21BSC5C6MTL

V Semester B.Sc. (NEP) (Repeaters) Degree Examination, June/July 2026
MATHEMATICS
DSC – 6 :Vector Calculus and Analytical Geometry

Time : 2 Hours Max. Marks : 60

***Instruction** : Answer **all** Sections.*

SECTION – A

1. Answer the following sub-questions, **each** sub-question carries **one** mark. **(10×1=10)**

   a) Define vector point function.

   b) If any two vectors are equal then $\vec{a}.(\vec{b}\times\vec{c}) =$ _____.

   c) $\nabla(\phi_1 - \phi_2) =$ _____.

   d) Define irrotational vector.

   e) Green's theorem gives the relation between plane surface integral and _____.

   f) State Stokes theorem.

   g) $l^2 + m^2 + n^2 =$ _____, where l, m, n are dc's of line.

   h) Write the equation of plane in the intercept form.

   i) Write the equation of sphere when diameter is given.

   j) Find the radius of the sphere $x^2 + y^2 + z^2 - x + 2y + z + \frac{3}{2} = 0$.

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## SECTION – B

Answer **any four** of the following questions, **each** question carries **five** marks. **(4×5=20)**

2. Find the unit vector coplanar with $\vec{b}$ and $\vec{c}$ and perpendicular to $\vec{a}$ where

   $\vec{a} = 2i + j - k$, $\vec{b} = i - 2j + 2k$ and $\vec{c} = 3i - j + 2k$.

3. Find the angle between the surfaces $x^2 + y^2 + z^2 = 9$ and $x^2 + y^2 - z = 3$ at the points (2, –1, 2) common to them.

4. Evaluate $\oint \vec{F} \cdot d\vec{r}$, where $\vec{F} = xyi + yzj + zxk$ and C is $\vec{r} = it + jt^2 + kt^3$, t is varying from –1 to 1.

5. Derive the equation of plane in the normal form.

6. Show that the two spheres

   $x^2 + y^2 + z^2 + 6y + 2z + 8 = 0$ and

   $x^2 + y^2 + z^2 + 6x + 4z + 20 = 0$ are orthogonal.

   Find the plane of their intersection.

7. Find the equation of the sphere through four points (0, 0, 0), (0, 1, –1), (–1, 2, 0), (1, 2, 3).

## SECTION – C

Answer **any three** of the following questions, **each** question carries **ten** marks. **(3×10=30)**

8. a) Given the space curve r(t) = ($t^3$, sint, t) calculate the Tangent, Normal and Binormal vectors at $t = \frac{\pi}{2}$.

   b) For the space curve $\vec{r}(t) = (\cos t, \sin t, t)$, calculate the derivatives of the Frenet frame vectors $\hat{T}, \hat{N}$ and $\hat{B}$ at $t = \frac{\pi}{2}$.

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9. a) Show that $\text{div}(\phi F) = \phi \,\text{div}\, F + F \cdot \text{grad}\, \phi$ .

   b) Show that $\text{div}(\text{curl}\, F) = \nabla.(\nabla \times F) = 0)$.

10. a) Evaluate $\int_S \vec{F} \cdot \hat{n} \cdot ds$ where $\vec{F} = yzi + zxj + xyk$ and S is the part of the surface of the sphere $x^2 + y^2 + z^2 = 1$ which lies in the first octant.

    b) State and prove Green's theorem.

11. a) Show that the points (1, 1, 1) and (–3, 0, 1) are equidistant from the plane $\vec{r}.(3i + 4j - 12k) = -13$ and are on opposite sides of the plane.

    b) Find the angle between the pair of planes $\vec{r}.(i - 2j + 3k) + 7 = 0$ and $\vec{r}.(3i + 4j - 7k) + 6 = 0$.

12. a) Find the limiting points of the co-axial system defined by the spheres

    $x^2 + y^2 + z^2 - 3x - 3y + 6 = 0$,

    $x^2 + y^2 + z^2 - 6y - 6z + 6 = 0$.

    b) Find the equation of a right circular cylinder whose axis is $\frac{x-1}{2} = \frac{y}{3} = \frac{z-3}{1}$ and radius 2.

