UG-C-457 **BPHY–11**

B.Sc. DEGREE EXAMINATION – DECEMBER 2020

PHYSICS

First Year

MECHANICS, PROPERTIES OF MATTER AND SOUND

Time : 3 Hours Maximum Marks : 75

PART - A ($5 \times 3 = 15$ marks)

Answer ALL questions.

1. Calculate the tangential and normal forces acting on a projectile thrown horizontally from the top of a building.

2. State and explain Newton's law of universal gravitation.

3. What are the units and dimensions of stress, strain, poisson's ratio and modulus of elasticity?

4. A metal plate of $10cm^2$ square rests on a $2 \times 10^{-3} m$ thick of castor oil layer. Calculate the horizontal force needed to move the plate at 0.03 ms^{-1}. coefficient of viscosity of castor oil 1.5 nsm^{-2}.

5. Explain Doppler effect.

PART - B ($5 \times 12 = 60$ marks)

Answer ALL questions.

6. (a) Find, the velocities and direction of the smooth spheres after oblique impact.

Or

(b) Explain (i) Elastic collision (ii) Inelastic collision (iii) Newton's law of impact. respectively.

7. (a) Determine the radius of 'g' with lattitude, altitude and depth.

Or

(b) Describe the method of calculating 'G' using Boy's method.

8. (a) Describe with relevant theory of an experiment to determine young's moduls of the material of the bar by uniform bending.

Or

(b) Determine the rigidity moduls of a wire experimentally by using the torsion pendulum. Give the necessary theory.

9. (a) Describe with necessary theory stoke's method of determining the viscosity of a highly viscous fluid.

Or

(b) Derive Poiseuille's formula for the rate of flow of liquid through a capillary tube. Describe experimental methods for determining the coefficient of viscosity of a liquid at room temperature.

10. (a) Using melde's string how you can determine the frequency of a tuning folk.

Or

(b) Explain the following :

(i) Composition of two SHM and beats.

(ii) Properties of ultrasonics and acoustics.

UG-C-541	BPHY-12

B.Sc. DEGREE EXAMINATION – DECEMBER – 2020

PHYSICS

FIRST YEAR

Optics and Spectroscopy

Time : 3 Hours **Maximum Marks : 75**

PART – A **(5 x 3 = 15 Marks)**

Answer All questions. Each question carry equal marks.

1. What do you understand by spherical aberration?
2. What is an air wedge?
3. Mention any two similarities between zone plate and convex lens.
4. What is double refraction?
5. Define population inversion

PART – B **(5 X 12 = 60 Marks)**

Answer All questions. Each question carry equal marks.

6. (a) Explain spherical aberration in lenses. Describe the methods of minimizing the spherical aberration in lenses.

OR

(b) Obtain the condition for achromatism of two thin lenses when placed in contact and separated by a distance.

7. (a) Explain interference and also explain how interference takes place in the case of thin films due to reflected light.

OR

(b) Describe an experiment to determine the wavelength of monochromatic light using biprism.

8. (a) Give the theory of plane transmission grating.

OR

(b) Derive an expression for the resolving power of a microscope.

9. (a) Write a note on

(i) Pile of plates and

(ii) Uniaxial crystals.

OR

(b) Explain the production and detection of plane and circularly polarised light.

10. (a) Explain Raman effect, Give the quantum theory of Raman effect.

OR

(b) Explain the following:

i) Induced absorption

ii) Spontaneous emission and

iii) Stimulated emission.

UG-C-545 **BPHY - 21**

B.Sc. DEGREE EXAMINATION – DECEMBER 2020

SECOND YEAR

HEAT AND THERMODYNAMICS

Time : 3 Hours **Maximum marks : 75**

PART-A **(5 X 3=15 Marks)**

Answer ALL Questions

1. Define specific heat capacity of liquid. Why gas has two specific heat capacities?
2. State and explain Maxwell's law of equipartition of energy.
3. Describe temperature – entropy diagram
4. Define Wiedmann Franz law and explain how it is related with particle velocity
5. Give a brief idea of Phase space.

PART-B **(5 × 12 = 60 Marks)**

Answer ALL questions

6. a. Discuss the experimental setup to determine the specific heat capacity of a liquid by Joule's Electrical method.

   Or

   b. Explain in detail the Debye's theory on specific heat of gas

7. a. Write Maxwell's law of distribution of velocities for molecules of a gas. Hence obtain the relation between most probable velocity, average velocity and root mean square velocity for the molecules of the gas. .

