

No. of Printed Pages : 2

21BSC6C13CHL



Sl. No. 292301

B.Sc. VI Semester Degree Examination, June/July - 2025

CHEMISTRY

Advanced Inorganic and Physical Chemistry

Paper : DSC-7

(NEP)

Time : 2 Hours

Maximum Marks : 60

Instruction to Candidates: Answer all Sections.

SECTION - A

Answer the following sub-questions. Each sub-question carries **One** mark.

(10×1=10)

1. a) Define overall stability or formation constant.
- b) $[Co(en)_3]^{3+}$ is more stable than $[Co(NH_3)_6]^{3+}$. why?
- c) What are spectrochemical series?
- d) Give one example for strong field ligand.
- e) What is magnetic susceptibility?
- f) What are term symbols?
- g) Define chemical potential.
- h) Write phase rule equation.
- i) Write Debye-Huckel-onsager conductance equation.
- j) Define electrocatalysis.

SECTION - B

Answer any **FOUR** of the following questions. Each question carries **Five** marks.

(4×5=20)

2. Write a note on factors affecting stability of complexes w.r.t charge and size of central metal ion.
3. Explain the determination of binary formation constant by ion-exchange method.



[P.T.O.]

4. Discuss the magnetic properties of octahedral complexes on the basis of crystal field theory.
5. Explain Racah Parameters in metal complexes.
6. Write briefly the excess thermodynamic function for Gibb's free energy.
7. Describe the extension of Debye-Huckel-onsager equation to ion-solvent interactions.

SECTION - C

Answer any **THREE** of the following questions. Each question carries **Ten** marks.
(3×10=30)

8. a) Explain the structure and bonding in dihydrogen and dioxygen as ligands in complexes of transition metals. (6)
b) Write a brief note on classification of hydrides as ligands. (4)
 9. a) Draw the crystal field splitting diagram in trigonal bipyramidal and square pyramidal geometry. (6)
b) Write a note on colour transition metal complexes on the basis of CFT. (4)
 10. a) Discuss briefly the Tanabe-Sugano diagrams. (6)
b) Write a note on spin-orbital coupling. (4)
 11. a) Explain the determination of activity coefficient by solubility method. (6)
b) Write a note on determination of Partial molar volume by graphical method. (4)
 12. a) Derive Butler-Volmer equation. (6)
b) Write a brief note on Conductance minima due to formation of triple ions. (4)
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No. of Printed Pages : 2

21BSC6C15CHL



Sl. No. 295361

B.Sc. VI Semester Degree Examination, June/July - 2025

CHEMISTRY

Advanced Organic Chemistry and Thermal Methods

Paper : DSC-8

(NEP)

Time : 2 Hours

Maximum Marks : 60

Instructions to Candidates: Answer all questions, as per instructions.

I. Answer the following questions. Each question carries **One** mark. (10×1=10)

1. a) Define group theory.
- b) What are the symmetry elements present in the NH_3 molecules?
- c) Write the principle of DSC.
- d) What are two Key differences between potentiometric and conductometric titration?
- e) What is stereo selectivity?
- f) Draw the structure formula of DCC.
- g) What is phosphonium ylide?
- h) What is the product formed. When an ester is treated with LAH?
- i) What is sigma-complex.
- j) Write the Goldberg reaction.

II. Answer any **FOUR** of the following questions. Each question carries **Five** marks. (4×5=20)

2. What is an aromatic electrophilic substitution reaction and how can its energy profile diagram be suplex?
3. What are four addition reaction of cyclopropane compound?
4. Derive the expression for orthonormalization conditions.



[P.T.O.]

5. What is benzilic acid rearrangement reaction?
6. How is the carboxylic acid group protected in peptide synthesis? Explain with an example.
7. Explain the basic principle of P^H -metric measurements. How does a glass electrode function in P^H determinations?

III. Answer any **THREE** of the following questions. Each question carries **Ten** marks.
(3×10=30)

8. a) What is the theory, principle and instrumentation of thermogravimetry?
b) Write about Great-orthogonality theorem and character tables.
 9. a) Write the application of group theory in Quantum mechanics.
b) Why is the half-equivalence point significant in pka determination?
 10. a) The Favorskii rearrangement is particularly useful for ring-contraction reactions. Illustrate with an example.
b) Describe the Gabriel phthalimide synthesis.
 11. a) Compare the electrophilic, nucleophilic and free radical addition mechanism to alkenes using suitable example.
b) Compare the reducing abilities of $LiAlH_4$ and $NaBH_4$ for
 - i. Aldehydes/ketones
 - ii. Ester and
 - iii. Nitrites.
 12. a) Draw the Wheland intermediate for the Nitration of benzene and explain why it is more stable than the corresponding intermediates for chlorobenzene.
b) How does the benzyne mechanism differ from $SNAr$? Illustrate using the reaction of chlorobenzene with KNH_2 in liquid Ammonia.
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No. of Printed Pages : 2

21BSC6C13PHL



Sl. No. 293776

B.Sc. VI Semester Degree Examination, June/July - 2025

PHYSICS

Elements of Condensed matter and Nuclear Physics

Paper : 6.1

(NEP)

Time : 2 Hours

Maximum Marks : 60

Instructions to Candidates: Non-programmed calculators are allowed.

