

250317

Science.

SASC407

RIZVI COLLEGE OF A/S/C

FOUNDATION COURSE -Paper IV (SEM IV)

March-2025

Duration: 2 1/2 Hrs

Total Marks :75

Note: 1. All questions are compulsory.

2. Figures to the right indicate full marks.

Q.1(A). Explain the following concepts (Any Five) 15 Marks

- a. PIL in India
- b. Public Services Guarantee Act
- c. Time management
- d. Cyber Crimes
- e. Soft Skills
- f. Sustainability Principle
- g. Polluters' Pay Principle
- h. Space Technology

OR

(B) Write a comprehensive note on the Foundation Course (Semester IV) project submitted by you.

Q.2.(A) Explain the important provisions of Consumer Protection Act

1986 in India? 15 Marks

OR

(B) Discuss the background of Right to Information. What can be done if the information is denied?

Q.3.(A) Comment on the various environmental approaches to understand ecology? 15 Marks

OR

(B) Write a detailed note on environmental movements?

Q.4.(A) How is biotechnology useful in different fields? What are its harmful effects? 15 Marks

OR

(B) What are the applications and disadvantages of Laser technology?

Q.5. (A) Goals must be SMART". Elaborate. What steps should be adopted in goal-setting? 15 Marks

OR

(B) Discuss the types of motivation and Abraham Maslow's theory of motivation?

SS 401 250304

Sem-IV

RIZVI COLLEGE OF ARTS, SCIENCE AND COMMERCE

S.Y.B.Sc. CHOICE BASED (Regular 2024-25) SEMESTER IV CHEMISTRY: PAPER I

(Time: 2½ Hours)

Total Marks: 75

N.B.: (1) All questions are compulsory.

(2) Figures to the right indicate full marks.

(3) Use of log table/ non-programmable calculator is allowed.

Q1. Answer the following attempt (any three)

15 Marks

1. Calculate the magnetic moments for the following metal ions
(At. no. of Mn = 25 & Cr = 24)
 - a) Mn^{+2}
 - b) Cr^{+3}
2. Write the electronic configuration of the following elements.
 - a) Chromium (At. no.24)
 - b) Copper (At. no. 29)
3. Explain origin of colour for transition metals and their compounds.
4. With the help of VBT explain $[Ni (Cl)_4]^{-2}$ coordination complex
(At. no. Ni = 28)
 - a) Magnetic properties.
 - b) Shape of the molecule
 - c) Type of hybridization involved.
5. Draw cis and trans geometrical isomerism in the following molecule
 - a) $[Pt(NH_3)Cl_2]$
 - b) $[Co(NH_3)_4Br_2]^+$

Q2. Answer the following attempt (any three). 15 Marks

1. What are aromatic carboxylic acid? Draw the structures of

- Phthalic Acid.
- Acetyl salicylic acid
- Cinnamic acid
- p - Methyl benzoic acid.

2. Write reactions to explain sulphonations of benzene and Naphthalene. Name the product formed.

3. Write the mechanism for the conversion of

- Amide to Acid.
- Ester to Acid.

4. Convert Benzoic acid to

- Benzoyl Chloride
- Methyl Benzoate.
- Benzamide.
- Benzyl Alcohol.

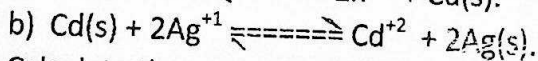
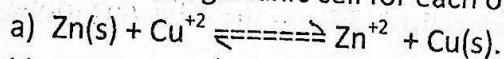
5. What are aromatic sulphonic acid? Draw the structure of

- BSA
- p - Toulene Sulponic acid
- Benzene 1,3disulphonic acid.
- m - Nitro BSA.

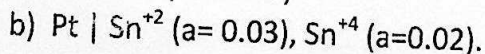
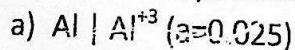
Q3. Answer the following attempt (any three).

15 Marks

1. Construct the galvanic cell for each of the following reactions.



2. Calculate the potential of the following electrodes.



3. Explain any two difference between electrolytic cell and galvanic cell.

4. What is a salt bridge? What are its function? How it is prepared?

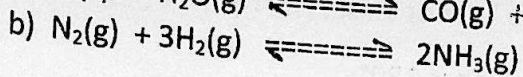
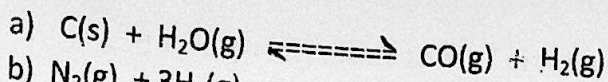
5. Draw and explain phase diagram for water system and show

- Triple point
- Sublimation curve.

Q4. Answer the following attempt (any three).

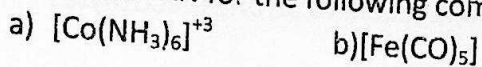
15 Marks

1. Calculate the number of phase and components present in the following system.



2. What are ligands? Explain its types.

3. Calculate EAN for the following complex.



4. Convert : (i) Grignard reagent to Benzoic acid.

(ii) Chlorobenzene to Benzoic acid.

5. Explain how Quinhydrone electrode is used to determine the strength of Hydrochloric acid.

Q5. A. Multiple choice questions. Attempt (any five).

5 Marks

1. IUPAC name of Acetic acid is _____.

a) Butanoic acid

b) Etanoic acid

c) Methanoic acid.

2. Functional group present in carboxylic acid is _____.

a) -CHO

b) -COOH

c) -CO-

3. Acetic acid on decarboxylation produces _____.

a) Methane

b) Ethane

c) Propane.

4. $[Ni(CO)_4]$ has coordination number equal to _____.

a) Four

b) Five.

c) Six.

5. In Galvanic cell, chemical energy is converted to _____.

a) Electrical energy.

b) Mechanical energy.

c) Heat energy.

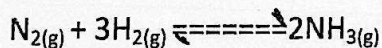
6. The mathematical expression for the phase rule is given by _____.

a) $F=C-P+2$

b) $F=C+P+1$

c) $F=C-P \times 2$

7. Calculate the number of phases in the system in equilibrium is _____



a) One

b) Two

c) Three

8. $[Ni(CO)_4]$ has EAN _____.

b) 36

b) 35

c) 54

9. $K_4[Fe(CN)_6]$ is a/an _____

b) Cationic

b) Anionic

c) Neutral

5. B. State the given statement is True or False. (Any Five)

5 Marks

1. Bond angle in sp hybridization is 180° .
2. He_2 has bond order of one.
3. Ostwald's dilution law is not applicable to strong electrolytes.
4. Temperature and refractive index are intensive properties.
5. Alcohols are more acidic than acetic acid.
6. Ferrocene is an organometallic compound.
7. Primary alcohols on oxidation first gives Ketone.
8. Williamson's synthesis is used to prepare ethers.

5.C. Match the columns A & B. (Any Five)

5 Marks

Column A		Column B	
1	Sulponation of Naphthalene at $80^\circ C$	A	Carboxylic acid
2	Sulponation of Naphthalene at $160^\circ C$	B	Always reduction
3	Grignard reagent and Carbon dioxide react in dry ether	C	$F = C - P + 1$
4	Decarboxylation of Salicylic acid	D	6
5	Oxidation state of Manganese in $KMnO_4$	E	Phenol
6	Oxidation state of Chromium in $K_2Cr_2O_7$	F	$F = C - P + 2$
7	Condensed phase rule	G	1-Naphthalene sulfonic acid
8	Cathode in a galvanic cell	H	2-Naphthalene sulfonic acid
		I	7

38402

250305

RIZVI COLLEGE OF ARTS, SCIENCE AND COMMERCE
S.Y.B.Sc. CHOICE BASED (REGULAR 2024-25) SEMESTER-IV CHEMISTRY: PAPER II

(Time: 2½ Hours)

Total Marks: 75

- N.B.: (1) All questions are compulsory.
 (2) Figures to the right indicate full marks.
 (3) Use of log table/ non-programmable calculator is allowed.

Q1 Attempt any 3

15M

- A Write a note on simple cubic lattice and body-centered cubic lattice.
 B Explain axis of symmetry and centre of symmetry
 C Differentiate between homogeneous and heterogeneous catalysis with suitable example.
 D What is acid catalysis? Give an account of kinetics of acid catalysis.
 E Silver metal has a density of $10.7 \times 10^6 \text{ gm}^{-3}$. Calculate edge length of the cube assuming crystal to be FCC. (mass of silver = 107.8 g)

Q2 Attempt any 3

15M

- A Give Properties and Uses of sulphuric acid
 B Write a note on acid rain.
 C i) Give the sources of NO_x and SO_x
 ii) Give uses of phosphoric acid
 D On the basis of $\text{p}K_b$ value, give classification of monoatomic anion.
 E Explain the hydrolysis of cation using the following equation:



3M

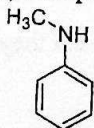
2M

Q3 Attempt any 3

15M

- A i) How is thiophene prepared from succinaldehyde.
 ii) Give nitration and halogenation reaction of thiophene
 B Draw the structure of the following :
 i) furan-3-sulphonic acid ii) 2-methyl-2-butanamine
 iii) N,N-dimethylaminobenzene iv) 3-methylcyclohexanamine
 v) 2-acetylfuran
 C Give reactions:
 i) Bromination of aniline
 ii) Action of HNO_2 on 2° amine.
 iii) How will you convert 4-methylaniline to toluene
 iv) How will you convert pyrrole to 2-nitropyrrole
 v) How will you convert furan to 2-acetylfuran
 D i) Complete the following reactions:

3M

Excess CH_3I

?

i) Moist Ag_2O ii) Δ

?

- ii) Give resonance structures of pyrrole.
 E i) Write a note on Hoffmann degradation of amide.
 ii) Give mechanism of diazotization of aniline.

