V Semester B.Sc. Degree Examination, November/December 2019

PHYSICS

Paper 5.1 – Atomic and Molecular Physics

(CBCS)

Time : 3 Hours   Max. Marks : 70

Instructions :

1) Answer **all** questions from Section A.
2) Answer any **five** from Section B and **any three** from Section C.

SECTION – A

Answer the following questions :   **(15 × 1 = 15)**

1. What is the nature of the path of a particle in the J.J. Thomson's experiment?

2. Find the ratio of specific charge of proton to electron. (Mass of proton = 1840 times the mass of electron)

3. Define the distance of closest approach.

4. Mention any one failure of Sommerfeld's model of atom.

5. The energy value in the first orbit of hydrogen is –13.6 eV. What will be the value of energy of electron in the first excited state?

6. What is anomalous Zeeman effect?

7. Which effect is electrically analog of the Zeeman effect?

8. How many elliptical and how many circular orbits are there for $n = 3$ according to Sommerfeld's atom model?

9. What are the possible values of orbital quantum number 'l' for $n = 3$?

10. In which region of electromagnetic spectrum pure rotational spectra of a molecule is formed?

11. What is the composition of a Ruby rod?

12. What is holography?

13. Due to scattering of sunlight smoke, fog and clouds appear white. Which type of scattering is responsible for this?

14. Give any one application of Raman effect.

15. State Pauli's exclusion principle.

SECTION – B

Answer **any five** of the following :   (5 × 5 = 25)

16. Describe the construction and working of Dempster's mass spectrograph.

17. Write a note on Sommerfeld's relativistic atom model.

18. Describe Stern-Gerlach experiment.

19. Discuss briefly fluorescence and phosphorescence.

20. Explain Raman effect on the basis of classical theory.

21. Discuss L-S coupling scheme.

22. Explain the construction and working of Ruby Laser.

SECTION – C

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

23. (a) Describe, with necessary theory Millikan's oil drop method to determine the charge of an electron.

    (b) A charged drop is just floating in a uniform electric field of 4×10^5 V/m. Find the charge on it. Given: Mass of the drop = 6.4×10^{-15} kg and $g = 10$ m/s^2.   (7 + 3)

24. Outline the Rutherford's theory of α-particle scattering and obtain the expression for the impact parameter interms of scattering angle.   (10)

25. (a) What is Zeeman effect? Explain the quantum theory of normal Zeeman effect.

    (b) Explain the different quantum numbers associated with Vector atom model.   (5 + 5)

26 (a) Obtain the expression for frequency of a pure rotational spectrum of a diatomic molecule.

(b) Describe experimental study of Raman effect.　　(5 + 5)

27. (a) Write a note on fine structure of spectral lines.

(b) Write a note on population inversion and optical pumping.　　(5 + 5)

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PHYSICS

Paper VI (5.2) – Statistical Mechanics, Quantum Mechanics and Electronics — I

(CBCS)

Time : 3 Hours   Max. Marks : 70

Instructions : *Write answers to Section A questions in the first two pages only.*

SECTION – A

Answer the following questions, each of **1** mark :   **(15 × 1 = 15)**

1. Write an expression for Bose-Einstein distribution function.

2. Define ensemble.

3. Define phase space.

4. What is debroglie wave?

5. State Heisenberg's uncertainty principle.

6. What is Compton effect?

7. What is a wave function?

8. Mention the expression for energy of a particle in one dimensional box.

9. What is zero point energy?

10. Give an example for donar impurity.

11. What is Zener diode?

12. What is L-section filter?

13. What is a Solar cell?

14. Write a disadvantage of LED.

15. What is 7-segment display?

SECTION – B

Answer **any five** of the following : (5 × 5 = 25)

16. Compare Maxwell Boltzman and Fermi Dirac distribution functions.

17. Explain the construction and working of photo diode.

18. Derive an expression for electrical conductivity of a semiconductor.

19. Derive an expression for energy gap in semiconductor.

20. Explain Davison and Germar experiment.

21. Explain the working of a npn transistor as an amplifier in CE configuration.

22. Deduce Schrodinger's time independent wave equation.

SECTION – C

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

23. (a) Explain the construction and working of Bridge rectifier with neat circuit diagram and obtain the expression for ripple factor of a full wave rectifier.

    (b) Calculate the emitter current for which $\beta = 100$ and base current = 20 μA. (8 + 2)

24. (a) Obtain an expression for Compton shift.

    (b) Find the energy of a neutron in electron volt whose debroglie wavelength is 1Å.

    Given: Mass of electron $= 1.67 \times 10^{-27}$ kg, $h = 6.625 \times 10^{-34}$ J.S. (7 + 3)

25. (a) Obtain an expression for energy of a linear harmonic oscillator using Schrodinger wave equation.

    (b) Find the lowest energy of an electron moving in one dimension of an infinitely high potential box of width 1 Å.