Answer All following sub-questions.

(10×1=10)

1. a) What is space lattice?
b) State Moseley's law.
c) Define susceptibility.
d) What is critical magnetic field?
e) State Radioactive decay law.
f) Define parity.
g) Define mean life.
h) Define ionisation.
i) Define photo electric effect.
j) What is an accelerator?

Answer any Four of the following questions.

(4×5=20)

2. With neat diagram explain construction and working of Bragg's x-ray spectrometer.
3. Explain Weidman-Franz law.
4. State and explain Meissner effect.
5. With neat diagram explain B-H curve.
6. Explain general properties of nuclei.
7. Explain Gamma ray interaction through photo electric effect.



[P.T.O.]

Answer any Three of the following questions.

(3×10=30)

8. Derive an expression for electrical and thermal conductivity of metals.
 9. Give the Langevin classical theory of diamagnetism.
 10. Give the Gamow's theory of α -decay.
 11. a) Explain construction and working of GM counter.
b) Explain energy kinematics of beta decay. **(5+5)**
 12. a) Write a note on cyclotron.
b) With neat diagram explain construction and working of synchrotron. **(5+5)**
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No. of Printed Pages : 2

21BSC6C15PHL



Sl. No. 296771

B.Sc. VI Semester Degree Examination, June/July - 2025

PHYSICS

Electronic Instrumentation and Sensors

Paper : DSC 8

(NEP)

Time : 2 Hours

Maximum Marks : 60

Instructions to Candidates: Use of non-programmable scientific calculator is permitted.

SECTION - A

Answer **All** sub-questions. Each sub-question carries 1 mark.

(10×1=10)

1. a) Define line voltage.
b) Name the IC used to produce a regulated voltage of +12V.
c) Define AF signal generator.
d) Define passive filter.
e) What is the function of filter in a power supply?
f) Name one advantage of using LED over LCD.
g) Define pulse width modulation.
h) What is the use of phase sensitive detection?
i) Define Piezo-electric transducer.
j) State one application of photoelectric transducer.

SECTION - B

Answer any **FOUR** of the following questions. Each question carries 5 marks.

(4×5=20)

2. With a diagram, explain the working of bridge wave rectifier.
3. Explain the working of L-section and π - section filter.
4. Explain the construction and working of Wein-bridge oscillator.
5. Explain the working of an R-2R ladder type D/A converter.



[P.T.O.]

6. Discuss the working of a strain gauge with its applications.
7. Describe the structure and working of LCD.

SECTION - C

Answer any **THREE** of the following questions. Each question carries **10** marks.
(3×10=30)

8. a) With a neat diagram, explain construction and working of cathode ray oscilloscope. (8)
b) Write any two characteristics of DC power supply. (2)
 9. a) Explain the working of AF sine and square wave generator. (6)
b) Write a note on RC low pass filter. (4)
 10. a) Explain the working principle of a pulse width modulation with a neat diagram. (6)
b) Write the advantages of digital transmission over analog transmission. (4)
 11. a) Explain different types of transducers. (5)
b) Explain the principle and working of an photovoltaic cell. (5)
 12. a) Describe the construction and working of a linear variable differential transformer. (7)
b) Determine the ripple factors of an L-type choke input filter comprising of 10H choke and 8 μ F capacitor, used with a bridge wave rectifier. (3)
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No. of Printed Pages : 2

21BSC6C13BOTL



Sl. No. 291961

B.Sc. VI Semester Degree Examination, June/July - 2025

BOTANY
Cell Biology
(NEP)

Time : 2 Hours

Maximum Marks : 60

SECTION - A

Answer **All** the sub-questions.

(10×1=10)

1. a) What are the Cell Theories?
b) What is Cell Junction?
c) Which organelles are called post-office of the cell?
d) Expand TOM and TIM.
e) Define Glycocalyx.
f) What are the phase of cell cycle?
g) What is the role of pRb?
h) What is Cell Biology?
i) What is Staining?
j) Name any two protein markers.