2M

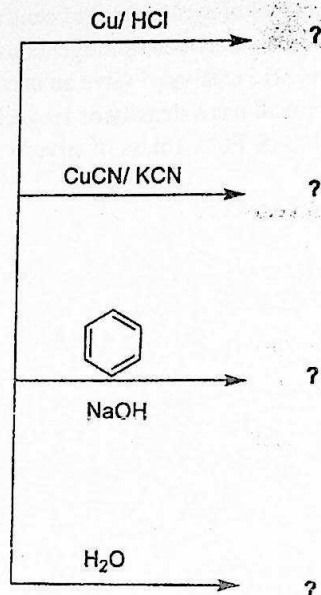
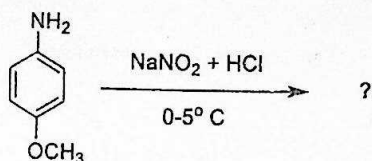
3M

2M

Q4 Attempt any 3

15M

- A** The second order reflection from (100) (110) & (111) planes of a cubic crystal occurred at $5^\circ 54'$, $8^\circ 24'$ and $5^\circ 12'$ respectively. What is the lattice type of the crystal?
- B** Explain catalytic promoters and catalytic poisons.
- C** Explain hydration of anion. What are the factors which affect the basicity of monoatomic anion?
- D** Complete the following reactions.



- E** Give preparation of amines using
- By reductive alkylation.
 - By reduction of nitriles.

3M

2M

Q5 A Multiple choice question (any 5 out of 9)

5M

- Bragg's equation is represented by _____.
 a) $n\lambda = 2d\sin\theta$ b) $d\lambda = 2n\sin\theta$ c) $n\lambda = 2 + (d\sin\theta)$
- If $a \neq b \neq c$ and $\alpha \neq \beta \neq \gamma \neq 90^\circ$, this Bravais lattice crystal is called as _____.
 a) Hexagonal b) Cubic c) Monoclinic
- _____ are substance which increase the activities of the catalyst, but they itself has no catalytic properties
 a) Inhibitors b) Catalytic poison c) Promoters
- pKa value for feebly acidic cation is _____.
 a) 6.0-11.5 b) 11.5-14.0 c) 14.0-16.0
- _____ falls as sulphuric acid during acid rain
 a) SO_2 b) SO_3 c) SO_4

SS403 250306

R-24

RIZVI COLLEGE OF ARTS, SCIENCE AND COMMERCE

S.Y.B.Sc. Chemistry choice based (Regular 2024-25)

Semester IV

Paper III

Time: 2 hr. 30 Minutes

Date:

Total Marks: 75 Marks

N. B: 1. all questions are compulsory

2. Figures to the right indicate full marks

3. Use of log table/ Non programmable calculate is allowed.

Q1. Attempt any 3 out of 5

15 Marks

1. Give a general idea of the different types of chromatography.
2. Write note on continuous extraction.
3. Describe batch extraction in solvent extraction.
4. How is paper chromatography applied for separation of cations?
5. Give principle and explain briefly application of Thin Layer Chromatography.

Q2. Attempt any 3 out of 5

15 Marks

1. Differentiate between indicator electrode and reference electrode.
2. Give Principle construction and working of conductivity cell used in conductance measurement.
3. Explain the basic principle of potentiometric titration.
4. What is meant by glass electrode? Give theory of glass electrode in brief.
5. Define Potentiometric titration. What are advantages of potentiometric titration?

Q3. Attempt any 3 out of 5

15 Marks

1. Explain Variance Ratio test.
2. Four repeated measurement for the analysis of platinum in a sample of platinum gave the following results :
10.61 10.52 10.63 10.68
Calculate the 99% confidence limit for the mean if no additional information about the precision of the method is known.
($t = 5.84$ for 99% confidence limit)
3. Briefly explain
(a) $2.5d$ rule and $4d$ rule (b) Q- Test
4. Explain Null hypothesis.
5. For the set of observations given below, derive an equation of the type $y = mx + c$ by the method of least squares. Assume a linear relationship between the variables.
X : 1 2 3 4 5 6
Y : 0.8 2.2 3.2 4.4 4.8 5.8

Q4. Attempt any 3 out of 5

15 Marks

1. Give principle and application of paper chromatography.
2. Explain basic principle of conductometric titration.

- 3 A new method is devised for an estimation of copper element in a particular sample. It gave the following results in *mmol*.
- | | | | |
|------|------|------|------|
| 0.95 | 0.94 | 0.92 | 0.93 |
|------|------|------|------|
- If another standard method was employed for an estimation of copper from the same sample, it gave results as 0.96 mmol of copper. On the basis of 90% confidence level, find whether the new method can be retained or not on the basis of null hypothesis
- 4 Explain Variance Ratio test.
- 5 Write note on different types of reference electrodes used in potentiometric titration.

Q5.A Multiple choice question (Any 5 out of 9)

(5 Marks)

1. In paper chromatography stationary phase is ----

a) Solid	b) Liquid supported by paper	c) Gas	d) None of above
----------	------------------------------	--------	------------------
2. For checking completion of a reaction ---- chromatography is very useful.

a) Paper	b) TLC	c) Planar	d) None of above
----------	--------	-----------	------------------
3. The most important advantage of conductometric titration is ----

a) Titration of mixture of acid	b) High cost	c) Use of conductance to determine equivalence point	d) Titration of dilute solution.
---------------------------------	--------------	--	----------------------------------
4. Generally with potentiometric titration we get ---- when emf is plotted vs volume of the titrant added.

a) V shape curve	b) a peak	c) S shape curve	d) W shape curve
------------------	-----------	------------------	------------------
5. Conductivity cell consist of ----

a) Two parallel Ag electrode	b) Two parallel glass electrode	c) Two parallel Pt electrode	d) Two parallel calomel electrode
------------------------------	---------------------------------	------------------------------	-----------------------------------
6. Null hypothesis often used as ----

a) Test for repeatability	b) Test for significance	c) Test for uncertainty	d) None of above
---------------------------	--------------------------	-------------------------	------------------
7. ---- test is used to reject the doubtful reading.

a) Q test	b) "t" test	c) P test	d) L test
-----------	-------------	-----------	-----------
8. ---- is most commonly used reference electrode.

a) Glass electrode	b) Platinum	c) SCE	d) Quinhydrone electrode
--------------------	-------------	--------	--------------------------
9. The overall shape of the normal error curve represents ---- of the given set of measurements.

a) Uncertainty	b) Accuracy	c) Precision	d) None of above
----------------	-------------	--------------	------------------

B Match the following (Any 5 out of 8)

(5 Marks)

- A**
1. Pt/H₂O .Q
 2. Conductivity cell
 3. Electrophoresis
 4. Paper chromatography
 5. CnR

- B**
1. Method to develop confidence limit
 2. Positive correlation
 3. Rejection of data
 4. Separation of proteins
 5. Separation by partition

6. $r = +1$
7. 2.5 d rule
8. Null hypothesis

6. Two parallel platinum electrodes

7. Separation by adsorption

8. Rejection of data

C True and False (Any 5 out of 8)

(5 Marks)

1. TLC is faster than paper chromatography.
2. Paper chromatography is an adsorption chromatography.
3. R_f value is independent of solvent system.
4. In TLC stationary phase is filled in column.
5. The overall shape of normal error curve is measure of precision of the measurements.
6. When number of measurements are more than 30 then practically \bar{x} and s are identical.
7. Q test is not used for rejection of data.
8. Null hypothesis is used to reject a data.

250307

SS404

RIZVI COLLEGE OF ARTS, SC. & COM.

S.Y.B.Sc (Physics) SEM - IV - Regular + ATLET
Paper-I (USPH401) New course

Time : 2 1/2 Hrs

Total Marks : 75 M

Note : 1. All questions are compulsory.

2. Figure to the right indicates full marks.

3. Use of non-programmable calculator is allowed.

4. Symbols have their usual meanings.

- Q1** Attempt any TWO of following question. (Each question carry 10 Mark) (20M)
- Explain the formation of dark bands in case if a FRESNEL DIFFRACTION at a straight edge. Show that they are uneven.
 - With the help of an intensity curve explain the FRAUNHOFER diffraction at a single slit.
 - Define polarization. Explain any two methods of polarization with suitable diagrams.
 - Show that the elliptical polarization is a special case of circular polarization.
- Q2** Attempt any TWO of following question. (Each question carry 10 Mark) (20M)
- Explain the diagram and the adjustment of MICHELSON INTERFEROMETER.
 - Explain how will you determine the thickness of a thin film using MICHELSON INTERFEROMETER.
 - What is RESOLVING POWER? Derive an expression for R.P of a telescope.
 - Obtain an expression for R.P of a grating.
- Q3** Attempt any TWO of following question. (Each question carry 10 Mark) (20M)
- Explain the function of Accumulator, Program counter, stack pointer in 8085 microprocessor.
 - Explain the five flags in 8085 microprocessor.
 - Explain RLC, RRC, RAL and RAC instructions with suitable example.
 - What is addressing modes. Describe the different addressing modes.
- Q4** Attempt any THREE of following question. (Each question carry 05 Mark) (15M)
- Differentiate between O-RAY and E-RAY.
 - Describe the intensity curve with the formation of fringes for a straight edge on the basis of FRESNEL'S theory.
 - Calculate the thickness of a quarter wave plate for a quartz crystal for a light of 5000 A.U. Given: R.I of O-Ray is 1.542 and E-Ray is 1.553.
 - Explain the register array in 8085 microprocessor.
 - Explain address and data bus in 8085 microprocessor.
 - Find the R.I of a glass if the angle of polarization is 60 degree.
 - A parallel beam of light of 6000 A.U gets diffracted by a single slit of width 0.3 mm. What is the angular position of the first minimum of diffracted light?

250310

SS406

Rizvi College of Arts, Science & Commerce
Off. Carter Road, Bandra (West), Mumbai-400050
S.Y.B.Sc. (Physics)- Regular + ATKT –New Course
Semester-IV Paper-II (Electrodynamics)

Time: $2\frac{1}{2}$ Hours

Max. Marks: 75

NOTE:

1. All questions are **compulsory**.
2. All questions carry equal marks.
3. Figures to the right indicate full marks.
4. Use of non-programmable scientific calculator is allowed.

Given: $\epsilon_0 = 8.85 \times 10^{-12}$ SI units.