    Given: Mass of electron $= 9.11 \times 10^{-31}$ kg, $h = 6.625 \times 10^{-34}$ J.S. (7 + 3)

26. (a) State and prove Boltzmann equi-partition theorem.

    (b) Write a note on Liquid crystals. (5 + 5)

27. (a) What is Hall effect? Obtain the expression for Hall coefficient.

    (b) Write a note on extrinsic semiconductors. (5 + 5)

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PHYSICS

Paper VI (5.2) – Statistical Mechanics, Quantum Mechanics and Electronics – I

(New)

Time : 3 Hours

Max. Marks : 80

Instructions : Write answers to Section A questions in the first two pages only.

SECTION – A

Answer the following questions, each of **1** mark :

(15 × 1 = 15)

1. Define phase space.

2. What is Stirling's approximation?

3. Name two particles involved in the Compton scattering.

4. Give an example for inelastic scattering.

5. What is Linear Harmonic Oscillator?

6. Mention the expression for energy of a Linear harmonic oscillator.

7. What is Eigen value?

8. Write an example for pentavalent impurity.

9. What is a semiconductor?

10. What is a conduction band?

11. What is π section filter?

12. What is PN junction?

13. What is meant by dark current of a photo diode?

14. What is Liquid crystal?

15. Write the expansion of MOSFET.

P.T.O.

SECTION – B

Answer **any five** of the following : (5 × 5 = 25)

16. Explain the construction and working of Solar cell.

17. State and prove Boltzmann equipartition theorem.

18. Derive an expression for electrical conductivity of a semiconductor.

19. Explain the construction and working of Half wave rectifier and obtain the expression for efficiency of half wave rectifier.

20. Explain the construction and working of JFET with a neat circuit dicut diagram.

21. Illustrate the Heisenberg's uncertainty principle by diffraction at a single slit.

22. Derive an expression for energy of a particle in one dimensional box.

SECTION – C

Answer **any four** of the following : (4 × 10 = 40)

23. (a) Explain the working of npn transistor as an amplifier in CE configuration. And establish the relation between α and β.

    (b) Calculate emitter current for which $\beta = 120$ and base current 25 μA.

    (8 + 2)

24. (a) Compare Maxwell Boltzmann and Bose Einstein distribution function.

    (b) Write a note on Seven segment display. (5 + 5)

25. (a) Derive the Schrodinger time independent wave equation.

    (b) An electron is constrained in a one dimension box of side 1 Å. Calculate the lowest energy in eV, that an electron can have.

    Given: Mass of electron $= 9.11 \times 10^{-31}$ kg , $h = 6.625 \times 10^{-34}$ J.S. (7 + 3)

26. (a) What is Hall effect? Derive the expression for Hall coefficient.

    (b) Based on band theory of solids, distinguish between conductors, insulators and semiconductors. (5 + 5)

27. (a) Obtain the expression for Compton shift.

    (b) Calculate the debroglie wavelength of an alpha particle accelerated through a potential difference of 4 kV.

    Given: Mass of α-particle $= 6.64 \times 10^{-27}$ kg . (7 + 3)

28. Explain the construction, working and characteristics of MOSFET. (10)

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MATHEMATICS

Paper IX & (5.1) – Integral Transforms

(CBCS - New)

Time : 3 Hours

Max. Marks : 70

Instructions : *Answer **All** the Sections.*

SECTION – A

Answer **any five** of the following :

(5 × 2 = 10)

1. Find $L[\cosh at]$.

2. Find $L[a^t]$.

3. Evaluate $L\left[\dfrac{\sin t}{t}\right]$.

4. Using Convolution theorem find $L^{-1}\left[\dfrac{1}{(s+1)(s+2)}\right]$.

5. If. $f(x) = e^x$ in $(-\pi, \pi)$ find Fourier coefficient of a_0.

6. Define infinite Fourier transform and inverse Fourier transform.

7. Find the Z-transform of e^{-an}.

SECTION – B

Answer **any five** of the following :

(5 × 6 = 30)

8. Evaluate $L[t^2 \sin at]$.

9. Find the Laplace transforms of the function

$$f(t) = \begin{cases} E & \text{for } 0 \le t \le T/2 \\ -E & \text{for } T/2 \le t \le T \end{cases}$$

and $f(t + T) = f(t)$ with period T.

P.T.O.

10. Find the Inverse Laplace transform of $\dfrac{1}{s(s+1)(s+2)(s+3)}$.

11. Solve the simultaneous differential equation $\dfrac{dx}{dt} + y = \sin t$; $\dfrac{dy}{dt} + x = \cos t$ with $x(0) = 2$, $y(0) = 0$.