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21BSC5C6ZOL

V Semester B.Sc. (NEP) (Repeaters) Degree Examination, June/July 2026
ZOOLOGY
DSC 6 : Chordates and Comparative Anatomy

Time : 2 Hours Max. Marks : 60

***Instructions :*** *1) Answer **all** the Sections.*
*2) Draw diagrams **wherever** necessary.*

SECTION – A

Answer **any ten** of the following sub-questions. **(10×1=10)**

1. a) What is a notochord ?
   b) What is urochordata ?
   c) Name an example of cephalochordata.
   d) Name one reptile with a poisonous bite.
   e) What type of circulation is seen in birds ?
   f) Define diaphragm in mammals.
   g) What is corpus callosum ?
   h) Define tricuspid valve ?
   i) What is atlas ?
   j) What do you mean by homeothermy ?
   k) What is the main difference between lungs and gills.
   l) What is nephron ?

SECTION – B

Answer **any four** of the following questions. **(4×5=20)**

2. Describe the general characters of phylum Chordata.

3. Explain the types of scales in fishes.

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4. Write the comparative account of the heart of shark and mammals.
5. List out the difference between chondrichthyes and osteichthyes.
6. Enumerate the salient features of the class Amphibians.
7. Write a note on monotremes and marsupials.

## SECTION – C

Answer **any three** of the following questions. **(3×10=30)**

8. Distinguish in detail between poisonous and non-poisonous snakes.
9. Describe the retrogressive metamorphosis in ascidian larva with labelled diagram.
10. Describe the general characters, classification and special features of class mammalia.
11. Write the comparative account of the heart of reptile and mammal.
12. Describe in detail about the migration in birds.

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21BSC5C6CHL

V Semester B.Sc. (NEP) (Repeaters) Degree Examination, June/July 2026
CHEMISTRY – VI
DSC-6 : Organic and Physical Chemistry

Time : 2 Hours Max. Marks : 60

***Instruction*** : *Answer **all** Sections.*

SECTION – A

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

1. a) Write Taft equation. 1
   b) Define hyper conjugation. 1
   c) Define Cram's rule. 1
   d) What is Epimerization ? 1
   e) Write the structure of pyrazole. 1
   f) Mention one biological importance of Vitamin-C. 1
   g) What is Laplacian operator ? 1
   h) What is tunneling ? 1
   i) What are inhibitors ? 1
   j) What is flash photolysis ? 1

SECTION – B

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

2. Explain the method of determining mechanism based on structure of products. 5

3. Describe the elucidation of open structure of D-Glucose. 5

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4. Explain any two methods of synthesis of thiozoles. 5

5. Explain applications of Schrodinger equation to harmonic oscillator. 5

6. Describe photochemical mechanism reaction between hydrogen and chlorine. 5

7. Explain the mechanism of lock and key theory. 5

## SECTION – C

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

8. a) Write energy levels for the
   i) Benzyl cation.
   ii) Benzyl carbanion and
   iii) Benzyl free radical. 6

   b) Explain effect of structure on reactivity with respect to resonance and steric effect. 4

9. a) Describe the conformational analysis of Methyl cyclohexane. 6

   b) Explain the mechanism of Ruff degradation. 4

10. a) Write the synthesis and biological importance of Vitamin-E. 6

    b) Write the biological importance of folic acid and pantothenic acid. 4

11. a) Explain the solutions of Schrodinger wave equation for a free particle. 6

    b) Write a note on Eigen values and Eigen function of angular momentum. 4

12. a) Explain the effect of enzyme concentration and pH on enzyme activity. 6

    b) Describe the Henri-Michaelis–Menten mechanism. 4

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21BSC5C6PHL

V Semester B.Sc. (NEP) (Repeaters) Degree Examination, June/July 2026
PHYSICS
DSC – 6 : Elements of Atomic, Molecular and Laser Physics

Time : 2 Hours Max. Marks : 60

***Instructions :*** *i) Answer **all** the Sections.*
*ii) Non-programmed scientific calculator are **allowed**.*

SECTION – A

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

   a) Define impact parameter.

   b) Define ionization potential.

   c) State Pauli's exclusion principle.

   d) Can principal quantum number be zero ?

   e) Define Stark effect.

   f) What is the nature of molecular spectra ?

   g) Define rigid rotator.

   h) Define stimulated emission.

   i) What is metastable state ?

   j) What is optical pumping ?