Q.1 Attempt any TWO of the followings:- (20)

1. What is the theorem of curl? Write its statement with suitable diagram. Explain its physical and geometrical interpretation.
2. Obtain divergence of a vector function in Spherical polar co-ordinate system. Consider $x = r \sin \theta \cos \phi$; $y = r \sin \theta \sin \phi$ and $z = r \cos \theta$
3. What do you mean by surface integrals? Explain its significance with necessary vector diagram.
4. Express (a) cylindrical unit vectors $\hat{s} = \cos \phi \hat{x} + \sin \phi \hat{y}$; $\hat{\phi} = -\sin \phi \hat{x} + \cos \phi \hat{y}$ and $\hat{z} = z$, in terms of $\hat{x}, \hat{y}, \hat{z}$. (b) Invert your answer to get $\hat{x}, \hat{y}, \hat{z}$ in terms of $\hat{s}, \hat{\phi}, \hat{z}$.

Q.2 Attempt any TWO of the followings:- (20)

1. Solve Laplace's equation in 1 – D in Cartesian co-ordinates. State the two boundary conditions where equation holds true.
2. State and explain the superposition principle of electrostatic potential.
3. What is Poisson's equation electrostatics of charge density ρ . Hence deduce Laplace's equation in electrostatics.
4. Write at least five important points to comment on electrostatic potential.

Q.3 Attempt any TWO of the followings:-

(20)

1. Obtain an equation for differential form of Ampere's circuital law.
2. Explain physical interpretation of bound currents.
3. What are steady currents? Obtain an expression for magnetic field due to steady current for infinitely long wire.
4. Explain the terms (a) magnetic susceptibility , (b) magnetic permeability. Give its physical significance.

Q.4 Attempt any THREE of the followings:-

(15)

1. Show that using spherical polar co-ordinate system the volume of a sphere is $\frac{4}{3} \pi R^3$, where R is the radius of the sphere.
2. Prove the following. (a) $\int_C r \cdot dr = 0$ and (b) $\int_C (\nabla\phi) \cdot dr = 0$
3. Consider a potential $V(x, y, z) = 4x^2yZ^3$ at a P (1 . 2 -1) then find potential at Q. Verify whether potential satisfy the Laplace's equation or not.
4. Using spherical polar co-ordinates solve Laplace's equation for potential function that simply dependent on distance (r) from the origin of the system.
5. Distinguish between electrostatics and Magneto-statics.
6. Show that $\oint B \cdot dl = \mu_0 I$; where symbols have their usual meaning.

250311

Rizvi College of Arts, Science & Commerce
Off. Carter Road, Bandra (West), Mumbai-400050
S.Y.B.Sc. (Physics)
Semester-IV Paper-III (Quantum Mechanics)

SC408

Time: $2\frac{1}{2}$ Hours

Max. Marks: 75

NOTE:

1. All questions are **compulsory**.
2. All questions carry equal marks.
3. Figures to the right indicate full marks.
4. Use of non-programmable scientific calculator is allowed.

Given: mass of electron 'm' = 9.1×10^{-31} kg
 Plank's constant $\hbar = 1.05 \times 10^{-34}$ J-sec
 $1eV = 1.6 \times 10^{-19}$ J

Q.1 Attempt any TWO of the followings:-

(20)

- i. What is wave function? Discuss the physical interpretation and normalization of wave function.
- ii. Derive time-independent form of Schrödinger Wave equation in one dimension. Hence also express it in three dimensional form.
- iii. State and explain the basic postulates of quantum mechanics.
- iv. Find the expectation value of the position $\langle x \rangle$ and momentum $\langle P \rangle$ of a particle if its normalized eigen function is

$$\psi(x) = \begin{cases} \sqrt{\frac{2}{L}} \sin \frac{\pi x}{L} & \text{for } 0 < x < L \\ 0 & \text{for all other } x \end{cases}$$

Q.2 Attempt any TWO of the followings:-

(20)

- i. Define the free particle. Show that the motion of the free particle in the positive x-direction is given by

$$\psi(x, t) = Ae^{i(kx - \omega t)}$$

Also check the normalization of free particle.

- ii. For step potential whose potential is described by

$$V(x) = \begin{cases} 0 & ; -\infty \leq x < 0 & \text{Region - I} \\ V_0 & ; 0 \leq x \leq +\infty & \text{Region - II} \end{cases}$$

A beam of electrons, each of mass m and energy E is incident on a step potential from left to right. For $E > V_0$, derive an expression for the reflection coefficient R.

- iii. A particle is confined to move in one-dimensional infinitely deep potential well whose potential is described by

$$V(x) = \begin{cases} 0 & \text{for } x > 0 \text{ and } x < L \\ \infty & \text{for } x \leq 0 \text{ and } x \geq L \end{cases}$$

Set up Schrodinger's equation and solve it to obtain normalized eigen function.

- iv. A particle is confined to a three dimensional box with sides L_x, L_y, L_z by impenetrable walls. Set up the Schrödinger time-independent wave equation for the particle and obtain its solution. Hence show that the eigen values of the energy of the particle is

$$E_{n_x n_y n_z} = \frac{\pi^2 \hbar^2}{2m} \left[\frac{n_x^2}{L_x^2} + \frac{n_y^2}{L_y^2} + \frac{n_z^2}{L_z^2} \right]$$

Q.3 Attempt any TWO of the followings:-

(20)

- i. Write (do not derive) down the expression for the transmission coefficient T and reflection coefficient R for the rectangular potential barrier of finite height V_0 and finite width a for the case $E > V_0$. Hence show that

- a) when $E \rightarrow V_0$, the transmission coefficient T is given by

$$T = \frac{1}{1 + \frac{mV_0 a^2}{2\hbar^2}}$$

- b) when $T \rightarrow 1$, the width of the potential barrier is an integral multiple of half wavelength.

- ii. State correspondence principle. Show how quantum and classical probabilities of a one-dimensional oscillator leads to correspondence principle.
 iii. The Hermite's differential equation for the one dimensional harmonic oscillator is given by

$$\frac{d^2 H}{d\xi^2} - 2\xi \frac{dH}{d\xi} + (\epsilon - 1)H = 0$$

Solve the above differential equation by the method of Frobenius/power series to obtain the eigenvalues of the harmonic oscillator.

- iv. Define Tunneling effect. Derive an expression of the approximate transmission coefficient of a potential barrier of height V_0 and width a .

Q.4 Attempt any THREE of the followings:-

(15)

- i. The Schrodinger's equation is

$$\frac{d^2 \psi(x)}{dx^2} + \frac{2m}{\hbar^2} [E - V(x)] = 0$$

when $V(x) = V$ & $E > V$, show that the solution may be written as

$$\psi(x) = A \sin kx + B \cos kx$$

where $k = \sqrt{\frac{2m(E-V)}{\hbar^2}}$.

- ii. Prove that: $\left(\frac{\partial}{\partial x} + x\right)\left(\frac{\partial}{\partial x} - x\right) = \frac{\partial^2}{\partial x^2} - x^2 - 1$

- iii. For a particle in a one dimension box, show that the fractional difference in the energy between adjacent energy level is given by

$$\frac{\Delta E_n}{E_n} = \frac{2n+1}{n^2}$$

- iv. Calculate the values of energy in one-dimensional box of length $2A^0$ for $n = 1$ and $n = 2$.

- v. Electrons of energy $5.0eV$ are incident on a barrier $3.0eV$ high and $1A^0$ wide. Calculate the transmission coefficient T .