12. Obtain the Fourier series for $f(x) = |x|$ in $-\pi < x < \pi$ and hence deduce that
$$\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \cdots = \frac{\pi^2}{8}.$$

13. Express $f(x)$ as a half range cosine series $f(x) = x$, $0 \le x \le L$.

SECTION – C

Answer **any five** of the following :　　　　　　　　　　　　　　　$(5 \times 6 = 30)$

14. Find the Fourier transform of
$$f(x) = \begin{cases} 1 & \text{for } |x| \le 1 \\ 0 & \text{for } |x| > 1 \end{cases}$$

Hence evaluate $\displaystyle\int_0^\infty \frac{\sin x}{x}\, dx$.

15. Obtain the Fourier sine transform of the function
$$f(x) = \begin{cases} x & \text{for } 0 < x < 1 \\ 2 - x & \text{for } 1 < x < 2 \\ 0 & \text{for } x > 2 \end{cases}.$$

16. [Modulation Property]

If $F_s[f(x) = F_s(u)$ and $F_c[f(x)] = F_c(u)$ then

(a) $F_s[f(x)\cos ax] = \dfrac{1}{2}[F_s(u+a) + F_s(u-a)]$

(b) $F_s[f(x)\sin ax] = \dfrac{1}{2}[F_c(u-a) - F_c(u+a)]$.

Here $F_c(u)$ Fourier cosine and $F_s(u)$ Fourier sine transform.

17. Find the Z-transform of $\sin(3n + 5)$.

18. Find Inverse Z-transform of $\left[\dfrac{8Z - Z^3}{(4 - Z)^3}\right]$.

19. Solve $y_{n+1} + \dfrac{1}{4}y_n = \left(\dfrac{1}{4}\right)^n$ with $y_0 = 0$ by using Z-transform.

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MATHEMATICS – X

Paper 5.2 (New) – Applied Mathematics

(CBCS)

Time : 3 Hours

Max. Marks : 70

Instructions : *Answer all the Sections.*

SECTION – A

Answer **any five** of the following :   (5 × 2 = 10)

1. Find the directional derivative of the function $\phi(x, y, z) = x \sin z - y \cos z$ at the origin in the direction of $2i - 2j + k$.

2. Prove that $div\,(curl\,\vec{f}) = 0$.

3. Find $\nabla^2\phi$ for the function $\phi = 2x^2yz^3$.

4. Define stationary function and write the solution of Euler's equation when '*f* is independent of *Y*.

5. Find the extremals of the functional $\int_{x_0}^{x_1}(y'^2 / x^3)\,dx$.

6. Write one-dimensional heat equation and write its appropriate solution.

7. Find the complete solution of $(D^2 + DD' + D' - 1)Z = 0$.

SECTION – B

Answer **any five** of the following :   (5 × 6 = 30)

8. Prove that $curl\,(curl\,\vec{f}) = grad\,(div\,\vec{f}) - \nabla^2\vec{f}$.

9. Find the angle between the normals to the surface $z^2 - xy = 0$ at the points (4, 1, 2) and (3, 3, –3).

10. Show that the following field $\vec{F}$ is a potential field and hence find its scalar potential ϕ such that $\vec{F} = \nabla\phi$, $\vec{F} = (6xy + z^3)i + (3x^2 - z)j + (3xz^2 - y)k$.

P.T.O.

11. Verify Gauss divergence theorem for $\vec{F} = 2xy\,i + yz^2\,j + xz\,k$ and S is the total surface of the rectangular parallelepiped bounded by the planes $x = 0$, $y = 0$, $z = 0$, $x = 1$, $y = 2$ and $z = 3$.

12. Verify Green's theorem in the plane for $\oint_C [(xy + y^2)dx + x^2 dy]$; where '$C$' is the closed curve bounded by $y = x$ and $y = x^2$.

13. Find the plane curve of fixed perimeter and maximum area.

SECTION – C

Answer **any five** of the following : $\hspace{2cm}$ (5 × 6 = 30)

14. Prove a necessary condition for $I = \int_{x_1}^{x_2} f(x, y, y')\,dx$ to be an extremum is that

$$\frac{\partial f}{\partial y} - \frac{d}{dx}\left(\frac{\partial f}{\partial y'}\right) = 0 \text{ is the Euler's equation.}$$

15. Solve: $(D^2 - (D')^2 - 3D + 3D')Z = xy$.

16. Solve: $[D^2 - DD' + D' - 1]Z = \cos(x + 2y) + e^y$.

17. Reduce the equation $\dfrac{\partial^2 z}{\partial x^2} + x^2 \dfrac{\partial^2 z}{\partial y^2} = 0$ to a canonical form.

18. Solve: $(D^2 - DD')Z = \sin x \cos 2y$.

19. Obtain the solution for one-dimensional wave equation $\dfrac{\partial^2 u}{\partial t^2} = c^2 \dfrac{\partial^2 u}{\partial x^2}$ by using the method of separation variables.