SECTION – B

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

2. State the postulates of Bohr's theory of hydrogen atoms.

3. Describe Frank-Hertz experiment.

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4. Discuss j-j coupling scheme.
5. Discuss briefly Fluorescence and Phosphorescence.
6. Explain the experimental study of Raman effect.
7. Write a note on population inversion and optical pumping.

## SECTION – C

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

8. a) Derive the expression for the total energy of the electron in the $n^{th}$ Bohr orbit of hydrogen atom. 6

   b) Explain in brief Sommerfeld's atomic model. 4

9. a) What is normal Zeeman effect ? Derive the expression for Zeeman effect on the basis of a classical theory. 7

   b) Calculate Lande' g-factor for 's' electron. 3

10. Obtain an expression for rotational energy of a diatomic molecule as a rigid rotator. 10

11. a) Derive an expression for quantum theory of Raman effect. 5

    b) Explain Stark effect with experimental study. 5

12. a) Derive the relation between Einstein's co-efficient and radiation energy density. 6

    b) Write any four applications of laser. 4

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21BSC5C6BOL

# V Semester B.Sc. (NEP) (Repeaters) Degree Examination, June/July 2026
## BOTANY
## DSC 6 : Genetics and Plant Breeding

Time : 2 Hours | Max. Marks : 60

### PART – A

Answer **all** the following questions. **(10×1=10)**

1. a) What is pleiotropy ?
   b) Define epistasis.
   c) What is allel frequency ?
   d) What are the center of origins of crop plants ?
   e) What is distant hybridization ?
   f) Mention one or two undesirable consequences of plant breeding.
   g) Define transposons.
   h) What is interference in crossing over ?
   i) Mention one example of mitochondrial mutation.
   j) Define quantitative inheritance.

### PART – B

Answer **any four** of the following questions. **(4×5=20)**

2. Explain the concept of multiple allels with example.
3. Describe the CIB method for mutation detections.
4. What is the role of natural selection in population genetics ?
5. Discuss the objectives of the plant breeding.
6. Explain the inheritance of Kernel colour in wheat.
7. Describe the role of polyploidy in crop improvement.

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## PART – C

Answer **any three** of the following questions. (3×10=30)

8. Explain the method of crop improvement through selection and hybridization.

9. Discuss breeding system and mode of reproduction in crop plants.

10. Write short notes :

    a) Define mutation. Describe types of mutation.

    b) What is the role of transposons in mutation ?

11. Describe the variation in chromosomes number and its structure.

12. What are complementary genes ? Describe the complementary gene inheritance with suitable example.

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21BSC5C5ZOL

V Semester B.Sc. (NEP) (Repeaters) Degree Examination, June/July 2026
ZOOLOGY
DSC 5 : Non-Chordates and Economic Zoology

Time : 2 Hours | Max. Marks : 60

***Instructions :*** *1) Answer **all** the Sections.*
*2) Draw diagrams **wherever** necessary.*

SECTION – A

Answer **any ten** of the following sub-questions. **(10×1=10)**

1. a) Which canal system is present in sycon ?
   b) Name the respiratory organ in pheretima.
   c) What is the locomotors structure in starfish ?
   d) What is the role of radula in pila ?
   e) Which symmetry is shown by phylum porifera ?
   f) Define Apiculture.
   g) What is Coelom ?
   h) Name the phylum to which paramecium belongs.
   i) Define cephalization.
   j) Name the disease caused by Ascaris lumbricoides.
   k) What is sericulture ?
   l) What is function of mantle ?

SECTION – B

Answer **any four** of the following questions. **(4×5=20)**

2. Explain the salient features of phylum platyhelminthes.
3. Describe the general characters of phylum coelenterata with suitable examples.
4. Describe the significance of the water canal system in porifera.

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5. Explain the importance about vermiculture.
6. Give an account of Rhodents as pests and its control measures.
7. Discuss the levels of organization in non-chordates with suitable phyla.