- vi. Calculate the zero-point energy in eV of a harmonic oscillator of frequency $2 \times 10^{15} Hz$. Given: $h = 6.63 \times 10^{-34} J\text{-sec}$

~~~~~ END ~~~~~

SS410 250312

S.Y. B.Sc. SEMESTER – IV EXAMINATION: MARCH 2025

MATHEMATICS PAPER –I: MULTIVARIABLE CALCULUS – I

Time:  $2\frac{1}{2}$  Hours

Maximum Marks: 75

NOTE: (1) All questions are compulsory.

(2) Figures to the right indicate full marks.

Qn. (1) Attempt any FOUR questions from the following. ( $4 \times 5 = 20$  Marks)

- (a) Show that the limit of a scalar valued function  $f: \mathbb{R}^n \rightarrow \mathbb{R}$  at a point  $a \in S$  if exists is unique.
- (b) Show that the limit of the function  $f(x, y)$  does not exist as  $(x, y) \rightarrow (0, 0)$  using path test  $y = mx$ , where

$$f(x, y) = \begin{cases} \frac{x^4 - y^4}{x^4 + y^4}, & (x, y) \neq (0, 0) \\ 0, & \text{otherwise} \end{cases}$$

- (c) Find the directional derivative of the function  $f(x, y, z) = 4xy + xz + zx$  at  $(2, 0, -1)$  in the direction of  $\vec{u} = 2\vec{i} + 3\vec{j} + \vec{k}$
- (d) Check the convergence of the sequence  $x_n = \left( \frac{4n-3}{16n+7}, \frac{14n^2+5}{7n^2+3n+1}, \frac{16n}{8n^2+10} \right)$

(e) If  $u = \log \left[ \frac{x^2+y^2}{x+y} \right]$ , prove that  $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = 1$ .

Qn. (2) Attempt any FOUR questions from the following. ( $4 \times 5 = 20$  Marks)

- (a) Show that if a scalar field  $f: \mathbb{R}^n \rightarrow \mathbb{R}$  is differentiable at a point  $a \in \mathbb{R}^n$  then  $f$  is continuous at  $a \in \mathbb{R}^n$ .
- (b) Let  $f, g: \mathbb{R}^n \rightarrow \mathbb{R}$  be two scalar fields differentiable at  $a \in \mathbb{R}^n$ . Show that  $f + g$  is differentiable at  $a \in \mathbb{R}^n$ .
- (c) Find the equation of tangent plane and normal line to the surface  $f(x, y, z) = yz - \log(x + z)$  at  $(0, 0, 1)$ .

- (d) Find the level curve of  $f(x, y, z) = 324 - x^2 - y^2 - z^2$  for  $C = 0$  and  $C = 224$ .
- (e) Find the total derivative  $\frac{du}{dt}$  where  $u = 3\sin x + \cos y$  where  $x = t^3, y = t^2$  using Chain rule.

**Qn. (3) Attempt any FOUR questions from the following. (4 × 5 = 20 Marks)**

- (a) Find the Taylor's polynomial of degree two for the function  $f(x, y) = \sin x \sin y$  at  $(0, 0)$
- (b) Find the linearization of the function  $f(x, y, z) = x^3 + 2xy^2 + 3z^3$  at  $(2, 1, 2)$
- (c) Find the Jacobian matrix of the function  $f: \mathbb{R}^3 \rightarrow \mathbb{R}^3$  given by  
 $f(x, y, z) = (2x + y, 2y + z, 2z + x)$  at  $(1, 2, 1)$ .
- (d) Find the points on the ellipse  $x^2 + 2y^2 = 1$  where  $f(x, y) = xy$  has its extreme values by using Lagrange multiplier method.
- (e) Find the local maxima and local minima for the function

$$f(x, y) = x^2 + xy + y^2 + 3x - 3y + 4$$

**Qn. (4) Attempt any THREE questions from the following. (3 × 5 = 15 Marks)**

- (a) Show that  $\|x + y\| \leq \|x\| + \|y\|$  for all  $x, y \in \mathbb{R}^n$ .
- (b) Find the iterated limits for the function  $f(x, y) = \begin{cases} \frac{x^2 y^2}{x^2 + y^2}, & (x, y) \neq (0, 0) \\ 0, & (x, y) = (0, 0) \end{cases}$
- (c) State and prove Euler's theorem for function of two variables.
- (d) Find the gradient of  $f(x, y, z) = x^3 + 2xyz^2 - 4zy^2$  at the point  $(1, 2, -3)$ .
- (e) If  $F(x, y, z) = 3xyz - \cos(x + y + z)$ , find  $\frac{\partial z}{\partial x}$  and  $\frac{\partial z}{\partial y}$ .
- (f) Find the Hessian matrix of  $f(x, y) = x^2 + 3xy - y^2$  at  $(-1, 6)$ .

\*\*\*\*\*

SS412 250313

SYBSC SEM IV EXAMINATION (EXTERNAL) MARCH 2025

MARKS : 75

TIME DURATION : 2hr 30min

N.B: 1) All questions are compulsory.

2) Figures to the right indicate full marks.

Q.1 Attempt any Four

(20)

- (i) Show that the vector spaces  $M_{2 \times 2}(\mathbb{R})$  and  $\mathbb{R}^4$  are isomorphic by explicitly defining an isomorphism.
- (ii) Let  $T : V \rightarrow W$  be a linear transformation where  $V$  and  $W$  are real vector spaces, then  $kT : V \rightarrow W$  is also linear transformation, where  $k \in \mathbb{R}$ .
- (iii) Verify whether the map  $T : \mathbb{R}^2 \rightarrow \mathbb{R}^3$  given by  $T(x, y) = (x + 2y, x - 2y, 3x + 4y)$  is a linear transformation.
- (iv) Verify Rank Nullity Theorem for the linear transformation,  $T : \mathbb{R}^2 \rightarrow \mathbb{R}^3$  such that,  $T(x, y) = (0, 3x, 2y)$ .
- (v) Find the matrix associated with the linear map  $T : \mathbb{R}^3 \rightarrow \mathbb{R}^3$  defined as  $T(x, y, z) = (3x, y, 4z)$  with respect to standard basis of  $\mathbb{R}^3$ .

Q.2 Attempt any Four

(20)

- (i) State and prove Pythagoras theorem.
- (ii) Find the angle between  $x = (-1, -1, 0)$ ,  $y = (0, 0, 1)$  using inner product  $\langle x, y \rangle = x_1y_1 + x_2y_2 + x_3y_3$ .
- (iii) State and prove Cauchy – Schwarz inequality.
- (iv) Using Gram Schmidt Orthogonalization process, find an orthogonal basis for the inner product space whose basis is  $\{(1, 1, 1), (-1, 1, 1), (1, 2, 1)\}$ .
- (v) Check whether  $(\mathbb{R}^2, \langle \rangle)$  is an inner product space or not with respect to the inner product defined as  $\langle x, y \rangle = 9x_1y_1 + 25x_2y_2$ , where  $x = (x_1, x_2)$  &  $y = (y_1, y_2)$ .

**Q.3 Attempt any Four****(20)**

- (i) Verify Cayley Hamilton theorem for the matrix  $\begin{bmatrix} 3 & 1 \\ 2 & -1 \end{bmatrix}$ .
- (ii) Let  $A$  be  $n \times n$  real matrix then, prove that characteristic polynomial of  $A$  is same as characteristic polynomial of  $A^T$ .
- (iii) Find eigen values and eigen vectors of  $\begin{bmatrix} 2 & -3 \\ 3 & 8 \end{bmatrix}$ .
- (iv) Let  $A$  be  $n \times n$  real matrix. Let  $\lambda_1, \lambda_2, \dots, \lambda_k$  be any  $k$  distinct real eigen values of  $A$ , then the corresponding eigen vectors are linearly independent in  $\mathbb{R}^n$ .
- (v) Prove that similar matrices have same eigen values.

**Q.4 Attempt any Three****(15)**

- (i) Let  $U, V, W$  be three real vector spaces. Let  $S : U \rightarrow V$  and  $T : V \rightarrow W$  be two linear transformations then  $T \circ S : U \rightarrow W$  is a linear transformation.
- (ii) Let  $V = M_{n \times n}(\mathbb{R}) =$  set of all real  $n \times n$  matrices. Define a relation  $\sim$  in  $V$  as  $A \sim B$  iff  $A$  and  $B$  are similar matrices, then this relation  $\sim$  is an equivalence relation in  $V$ .
- (iii) State and prove triangle inequality.
- (iv) Find orthogonal complement of  $W = \{(x, y) \in \mathbb{R}^2 : x = y\}$  in  $\mathbb{R}^2$ .
- (v) Find the inverse of the matrix  $\begin{bmatrix} 2 & 1 \\ 4 & -3 \end{bmatrix}$  by using Cayley Hamilton theorem.
- (vi) Find the eigen values and eigen vectors of the linear transformation  $T : \mathbb{R}^2 \rightarrow \mathbb{R}^2$  given by  $T(x, y) = (4x + 2y, 3x + 2y)$ .

SS414 250315

S.Y. B.Sc. SEMESTER – IV EXAMINATION: MARCH 2025

MATHEMATICS PAPER –III: NUMERICAL METHODS (ELECTIVE - A)

Time:  $2\frac{1}{2}$  Hours

Maximum Marks: 75

NOTE: (1) All questions are compulsory.

(2) Figures to the right indicate full marks.

Qn. (1) Attempt any FOUR questions from the following. ( $4 \times 5 = 20$  Marks)

- (a) Find a real root of the equation  $x^3 - 2x - 5 = 0$  by using Newton – Raphson method up to two approximations. (Choose  $x_0 = 2$ )
- (b) Find a real root of the equation  $x^3 - x - 4 = 0$  by using the method of false position up to two approximations.
- (c) Find a real root of the equation  $x^3 + x - 1 = 0$  by using secant method up to two approximations.
- (d) Find a real root of the equation  $x = (4 - x)^{1/3}$  by using the fixed point iteration method up to three approximations.
- (e) Evaluate the sum  $S = \sqrt{3} + \sqrt{5} + \sqrt{11}$  to 4 significant digits and find its absolute and relative errors.

Qn. (2) Attempt any FOUR questions from the following. ( $4 \times 5 = 20$  Marks)

- (a) Using Lagrange's interpolation formula, find the value of  $f(5)$  from the following table.

|        |    |    |    |    |
|--------|----|----|----|----|
| $x$    | 2  | 3  | 7  | 8  |
| $f(x)$ | 24 | 35 | 45 | 64 |

- (b) The population of a town in the decennial census was as given below. Find the population for the year 1895 by using Newton's forward difference interpolation formula.

|                                   |      |      |      |      |      |
|-----------------------------------|------|------|------|------|------|
| Year ( $x$ )                      | 1891 | 1901 | 1911 | 1921 | 1931 |
| Population ( $y$ )<br>(in 1000's) | 56   | 76   | 91   | 103  | 121  |

- (c) Calculate the area bounded by the curve from the following table using Trapezoidal's rule.

|     |    |     |     |     |     |     |     |     |     |
|-----|----|-----|-----|-----|-----|-----|-----|-----|-----|
| $x$ | 0  | 0.5 | 1.0 | 1.5 | 2.0 | 2.5 | 3.0 | 3.5 | 4.0 |
| $y$ | 18 | 14  | 10  | 8   | 8.5 | 12  | 14  | 15  | 16  |

- (d) The velocities of a car at intervals of two minutes are given below. Find the distance covered by the car using Simpson's  $\left(\frac{1}{3}\right)$  rule.

|                        |   |    |    |    |    |    |    |
|------------------------|---|----|----|----|----|----|----|
| Time in minutes (x)    | 0 | 2  | 4  | 6  | 8  | 10 | 12 |
| Velocity in km/hr. (y) | 0 | 27 | 35 | 32 | 23 | 12 | 5  |

- (e) Evaluate  $I = \int_0^2 \frac{1}{1+x} dx$  using Simpson's  $\left(\frac{3}{8}\right)$  rule with  $h = 0.25$ .

**Qn. (3) Attempt any TWO questions from the following. (2 × 10 = 20 Marks)**

- (a) Solve the following system of equations by LU factorization method.

$$\begin{aligned} 2x + 3y + z &= 6 \\ x + 2y + 3z &= 3 \\ 3x + y + 2z &= 5 \end{aligned}$$

- (b) Solve the following system of equations by Gauss – Seidel method up to two iterations.

$$\begin{aligned} 5x + 2y + z &= 9 \\ x + 5y - z &= -22 \\ -2x + 3y + 5z &= 22 \end{aligned}$$

- (c) Find the eigenvalue of the following matrix by Jacobi's method

$$\begin{bmatrix} 2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 2 \end{bmatrix}$$

**Qn. (4) Attempt any THREE questions from the following. (3 × 5 = 15 Marks)**

- (a) Find the real root of the equation  $4x = \cos x + 6$  using fixed point method.

- (b) Round-off the following numbers to four significant figures:

48.46235, 0.80029, 0.0032218, 29.235101, 4.36425

- (c) Estimate  $\log(3.5)$  using Newton's backward interpolation formula from the given table.

|      |     |      |       |       |
|------|-----|------|-------|-------|
| x    | 1.0 | 2.0  | 3.0   | 4.0   |
| logx | 0.0 | 0.69 | 1.099 | 1.386 |

- (d) Fit a straight line for the equation  $y = 6.71 + 0.38x$  for  $x = 0,1,2,3,4,5$ .

- (e) Find the eigenvalues of the matrix  $A = \begin{bmatrix} 4 & 3 \\ 1 & 2 \end{bmatrix}$  using the Rutishauser method.

- (f) Solve the following system of equations by Gauss – Seidel method up to two iterations.

$$\begin{aligned} 2x + 5y &= 16 \\ 3x + y &= 11 \end{aligned}$$

\*\*\*\*\*

250312

SS411

SET-1

**Rizvi College of Arts, Science and Commerce**  
**S. Y. B.Sc. Botany-Choice Based- Sem. IV**  
**Paper - I**

Date:

Duration: 2 1/2 hours

Marks: 75

N.B:

1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Draw neat labelled diagrams wherever necessary.

| Q.1 | Attempt any 15 of the following: (MCQs)                                                                                                                                                                                                                                    | 15 |
|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| 1.  | _____ is a general characteristic of Ascomycota.<br>A) They produce conidia as asexual spores.<br>B) They form basidia as sexual reproductive structures.<br>C) They have a symbiotic relationship with algae.<br>D) They produce zygospores during sexual reproduction    |    |
| 2   | _____ is the causal organism of the disease "Powdery mildew"<br>A) Phytophthora infestans                      B) Erysiphe graminis<br>C) Alternaria solani                              D) Puccinia graminis                                                              |    |
| 3   | In the life cycle of <i>Erysiphe</i> (Powdery mildew), the sexual reproductive structure is called _____<br>A) Conidia                      B) Ascus                      C) Zygote                      D) Basidium                                                       |    |
| 4   | _____ is the causative organism of Late blight of potato.<br>A) Fusarium oxysporum                      B) Alternaria solani<br>C) Phytophthora infestans                      D) Puccinia graminis                                                                        |    |
| 5   | The plant disease cycle of late blight of potato involves which of the following stages?<br>A) Spore production, infection, and symptom development                      B) Only spore production<br>C) Only symptom development                      D) None of the above |    |
| 6   | _____ is organisms causes "Late blight" of potato.<br>A) Fungi                      B) Bacteria                      C) Virus                      D) Protozoa                                                                                                             |    |
| 7   | In G. M. Smith's classification system, which of the following is an order under the class Psilophyta.<br>a) Lycopodiales                      b) Sphenophyllales                      c) Psilotales                      d) Equisetales                                   |    |
| 8   | The classification of Selaginella in the G. M. Smith system its order _____<br>a) Lycopodiales                      b) Selaginellales                      c) Equisetales                      d) Sphenophyllales                                                          |    |
| 9   | _____ is true about the structure of Selaginella.<br>a) It has true roots, stems, and leaves                      b) It lacks vascular tissues<br>c) It reproduces through seeds                      d) It has no differentiation of tissues                              |    |
| 10  | The life cycle of Selaginella is characterized by _____<br>a) A dominant gametophyte generation                      b) An alternation of generations with a dominant sporophyte                                                                                           |    |

|            |                                                                                                                                                                                                                                                                                                                                          |                                           |