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MATHEMATICS – XI

Paper 5.3 – Graph Theory – I

(CBCS)

Time : 3 Hours

Max. Marks : 70

Instructions : *Answer **all** Sections.*

SECTION – A

Answer **any five** of the following :

(5 × 2 = 10)

1. Define order and size of a graph.

2. Define isomorphic graphs with example.

3. Define cut-vertex of a graph. Give an example of a graph which has a bridge but not cut vertex.

4. Show that K_p is $(P-1)$ regular.

5. Define binary tree with an example.

6. Define vertex connectivity of a graph and find $\lambda(C_n)$.

7. State Menger's theorem.

SECTION – B

Answer **any five** of the following :

(5 × 6 = 30)

8. Prove that any graph G or $\overline{G}$ is connected.

9. Prove that every self complementary graph has $4n$ or $4n+1$ vertices.

10. If G is a (p, q) graph whose vertices have degree d_i, then show that $L(G)$ has q vertices and q_L edges where $q_L = \sum_{i=1}^{p} d_i^2 - q$.

11. Show that every $u-v$ walk contains $u-v$ path.

12. If T is a binary tree with n terminal vertices then T has $(2n - 1)$ vertices.

13. Suppose a tree T has N_1 vertices of degree 1, N_2 vertices of degree 2, N_3 vertices of degree 3, ... N_k vertices of degree k, prove that $N_1 = 2 + N_3 + 2N_4 + 3N_5 + \cdots + (k - 2)N_k$.

SECTION – C

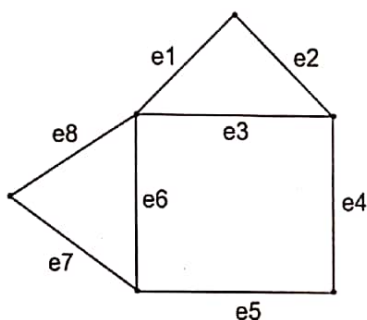Answer **any five** of the following : $(5 \times 6 = 30)$

14. Find the graph G which has adjacency matrix

$$\begin{bmatrix} 0 & 1 & 1 & 1 & 0 & 0 \\ 1 & 0 & 1 & 0 & 0 & 0 \\ 1 & 1 & 0 & 1 & 0 & 0 \\ 1 & 0 & 1 & 0 & 1 & 1 \\ 0 & 0 & 0 & 1 & 0 & 1 \\ 0 & 0 & 0 & 1 & 1 & 0 \end{bmatrix}.$$

15. Define cycle matrix. Find the cycle matrix of the graph G.

16. State and prove Whitney's theorem.

17. Explain Konigberg's seven bridge problem.

18. Prove that any connected graph G is Eulerian if and only if every vertex of G is of even degree.

19. Draw the graph

    (a) which is Eulerian but not Hamiltonian

    (b) which is Hamiltonian but not Eulerian

    (c) which is Eulerian and also Hamiltonian.

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MATHEMATICS

Paper IX (5.1) – Integral Transforms

(New)

Time : 3 Hours   Max. Marks : 80

Instructions : *Answer **all** the Sections.*

SECTION – A

Answer **any ten** of the following :   (10 × 2 = 20)

1. Find $L[e^{at}]$.

2. Find $L[\cos^2 4t]$.

3. Find $L[e^{3t} \cos 3t]$.

4. Find $L^{-1}\left[\dfrac{s}{(s+2)^2}\right]$.

5. Using Convolution theorem find $L^{-1}\left[\dfrac{1}{s(s^2+1)}\right]$.

6. If $f(x) = x$ in $(-\pi, \pi)$ find Fourier coefficient of a_n.

7. If $f(x) = \begin{cases} -k & \text{in } (-\pi, 0) \\ k & \text{in } (0, \pi) \end{cases}$ find Fourier coefficient of a_0.

8. Define inverse Fourier cosine and sine transform.

9. Find sine transform of $2e^{-5x} + 5e^{-2x}$.

10. Define Z-transform and inverse Z-transform.

11. If U_n and V_n be any two discrete valued function then $Z_T(C_1 U_n + C_2 V_n) = C_1 Z_T(U_n) + C_2 Z_T(V_n)$ where C_1 and C_2 are constant.

12. Find the Inverse Z-transform of $\dfrac{z}{(z-2)(z-3)}$.

SECTION – B

Answer **any five** of the following : (5 × 6 = 30)

13. Evaluate $L\left[\dfrac{2\sin 5t \cos 3t}{t}\right]$.

14. Evaluate $L^{-1}\left[\dfrac{s+2}{s^2-4s+13}\right]$.

15. Verify the Convolution theorem for the function $f(t) = \cos t$, $g(t) = e^t$.

16. Solve $y'' + 9y = 25e^{4t}$ given $y(0) = 3$ and $y'(0) = 1$ using Laplace transform.

17. Solve the simultaneous differential $\dfrac{dx}{dt} + 4y = 0$; $\dfrac{dy}{dt} - 9x = 0$, given $x(0) = 2$, $y(0) = 1$ by using Laplace transform.