   Or

   b. Define Molar heat ratio. Discuss the atomicity of gases in detail.

8. a. Derive Classius-Clapeyron equation of latent heat. Explain its effect on change of pressure in melting and boiling point.

   Or

   b. i. State and explain third law of thermodynamics.
   ii. Discuss the change in entropy during reversible and irreversible cycle.

9. a. Discuss Lee's disc method for finding the coefficient of thermal conductivity of a bad conductor. Can this method be used for good conductors?

   Or

   b. i. State and explain Newton's law of cooling
   ii. Explain the radial and cylindrical flow of heat.

10. a. Applying Maxwell-Boltzmann distribution law show that the internal energy of an ideal mono atomic gas depends only on its temperature.

Or

b. Derive the Bose- Einstein distribution law.

UG-C-460	BPHY-22

B.SC. DEGREE EXAMINATION – DECEMBER 2020

PHYSICS

SECOND YEAR

ELECTRICITY AND MAGNETISM

Time : 3 Hours **Maximum marks : 75**

(5 X 3=15 Marks)

PART - A

Answer **ALL** Questions

1. State and prove Gauss's law
2. Explain briefly about thermo electric diagrams
3. Explain the electromagnetic induction laws
4. What is meant by skin effect? What are the factors affecting skin effect?
5. Derive the relation between Permeability and Susceptibility

PART B

(5 × 12 = 60 Marks)

Answer **ALL** questions

6. a. Obtain expressions for the potential at an external point and at an internal point due to a uniformly charged non conducting solid sphere

Or

b. i. State and explain Gauss theorem in electrostatics

ii. Deduce Coulomb's inverse square law from Gauss's law.

7. a. Explain the principle, experimental set up and working of Wheatstone's bridge with neat diagram

Or

b. Explain the principle, experimental set up and working of Carey Foster's bridge with neat diagram

8. a. Discuss the experimental determination of mutual inductance. Obtain an expression for coefficient of coupling.

Or

b. Discuss how the charge and discharging of a capacitor through a high resistor helps it measurement.

9. a. Explain the working of series and parallel resonance ac circuits. Discuss the resonance conditions and compare the same.

Or

b. Discuss the current flow through LC, LR and RC circuits

10. a. Discuss the Langevin's theory of Para magnetism in detail.

Or

b. Discuss the Langevin's theory of Para magnetism in detail

UG-C-546	BPHY-31

UG DEGREE EXAMINATION – DECEMBER - 2020

PHYSICS

THIRD YEAR

ATOMIC AND SOLID STATE PHYSICS

Time: 3 Hours **Maximum Marks: 75**

Part A (5 x 3 = 15 Marks)

Answer ALL questions

1. What do you understand by critical potential?
2. Explain the fine structure of sodium D-lines.
3. Discuss the rotating crystal method of crystal studies.
4. What is a photo-multiplier? Explain.
5. What are Miller indices?

Part B (5 x 12 = 60 Marks)

Answer ALL questions

6. a) Explain Sommerfeld relativistic atom model. Obtain the condition for the allowed elliptical orbits.

Or

b) (i) Explain L-S and j-j coupling of angular moment

(ii) State and explain Pauli's exclusion principle

7. a) Show that the electron around the nucleus has magnetic moment due to orbital and spin motion.

Or

b) Derive an expression for Lande's splitting factor and explain the anomalous Zeeman effect for the sodium D lines.

8. a) Describe the continuous and characteristic X-ray spectra.

Or

b) (i) State and explain Moseley's law. Give its importance.

(ii) Explain the powder crystal method to investigate the crystal structure.

9. a) Derive Einstein's photoelectric equation. Describe Millikan's experiment to verify the same.

Or

b) What is photoelectric effect? Describe the Richardson and Compton experiment to study the photoelectric phenomena and hence give the laws of photoelectric emission.

10. a) (i) Obtain the atomic radius of SC, FCC and BCC crystals.

(ii) Describe the diamond crystal.

Or

b) Discuss the atomic packing factor of SC, FCC and BCC structure and hence show that FCC is more closely packed than BCC crystal structure

BPHY–32

B.SC. DEGREE EXAMINATION – DECEMBER - 2020

PHYSICS

THIRD YEAR

WAVE MECHANICS AND NUCLEAR PHYSICS

Time: 3 Hours Maximum Marks: 75

PART A (5 × 3 = 15 Marks)

Answer ALL questions.