SECTION - B

Answer any **FOUR** of the following questions.

(4×5=20)

2. Explain cell-cell interaction.
3. Explain the types of protein markers enzymes and their role in cell.
4. Explain RNA processing in cell.
5. Give an account on fixatives. And types of fixative.
6. Explain the role of Glycosylation.
7. Explain proton pump association with Na⁺/K⁺ transport.



[P.T.O.]

SECTION - C

Answer any **THREE** of the following questions.

(3×10=30)

8. Elaborate the active and passive transportation with their types and examples.
 9. Describe about protein folding process.
 10. Explain the regulation of cell cycle phases?
 11. Explain the semi autonomous nature of mitochondria and chloroplast.
 12. Write an account on Biogenesis of mitochondria in cell.
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B.Sc. VI Semester Degree Examination, June/July - 2025

BOTANY

**Plant Physiology and Biochemistry
(NEP)**

Time : 2 Hours

Maximum Marks : 60

SECTION - A

Answer **All** the sub-questions.

(10×1=10)

1. a) What is Turgour pressure?
b) Define the term 'Ascent of sap'.
c) Expand ATP and NAD.
d) Name the Gaseous hormone.
e) What is biological nitrogen fixation?
f) Define the term Senescence.
g) What is Nastic movement?
h) What are plant growth regulators.
i) Define lipids.
j) What are secondary metabolites? Give example.

SECTION - B

Answer any **FOUR** of the following questions.

(4×5=20)

2. Explain in detail about the mechanism of guard cell movement.
3. What are cytokinins? Write their physiological effects on plant growth and development.
4. What is Water potential? Explain its components.
5. Explain about biological clocks in plants.
6. Give the structure and functions of phytochromes and phototropins.
7. Explain Kreb's cycle with schematic representation.



SECTION - C

Answer any **THREE** of the following questions.

(3×10=30)

8. What is phloem transport? Explain Munch mass flow hypothesis.
 9. Briefly explain cyclic and non-cyclic photophosphorylation.
 10. Explain practical utility of growth regulations in Agriculture and horticulture.
 11. What are vitamins? Give the classification and their function.
 12. Comment on
 - a) Phototropism.
 - b) Hydrotropism.
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B.Sc. VI Semester Degree Examination, June/July - 2025

MATHEMATICS

Linear Algebra

Paper : DSC-7

(NEP)

Time : 2 Hours

Maximum Marks : 60

Instructions to Candidates: Answer All Sections.

SECTION - A

Answer the following sub-questions. Each sub-question carries 1 mark. (10×1=10)

1. a) Define vector space and give an example.
- b) Prove that the set $S = \{(1, 3, 2), (1, -7, -8), (2, 1, -1)\}$ is linearly dependent.
- c) Define linear transformation.
- d) State Rank-Nullity theorem.
- e) Define Diagonalization of a matrix.
- f) Define Eigen space of a vector space.
- g) What are the conditions for invertibility.
- h) What is inner product in a vector spaces?
- i) Define minimal polynomial of a transformation.
- j) Determine if the vectors $u = (1, 2, 3)$ and $V = (4, -8, 4)$ are orthogonal.

SECTION - B

Answer any **FOUR** of the following questions. Each question carries 5 marks.

(4×5=20)

2. Express a vector $(5, -5, 4)$ as a linear combination of the vectors $(1, -3, 2)$ and $(2, -1, 1)$ in the vector space $V_3(\mathbb{R})$.



3. Given the matrix, $\begin{bmatrix} 2 & -3 \\ 1 & 1 \end{bmatrix}$ determine the corresponding linear transformation $T: \mathbb{R}^2 \rightarrow \mathbb{R}^2$ relative to the standard basis of $\mathbb{R}^2$.
4. Find the algebraic and geometric multiplications of eigen values of a linear transformation about matrix is $A = \begin{pmatrix} 3 & 1 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 3 \end{pmatrix}$.
5. Consider the linear transformation $T: \mathbb{R}^2 \rightarrow \mathbb{R}^2$ defined by $T\left(\begin{bmatrix} x \\ y \end{bmatrix}\right) = \begin{bmatrix} 2x + y \\ x - y \end{bmatrix}$ determine whether T is invertible or not. If so, find the inverse of T.
6. Consider the vectors $u = \begin{bmatrix} 1 \\ 2 \\ 3 \\ 4 \end{bmatrix}$ and $v = \begin{bmatrix} -1 \\ 0 \\ 1 \\ 2 \end{bmatrix}$ in $\mathbb{R}^4$. Compute the inner product $\langle u, v \rangle$ and verify the properties of the inner product.
7. Consider the linear transformation $T: \mathbb{R}^3 \rightarrow \mathbb{R}^3$ defined by $T\left(\begin{bmatrix} x \\ y \\ z \end{bmatrix}\right) = \begin{bmatrix} x + y + z \\ 2x + 2y + 2z \\ 3x + 3y + 3z \end{bmatrix}$ determine whether, T is singular or not.