18. Find the Fourier series of $f(x) = x - x^2$ in $-\pi \le x \le \pi$. Hence deduce that
$$\frac{\pi^2}{12} = \frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} \cdots.$$

19. Obtain the Fourier series of $f(x) = |x|$ in $(-L, L)$.

SECTION – C

Answer **any five** of the following : (5 × 6 = 30)

20. Find the Fourier transform of $f(x) = \begin{cases} 1-x^2 & |x| \le 1 \\ 0 & |x| > 1 \end{cases}$.

21. Find the Fourier sine transform of the function $f(x) = \begin{cases} \sin x & 0 < x < a \\ 0 & x > a \end{cases}$.

22. Find the Fourier cosine transform of $f(x) = e^{-ax} \cos ax$.

23. Using Parseval identity show that $\displaystyle\int_0^\infty \frac{dx}{(1+x^2)^2} = \frac{\pi}{4}$.

24. Given $Z_T(U_n) = \dfrac{2Z^2 + 3Z + 4}{(Z-3)^3}$, $|Z| > 3$ show that $U_2 = 21$.

25. Obtain the inverse Z-transform of $\dfrac{Z}{(Z+1)^2}$ by Power expansion.

26. Solve by using Z-transforms $y_{n+2} - 4y_n = 0$ given that $y_n = 0$ and $y_1 = 2$.

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BOTANY

Paper 5.1 – Morphology, Taxonomy and Economic Botany

(CBCS - New)

Time : 3 Hours   Max. Marks : 70

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

I. Answer the following :   (15 × 1 = 15)

1. What is Systematic botany?

2. Assign **any one** of the following plants to the respective family: (a) Clove (b) Cotton.

3. What are dichlamydeous flowers?

4. What is an Integument? Mention its function.

5. What is gynobasic style?

6. What are the three parts of the carpals?

7. Name the largest petal in the family Papilionaceae.

8. What is natural system of classification?

9. What is an Herbarium?

10. Name the family having Androphore and Gynophore.

11. What is bilipped corolla?

12. What is Rhizome?

13. Name an essential oil yielding plants in the family Myrtaceae.

14. Give the Botanical name of any three plants that are now in flower on your College Campus.

15. What are Pnematophores?

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II   Answer **any five** of the following :   (5 × 5 = 25)

16.   Comment upon **any one** of the following :
      (a)   Corolla of papilionaceae.
      (b)   Tendrils and Androecium of cucurbitaceae.

17.   What is Phyllotaxy? Explain the different types with suitable examples.

18.   Construct the floral diagram and give the floral formula of typical member Malvaceae.

19.   Explain the salient features of the family Labiatae.

20.   Explain Taproot modification.

21.   Assign the following genera to their respective families, write their botanical names and add a note on their economic importance:
      (a)   Brassica nigra
      (b)   Coffea Arabica.

22.   What is placentation? Explain the different types of placentation with suitable examples.

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

23.   Briefly outline the Bentham and Hooker system of classification and add a note on their merits and demerits.

24.   What is cohesion of stamens? Describe the different types of cohesion with suitable examples.

25.   Assign the following plants to their respective families. Write their botanical names and add a note on their economic importance:
      (a)   Groundnut
      (b)   Rubber
      (c)   Bottle gourd
      (d)   Gum tree.

26.   Describe the distinguished characteristics of the family Compositae, giving economic importance of three plants along with their botanical names.

27.   (a)   What is an fruit? Explain the different types of composite fruits with suitable examples.

                              Or

      (b)   Write the salient features of the family Gramineae, giving economic importance of any three plants along with their botanical names.

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BOTANY

Paper 5.2 – Cell Biology and Cytogenetics

(CBCS)

Time : 3 Hours

Max. Marks : 70

Instructions :

1) *Answer **all** the questions.*

2) *Draw diagrams wherever necessary.*

I. Answer the following : (15 × 1 = 15)

1. What is reverse transcription?

2. In which part of the plastid light reactions occurs?

3. What are centromeres?

4. Who proposed the clover-leaf model of tRNA?

5. What are autosomes and allosomes?

6. Give the phenotypic ratio of supplementary factors.

7. Who proposed the term Nucleic acids?

8. Name the cell organelle involved in protein synthesis.

9. What is Euploidy? Give an example.

10. Define the term 'gene'.

11. What is linkage and crossing over?

12. What are multiple alleles? Give an example.

13. What is Phenotype? Give the phenotypic ratio of Mendel's monohybrid experiment.

14. What are dictzosomes?

15. What are Balbionic rings?

P.T.O.

