



**B.Sc. VI Semester (CBCS) Degree Examination,
August/September - 2022**

PHYSICS - VI

101300

6.1 : Nuclear Physics, Solid State Physics and Astrophysics

Time : 3 Hours

Maximum Marks : 70

Note : Answer *all* questions from **Section - A** in the first *two* pages only.

SECTION - A

Answer the following.

15 \times 1=15

1. Two nuclei of mass number in the ratio 1 : 8, what is the ratio of their nuclear radii ?
2. Define decay constant.
3. What is the principle of scintillation counter ?
4. What is bioenergy ?
5. What are thermonuclear reactions ?
6. Define Bravais lattice.
7. How many atoms per unit cell are present in a simple cubic crystal ?
8. What is Miller indices ?
9. How does Fermi energy vary with temperature ?
10. What is hysteresis loop in magnetism ?
11. Define magnetic susceptibility.
12. What is the importance of Cooper pairs in superconductivity ?
13. What is critical field of a superconductors ?
14. Define luminosity of a star.
15. What is a neutron star ?



P.T.O.

SECTION - B

Answer **any five** of the following.

5x5=25

16. Write a note on nuclear shell model.
17. Explain the characteristics of Alpha, Beta and Gamma particles.
18. Discuss the Langevin's Classical Theory of diamagnetism.
19. State and derive Bragg's law of X-ray diffraction.
20. Obtain an expression for electrical conductivity of metals.
21. Explain Meissner effect.
22. Draw and explain HR diagram.

SECTION - C

Answer **any three** of the following.

3x10=30

23. (a) What is a nuclear force ? Give the characteristics of nuclear forces. **5+5**
(b) Define mean life of a radioactive element and obtain the expression for it.
24. (a) Explain the principle and working of a Geiger Muller counter. **7+3**
(b) The frequency of the oscillating potential difference applied to the dees of a cyclotron is 7×10^6 Hz. Determine the magnetic field necessary to accelerate protons. Given; $e = 1.6 \times 10^{-19}$ C and $m_p = 1.6726 \times 10^{-27}$ kg.
25. (a) With neat diagram, explain the working of a nuclear reactor. **5+5**
(b) Write a note on wind energy.
26. (a) Explain Debye's Theory of specific heat of solids. **7+3**
(b) Mention the limitations of Einstein's Theory of specific heat.
27. (a) What is superconductivity ? Enumerate the applications of superconductors. **5+5**
(b) Write a note on formation and evolution of stars.

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PHYSICS - VIII

6.2 : Material Science and Electronics - II

Time : 3 Hours

Maximum Marks : 70

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

SECTION - A

Answer the following :

15x1=15

1. What is meant by ferrous material ?
2. Define metallic bonding in materials.
3. Which material has highest Mohr's hardness number ?
4. Define thermal conductivity of metals.
5. Define thin film.
6. Mention any one application of thin film.
7. What are nano-materials ?
8. What is a multivibrator ?
9. Positive feedback is used in (a) Amplifiers (b) Oscillators (c) Diodes
10. What is a OR-gate ?
11. Define flip-flop.
12. Define ring counter.
13. Write the diagram of an AM waveform with 100 percent modulation.
14. What is modulation ?
15. Define selectivity of the radio receiver.



P.T.O.

SECTION - BAnswer **any five** of the following questions :**5x5=25**

16. Explain Engineering classification of materials.
17. What is sputtering ? Explain sputtering deposition method of preparing thin film.
18. Write a note on quantum nano structures.
19. Write a note on Fatigue.
20. Explain the working of a half-adder with a logic circuit and truth table.
21. Explain J-K flip-flop.
22. Derive power relation in A.M wave.

SECTION - CAnswer **any three** of the following questions :**3x10=30**

23. (a) Compare crystalline and non-crystalline state of materials. (5+5)
(b) Explain Ionic bonding in materials with examples.
24. (a) List the differences between brittle structure and ductile structure. (5+5)
(b) Derive an expression for electrical conductivity in metals.
25. (a) What is a NAND gate ? Draw the logic symbol of a NAND gate. Why the NAND gate is called a Universal logic gate ? How does AND and OR gate be generated from using NAND gate ? (6+4)
(b) Simplify the following Boolean expression and draw the simplified logic circuit.
26. (a) What is an oscillator ? Write the two conditions for Barkhausen criterion. Explain with neat diagram the working of a Colpitt's oscillator. (7+3)
(b) In an R-C phase shift oscillator $R=10K\ \Omega$ $C=1Kpf$. Calculate the frequency of oscillations produced.
27. (a) Compare A.M and F.M. (5+5)
(b) Draw the block diagram of AM and FM receivers.