## SECTION – C

Answer **any three** of the following questions. **(3×10=30)**

8. Explain the general characters and classification in phylum arthropoda.
9. Describe the general character and torsion in phylum mollusca.
10. Give the detail account of the life cycle of mosquitoes and a note on its control measures.
11. Describe the techniques and economic importance of apiculture with Apis Indica.
12. Write the salient features of the phylum annelida and add a note on its classification upto classes with example.

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21BSC5C5MTL

# V Semester B.Sc. (NEP) (Repeaters) Degree Examination, June/July 2026
## MATHEMATICS
## DSC – 5 : Real Analysis – II and Complex Analysis

Time : 2 Hours  Max. Marks : 60

***Instruction :*** *Answer* ***all*** *Sections.*

SECTION – A

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

1. a) Define partition points of the partition.
   b) Define lower Darboux sum.
   c) Define primitive of a function.
   d) State first mean value theorem.
   e) Define Argand Plane.
   f) Define Analytic function.
   g) Define Bilinear transformation.
   h) Define Jacobian of a transformation.
   i) Define Jordan Arc.
   j) State Cauchy's fundamental theorem.

SECTION – B

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

2. State and prove necessary and sufficient condition of Riemann integrability.
3. Using the first mean value theorem show that $\frac{1}{3\sqrt{2}} < \int_0^1 \frac{x^2}{\sqrt{1+x}}\,dx < \frac{1}{3}$.
4. If $f(z) = u + iv$ is analytic in a domain D, then v is harmonic conjugate of u. Conversely if v is harmonic conjugate of u in a domain D, then $f(z) = u + iv$ is analytic in D.
5. Find the fixed points and the normal form of the bilinear transformation $w = \frac{3z-4}{z-1}$.

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6. Evaluate $\int_C (x^2 - iy^2)dz$ along the line joining (1, 2) and (2, 8).

7. Examine the convergence of $\int_0^{\pi} \frac{dx}{\sin x}$.

## SECTION – C

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

8. a) If f(x) is a bounded function on [a, b] then prove that $\int_a^b f(x)dx \leq \int_a^{\bar{b}} f(x)\,dx$.

   b) If $f(x) = x^2$ is defined on [0, 1] and $P = \left\{0, \frac{1}{4}, \frac{2}{4}, \frac{3}{4}, 1\right\}$ find U(p, f) and L(p, f).

9. a) If $f \in R[a,b]$ and $\phi$ is a primitive of f on [a, b], then prove that $\int_a^b f(x)dx = \phi(b) - \phi(a)$.

   b) Show that $\int_0^1 \frac{1+x}{(2+x)^2}.e^x\,dx = \frac{e}{3} - \frac{1}{2}$.

10. a) Find the analytic function whose imaginary part is $e^x \sin y$ by Milne-Thomson's method.

    b) Evaluate $\lim_{z \to (1-i)} \left(\frac{z^2 - z + 1 - i}{z^2 + 2z + 2}\right)$.

11. a) Prove that the product of two bilinear transformations is a bilinear transformation.

    b) Find the bilinear transformation which maps the points 2, 1, 0 into 1, 0, i respectively.

12. a) Evaluate $\int_C \frac{z}{(9 - z^2)(z + 1)}\,dz$ where C is $|z| = 2$.

    b) If f(z) is analytic within and on a simple closed curve C and $Z_0$ is any point within C, then prove that $f'(z_0) = \frac{1}{2\pi i}\int_C \frac{f(z)}{(z - z_0)^2}.\,dz$.

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21BSC5C5CHL

# V Semester B.Sc. (NEP) (Repeaters) Degree Examination, June/July 2026
## CHEMISTRY
## DSC – 5 : Inorganic Chemistry and Spectroscopy

Time : 2 Hours | Max. Marks : 60

***Instruction*** *: Answer **all** the questions.*

### SECTION – A

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

1. a) Define symbiosis.
   b) What are molecular sieves ?
   c) Define quarks.
   d) What is binding energy ?
   e) What is absorption spectroscopy ?
   f) Define chromophore.
   g) What is Raman effect ?
   h) State Born-oppenheimer approximation.
   i) What is Larmor frequency ?
   j) Define chemical shift.