|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|
|            | c) Asexual reproduction only                                                                                                                                                                                                                                                                                                             | d) The absence of a sporophyte generation |
| 11         | _____ is a characteristic feature of Pteridophytes.                                                                                                                                                                                                                                                                                      |                                           |
|            | a) They are non-vascular plants<br>b) They are seed-bearing plants<br>c) They possess vascular tissue and reproduce through spores<br>d) They have a dominant gametophyte generation                                                                                                                                                     |                                           |
| 12         | _____ is a key feature of the geological time scale.                                                                                                                                                                                                                                                                                     |                                           |
|            | a) It divides Earth's history into periods based on the appearance of animals<br>b) It is based only on fossil records from the Mesozoic era<br>c) It is a linear representation of Earth's history without any gaps<br>d) It categorizes Earth's history into eons, eras, periods, and epochs based on geological and biological events |                                           |
| 13         | _____ are the two main types of fossils.                                                                                                                                                                                                                                                                                                 |                                           |
|            | a) True and false fossils<br>b) Body fossils and trace fossils<br>c) Organic and inorganic fossils<br>d) Freshwater and marine fossils                                                                                                                                                                                                   |                                           |
| 14         | The formation of fossils typically requires _____                                                                                                                                                                                                                                                                                        |                                           |
|            | a) A warm, acidic environment<br>b) Rapid burial and the presence of minerals<br>c) A lack of oxygen to prevent decomposition<br>d) Constant sunlight exposure                                                                                                                                                                           |                                           |
| 15         | _____ is the class under Gymnosperms that includes conifer                                                                                                                                                                                                                                                                               |                                           |
|            | a) Cycadopsida    b) Coniferopsida    c) Ginkgoopsida    d) Gnetopsida                                                                                                                                                                                                                                                                   |                                           |
| 16         | _____ orders is included under the class Coniferopsida in Chamberlain's system of classification?                                                                                                                                                                                                                                        |                                           |
|            | a) Gnetales    b) Pinales    c) Cycadales    d) Ginkgoales                                                                                                                                                                                                                                                                               |                                           |
| 17         | _____ is an example of a plant from the order Pinales under the class Coniferopsida                                                                                                                                                                                                                                                      |                                           |
|            | a) <i>Gnetum</i> b) <i>Pinus</i> c) <i>Ginkgo biloba</i> d) <i>Cycas</i>                                                                                                                                                                                                                                                                 |                                           |
| 18         | _____ is NOT a characteristic of the class Coniferopsida.                                                                                                                                                                                                                                                                                |                                           |
|            | a) They produce seeds<br>b) They have needle-like leaves<br>c) They have non-vascular tissue<br>d) They are primarily wind-pollinated                                                                                                                                                                                                    |                                           |
| 19         | _____ is the most significant economic importance of Coniferophyta.                                                                                                                                                                                                                                                                      |                                           |
|            | a) They provide edible fruits<br>b) They are the main source of rubber<br>c) They are a major source of timber and pulp<br>d) They produce spices and medicinal plants                                                                                                                                                                   |                                           |
| 20         | The reproductive structure in <i>Pinus</i> that produces male gametes is called _____                                                                                                                                                                                                                                                    |                                           |
|            | a) Seed cones    b) Pollen cones    c) Ovules    d) Sporangia                                                                                                                                                                                                                                                                            |                                           |
| <b>Q.2</b> | <b>Attempt any two of the following</b>                                                                                                                                                                                                                                                                                                  |                                           |
|            | a) Describe the general characteristics of Ascomycetes, highlighting their habitat, structure, reproduction, and economic importance                                                                                                                                                                                                     | <b>15</b>                                 |
|            |                                                                                                                                                                                                                                                                                                                                          | 7.5                                       |

|            |                                                                                                                                                      |          |
|------------|------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| b          | Explain the structure, life cycle, and systematic position of <i>Erysiphe</i> (Powdery Mildew), and discuss its role as a plant pathogen             | 7        |
| c          | Discuss the structure, life cycle, and systematic position of <i>Xylaria</i> and its ecological role in wood decay.                                  | 7        |
| d          | Discuss the symptoms, causative organism, disease cycle, and control measures of Powdery Mildew ( <i>Erysiphe</i> spp.).                             | 7        |
| <b>Q.3</b> | <b>Attempt any two of the following</b>                                                                                                              | <b>1</b> |
| a          | Explain the classification of Pteridophytes as per G. M. Smith's system                                                                              | 7        |
| b          | Discuss the geological time scale and its relationship to the formation of fossils.                                                                  | 7        |
| c          | Elaborate on the structure and systematic position of the form genus <i>Rhynia</i> in paleobotany                                                    | 7        |
| d          | Describe the life cycle of <i>Selaginella</i> with special emphasis on its heterosporous nature.                                                     | 7        |
| <b>Q.4</b> | <b>Attempt any two of the following</b>                                                                                                              | <b>1</b> |
| a          | Discuss the salient features, classification, and economic importance of the class Coniferophyta according to Chamberlain's system of classification | 7        |
| b          | Explain the structure, life cycle, and systematic position of <i>Pinus</i> .                                                                         | 7        |
| c          | Describe the structure and systematic position of the form genus <i>Cordaites</i> and discuss its significance in the evolution of gymnosperms.      | 7        |
| d          | Discuss the classification of Gymnosperms according to Chamberlain's system, focusing on the economic significance of the class Coniferophyta.       | 7        |
| <b>Q.5</b> | <b>Write Short notes on any Three of the following</b>                                                                                               | <b>1</b> |
| a          | Significance of Lichens                                                                                                                              |          |
| b          | Control measures of Late blight of potato                                                                                                            |          |
| c          | Control measures of o Powder                                                                                                                         |          |
| d          | Difference between Psilophyta and Lepidophyta                                                                                                        |          |
| e          | Formation and types of fossils                                                                                                                       |          |
| f          | Economic importance of Coniferophyta                                                                                                                 |          |

250313

SS413

| Sem. IV Botany Paper – II                                                                                                              |                                                                                                                                                                                                                                                                                                                                                      | Duration: 2 hours | Marks: 75 |
|----------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|-----------|
| <b>N.B:</b>                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                      |                   |           |
| 1. All questions are compulsory.<br>2. Figures to the right indicate full marks.<br>3. Draw neat labelled diagrams wherever necessary. |                                                                                                                                                                                                                                                                                                                                                      |                   |           |
| <b>Q.1</b>                                                                                                                             | <b>Attempt any 15 of the following: (MCQs) (Based on all 3 Units)</b>                                                                                                                                                                                                                                                                                |                   | <b>15</b> |