SECTION - C

Answer any **THREE** questions. Each question carries **10** marks. (3×10=30)

8. a) Prove that $(3, -7, 6)$ is the span of the vectors $(1, -3, 2)$, $(2, 4, 1)$ and $(1, 1, 1)$.
b) The intersection of two subspaces of a vector space V over a field F is also a subspace of $V(F)$.



9. a) Find the matrix of linear transformation $T: V_2(R) \rightarrow V_3(R)$ defined by $T(x, y) = (2y - x, y, 3y - 3x)$ relative basis $B_1 = \{(1, 1), (-1, 1)\}$ and $B_2 = \{(1, 1, 1), (1, -1, 1), (0, 0, 1)\}$.
- b) Find the range space, Kernel rank and nullity of the linear transformation $T: V_2(R) \rightarrow V_2(R)$ defined by $T(x, y) = (x + y, x)$. Also verify the rank nullity theorem.
10. a) Find Eigen values and Eigen vectors of a linear transformation $T: R^2 \rightarrow R^2$ defined by $A(V) = AV$ where $A = \begin{pmatrix} 4 & 1 \\ 2 & 3 \end{pmatrix}$.
- b) Diagonalize the matrix: $A = \begin{pmatrix} 3 & 1 \\ 0 & 2 \end{pmatrix}$.
11. a) Determine the relationship between the minimal and characteristic polynomials of the linear transformation $T: R^3 \rightarrow R^3$ defined by
- $$T \begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 2x + y \\ x + 2y \\ z \end{pmatrix}.$$
- b) Consider the linear transformation $T: R^2 \rightarrow R^2$ defined by
- $$T \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} x + 2y \\ 2x + 4y \end{pmatrix}.$$
- Determine whether T is singular or not.
12. a) Show that the function $\langle *, * \rangle: R^3 \times R^3 \rightarrow R$ defined by $\langle u, v \rangle = \sum_{i=1}^3 u_i v_i$ where $u = (u_1, u_2, u_3)$ and $v = (v_1, v_2, v_3)$ are vectors in R^3 is an inner product.
- b) State and prove Cauchy-Schwarz inequality.



No. of Printed Pages : 3

21BSC6C15MAL



Sl. No. 296061

B.Sc. VI Semester Degree Examination, June/July - 2025

MATHEMATICS

Numerical Analysis

Paper : DSC-8 (6.2)

(NEP)

Time : 2 Hours

Maximum Marks : 60

Instructions to Candidates: Answer All Sections.

SECTION - A

Answer **All** the questions.

(10×1=10)

1. a. Define Percentage Error.
- b. Define Approximate Number.
- c. Define algebraic equations.
- d. Write secant method formula.
- e. When we apply Gauss Seidal method?
- f. Define diagonally dominated matrix.
- g. Write Inverse lagrange interpolation formula.
- h. Write the Newtons divided difference formula.
- i. Write the formula for Weddle's Rule.
- j. Write Trapezoidal Rule formula.

SECTION - B

Answer any **Four** of the following questions.

(4×5=20)

2. If 0.182 is the approximate value of $\frac{2}{11}$, find the absolute, relative and percentage errors.
3. Use the regula falsi method to find the a real root of the equation $x^3 - 5x - 7 = 0$.
4. Solve the system of equation by Gauss elimination method.

$$\begin{aligned}x + y + z &= 9 \\x - 2y + 3z &= 8 \\2x + y - z &= 3\end{aligned}$$



[P.T.O.]

5. Use the Newtons Forward interpolation formula find $y(1.4)$ given the data.

$x:$	1	2	3	4	5
$y:$	10	26	58	112	194

6. Evaluate $\int_0^6 3x^2 dx$ dividing the interval $[0, 6]$ into six equal parts apply Simpson's $3/8^{\text{th}}$ Rule.
7. Find the root of an equation $2x^3 - 2x - 5 = 0$ by using iteration method.

SECTION - C

Answer any **Three** of the following questions.

