosporin, Vancomycin
 - (b) Chloramphenicol, Erythromycin
 - (c) Quinolone
 - (d) Rifamycin
- (viii) In which phase, DNA duplication was finished and equally divided into future sub cells?
 - (a) Post synthetic phase
 - (b) Pre-synthetic phase
 - (c) Resting phase
 - (d) Mitosis

Que:2 Answer the following. (Any seven)**[14]**

- (i) Give the importance of apparent volume of distribution.
- (ii) Write a note on: drug elimination in terms of renal tubular re-absorption.
- (iii) Give details of oxidation reaction in drug metabolism process.
- (iv) What do you mean by Enzyme inhibition?
- (v) Write a note on Monoamine Oxidase inhibitors.
- (vi) Give the importance of Selective Serotonin Reuptake Inhibitors.
- (vii) Give the details of Kirby-Bauer test for antibiotic.

- (viii) Give details of Proliferating cells and Non-proliferating cells
- (ix) Give the examples of DNA Cross linking.

- Que:3**
- (a) Discuss the pharmacokinetics and brief the various routes for drug administration. [6]
 - (b) Give the various factors for the drug absorption. Discuss the role of computer assisted drug design programme. [6]

OR

- (b) **Answer the followings.** [6]
 - (i) Discuss the renal glomerular filtration in drug elimination process.
 - (ii) A Doctor prescribes Theophylline (370 mg) to one patient having 70 kg weight. Dose interval is assigned for 9 hrs. [Pharmacokinetic standard for this medicine is 2.7 L/h, volume of distribution is 35L, first order elimination rate (K_e) is 0.08 h^{-1} , MEC = 10 mg/L, MTC = 20 mg/L, Bioavailability is = 1]. To find out the steady state level of drug concentration in plasma and also calculate the loading of dose.

- Que:4**
- (a) Give the characteristics of receptor in drug design. Discuss the various types of receptors with suitable examples. [6]
 - (b) **Answer the followings.** [6]
 - (i) Give significance of agonist and antagonist in pharmacodynamics.
 - (ii) Explain the binding site and their characteristics properties.

OR

- (b) What are chemical messengers? Discuss briefly their signaling through hormones. [6]

- Que:5**
- (a) Give the important role of antianxiety drugs. Discuss the metabolism of benzodiazepines and explain their structural activity report. [6]
 - (b) **Answer the followings.** [6]
 - (i) Give the synthesis of Felodipine.
 - (ii) Discuss the Cardiovascular System.

OR

- (b) Discuss the mode of action with properties of tricyclic antidepressants drugs. Give any one synthesis of this class of drug. [6]

- Que:6**
- (a) What are Antibiotics? Give their classification and discuss how different antibiotic targets take place on the cell structure of bacteria? [6]
 - (b) **Give synthesis and applications of the following drugs.** [6]
 - (i) Ampicillin
 - (ii) Ciprofloxacin

OR

- (b) What are antineoplastic agents? Give the importance of cyclophosphamide in terms of metabolism process and provide their clinical applications. [6]

***** The End *****

[76/A-46] () SARDAR PATEL UNIVERSITY
 M.Sc. (Chemistry) IVth Semester Examination (CBCS)
 April-2017

Tuesday, Date: 18.04.2017

Time: 2.00 p.m. to 5.00 p.m., Paper: PS04ECHE05

Subject: Environmental Chemistry, Max. Marks: 70

- N.B.: i), The numbers of the marks carried by each question is indicated at the end of the question
 ii) Assume suitable data if considered necessary and indicate the same clearly.

Q.1 Attempt the following MCQs

[08]

- i) Transpiration is a key component of _____
 - a) Oxygen cycle
 - b) Nitrogen cycle
 - c) Hydrological cycle
 - d) Sulfur cycle
- ii) Which among the following is/are physical weathering agent(s)?
 - a) Water
 - b) Ice
 - c) Temperature
 - d) All
- iii) A sample of air 99.9 % dried contains element(s) such as ____
 - a) Oxygen
 - b) Nitrogen
 - c) Argon
 - d) All
- iv) An ideal temperature for pyrolysis of solid waste is around.....
 - a) 1000 °C
 - b) 550 °C
 - c) 700 °C
 - d) 910 °C
- v) A conversion ' $N_{2(g)} \rightarrow NH_4^+$ ' mediated by soil bacteria is called
 - a) Nitrogen fixation
 - b) Nitrification
 - c) Nitrate reduction
 - d) De-nitrification
- vi) Which of the following is not a water quality parameter?
 - a) COD
 - b) SOMG
 - c) DO
 - d) BOD
- vii) Which of the following is known to confer odor to water?
 - a) TON
 - b) TOM
 - c) TNO
 - d) TDS
- viii) The first component of sampling train is _____
 - a) Collector
 - b) Vacuum source
 - c) Metering device
 - d) None

Q.2 Attempt any Seven

[14]

- i) State 'pathway of pollutant' giving a suitable example.
- ii) Introduce in brief 'biosphere' and 'ecosystem'.
- iii) State chemical and other solid wastes, with suitable examples.
- iv) What is bio-drying process? State the mechanism of this process.
- v) Describe in brief phosphate cycle, giving its importance.
- vi) State 'PAN' and 'PHS'.
- vii) What do you mean by acid rain? Describe mechanism of acid rain.
- viii) A water sample is reported to have 5.0 ppb of $CaCO_3$. Calculate this concentration in molarity [Ca = 40, C = 12, O = 16].
- ix) Illustrate the term 'particulate matters'.