| 1.                                                                                                                                     | Secondary growth in dicotyledonous plants primarily results from the activity of:<br>a) Apical meristem<br>b) Lateral meristem<br>c) Intercalary meristem<br>d) Root cap                                                                                                                                                                             |                   |           |
| 2.                                                                                                                                     | The cambium between secondary xylem and secondary phloem in a dicot stem is called:<br>a) Intercalary cambium<br>b) Vascular cambium<br>c) Cork cambium<br>d) Pheilogen                                                                                                                                                                              |                   |           |
|                                                                                                                                        | Growth rings in trees are formed primarily due to:<br>a) Variation in temperature<br>b) The seasonal activity of vascular cambium<br>c) Light intensity<br>d) Soil nutrient availability                                                                                                                                                             |                   |           |
| 4.                                                                                                                                     | Lenticels are found in which part of a plant?<br>a) Roots<br>b) Stem and branches<br>c) Leaves<br>d) Flowers                                                                                                                                                                                                                                         |                   |           |
| 5.                                                                                                                                     | The tissue primarily responsible for providing mechanical strength and support in plants is:<br>a) Parenchyma<br>b) Sclerenchyma<br>c) Xylem<br>d) Phloem                                                                                                                                                                                            |                   |           |
| 6.                                                                                                                                     | Which of the following is true about the secondary phloem in dicot stems during secondary growth?<br>a) It becomes part of the bark and contributes to the transport of nutrients<br>b) It contributes to the growth in height of the plant<br>c) It is formed exclusively by the pericycle<br>d) It replaces primary phloem during secondary growth |                   |           |
| 7.                                                                                                                                     | In secondary growth, the cork cambium produces:<br>a) Vascular tissue<br>b) Secondary phloem                                                                                                                                                                                                                                                         |                   |           |

250313

SS413

| Sem. IV                                            | Botany Paper – II                                                                                                                                                                                                                                                                                                                                    | Duration: 2 hours | Marks: 75 |
|----------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|-----------|
| <b>N.B:</b>                                        |                                                                                                                                                                                                                                                                                                                                                      |                   |           |
| 1. All questions are compulsory.                   |                                                                                                                                                                                                                                                                                                                                                      |                   |           |
| 2. Figures to the right indicate full marks.       |                                                                                                                                                                                                                                                                                                                                                      |                   |           |
| 3. Draw neat labelled diagrams wherever necessary. |                                                                                                                                                                                                                                                                                                                                                      |                   |           |
| <b>Q.1</b>                                         | <b>Attempt any 15 of the following: (MCQs) (Based on all 3 Units)</b>                                                                                                                                                                                                                                                                                |                   | <b>15</b> |
| 1.                                                 | Secondary growth in dicotyledonous plants primarily results from the activity of:<br>a) Apical meristem<br>b) Lateral meristem<br>c) Intercalary meristem<br>d) Root cap                                                                                                                                                                             |                   |           |
| 2.                                                 | The cambium between secondary xylem and secondary phloem in a dicot stem is called:<br>a) Intercalary cambium<br>b) Vascular cambium<br>c) Cork cambium<br>d) Phellogen                                                                                                                                                                              |                   |           |
| 3.                                                 | Growth rings in trees are formed primarily due to:<br>a) Variation in temperature<br>b) The seasonal activity of vascular cambium<br>c) Light intensity<br>d) Soil nutrient availability                                                                                                                                                             |                   |           |
| 4.                                                 | Lenticels are found in which part of a plant?<br>a) Roots<br>b) Stem and branches<br>c) Leaves<br>d) Flowers                                                                                                                                                                                                                                         |                   |           |
| 5.                                                 | The tissue primarily responsible for providing mechanical strength and support in plants is:<br>a) Parenchyma<br>b) Sclerenchyma<br>c) Xylem<br>d) Phloem                                                                                                                                                                                            |                   |           |
| 6.                                                 | Which of the following is true about the secondary phloem in dicot stems during secondary growth?<br>a) It becomes part of the bark and contributes to the transport of nutrients<br>b) It contributes to the growth in height of the plant<br>c) It is formed exclusively by the pericycle<br>d) It replaces primary phloem during secondary growth |                   |           |
| 7.                                                 | In secondary growth, the cork cambium produces:<br>a) Vascular tissue<br>b) Secondary phloem                                                                                                                                                                                                                                                         |                   |           |

|     |                                                                                                                                                                                                             |  |
|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
|     | c) Secondary xylem<br>d) Cork and phelloderm                                                                                                                                                                |  |
| 8.  | Short-day plants typically flower when the day length is:<br>a) Longer than a specific threshold<br>b) Shorter than a specific threshold<br>c) Constant throughout the year<br>d) Not a factor in flowering |  |
| 9.  | Vernalization is most commonly observed in:<br>a) Annual plants<br>b) Biennial plants<br>c) Perennial plants<br>d) Aquatic plants                                                                           |  |
| 10. | The pigment responsible for photoperiodic flowering is:<br>a) Chlorophyll<br>b) Phytochrome<br>c) Carotenoid<br>d) Xanthophyll                                                                              |  |
| 11. | The I girdle is a term related to which aspect of plant biology?<br>a) Chloroplast structure<br>b) Cell membrane structure<br>c) Leaf venation<br>d) Photosynthesis pathway                                 |  |
| 12. | Phytochrome's role in flowering is mainly controlled by:<br>a) Short-day and long-day light cycles<br>b) Temperature changes<br>c) Nutrient availability<br>d) Root pressure                                |  |
| 13. | The conversion of Pr to Pfr is triggered by:<br>a) Far-red light<br>b) Red light<br>c) Green light<br>d) Blue light                                                                                         |  |
| 14. | Anaerobic respiration occurs in which part of the cell?<br>a) Nucleus<br>b) Mitochondria<br>c) Cytoplasm<br>d) Endoplasmic reticulum                                                                        |  |
| 15. | The diversity of a community is typically measured using:<br>a) Simpson's index<br>b) Niche breadth<br>c) Temperature variation<br>d) Species interactions                                                  |  |
| 16. | The primary source of sulphur in the environment is:                                                                                                                                                        |  |

|            |                                                                                                                                                                                                                                                                                                                                             |           |
|------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
|            | <ul style="list-style-type: none"> <li>a) Soil</li> <li>b) Volcanoes</li> <li>c) Ocean water</li> <li>d) Lightning</li> </ul>                                                                                                                                                                                                               |           |
| 17.        | <p>In community ecology, qualitative characters refer to:</p> <ul style="list-style-type: none"> <li>a) The number of individuals in a community</li> <li>b) The diversity of species present in the community</li> <li>c) The physical characteristics of the environment</li> <li>d) The types of interactions between species</li> </ul> |           |
| 18.        | <p>The process of weathering plays an essential role in:</p> <ul style="list-style-type: none"> <li>a) The breakdown of rocks into smaller particles</li> <li>b) The movement of soil from one location to another</li> <li>c) The accumulation of water in soil</li> <li>d) The increase in soil temperature</li> </ul>                    |           |
| 19.        | <p>Which of the following is NOT a soil type based on texture?</p> <ul style="list-style-type: none"> <li>a) Sandy soil</li> <li>b) Clay soil</li> <li>c) Loamy soil</li> <li>d) Forest soil</li> </ul>                                                                                                                                     |           |
| 20.        | <p>The term "edaphic factor" refers to:</p> <ul style="list-style-type: none"> <li>a) Climate conditions</li> <li>b) Soil-related environmental factors</li> <li>c) Biotic interactions</li> <li>d) Light intensity</li> </ul>                                                                                                              |           |
| <b>Q.2</b> | <b>Attempt any two of the following: (Based Unit 1)</b>                                                                                                                                                                                                                                                                                     | <b>15</b> |
| a          | Describe the process of secondary growth in dicot root.                                                                                                                                                                                                                                                                                     | 7.5       |