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II. Answer **any five** of the following : (5 × 5 = 25)

16. Sketch and label, mention the functions of Mitochondria.

17. What is Incomplete dominance? Explain with suitable examples.

18. What are complementary factors? Explain with suitable examples.

19. Why did the Mendel selected the Pea plants for his experiment? Explain the Mendel's monohybrid experiment.

20. With the help of neat and labeled diagram explain the double helicoid model of DNA.

21. What is genetic code? Explain its characteristics.

22. With the help of neat and labeled diagram describe the structure of polytene chromosomes.

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

23. Describe the mechanism of chromosomal theory of sex-determination.

24. What is gene interaction? Describe the inheritance of comb characters in poultry.

25. Establish the relationship between DNA and protein synthesis.

26. What is Gene mutation? Explain the different types with suitable examples.

27. A tall red when crossed with dwarf red plant produce a dwarf white plant. Give the geno types of the parents of the generation.

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ZOOLOGY

Paper Z-5.1 – Cell Biology and Developmental Biology

(CBCS)

Time : 3 Hours   Max. Marks : 70

Instructions :

    1)   *Answer **all** Sections.*

    2)   *Draw labelled diagrams wherever necessary.*

SECTION – A

Answer **any five** of the following :   (5 × 2 = 10)

1. What is oncology? Name any two chemical carcinogens.

2. What is Graffian follicle? Mention the function of corpus luteum.

3. Expand RER and SER.

4. Define Monospermy and Polyspermy.

5. What is fate map and Grey crescent?

6. Define Synapsis and Chiasmata.

7. Define Fertilizin and Antifertilizin.

SECTION – B

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

8. Mention Germ layers and their derivatives.

9. Write the differences between sperm and the ovum.

10. Draw a neat labeled diagram of Hen's egg.

11. Explain the process of Oogenesis with the schematic representation.

12. Explain the structure of 24 hours of chick embryo (whole mount).

13. Describe the Cleavage of Frog's egg with suitable diagrams.

P.T.O.

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B.   Answer **any two** of the following :   (2 × 5 = 10)

14.   Enumerate the characters of cancer cells.

15.   Distinguish between Mitosis and Meiosis.

16.   Write the differences between Prokaryotes and Eukaryotes.

SECTION – C

A.   Answer **any two** of the following in detail :   (2 × 10 = 20)

17.   Describe the structure of 48 hours chick embryo with a neat labeled diagram.

18.   Describe the mechanism of fertilization and its significance.

19.   Describe the ultra structure of mitochondrion with a labeled diagram. Add a note on its functions.

B.   Answer **any one** of the following in detail :   (1 × 10 = 10)

20.   Explain the Prophase – I of Meiosis with a labeled diagram.

21.   Describe the ultra structure of Endoplasmic reticulum with a neat labeled diagram and mention its functions.

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ZOOLOGY

Paper 5.2 – Environmental Biology and Wildlife Zoology

(CBCS)

Time : 3 Hours

Max. Marks : 70

Instructions :

1) *Answer **all** the Sections.*

2) *Draw neat labelled diagrams wherever necessary.*

SECTION – A

Answer **any five** of the following :

(5 × 2 = 10)

1. What do you mean by ante-ecology?

2. What is atmosphere? Mention any two zones of it.

3. List abiotic components (any four).

4. Define conservation. Mention any two methods of conservation.

5. Define Mutualism. Give an example.

6. Expand IUCN and BNHS.

SECTION – B

Answer **any six** of the following :

(6 × 5 = 30)

7. Write a brief note on Pond ecosystem.

8. Explain briefly about renewable energy resources.

9. Explain briefly about adaptations of aquatic animals.

10. Write a short note on hydrological cycle.

11. Give an account of desert and its biomes.

12. Write a short note on any five National Parks of Karnataka.

13. Explain about the climatic changes on biodiversity.

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SECTION – C

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

14. Describe the food chain in ecosystem with the help of ettonian pyramids.

15. Write a detailed note on terrestrial ecosystem/habitat.

16. Write a detailed account on air pollution.

17. Describe the factors responsible for depletion of wildlife.

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V Semester B.Sc. Degree Examination, November/December 2019

Paper 5.1 — CHEMISTRY — V

(New Syllabus) (CBCS)

Time : 3 Hours

Max. Marks : 70

Instructions :

1) Section A – contains questions from Inorganic, Organic and Physical Chemistry.

2) Section B – contains questions from Inorganic Chemistry.
    Section C – contains questions from Organic Chemistry.
    Section D – contains questions from Physical Chemistry.

3) Answer **all** the four Sections A, B, C and D.