(3×10=30)

8. a) Find the number of trust worthy figure in $(476)^{1/5}$ where 476 is correct to three significant figures.
- b) Find the difference $X = \sqrt{6.27} - \sqrt{6.26}$ and evaluate the relative and percentage error.
9. a) Use Newton Raphson method to find a real root of the equation $x^3 - 2x - 5 = 0$.
- b) Find the real root of the equation $x^3 - x - 1 = 0$ by using Bisection method.
10. a) Solve the following system of equation by Gauss-Seidal method.
- $$\begin{aligned} 20x + y - 2z &= 17 \\ 3x + 20y - z &= -18 \\ 2x - 3y + 20z &= 25. \end{aligned}$$
- b) Apply Jacobi iteration method to solve
- $$\begin{aligned} 10x + y + z &= 12 \\ 2x + 10y + z &= 13 \\ 2x + 2y + 10z &= 14. \end{aligned}$$
11. a) Using the Lagrange's interpolation formula to find the value of y at $x = 3$.
- | | | | | |
|------|---|---|----|-----|
| $x:$ | 0 | 1 | 2 | 5 |
| $y:$ | 2 | 3 | 12 | 147 |
- b) Use Newtons divided difference formula to find $f(4)$.
- | | | | | |
|---------|----|---|----|-----|
| $x:$ | 0 | 2 | 3 | 6 |
| $f(x):$ | -4 | 2 | 14 | 158 |



12. a) Evaluate $\int_0^1 \frac{dx}{1+x^2}$ by using Simpson's $\frac{1}{3}^{rd}$ Rule taking four equal parts.

b) A function is specified by the following table.

x:	1.00	1.05	1.10	1.15	1.20	1.25	1.30
y:	1.00	1.0247	1.0488	1.0723	1.0954	1.1180	1.1401

Find y' and y'' at $x = 1$





B.Sc. VI Semester Degree Examination, June/July - 2025

ZOOLOGY

Environmental Biology, WildLife Management and Conservation

Paper : Z-6.2

(NEP)

Time : 2 Hours

Maximum Marks : 60

Instructions to Candidates:1. Answer all the Sections.

2. Draw neat labelled diagrams wherever necessary.

SECTION - A

Answer **All** the questions in **One or Two** sentences each.

(10×1=10)

1. a) What is food web?
- b) Define amensalism.
- c) What do you mean by bioaquification.
- d) What is population density?
- e) What do you mean by over degradation?
- f) List any two animals of Deccan plater.
- g) Define ozone layer depletion.
- h) What is population growth?
- i) List any two National parks of Karnataka.
- j) What is tracing movement?

SECTION - B

Answer any **FOUR** questions of the following questions.

(4×5=20)

2. Explain the structure of pond ecosystem.
3. Write a short note on desert adaptations
4. Explain briefly about soil pollution.
5. List the biodiversity of western ghats.



6. Write a note on biosphere reserves with examples.
7. Discuss briefly about Wildlife threats.

SECTION - C

Answer any **THREE** of the following questions.

(3×10=30)

8. Describe the ecological pyramids with the help of diagram.
 9. Discuss the causes and effect of Air pollution.
 10. Write a detailed note on effects of climate changes on biodiversity.
 11. Explain project Tiger.
 12. Write a note on population ecology.
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B.Sc. VI Semester Degree Examination, June/July - 2025

ZOOLOGY

Evolutionary and Developmental Biology

Paper : Z-6.1

(NEP)

Time : 2 Hours

Maximum Marks : 60

Instructions to Candidates: i) Answer All Sections.

ii) Draw labelled diagrams wherever necessary.

SECTION - A

Answer the following sub-questions in one word or one sentence each. Each question carries **One** mark. (10×1=10)

1. a) What is gene pool?
- b) What do you mean by divergence?
- c) Define Allopatric speciation.
- d) What is palaeontology?
- e) Mention the Acrosomal enzymes.
- f) What is blastocoel?
- g) Define Graffian follide.
- h) What are morphogenic movements?
- i) Expand HIV.
- j) Name the causal agent of syphilis.

SECTION - B

Answer any **FOUR** of the following questions. Each question carries **Five** marks. (4×5=20)

2. Briefly explain the principles of Darwinism.
3. Describe the morphological evidences of evolution.



4. Mention the differences between sperm and ovum.
5. Give the brief account of parthenogenesis.
6. Sketch and label Graffian follicle.
7. Give an account of Sperm Bank.

SECTION - C

Answer any **THREE** of the following questions. Each question carries **Ten** marks.
(3×10=30)

8. Explain in detail about the modern synthetic theory of evolution.
 9. Describe in detail about the sympatric speciation.
 10. Explain Hardy-Weinberg equilibrium and conditions for its maintenance.
 11. What is Spermatogenesis? Explain the steps involved in spermatogenesis with the schematic representation.
 12. Write an explanatory note on causative agent mode of transmission, symptoms and preventive measures of syphilis.
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