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6.1 : CHEMISTRY - VII

(NEW CBCS)

101707

Time : 3 Hours

Maximum Marks : 70

- Instructions :** (i) **Section-A** contains questions from Inorganic, Organic and Physical Chemistry
Section-B contains questions from Inorganic Chemistry,
Section-C contains questions from Organic Chemistry,
Section-D contains questions from Physical Chemistry
(ii) Answer **all** the **four** sections **A, B, C** and **D**.

SECTION - A

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

10x1=10

1. What are ingredients of glass ?
2. Name the extenders used in paint.
3. Give different types of air pollution.
4. What are Polyphosphazenes ?
5. Write the structure of Camphor.
6. Mention the uses of quinine.
7. What are hormones ?
8. What is peptide linkage ?
9. What do you mean by zero point energy ?
10. State Born-Oppenheimer approximation.
11. Classify the molecule into IR-active and IR-inactive ; CO, Cl₂.
12. What are Stokes-lines ?



P.T.O.

SECTION - BAnswer **any two** of the following questions.**2x10=20**

13. (a) How do you manufacture Portland cement by dry process ? 6
(b) Point out any four differences between inorganic and organic polymers. 4
14. (a) Write a note on industrial effluents, their effects and treatment. 6
(b) Explain briefly the constituents of paints. 4
15. (a) Explain the methods of preparation of silicones and its applications. 6
(b) Explain any four types of glasses. 4

SECTION - CAnswer **any two** of the following questions.**2x10=20**

16. (a) Explain the classification of Terpenes and state isoprene rule. 6
(b) Give the synthesis of nicotine. 4
17. (a) Write the classification of proteins on molecular shape. 6
(b) Give the synthesis of Adrenaline. 4
18. (a) Write biological importance of Vitamin A, B and D. 6
(b) Elucidate the structure of citral. 4

SECTION - DAnswer **any two** of the following questions.**2x10=20**

19. (a) What are electromagnetic radiations ? Give the important characteristic properties of electromagnetic radiations. 6
(b) The internuclear distance of CO molecule is 1.13 Å. Calculate the energy in Joules of this molecule in the first excited rotational level. The atomic masses are $^{12}\text{C} = 1.19 \times 10^{-26}$ kg, $^{16}\text{O} = 1.66 \times 10^{-26}$ kg 4
20. (a) Write a note on pure rotational Raman spectra of a diatomic molecule. 6
(b) Explain the effect of isotopic substitution in case of rotational spectra. 4
21. (a) Derive energy equation for vibrational spectra of Anharmonic oscillator for a diatomic molecule. 6
(b) Explain briefly the factors which affect the intensity of spectral lines. 4

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CHEMISTRY - VIII

101666

**6.2 : Chemistry
(NEW CBCS)**

Time : 3 Hours

Maximum Marks : 70

Instructions :

- (i) **Section-A** contains questions from Inorganic, Organic and Physical Chemistry
- (ii) **Section-B** contains questions from Inorganic, Chemistry
Section-C contains questions from Organic Chemistry and
Section-D contains questions from Physical Chemistry
- (iii) Answer **all** the **four sections A, B, C and D**

SECTION - A

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

10x1=10

1. Give the IUPAC name of the $\text{Fe}(\text{CO})_5$.
2. What are Nanomaterials ?
3. What are cytochromes ?
4. What are non-essential trace elements ?
5. What is meant by food adulteration ?
6. Draw the molecular orbital picture of furan.
7. What are tranquilizers ?
8. Write one use of gammexine.
9. What is Galvanic cell ?
10. Define over voltage.
11. Define standard electrode potential.
12. Electrode potential of Zn/Zn^{2+} and Cu/Cu^{2+} electrodes are -0.76V and 0.34V respectively. Calculate EMF of cell constructed with them.



P.T.O.

SECTION - BAnswer **any two** of the following questions.**2x10=20**

13. (a) Write a note on preparation, structure and bonding of metal carbonyls. 6
(b) Explain briefly the structure and functions of haemoglobin. 4
14. (a) Explain the structure and preparation of ferrocene. 6
(b) Write a note on particle reinforced, fiber reinforced and structural composites. 4
15. (a) Write a note on Nanomaterials. 6
(b) Write a note on metalloenzymes briefly. 4

SECTION - CAnswer **any two** of the following questions.**2x10=20**

16. (a) Write any two methods of synthesis of thiophene. 6
(b) Write a note on analysis of moisture in spices. 4
17. (a) How do you analyse ash in honey ? 6
(b) Write any two substitution reactions of pyrrole. 4
18. (a) Explain the synthesis of antipyrine and chloramine - T. 6
(b) Write the synthesis and use of paracetamol. 4