SECTION – A

Answer **any ten** of the following :   (10 × 2 = 20)

1. Cu^{2+} ions are coloured while Zn^{2+} ions are colourless. Give reason.

2. What is micro state?

3. What are carboranes?

4. What are intercalation compounds?

5. What are equivalent protons?

6. Write the IUPAC name of C_2H_5SH.

7. What is meant by essential amino acids?

8. Arrange the increasing order of stretching frequencies of $C \equiv C$, $C = C$ and $C - C$.

9. Give two examples for molecules with permanent dipole moment.

10. State Einstein law of photochemical equivalence.

11. What is chemiluminescence?

12. Define induced polarization?

SECTION – B

Answer **any two** of the following :   (2 × 10 = 20)

13. (a) Determine the term symbols for an electronic configuration of P^2.   (6)

(b) Write a note on temperature independent paramagnetism.   (4)

14. (a) Discuss the electronic spectrum of $[Ti(H_2O)_6]^{3+}$ complex ion.   (6)

(b) Give the preparation and properties of S_4N_4.   (4)

15. (a) How do you determine magnetic susceptibility and magnetic moment by Guoy's method?   (6)

(b) Write a note on charge transfer spectra.   (4)

SECTION – C

Answer **any two** of the following :   (2 × 10 = 20)

16. (a) Describe the principle and applications of NMR spectra.   (6)

(b) Give any two methods of preparation of thiols.   (4)

17. (a) Discuss the classification and structure of amino acids.   (6)

(b) Describe the basic components of spectrophotometer.   (4)

18. (a) Explain principle and instrumentation of IR spectroscopy.   (6)

(b) Write a note on :   (4)

(i) Magnetic Anisotopy.

(ii) $(N + 1)$ rule.

SECTION – D

Answer **any two** of the following :   (2 × 10 = 20)

19. (a) Define Quantum yield. Give reasons for (i) high quantum yield (ii) low quantum yield.   (6)

(b) Calculate the value of Einstein's energy for the radiation of wavelength 4000 Å.   (4)

20. (a) Discuss the applications of dipole moment in elucidation structure of BF_3 and CO_2.   (6)

(b) Explain : (i) Photo inhibition (ii) Photo sensitization.   (4)

21. (a) Give Clausius-Mosotti equation. Explain the terms and discuss its importance.   (6)

(b) State and explain Beer's law.   (4)

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Paper 5.2 – CHEMISTRY

(CBCS - New)

Time : 3 Hours   Max. Marks : 70

Instructions :

1) Section A contains questions from Inorganic, Organic and Physical Chemistry.

2) Section B contains questions from Inorganic Chemistry.
Section C contains questions from Organic Chemistry.
Section D contains questions from Physical Chemistry.

3) Answer **all** the four Sections A, B, C and D.

SECTION – A

Answer **any ten** of the following questions :   (10 × 1 = 10)

1. What do you mean by Sampling of solids?

2. Define dielectric constant.

3. What are Non-aqueous solvents?

4. Write Radioactive displacement law.

5. Define Synthetic polymers.

6. Write the Haworth structure of Glucose.

7. What are Syndats?

8. Define Chromophore.

9. How does specific conductance varies with dilution?

10. Define Cell constant.

11. What is Ionic conductance?

12. Define degree of polymerisation.

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SECTION – B

Answer **any two** of the following questions : (2 × 10 = 20)

13. (a) Describe the types of determinate errors. (6)

    (b) Explain significant figures and computations. (4)

14. (a) Discuss the classification of solvents with examples. (6)

    (b) Write any two chemical reactions of liquid ammonia as a solvent. (4)

15. (a) Describe the Nuclear stability based on N/P ratio. (6)

    (b) Explain Mass defect and Binding energy. (4)

SECTION – C

Answer **any two** of the following questions : (2 × 10 = 20)

16. (a) Elucidate the open chain structure of D-Glucose. (6)

    (b) Write a note on chain shortening in aldoses. (4)

17. (a) How do you determine Iodine number of oils and fats? (6)

    (b) Explain the acidity of α-hydrogen atoms in ethyl acetoacetate. (4)

18. (a) Explain the manufacture of soap by Modern continuous process. (6)

    (b) Write a note on cleaning action of soaps. (4)

SECTION – D

Answer **any two** of the following questions : (2 × 10 = 20)

19. (a) Describe the conductometric titration of (i) strong acid and strong base (ii) weak acid and strong base. (6)

    (b) Write a note on influence of molecular weight on mechanical properties of polymers. (4)

20. (a) Describe the experimental method of determining transport number of anion by Hittorf's method. (6)

    (b) State Kohlrausch's law and write any two applications. (4)

21. (a) Describe Debye-Huckel-Onsagar equation for strong electrolytes. (6)

    (b) Write a note on variation of equivalent conductivity with dilution. (4)

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V Semester B.Sc. Degree Examination, November/December 2019

Paper 5.1 — CHEMISTRY — V

(New Syllabus)

Time : 3 Hours

Max. Marks : 80

Instructions :

1) *Section A – contains questions from Inorganic, Organic and Physical Chemistry.*

2) *Section B – contains questions from Inorganic Chemistry.*
    Section C – contains questions from Organic Chemistry.
    Section D – contains questions from Physical Chemistry.