### SECTION – B

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

2. Explain structure and bonding in carboranes. 5
3. Give the salient features of nuclear shell model. 5
4. Discuss the types of electronic transitions in UV spectroscopy. 5
5. Explain the selection rules in rotation spectroscopy. 5
6. Write a note on spin-spin coupling and high resolution spectra. 5
7. Explain vibrational Raman spectra. 5

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## SECTION – C

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

8. a) What is HSAB concept ? Give its applications. 6

   b) Give the classification and structure of silicates. 4

9. a) Explain the classification of nuclides based on Z and N values. 6

   b) Discuss the liquid drop model. 4

10. a) Discuss the application of woodward rule for calculation of $\lambda$ max. 6

    b) Write a note on fingerprint region and its significance. 4

11. a) Explain the determination of bond lengths of diatomic molecules. 6

    b) Write a note on overtomes and hot bands. 4

12. a) Explain the principle and instrumentation of mass spectroscopy. 6

    b) Give the principle of NMR spectroscopy. 4

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21BSC5C5BOL

V Semester B.Sc. (NEP) (Repeaters) Degree Examination, June/July 2026
BOTANY
DSC 5 : Plant Morphology and Taxonomy

Time : 2 Hours | Max. Marks : 60

PART – A

Answer the following questions : (10×1=10)

1. a) Define a fibrous root system.
   b) What is cymose type of inflorescence ?
   c) Give floral formula of Cucurbitaceae.
   d) List out the phylogenetic system of classification.
   e) Expand ICBN.
   f) Mention any two important herbaria in the world.
   g) What is bracketed key ?
   h) Draw floral diagram of Euphorbiaceae.
   i) Define analogy.
   j) What is author citation ?

PART – B

Answer **any four** of the following questions : (4×5=20)

2. Describe the modification of leaf.
3. Write a brief account on Linnaeus system and its merits and demerits.
4. Explain the role of botanical garden and e-flora in taxonomy.
5. Describe the diagnostic features of families Rutaceae.
6. What is cladogram ? How does it differ from phylogenetic tree ?
7. Write a note on floral formula and floral diagram.

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## PART – C

Answer **any three** of the following questions : **(3×10=30)**

8. Briefly explain the types of fruits with suitable examples.

9. What is an herbarium ? Explain the techniques of preparation.

10. Write short notes on :

    a) Discuss the history and taxonomy relevance.

    b) What is the role and priority in nomenclature ?

11. Give an account on :

    a) Define taxonomy. Write a detailed note on numerical taxonomy and its significance.

    b) Role of nuclear ribosomal 18s DNA in molecular taxonomy.

12. Describe the characteristic feature, economic importance of Solanaceae and Poaceae.

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21BSC5C5PHL

**V Semester B.Sc. (NEP) (Repeaters) Degree Examination, June/July 2026**
**PHYSICS**
**DSC 5 : Classical Mechanics – I and Quantum Mechanics – I**

Time : 2 Hours | Max. Marks : 60

***Instruction** : Non-programmed scientific calculators are **allowed**.*

SECTION – A

I. Answer **all** the questions. **(10×1=10)**

1) a) What are degrees of freedom ?
   b) What are generalised coordinates ?
   c) What is a non-inertial frame of reference ?
   d) Write the expression for length contraction.
   e) What is Doppler shift ?
   f) State Heisenberg's uncertainty principle.
   g) State Ehrenfest's theorem.
   h) What are matter waves ?
   i) What is wave packet ?
   j) What is zero point energy ?

SECTION – B

II. Answer **any four** of the following questions. **(4×5=20)**

2) State and explain law of conservation of linear momentum.
3) Derive an expression for time dilation.
4) Derive an expression for fictitious forces in rotating frame of reference.
5) Derive the relation between phase velocity and group velocity.
6) Write a note on G.P. Thomson's experiment.
7) Derive an expression for probability current density.

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## SECTION – C

III. Answer **any three** of the following. (3×10=30)

8) a) Derive an expression for displacement of simple pendulum. (7+3)

b) Write a note on constraints.

9) Explain Michelson's Morley experiment. Write its negative results.

10) Define Compton effect and derive an expression for it.

11) Derive an expression for energy eigen value and eigen functions of a particle in 1-D infinite potential well.

12) a) What is degeneracy of a state ? (4+6)

b) Derive an expression for Schrödinger's time independent wave equation.

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