SECTION - DAnswer **any two** of the following questions.**2x10=20**

19. (a) Derive an expression for EMF of the concentration cell with transference. 6
(b) Write a note on Calomel electrode with neat labelled diagram. 4
20. (a) Explain the method of determination of pH of a solution using glass electrode. 6
(b) Write a note on liquid junction potential. 4
21. (a) Explain the construction and working of Hydrogen-Oxygen fuel cell. Write its importance. 6
(b) Write a note on potentiometric redox titrations. 4

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MATHEMATICS - XIII

6.2 : Numerical Analysis

Time : 3 Hours

Maximum Marks : 70

Note : (i) Answer **all** the sections.

(ii) Non-programmable calculators may be used.

SECTION - A

I. Answer **any five** of the following.

2x5=10

1. Evaluate 'e' to 4 significant figures and determine the absolute and relative error.
2. State Regula-falsi Method.
3. Construct the backward difference table given that :

x	10	20	30	40	50
y	1	1.3010	1.4771	1.6021	1.6990

 Find the value of $\nabla^2 y_2$.
4. Prove that $\nabla = \Delta \bar{E}^{-1}$.
5. State Lagrange interpolation method.
6. Evaluate $\Delta \log x$.
7. Define Euler rule.

SECTION - B

II. Answer **any five** of the following.

6x5=30

8. Find the root of the equation $x + \log_{10} x = 3.375$ near 2.9 correct to four significant figures.
9. Find the real root of the equation $x^3 + x + 1 = 0$ that lies near 0.65 and correct to three decimal place by iterative method.
10. Use Gauss-Seidel iteration method to solve $10x + y + z = 12$; $2x + 10y + z = 13$; $2x + 2y + 10z = 14$.



P.T.O.

11. Find a polynomial of degree 2 which takes the values.

x	1	2	3	4
$f(x)$	2	2	4	8

12. The population of a town is as follows :

year	1921	1931	1941	1951	1961	1971
pop in lakhs	10	14	19	26	36	41

Estimate the increase in population during the period 1955 to 1961.

13. Express $f(x) = 3x^3 + 2x^2 - 5x - 5$ in factorial notation and also find its successive difference.

SECTION - C

- III. Answer **any five** of the following.

6x5=30

14. The following table gives the temperature 'θ' of a cooling body at different instants of time t in seconds

t	1	3	5	7	9
θ	85.3°	74.5°	67.0°	60.5°	54.3°

find the rate of cooling at t=8 seconds.

15. Evaluate $\int_0^1 \frac{dx}{1+x}$ by trapezoidal rule by considering eight sub-intervals of the interval (0, 1).

16. Evaluate $\int_0^1 \frac{dx}{1+x^2}$ by Simpson $\frac{1}{3}$ rule by dividing the interval (0,1) into six equal parts.

17. Solve the differential equation $\frac{dy}{dx} = x - y^2$ by using Picard Method given $y(0)=1$ for $x=0.1$ upto 2nd approximation.

18. Using Euler modified method solve $\frac{dy}{dx} = x^2 + y$ where $y=0.94$ when $x=0$ for $x=0.1$.

19. Find the approximate solution at $x=1.2$ of the equation $\frac{dy}{dx} = xy$ given $y(1)=2$ by Runge - Kutta Method.

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MATHEMATICS - XIV (OPTIONAL)

101225

6.3 : Graph Theory - II
(NEW CBCS)

Time : 3 Hours

Maximum Marks : 70

Instructions : Answer **all** Sections.

SECTION - A

Answer **any five** of the following.

5x2=10

1. Define balanced diagram with an example.
2. Find the out degree and in degree.



3. Define total graph and find $T(P_3)$.
4. Define inner vertex set. Find the inner vertex set of $K_{2,4}$.
5. A connected planar graph G has 9 vertices with degrees 2, 2, 3, 3, 3, 4, 5, 6, 6. Find the number of regions or faces of G .
6. Find chromatic number of K_4 and C_6 .
7. Define underlying graph.



P.T.O.

SECTION - B

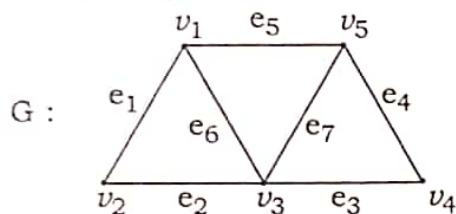
Answer **any five** of the following.