| b          | Explain the formation of growth rings in woody perennial plants.                                                                                                                                                                                                                                                                            | 7.5       |
| c          | Explain in brief, distribution of mechanical tissues with respect to shearing stress.                                                                                                                                                                                                                                                       | 7.5       |
| d          | What are vascular bundles? Give an account of different types of closed vascular bundles.                                                                                                                                                                                                                                                   | 7.5       |
|            |                                                                                                                                                                                                                                                                                                                                             |           |
| <b>Q.3</b> | <b>Attempt any two of the following:(Based Unit 2)</b>                                                                                                                                                                                                                                                                                      | <b>15</b> |
| a          | Describe the different steps involved in TCA cycle and add a note on its energetics.                                                                                                                                                                                                                                                        | 7.5       |
| b          | Discuss the effect of quality of light on night break on Long Day Plants/ Short Day plants                                                                                                                                                                                                                                                  | 7.5       |
| c          | Give an account of photorespiration in C3 plants.                                                                                                                                                                                                                                                                                           | 7.5       |
| d          | Explain different components of electron transport system.                                                                                                                                                                                                                                                                                  | 7.5       |
|            |                                                                                                                                                                                                                                                                                                                                             |           |
| <b>Q.4</b> | <b>Attempt any two of the following:(Based Unit 3)</b>                                                                                                                                                                                                                                                                                      | <b>15</b> |
| a          | What are biogeochemical Cycles? Explain in detail Water cycle.                                                                                                                                                                                                                                                                              | 7.5       |
| b          | What is soil profile. Write a note on the components of soil profile.                                                                                                                                                                                                                                                                       | 7.5       |

|            |                                                                                                       |
|------------|-------------------------------------------------------------------------------------------------------|
| c          | Give an account of Raunkier's life forms. Add a note on the modification given by Brown and Blanquet. |
| d          | Describe qualitative characters of plant community.                                                   |
|            |                                                                                                       |
| <b>Q.5</b> | <b>Write Short notes on any Three of the following: (Based on all 3 Units)</b>                        |
| a          | Inextensibility                                                                                       |
| b          | J-girders                                                                                             |
| c          | Significance of photorespiration.                                                                     |
| d          | Physico-chemical properties of phytochromes.                                                          |
| e          | Nitrogen fixation                                                                                     |
| f          | Soil humus                                                                                            |

250315

SS415

**UNIVERSITY OF MUMBAI**  
**COLLEGE: RIZVI COLLEGE OF ARTS, SCIENCE AND COMMERCE**  
**S.Y. B.Sc. Botany-Choice Base**  
**Sem. IV**  
**Paper - III**

| Sem. IV                                            | Botany Paper – III                                                                | Duration: 2 hours | Marks: 75 |
|----------------------------------------------------|-----------------------------------------------------------------------------------|-------------------|-----------|
| <b>N.B:</b>                                        |                                                                                   |                   |           |
| 1. All questions are compulsory.                   |                                                                                   |                   |           |
| 2. Figures to the right indicate full marks.       |                                                                                   |                   |           |
| 3. Draw neat labelled diagrams wherever necessary. |                                                                                   |                   |           |
| <b>Q.1</b>                                         | <b>Attempt any 15 of the following: (MCQs) (Based on all 3 Units)</b>             |                   | <b>15</b> |
| 1.                                                 | The art of creating sculptures by clipping trees and shrubs is called _____       |                   |           |
|                                                    | a) husbandry      b) cultivation      c) trimming      d) topiary                 |                   |           |
| 2.                                                 | Cottage garden, woodland garden and meadow garden are variations of _____         |                   |           |
|                                                    | a) formal garden      b) informal garden      c) landscaping      d) floriculture |                   |           |
| 3.                                                 | Lloyd Botanical garden is located at _____                                        |                   |           |
|                                                    | a) Kolkata      b) Lucknow      c) Darjeeling      d) Shillong                    |                   |           |
| 4.                                                 | Oldest Botanical garden is located at _____                                       |                   |           |
|                                                    | a) London      b) Padua (Italy)      c) Geneva      d) New York                   |                   |           |
| 5.                                                 | Jijamata Udyan is located in _____                                                |                   |           |
|                                                    | a) Delhi      b) Mumbai      c) Kolkata      d) Bangalore                         |                   |           |
| 6.                                                 | Which of the following is used in lawn preparation _____:                         |                   |           |
|                                                    | a) <i>Nymphaea</i> b) <i>Tagetes</i> c) <i>Ixora</i> d) <i>Cynodon</i>            |                   |           |
| 7.                                                 | _____ is known as father of tissue culture.                                       |                   |           |
|                                                    | a) Morgan Robertis      b) Haberlandt      c) Schwann      d) De                  |                   |           |
| 8.                                                 | Cell theory was postulated by _____.                                              |                   |           |

|            |                                                                                                                                                                                                                             |           |
|------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
|            | a) De Robertis Schwann      b) Anton LeuwenHoek      c) Morgan      d) Schleiden and                                                                                                                                        |           |
| 9.         | Transfer of genes into plant cells can be done by using _____.<br>(a) Agrobacterium      (b) Rhizobium      (c) Neurospora      (d) Rhizopus                                                                                |           |
| 10.        | _____ can be a marker gene in a vector.<br>(a) Resistance to antibiotic      (b) Origin of replication (c) Autonomous replication      (d) None of these                                                                    |           |
| 11.        | The enzyme that catalyzes the transfer of phosphate from ATP to the 5' end of either DNA or RNA is _____.<br>(a) phosphatase      (b) polynuclease      (c) kinase      (d) polymerase                                      |           |
| 12.        | The enzyme used for joining the DNA fragments is _____.<br>(a) phosphatase      (b) ligase      (c) exonuclease      (d) helicase                                                                                           |           |
| 13.        | Restriction enzymes are used to _____ DNA.<br>(a) modify      (b) join      (c) cut      (d) hybridize                                                                                                                      |           |
| 14.        | Higher cytokinin in the medium leads to the formation of _____.<br>(a) shoots      (b) roots      (c) callus      (d) root hairs                                                                                            |           |
| 15.        | The statistical tool used to evaluate the difference between observed and expected data is called as _____.<br>(a) Chi square test      (b) Coefficient of correlation      (c) Z test      (d) T test                      |           |
| 16.        | The null hypothesis is denoted by _____.<br>(a) H4      (b) H2      (c) H3      (d) H0                                                                                                                                      |           |
| 17.        | The alternative hypothesis is denoted by _____.<br>(a) H1      (b) H2      (c) H3      (d) H4                                                                                                                               |           |
| 18.        | Degree of freedom while calculating $X^2$ is = _____.<br>(a) n-6      (b) n-3      (c) n-1      (d) n-0                                                                                                                     |           |
| 19.        | When the amount of one variable tends to bear a constant ratio to the amount of the change in second variable, it is called as _____ correlation.<br>(a) linear      (b) non-linear      (c) sigmoid      (d) none of these |           |
| 20.        | In perfect negative correlation, the two variables are _____ proportional to each other.<br>(a) directly      (b) inversely      (c) not      (d) all of these                                                              |           |
| <b>Q.2</b> | <b>Attempt any two of the following: (Based Unit 1)</b>                                                                                                                                                                     | <b>15</b> |
| a          | What is a National Park? Discuss its importance.                                                                                                                                                                            | 7.5       |
| b          | Define horticulture. Discuss the importance and objectives of horticulture.                                                                                                                                                 | 7.5       |
| c          | What is a botanical garden? Discuss its importance.                                                                                                                                                                         | 7.5       |

|                                                                                    |                                                                                        |     |