O.3 Attempt the following

- a) Discuss common features and composition of the soil, describing key processes of soil formation. [06]
- b) What do you understand by hydrosphere? Outline microbially-mediated redox processes. Discuss typical features of iron and manganese bacteria in the water. [06]

OR

- b) What do you understand by 'NO_x'? Give key reactions which are associated to sources and the sink of NO_x.

O.4

- a) Describe in brief [06]
- i) Texture and permeability of the soil.
- ii) Alkalinity analysis of water
- b) List key roles of atmosphere. Write a note on atmospheric structure. [06]

OR

- b) Outline : i) Incineration of MSW ii) Humic substances

Q.5

- a) Give significance of air pollution analysis. Discuss analysis of SO₂, NO-NO_x, O₃ and CO in the air sample. [06]
- b) Attempt the following [06]
- i) Discuss key sources of air pollution.
- ii) Write a note on ozone depletion.

OR

- b) Discuss the DOAS for air sample. A 26 L of air sample was collected and used for O₃ analysis. If the I₂(g) liberated from this air sample, after it was passed through KI solution, consumed 42.18 mL of 0.0978 M Na₂S₂O₃ in the titration, calculate concentration of O₃ in ppm and ppb, both.

Q.6

- a) Give notes on BOD and COD, in detail. Calculate theoretical COD value (in mg/mL) of a solution which contains 450 mg of ethyl alcohol in 500 mL. [06]
- b) Attempt the following [06]
- i) Give an account of major components of water, and methods to analyze them, emphasizing on their significant effects.
- ii) A 200 mL water sample was treated with hydroxime hydrochloride, to reduce Fe(III) to Fe(II), and then with 1,10-phenanthroline in excess, to receive colored solution at appropriate buffer pH. The solution was diluted to 250 mL with distilled water; the % T of which was 63.1 measured at 533 nm. 1L of another solution was prepared—dissolving 72.5 mg of pure Fe wire in acid—and treated in the same way. A 10 mL aliquot of this solution was diluted to 100 mL, and the absorbance of diluted solution when measured employing the same cell had showed value 0.288. Calculate concentration of Fe in ppm in the water sample.

OR

- b) List key parameters for physical examination of water, and discuss them in detail.

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SEAT No. _____

Number of Printed Pages : 2

[78]

SARDAR PATEL UNIVERSITY
(CBCS) M. Sc. Examination – 2017, Semester - IV
PS04EINC01: Fabrication Techniques and Instrumentation
Tuesday , 18th April, 2017, Time: 02:00 pm – 5:00 pm

Total Marks: 70

Note: The figures to the right indicate maximum marks.

- Q-1
- (a) In which pump chemisorptions technique is used? 1
 - (a) Getter pump
 - (b) Sorption pump
 - (c) Cryo pump
 - (d) Turbo molecular
 - (b) The Pirani gauge is a type of _____. 1
 - (a) Thermal conductive
 - (b) Thermal insulation
 - (c) Thermal inductive
 - (d) None of them
 - (c) In electron beam evaporation methods, _____ is used as a universally employed evaporation source. 1
 - (a) Hot cathode
 - (b) Anode
 - (c) Ions
 - (d) a and b both
 - (d) _____ is a process of making metal articles by electroplating of the metal onto a pattern (mold, mandrel), followed by removal of the deposited layer. 1
 - (a) Electroforming
 - (b) Rack plating
 - (c) Barrel plating
 - (d) Electro less plating
 - (e) What is TCF? 1
 - (a) Temperature coefficient factor
 - (b) Temperature coefficient of frequency
 - (c) Temperature coefficient in farad
 - (d) Temperature coefficient in farad
 - (f) In Photolithography the light sensitive polymers is called as _____. 1
 - (a) Photo conductive
 - (b) Photo voltaic
 - (c) Photo resist
 - (d) Mask
 - (g) What is the function of sensitizer in photo resist? 1
 - (a) Absorb energy
 - (b) Film coating
 - (c) Film forming
 - (d) Exposed of light
 - (h) Which tool is used for simultaneous control of more than one movement? 1
 - (a) Contour cutting
 - (b) Axial cut
 - (c) Point to point placement
 - (d) Stepper motor
- Q-2 Attempt any 7
- (a) In lithography what is positive and negative photo resist? 2
 - (b) List the types of electron gun used in electron beam evaporation. 2
 - (c) What are the applications of MOCVD? 2
 - (d) What is back streaming and back migration? 2
 - (e) What are the characteristics of good photo resists? 2
 - (f) Write a short note on Proximity Optical Lithography. 2
 - (g) Differentiate between SEM and TEM. 2
 - (h) List advantages of CNC machine. 2
 - (i) Give the difference between lathe and milling machines. 2

- Q-3 (a) With suitable diagram explain Electron beam evaporation. 6
- (b) Write basic transport and growth mechanism for MOCVD. 6
- OR
- (b) Describe molecular beam epitaxy for single crystal deposition with its advantages and disadvantages. 6
- Q-4 (a) With schematic diagram explain Cryo pump with its applications. 6
- (b) Define electroplating and explain nickel electroplating process. 6
- OR
- (b) Explain cold cathode ionization gauge. 6
- Q-5 (a) With neat diagram explain Float zone method. 6
- (b) What is lithography? Explain Electron Beam Lithography. 6
- OR
- (b) Describe all the steps for Photolithography process. 6
- Q-6 (a) With suitable diagram describe the working of Scanning Electron Microscope (SEM). 6
- (b) List out and describe the types of milling machines. 6
- OR
- (b) Give the detail note on working operation of CNC milling machine. 6

Good Luck