5x6=30

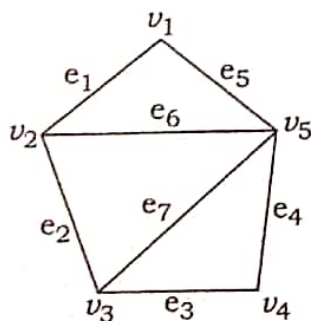
8. Define incidence matrix and find the graph whose incidence matrix is :

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

9. Find the cycle matrix of the graph G shown below.



10. If G is a (p, q) graph whose vertices have degrees d_i then show that $L(G)$ has q vertices and q_L edges where $q_L = \sum d_i^2 - q$.
11. Let G be a connected planar graph with p vertices, q edges and r regions (or faces) then prove that $q - p + 2 = r$.
12. Show that K_5 and $K_{3,3}$ are non-planar.
13. Let G be a connected planar graph with p vertices and q edges ($q > 2$), r -regions then prove that :
- (i) $q \geq \frac{3}{2}r$
- (ii) $q \leq 3p - 6$
14. Find the incidence matrix of the graph.



SECTION - C

Answer **any five** of the following.

5×6=30

15. Prove that a cycle with n vertices is 2-chromatic if n is even and 3-chromatic if n is odd.
16. If G is K -critical graph then prove that $\delta(G) \geq k-1$.
17. Prove that every connected simple planar graph G is 6-colorable.
18. If D is a digraph of order p and size q with $V(D) = \{v_1, v_2, v_3, \dots, v_p\}$ then prove that $\sum_{i=1}^p \text{od } v_i = \sum_{i=1}^p \text{id } v_i = q$.
19. If $\Delta(G)$ is the maximum of the degrees of the vertices of a graph G , then prove that $\chi(G) \leq 1 + \Delta(G)$.
20. Determine the chromatic polynomial of the cycle C_4 .
21. If G is connected graph and $e = \{a, b\}$ is an edge in G then $P(G_e, \lambda) = P(G, \lambda) + P(G'_e, \lambda)$.

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BOTANY - VI

6.1 : Plant Breeding, Biotechnology and Plant Tissue Culture

Time : 3 Hours

Maximum Marks : 70

- Note :** (i) Answer **all** the questions.
(ii) Draw diagram wherever necessary.

SECTION - A

I. Answer **all** the following questions.

15x1=15

1. What are plasmids ?
2. What is Bagging ?
3. What is Pollen Bank ?
4. Define the term callus.
5. Expand ELISA.
6. What is Scion ?
7. What is gene gun ?
8. Define DNA Ligase.
9. What is Biotechnology ?
10. What are synthetic seeds ?
11. What are polyclonal Antibodies ?
12. What is mass selection ?
13. What is intraspecific hybridization.
14. What is Grafting ?
15. What is genetic Engineering ?



P.T.O.

SECTION - B

II. Answer **any five** of the following.

5x5=25

16. Write a note on DNA Finger printing technology.
17. Explain gooting and wedge grafting.
18. Write the applications of plant tissue culture.
19. What is plant breeding add a Note on Their scope and objectives ?
20. Explain the somatic Embryogenesis.
21. Write a Note on Recurrent Selection.
22. Describe with Neat labelled diagram of pBR-322.

SECTION - C

III. Answer **any three** of the following.

3x10=30

23. How transgenic plants are produced ? Explain with reference to BT-Cotton.
24. Explain the process involved in recombinant and DNA technology.
25. Explain pure line selection method of plant breeding.
26. What is haploid culture ? Describe anther Culture.
27. What are vectors ? Discuss the vectors along with Ti plasmid vectors used for gene transfer in plants.

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BOTANY - VIII

6.2 : Plant Physiology

100548

Time : 3 Hours

Maximum Marks : 70

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- Note :** (i) Answer **all** questions.
(ii) Diagram will enhance the value of answers.
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SECTION - A

I. Answer **all** the following questions.

15×1=15

1. What is Imbibition ?
2. What are hydathodes ?
3. What is active absorption of water ?
4. Who proposed the mass flow hypothesis ?
5. Give a general formula of photosynthesis.
6. What are C₃ plants ?
7. What are Quantosomes ?
8. Define growth.
9. Mention the hormone that brings about parthenocarpy.
10. What is aerobic Respiration ?
11. What is an ascent of sap ?
12. What is semipermeable membrane ? Give an example.
13. Expand FAD.
14. What is root pressure?
15. What is Vernalization?



P.T.O.