|------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|-----|
| d                                                                                  | Write an essay on Sanjay Gandhi National Park/VeermataJijabaiBhonsleUdyan (VJBU).      | 7.5 |
| <b>Q.3 Attempt any two of the following:(Based Unit 2)</b>                         |                                                                                        |     |
| a                                                                                  | Describe the process of anther/ pollen culture. Add a note on it's importance.         | 7.5 |
| b                                                                                  | Describe the process of r-DNA technology/ gene cloning.                                | 7.5 |
| c                                                                                  | Give a detailed account of different enzymes used in gene cloning process.             | 7.5 |
| d                                                                                  | What are cloning vectors? Describe plasmid as cloning vectors.                         | 7.5 |
| <b>Q.4 Attempt any two of the following:(Based Unit 3)</b>                         |                                                                                        |     |
| a                                                                                  | Describe various tools used in bioinformatics related to biotechnology.                | 7.5 |
| b                                                                                  | Give an account of bioinformatics programme in India.                                  | 7.5 |
| c                                                                                  | Explain BLAST as a retrieval tool of biological data.                                  | 7.5 |
| d                                                                                  | With reference to the dedicated tools of retrieving a biological data, explain ENTREZ. | 7.5 |
| <b>Q.5 Write Short notes on any Three of the following: (Based on all 3 Units)</b> |                                                                                        |     |
| a                                                                                  | Significance / importance of horticulture                                              |     |
| b                                                                                  | Botanical garden.                                                                      |     |
| c                                                                                  | Ultra filtration                                                                       |     |
| d                                                                                  | PGRs used in PTC                                                                       |     |
| e                                                                                  | What are the services offered by ENTREZ?                                               |     |
| f                                                                                  | Write a short note on NCBI.                                                            |     |

Time : 2.30 hours

Total Marks : 75

- N.B :**
1. All questions are compulsory
  2. All questions carry equal marks
  3. Draw neat and labelled diagram wherever necessary

Sem-IV  
Reg:

**Q.1) Multiple Choice Questions (MCQ) (attempt 15 out of 20)**

15

1. The concept of "use and disuse of organs" was proposed by \_\_\_\_\_.  
(Darwin, Lamarck, Thomas Malthus, Oparin)
2. \_\_\_\_\_ deals with the formation of embryo up to hatching or birth.  
(Cytology, embryology, ecology, paleontology)
3. The gas that was absent in the primitive atmosphere of the earth \_\_\_\_\_.  
(Methane, oxygen, ammonia, hydrogen)
4. \_\_\_\_\_ introduced binomial nomenclature for naming species.  
(Weismann, Darwin, Leonardo da Vinci, George Cuvier)
5. The study of fossils is called as \_\_\_\_\_.  
(Ecology, paleontology, embryology, physiology)
6. The book "On the origin of species" was written by \_\_\_\_\_.  
(Lamarck, Darwin, Oparin, Weismann)
7. The mathematical equation that expresses Hardy-Weinberg equilibrium is \_\_\_\_\_.  
( $p^2 + 2pq + q^2 = 1$ ,  $p + q = 1$ ,  $p^2 - q^2 = 1$ ,  $pq = 0$ )
8. A group of interbreeding individuals of the same species that share a common gene pool is referred to as \_\_\_\_\_.  
(Ecosystem, Population, Community, Biosphere)
9. The selection of mates based on similar traits is called \_\_\_\_\_.  
(Random mating, Assortative mating, Genetic drift, Mutation pressure)
10. The ability of an individual to pass on its genes to the next generation is measured as \_\_\_\_\_.  
(Reproductive fitness, Gene frequency, Hardy-Weinberg stability, Mutation rate)
11. The sum of all alleles present in a population is called its \_\_\_\_\_.  
(Gene pool, Gene flow, Genetic drift, Phenotype frequency)
12. When both extreme phenotypes are favored over the intermediate, it is called \_\_\_\_\_.  
(Directional selection, Stabilizing selection, Disruptive selection, Artificial selection)
13. The random change in allele frequencies due to chance events, particularly in small populations, is known as \_\_\_\_\_.  
(Genetic drift, Natural selection, Mutation, Evolution)
14. The sum of dominant and recessive allele frequencies in a population is always \_\_\_\_\_.  
(1, 0, 75, 0.5)
15. Deductive reasoning is a \_\_\_\_\_.  
(Bottom-up approach, top-down approach, random approach, lateral approach)
16. Fundamental research is also known as \_\_\_\_\_.  
(Applied research, clinical research, pure research, technical research)

17. A hypothesis is \_\_\_\_\_.

(A conclusion, an educated guess, a random assumption, a fact)

18. A good title for a research paper should be \_\_\_\_\_.

(Short and attractive, lengthy and detailed, vague and general, full of abbreviations)

19. A literature review provides \_\_\_\_\_.

(Background information, statistical tests, experimental errors, personal opinions)

20. A research monograph focuses on \_\_\_\_\_.

(A single topic, multiple subjects, random topics, general science)

**Q.2 A)** Discuss brief accounts of origin of life.

07

**OR**

A) Describe chemical evolution with Haldane and Oparin theory.

**Q.2 B) Write short note on any two. (4 marks each)**

08

- Geographical distribution of organic evolution.
- Origin of eukaryotic cell
- Evidence from genetics.
- Recapitulation theory

**Q.3 A)** State the Hardy Weinberg's law of equilibrium and discuss its salient features.

07

**OR**

A) Discuss pre-zygotic barriers which lead to reproductive isolation.

**Q.3 B) Write short note on any two. (4 marks each)**

08

- Genetic drift
- Bottleneck effect
- Allopatric speciation
- Genetic drift

**Q.4A)** Explain research report and its types.

07

**OR**

A) Explain components of research paper

**B) Write short note on any two. (4 marks each)**

08

- Applied research
- Formulating research hypothesis
- Ethics in animal research
- Self plagiarism

**Q.5 Write short note on any three. (5 marks each)**

15

- Types of fossils
- Difference between Darwinism and Neo- Darwinism theory.
- Mega-evolution
- Cline
- Key word in research paper
- Poster presentation

250310

SS407

## SYBSc. ZOOLOGY SEMESTER IV PAPER II (COURSE IX)

Time : 2.5 Hrs

Total Marks : 75

N.B :

1. All questions are compulsory
2. All questions carry equal marks
3. Draw neat and labelled diagram wherever necessary

Regular

Q 1. Multiple Choice Question (MCQ) (attempt any 15 out of 20) (1 mark each)

15 Marks

1. The cell organelles is involved in protein synthesis.  
(Mitochondria , endoplasmic reticulum, chloroplast, lysosome)
2. The term cell was given by \_\_\_\_\_  
(Robert Hook, Schwann, Leeuwenhoek, Robert brown)
3. The process that requires energy [ATP]  
(Diffusion, osmosis, active transport, facilitated diffusion)
4. The plasma membrane is \_\_\_\_\_  
(Completely permeable, impermeable, selectively permeable, fully rigid)
5. Microfilaments are made up of \_\_\_\_\_  
(Myosin, actin, lipid, protein)
6. Sarcoplasmic reticulum is found in \_\_\_\_\_  
(Muscle cells, skeleton cells, tissue, stomach)
7. Which organelle is known as the suicidal bag of the cell \_\_\_\_\_  
(Mitochondria, ribosome, lysosome, chloroplast)
8. \_\_\_\_\_ is more stable and persists even after the death of the cell.  
(Golgi complex, Nucleus, Rough endoplasmic reticulum, Smooth endoplasmic reticulum)
9. The trans cisternae face of golgi complex faces \_\_\_\_\_.  
(RER, Nucleus, Plasma membrane, Golgi complex)
10. One of the cell organelle that is polymorphic \_\_\_\_\_.  
(Lysosomes, Golgi complex, Nucleolus, Cristae)
11. A major function of peroxisomes is breakdown of \_\_\_\_\_ molecule in a process called beta – oxidation.  
(Fatty acid, Amino acid, Nucleic acid ,Acetic acid)
12. \_\_\_\_\_ are storage batteries of the cell.  
(Golgi bodies, Lysosomes, Mitochondria, Endoplasmic reticulum)
13. The complex III of respiratory chain is composed of \_\_\_\_\_.  
(FMN, Cytochrome b, Cytochrome c, ATP)
14. Molecular formula of sucrose is \_\_\_\_\_  
( $C_6H_{12}O_6$ ,  $C_{12}H_{22}O_{11}$ ,  $C_{14}H_{24}O_{14}$ ,  $C_{16}H_{28}H_{16}$ )
15. The term protein was coined by \_\_\_\_\_ in 1838.  
(C. Benda, G.J Mulder, Krebs, Kolliker)

16. Ascorbic acid is also called as \_\_\_\_\_  
(Aspartic acid, vitamin A, vitamin D, Glutamic acid)
17. Lipids soluble vitamin is \_\_\_\_\_  
(Vitamin A, Vitamin D, Vitamin C, Vitamin K)
18. Plants sterols is called \_\_\_\_\_  
(Cholesterol, phytosterol, lecithin, fatty acid)
19. Night blindness is \_\_\_\_\_  
(Phrynoderma, Rickets, Osteomalacia, Nyctalopia)
20. Silk protein is \_\_\_\_\_  
(Proline, Tyrosine, Sericin, Lecithin)

Q 2. A. Describe the membrane receptors and their classification.

7 Marks

OR

- A. Describe endocytosis and its types.  
B. Write short note on any two. (4 marks each)
- Cell theory
  - Ultrastructure of nucleolus
  - Functions of microfilaments.
  - Active transport.

8 Marks

Q 3. A. Describe polymorphic forms of lysosomes.

7 Marks

OR

- A. Explain in details Kreb's cycle.  
B. Write short note on any two. (4 marks each)
- General morphology of Endoplasmic reticulum.
  - Small vesicles of Golgi apparatus.
  - Peroxisomes.
  - Function of mitochondria..

8 Marks

Q 4. A. Discuss structure, causes of deficiency and therapeutic uses of vitamin C.

7 Marks

OR

- A. Explain Cyclic structure in monosaccharides.  
B. Write short note on any two. (4 marks each)
- Function of macromolecules.
  - Primary structure of protein.
  - Isomerism in fatty acids.
  - Causes of deficiency of vitamin B12.

8 Marks

Q 5. Write short note on any three. (5 marks each)

15 Marks

- Cytoplasm with cell organelles.
- Plasmodesmata in plants.
- Origin and occurrence of lysosomes.
- Ultrastructure of Golgi complex.
- Oligosaccharides
- Steroids

Time : 2.30 hours

Total Marks : 75

- N.B :**
1. All questions are compulsory
  2. All questions carry equal marks
  3. Draw neat and labelled diagram wherever necessary

**Q.1) Multiple Choice Questions (MCQ) (attempt 15 out of 20)**

15

1. \_\_\_\_\_ egg is characterized by its negligible amount of yolk.  
(Alecithal, microlecithal, mesolecithal, macrolecithal)
2. Protostomes are inclusive invertebrate which develop \_\_\_\_\_ from blastopore.  
(Mouth, anus, nervous system, skeletal system)
3. \_\_\_\_\_ part of sperm is made of an axial filament surrounded by mitochondria and little amount of cytoplasm.  
(Acrosome, neck, mid-piece, end piece)
4. Inside the egg, the area of heavy deposition of yolk is known as \_\_\_\_\_.  
(Animal pole, vegetal pole, nuclear pole, micropyle)
5. The type of blastula found in amphibians is \_\_\_\_\_.  
(Coeloblastula, stereoblastula, discoblastula, amphiblastula)
6. Amphioxus egg is \_\_\_\_\_.  
(Microlecithal, mesolecithal, macrolecithal, alecithal)
7. In IVF fertilization take place in \_\_\_\_\_.  
(laboratory, fallopian tube, ovary, uterus)
8. The vitamin essential for female reproductive health is \_\_\_\_\_.  
(Vitamin A, vitamin C, vitamin D, folic acid)
9. The first successful IVF baby Louise Brown was born in \_\_\_\_\_.  
(1968, 1978, 1988, 1998)
10. \_\_\_\_\_ ART technique is commonly used for male infertility.  
(IVF, ZIFT, GIFT, ICSI)
11. \_\_\_\_\_ technique is commonly used to preserve sperm.  
(Dehydration, cryopreservation, pasteurization, incubation)
12. Sperm is usually stored in \_\_\_\_\_.  
(Ice packs, liquid nitrogen, dry air, hot water)
13. \_\_\_\_\_ surgery treats blocked fallopian tubes.  
(Hysterectomy, tubectomy, oophorectomy, laparoscopy)
14. The temperature of thermosphere may be as high as \_\_\_\_\_.  
(150° C, 1500° C, 15000° C, 25000° C)
15. \_\_\_\_\_ has helped in air pollution monitoring in metro cities.  
(UNCED, PUC, DDT, UNFCCC)
16. \_\_\_\_\_ brings about changes in pH of water in lakes and river.  
(Particulate matter, Methane, Acid rains, Radioactive wastes)
17. 'A' horizon of soil consists of \_\_\_\_\_.  
(Fungi, Iron, Broken rocks, Solid rocks)
18. One of the effect of noise pollution is \_\_\_\_\_.  
(Loss of soil fertility, Genetic defects, Lung emphysema, Hearing impairment)

19. The amount of CO<sub>2</sub> generated by the activities of an individual or an organization is termed as \_\_\_\_\_.  
(Carbon footprints, e-waste, Radio protections, Salinization)
20. The type of waste that is a key contributor to solid waste pollution \_\_\_\_\_  
(Renewable resources, plastic waste, solar energy, wind power)

**Q.2 A)** Describe the types of sperms in animals.

07

**OR**

A) Explain the types of blastulae.

**Q.2 B) Write short note on any two. (4 marks each)**

08

- Holoblastic cleavage
- Mosaic and determinate egg.
- Types of movements in epiboly.
- Gastrulation in frog.

**Q.3 A)** Describe the hormonal regulation of female reproductive system

07

**OR**

A) Describe the menopause and andropause.

**Q.3 B) Write short note on any two. (4 marks each)**

08

- Endometriosis
- Gonorrhoea
- ZIFT
- Vasectomy and tubectomy

**Q.4A)** List the type and source of air pollution.

07

**OR**

A) What is radioactive pollution? Explain the various hazards of radioactive pollution.

**Q.4 B) Write short note on any two. (4 marks each)**

08

- Causes and effects of ozone depletion.
- Control measures of water pollution.
- Effects of solid waste pollution.
- Climate change and global warming.

**Q.5 Write short note on any three. (5 marks each)**

15

- Oligolecithal eggs.
- Basic structure of sperm.
- Cryopreservation of sperms
- Idiopathic infertility
- Soil profile.
- Effects of noise pollution.