1. State and explain Heisenberg's Uncertainity Principle.
2. Mention the properties of wave function.
3. Explain the concept of Binding energy with one example.
4. Define and derive the expression for mean life Time.
5. Distinguish between Nuclear Fission and Fusion with one example.

PART B (5 × 12 = 60 Marks)

Answer ALL questions.

6. (a) Describe G.P. Thompson experiment and Mention the important conclusion.

Or

(b) Explain the concept of wave nature of an electron using Davisson and Germer's experiment.

7. (a) Derive an expression for Time dependent Schrodinger's equation.

Or

(b) Explain in detail about a rigid rotator and mention its significance.

8. (a) Derive an expression for semi empirical mass formula.

Or

(b) Explain shell model with evidences.

9. (a) Explain the construction and the working of Cyclotron.

Or

(b) Describe the construction and the working of Linear Accelerator.

10. (a) Write a note on i). Carbon-Nitrogen Cycle

ii). Proton-Proton Cycle

Or

(b) Explain the principle and working of a nuclear reactor.

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BPHY-33

B.Sc. DEGREE EXAMINATION – DECEMBER – 2020

PHYSICS

Third Year

BASIC AND DIGITAL ELECTRONICS

Time: 3 Hours **Maximum Marks: 75**

Part A (5x3 = 15 Marks)

Answer ALL questions

1. What is a MOSFET? Give any two applications.
2. Give the working of a subtractor using op-amp with a neat diagram.
3. Given $(29A.8)_{16} = (x)_8 = (y)_{10}$. Find x & y.
4. Draw the circuit and explain a ring counter?
5. Write a program to add two 8 bit hex number.

Part B (5x3 = 15 Marks)

Answer ALL questions

6. A) What is a filter circuit? Explain low, high and band pass filters with a neat diagram.

   Or

   B) Explain the different transistor configurations. Obtain the relation between α, β and γ.

7. A) Draw the circuit diagram of a RC coupled amplifier. Obtain the expressions for voltage gain at low, mid and high frequencies.

   Or

   B) Explain with neat circuits, the working of an Operational amplifier as Inverting and Non-inverting summing amplifier.

8. A) Simplify the SOP, F(ABCD) = Σ(1,2,3,4,7,9,11,13,15) using K-map and hence draw the logic circuit diagram using AND, OR, NOT gates.

   Or

   B) Show that NOR gate is a universal gate and hence give the necessary

9. A) Explain the working of a full adder with a necessary diagrams.

   Or

B) Describe the working of a JK Master Slave flip-flop with a neat diagram.

10. A) Explain in detail the data transfer instructions of 8085 with necessary examples.

Or

B) (i) Discuss the branching operations in 8085.

(ii) Explain: Debugging, Looping, Subroutines.

BPHY-34

B.SC. DEGREE EXAMINATION – DECEMBER - 2020

PHYSICS

THIRD YEAR

MATHEMATICAL PHYSICS

Time: 3 Hours Maximum Marks: 75

PART A (5 × 3 = 15 Marks)

Answer ALL questions.

1. State D' Alembert's principle.
2. Define Phase Space.
3. Find the value of $\Gamma(-\frac{1}{2})$ and $\beta(3,2)$.
4. Show that $A=\begin{pmatrix} \frac{1}{\sqrt{2}} & \frac{i}{\sqrt{2}} \\ \frac{-i}{\sqrt{2}} & \frac{-1}{\sqrt{2}} \end{pmatrix}$ is a unitary matrix.
5. Show that $\vec{F}=(2xy+z^3)\hat{i}+x^2\hat{j}+3xz^2\hat{k}$ is a conservative force field.

PART B (5 × 12 = 60 Marks)

Answer ALL questions.

6. (a) Define generalized coordinates. Obtain expressions for generalized displacement, velocity, momentum and force.

Or

(b) Derive Lagrangian's equation of motion from D'Alembert's principle for a holonomic conservative system.

7. (a) Derive Hamilton's canonical equation of motion from the Lagrangian equations using Lagrange transformations.

Or

(b) Obtain the Hamiltonian and Hamilton's equation for the two dimensional harmonic oscillator.

8. (a) Show that $2^{2m-1}\Gamma(m)\Gamma(m+\frac{1}{2}) = \sqrt{\pi}\Gamma(2m)$

Or

(b) Find the Relation between Gamma and Beta functions.