SECTION - B

II. Answer **any five** of the following questions.

5x5=25

16. What is photophosphorylation ? Describe non-cyclic Photophosphorylation.
17. Explain theory of transpiration pull and cohesion force.
18. What are enzymes ? Write the classification of enzymes.
19. What is Auxine ? Explain practical applications of Auxins.
20. Write a short note on :
 - (a) R.Q
 - (b) Guttation
21. Transpiration is a necessary evil ? Justify the statement.
22. Illustrate the Mechanism of Electron transport system.

SECTION - C

III. Answer **any three** of the following questions.

3x10=30

23. Describe biochemical reaction of E.M.P pathway with schematic representation.
24. Where does Calvin Cycle takes place ? Explain the process in detail.
25. Write a short note on :
 - (a) Phototropism
 - (b) Kranz anatomy
26. What is active absorption of salt ? Explain the mechanism of active absorption.
27. What will happen if a plant cell is kept in a hypertonic and hypotonic solution, discuss and write the significance of plasmolysis.

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**B.Sc. VI Semester (CBCS) Degree Examination,
August/September - 2022**

**ZOOLOGY - VI
Z - 6.1 GENETICS & BIOTECHNOLOGY**

100545

Time : 3 Hours

Maximum Marks : 70

- Note :** (i) Answer **all** the questions.
(ii) Draw neat labelled diagrams wherever necessary.

SECTION-A

Answer **any five** of the following in **one** or **two** sentences each :

5x2=10

1. What is Y-Linked inheritance ? Give example.
2. Define Eugenics.
3. What is degeneracy ?
4. What is Crossing over ?
5. Define barr body and Gynandromorphs.
6. What is Zig-Zag inheritance ? Give example.

SECTION-B

PART-A

Answer **any four** of the following :

4x5=20

7. Give an account of XX-XY type of Sex determination in Human beings.
8. Describe the Lamp brush Chromosome with a neat labelled diagram.
9. Briefly explain the Phenylketonuria and Alkaptonuria.
10. Briefly explain the branches of Genetics.



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11. Explain the inheritance of Supplementary factors by taking comb pattern in fowls (9:3:3:1)
12. What is colour blindness ? Explain with suitable example.

PART-B

Answer **any two** of the following :

2x5=10

13. Write the differences between DNA and RNA.
14. Describe the applications of r-DNA technology.
15. Describe the properties of Genetic code.

SECTION-C**PART-A**

Answer **any two** of the following :

2x10=20

16. Describe the multiple gene inheritance with respect to the skin colour in man (1:4:6:4:1)
17. Explain the causes and symptoms of Down's Syndrome and Klinefelter's syndrome.
18. What is sexlinked inheritance ? Explain it with reference to the Eye colour in *Drosophila*.

PART-B

Answer **any one** of the following :

1x10=10

19. With the help of neat labelled diagram explain Watson and Crick model of DNA.
20. Explain the process of Protein Biosynthesis in detail.

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**B.Sc. VI Semester (CBCS) Degree Examination,
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ZOOLOGY - VII

100541

Z-6.2 : Ethology, Evolution and Zoogeography

Time : 3 Hours

Maximum Marks : 70

Note : (i) Answer **all** the **Sections**.

(ii) Draw labelled diagrams wherever necessary.

SECTION-A

Answer **any five** of the following.

5x2=10

1. What is amphidromous migration ? Give example.
2. Define irritability and Kinesis.
3. What is biogenesis ? Who proposed the theory of biogenesis ?
4. Mention the significance of Zoogeography. Who is the father of Zoogeography ?
5. What do you mean by gene pool and genetic flow ?
6. What is trophallaxis ? Give example.

SECTION-B

(A) Write a short note on **any four** of the following.

4x5=20

7. Briefly explain about the Social Organization in Honeybee.
8. Give an account of an experiment of Pavlov on Dogs for conditional reflex.
9. Describe the types of migration in birds.
10. Write a short note on Anadromous migration with example.
11. Explain briefly about the warning and Aggressive mimicry with suitable examples.
12. Briefly explain the courtship behaviour in Scorpion and Jacana.



P.T.O.

(B) Answer **any two** of the following.

2x5=10

13. Write a short note on the types of Speciation.
14. Briefly explain Nearctic realm and Oriental realm.
15. Describe the principles of Hugo Devries theory of Evolution.

SECTION-C

(A) Answer **any two** of the following.

2x10=20

16. Describe the different kinds of parental care in Amphibians with examples.
17. Briefly explain the types of nests. Add a note on the nesting behaviour in birds with suitable example.
18. Briefly explain the principles of courtship behaviour with suitable examples.

(B) Answer **any one** of the following.

1x10=10

19. Explain the detail account of the principles of Darwinism.
20. Give the detailed note on Anatomical evidences in favour of organic evolution.

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