3) *Answer **all** the four Sections A, B, C and D.*

SECTION – A

Answer **any ten** of the following :

(10 × 2 = 20)

1. Define paramagnetism.

2. State spin section rule.

3. Write the structure of (a) S_4N_4 (b) $(NPCl_2)_4$.

4. What are carboranes?

5. What are equivalent protons?

6. What are thiols? Give an example.

7. What is basic amino acid? Give an example.

8. What is chemical shift?

9. Write Clausius-Mossotti equation.

10. What is phosphorescence?

11. What do you mean by photo inhibitor? Give an example.

12. Define molar polarization.

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SECTION – B

Answer **any two** of the following : $(2 \times 10 = 20)$

13. (a) Give a brief account of Diamagnetism, Paramagnetism and Antiferromagnetism. **(6)**

    (b) Write a note on classification of silicates. **(4)**

14. (a) Describe the spectrum of $[Ti(H_2O)_6]^{3+}$ complex ion. **(6)**

    (b) Describe the magnetic properties of tetrahedral complex based on crystal field theory. **(4)**

15. (a) Write the preparation, properties and structure of S_4N_4. **(6)**

    (b) Write a note on charge transfer spectra. **(4)**

SECTION – C

Answer **any two** of the following : $(2 \times 10 = 20)$

16. (a) Give any three methods of synthesis of α-amino acids. **(6)**

    (b) Write a note on spin-spin coupling. **(4)**

17. (a) Describe the principle and applications of NMR spectra. **(6)**

    (b) Write a note on the iso-electric point of amino acid. **(4)**

18. (a) Describe the basic components of spectrophotometer. **(6)**

    (b) Give the reactions of Diethyl sulphide. **(4)**

SECTION – D

Answer **any two** of the following : $(2 \times 10 = 20)$

19. (a) State and explain Beer's law. **(6)**

    (b) State and explain Einstein's law of photochemical equivalence. **(4)**

20. (a) What is Quantum yield? Give reasons for (i) high quantum yield (ii) low quantum yield. **(6)**

    (b) Write a note on : **(4)**

    (i) Phosphorescence

    (ii) Fluorescence.

21. (a) Write a note on induced polarization. **(6)**

    (b) Calculate the value of Einstein's energy for the radiation frequency 3×10^{13} Hz. **(4)**

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V Semester B.Sc. Degree Examination, November/December 2019

Paper 5.2 – CHEMISTRY – VI

(New)

Time : 3 Hours

Max. Marks : 80

Instructions :

1) Section A contains questions from all the Sections.

2) Section B contains questions from Inorganic Chemistry.
   Section C contains questions from Organic Chemistry.
   Section D contains questions from Physical Chemistry.

3) Answer **all** the Sections A, B, C and D.

SECTION – A

Answer **any ten** of the following questions : $(10 \times 2 = 20)$

1. What are significant figures?

2. Define the term precision.

3. Write the classification of solvents.

4. Define radioactive displacement law.

5. Define Epimerisation.

6. What are iodine number of oil and fat?

7. What is Malachite green?

8. Write any two uses of Teflon.

9. Define cell constant.

10. State Kohlrausch's law.

11. State Hittorf's law.

12. Define number average and mass average molecular weight.

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Answer **any two** of the following questions : (2 × 10 = 20)

13. (a) Explain the factors affecting the choice of analytic methods. (6)

    (b) Write a note on safety in analytical laboratory. (4)

14. (a) Describe the general properties of solvents. (6)

    (b) Explain nuclear fission with equations. (4)

15. (a) Describe the structure of nucleus and nuclear models. (Liquid drop model) (6)

    (b) Give any two chemical reactions in liquid SO_2. (4)

SECTION – C

Answer **any two** of the following questions : (2 × 10 = 20)

16. (a) Write the synthesis of ethylacetoacetate with mechanism. (6)

    (b) Write the synthesis of methyl orange. (4)

17. (a) Explain the interconversion of Glucose into Fructose and vice-versa with equations. (6)

    (b) Explain the classification of carbohydrates. (4)

18. (a) Explain the manufacture of soap by modern continuous process. (6)

    (b) Explain thermoplastic and thermosetting polymers with examples. (4)

SECTION – D

Answer **any two** of the following questions : (2 × 10 = 20)

19. (a) Define specific molar and equivalent conductance with their units. (6)

    (b) How do you determine solubility and solubility product of sparingly soluble salt? (4)

20. (a) Explain Debye-Huckel-Onsagar equation for strong electrolytes. (6)

    (b) Explain conductometric acid-base titrations. (4)

21. (a) Explain the viscosity method of determination of molecular weight of polymers. (6)

    (b) The conductance of 0.1 N $AgNO_3$ solution taken in a cell with cell constant 0.9555 cm^{-1} is 0.0099 mhos. Calculate (i) Specific conductance (ii) Equivalent conductance. (4)

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