9. (a) Diagonalize the matrix $A = \begin{pmatrix} 2 & -2 & 3 \\ 1 & 1 & 1 \\ 1 & 3 & -1 \end{pmatrix}$.

Or

(b) Find the characteristic equation of the matrix $A = \begin{pmatrix} 1 & 2 & 3 \\ 2 & -1 & 4 \\ 3 & 1 & 1 \end{pmatrix}$ and verify the Cayley-Hamilton theorem.

10. (a) Show that i). $div(\phi A) = \phi divA + A \cdot grad\phi$

ii). $curl(A \times B) = (B \cdot \nabla)A - (A \cdot \nabla)B + AdivB - BdivA$.

Or

(b) State and prove the Stoke's theorem.

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UG-C-442 BPHYA-01

B.Sc. DEGREE EXAMINATION - DECEMBER 2020

PHYSICS

FIRST YEAR

DIFFERENTIAL EQUATIONS

Time: 3 Hours **Maximum Marks: 75**

Section A (5 x 5 = 25 Marks)

Answer any **FIVE** questions:

1. Solve: $\frac{dy}{dx} + y \cot x = \sin 2x$

2. Solve: $\frac{d^2y}{dx^2} - 3\frac{dy}{dx} + 2y = 0$

3. Solve: $\frac{dx}{y^2} = \frac{dy}{-xy} = \frac{dz}{x(z-2y)}$

4. Solve: $p + q = \sin x + \sin y$

5. Solve : $p^2z^2 + q^2 = 1$.

6. Find $L\left(\frac{e^{3t} - e^{-2t}}{t}\right)$

7. Show that $L\,(e^{-at} f(t)) = F\,(s + a)$ where $F(s) = L\,(f(t))$.

8. Find the particular integral to $(D^2 - 4D - 12)\, y = \sin x \sin 2x$.

Section B (5 x 10 = 50 Marks)

Answer any **FIVE** questions.

9. Solve: $xy\,p^2 + (x + y)\,p + 1 = 0$.

10. Solve: $(D^2 - 4D + 3)\,y = x^3e^{2x}$

11. Solve by method of variation of parameters $\frac{d^2y}{dx^2} + y = cosec\ x$

12. Solve $(mz - ny)\,dx + (nx - lz)\,dy + (ly - mx)\,dz = 0$.

13. Solve $(y^3x) - 2x^4)\,p + (2y^4 - x^3y)q = qz\,(x^3 - y^3)$.

14. Solve $\frac{dx}{dt} = 2x - 3y, \frac{dy}{dt} = y - 2x$ using laplace transformations given that $x(0) = 8$, $y(0) = 3$.

15. Solve: $(p^2 + q^2)y = qz$.

16. Solve: $(x^2D^2 - 2xD - 4)y = x^2 + 2logx$

UG-356 **BPHYA-02**

B.Sc. DEGREE EXAMINATION – DECEMBER 2020.

SECOND YEAR

GENERAL CHEMISTRY

Time : 3 hours Maximum marks : 75

PART A — (3 × 5 = 15 marks)

Answer any THREE questions.

1. Illustrate the formation of the following bonds. (5)
   (a) Covalent bond
   (b) Hydrogen bond.

2. Account the following. (5)
   (a) Polymerization
   (b) Sublimation

3. Define the terms with a suitable example. (5)
   (a) Autocatalysis. (b) Enzyme catalysis.

4. Give the definition and uses of (5)
   (a) Dettol
   (b) Anaesthetics.

5. What do you understand by the term green-house effect? (5)

PART B — (4 × 15 = 60 marks)

Answer any FOUR questions.

6. (a) Write a short note on molarity, normality.

   (5 + 10)

   (b) Discuss the analysis of end point in Volumetric titration using indicators.

7. (a) How will you purify an organic compound using fractional crystallization? (5 + 10)
   (b) Explain thin layer chromatography and its applications.

8. (a) Explain lock and key theory. (5 + 5 + 5)

(b) Discuss the vulcanization of rubber.

(c) Discuss the preparation and uses of Teflon.

9. (a) Write the structure, occurrence and deficiency disease caused by vitamin A and vitamin E. (6 + 4 + 5)

(b) List out the uses of pamaquine.

(c) Give the uses of streptomycin.

10. (a) Write a note on acid rain. (5 + 4 + 6)

(b) How do chemists handle poisonous chemicals?

(c) What is the first aid techniques used in chemical laboratory?

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