

**PGIIS-N 1511 B-2K13**  
**M.Sc. IIIrd Semester (CBCS) Degree Examination**  
**Physics**  
**(Biophysics - I)**  
**Paper - SCT-3.2**  
**(New)**

Time : 3 Hours

Maximum Marks : 80

**Instructions:**

Answer all the questions of 15 marks each and any two questions of 10 marks each.

1. What are thermodynamical potentials? Discuss chemical and redox potentials (15)

**OR**

2. Explain in detail, mechanism of energy trapping and transfer (15)

3. Give the structure of cell membrane. Discuss transport across membranes. (15)

**OR**

4. What are bio potentials? Explain in detail Nernst's - planck equation (15)

5. What are auditory receptors? Discuss the mechanism of sound perception (15)

**OR**

6. What are somatic and visceral receptors? Discuss the mechanism of muscle contractility and motility (15)

7. Explain immunal responses. Give the detailed account of immunological memory (15)

**OR**

8. What is genetic code? Give the description of genome organization (15)

9. What is Kreb's cycle, explain? (10)

10. Explain information processing in neural system (10)
  11. Write a note on generator potentials (10)
  12. Write a note on neural nets. (10)
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**PGIIS-N 1509 B-2K13****M.Sc IIIrd Semester(CBCS) Degree Examination****Physics****(Nuclear Physics - I)****Paper -SCT-3.2****(New)**

Time : 3 Hours

Maximum Marks : 80

**Instructions to Candidates :**Answer all the questions of **15** marks each and any **two** questions of **10** marks each.

1. Discuss scattering of thermal neutrons from ortho and para hydrogen. Hence prove that nuclear force is spin dependent. (15)

**(OR)**

2. Give the effective range theory of p-p scattering at low energy. Comment on scattering length. (15)
3. What are the evidences of the collective motion in nuclei? Briefly discuss the rotational motion of even - even nuclei and obtain an expression for the energy eigen values(15)

**(OR)**

4. Considering the neutrons and protons of the nucleus as independent, fully degenerate fermi gas, obtain expression for the fermi energy of protons and neutrons. (15)
5. Explain why some elementary particles are called strange particles. Give Gellman - Nishijima scheme and predict the strangeness quantum number of all the baryons.(15)

**OR**

6. What are fundamental interactions? Give their salient features by comparing and contrasting their basic properties. (15)
7. Describe the Quark model and show how it explains the composition of baryons (15)

(OR)

8. Discuss Grand Unified Theory (GUT) and proton decay (15)
  9. Discuss the ground state properties of deuteron (10)
  - 10 Write a note on shell model predictions (10)
  11. Briefly discuss non conservation of parity in weak interactions. (10)
  12. Write and explain Gellmann - Okubo mass formula. (10)
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**PGIIS -N 1512 B-2K13**  
**M.Sc. IIIrd Semester(CBCS) Degree Examination**  
**Physics**  
**(Mechanics)**  
**Paper - OET-3.1**  
**(New)**

Time : 3 Hours

Maximum Marks :80

**Instruction :**Answer all the questions of **15** marks each and any **two** questions of **10** marks each

1. a) State and prove the laws of conservation of energy, linear momentum and angular momentum for single particle system (10+5)  
b) State and explain D'Alembert's principle  

(OR)
2. a) State and explain Kepler's laws of planetary motion (6+9)  
b) Derive Lagrangian equation of motion using D'Alembert's principle
3. a) State the postulates of special theory of relativity (4+11)  
b) Discuss the Lorentz transformations and their consequences  

(OR)
4. a) What is meant by four dimensional formulations? Explain (6+9)  
b) Explain the conservation of four momentum and its application
5. a) Discuss inadequacy of classical mechanics and state the postulates of quantum mechanics. (10+5)  
b) Explain Heisenberg's uncertainty principle.  

(OR)
6. a) State and Explain Ehrenfest's theorem. (6+9)  
b) Solve the problem of Harmonic oscillator using schrodinger equation.

- 7 a) What are canonical, micro canonical and grand canonical ensembles (8+7)  
b) Derive the Boltzmann equipartition theorem.

(OR)

8. a) What is Gibb's paradox and discuss its remedy. (10+5)  
b) Distinguish between fermions and bosons.

9. Compare Newtonian and Lagrangian formulations of mechanics (10)

10. Explain the relativistic Doppler's effect. (10)

11. Solve the square well potential problem and obtain its Eigen values. (10)

12 Write a note on phase space. (10)

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**PGIIS-O 1507 B-2K13****M.Sc. IIIrd Semester (Non - CBCS) Degree Examination****Physics****(Nuclear Physics - I)****Paper - 3.3****(Old)**

Time : 3 Hours

Maximum Marks . 80

**Instructions to candidates:**

1. Answer any **six** questions of 12 marks each.
2. Question No. 9 is compulsory.

1. Outline the theory of deuteron assuming a spherically symmetric central square potential and show that it is loosely bound as well as it exists both in S and D state. (12)
2. Derive expressions for the scattering cross section for slow neutron scattering for para and ortho hydrogen. Show that these results verify Wigner's hypothesis of spin dependence of nuclear interactions. (12)
3. Arrive at the expression for the magnetic moments of the ground states of the nucleus based on the shell model. Explain why the observed momenta deviate from these limits. (12)
4. What are magic numbers? Discuss briefly the role of spin-orbit coupling in obtaining all the magic numbers from the shell model. Explain the use of Nordheims rule. (12)
5. Give the reasons for the formulation of collective model of the nucleus. Obtain the rotational energy spectrum and wave functions of an odd A nucleus. (12)
6. Using Fermi gas model, estimate the depth of the nuclear potential well and obtain the asymmetry energy correction term of the semi-empirical mass formula. (12)
7. a) Give an account of Physical quantities conserved and not conserved in strong, electromagnetic and weak interactions.  
b) What do you mean by  $\tau - \theta$  puzzle? Explain how it was resolved. (8+4)

8. a) Discuss the symmetry properties of elementary particles with a special reference to a meson octet.

b) What is C-P Violation? Explain it in the context of  $K^0$ - $\bar{K}^0$  system. (6+6)

9. Answer any two of the following:

a) Distinguish between n-p and p-p scattering at low energy. (4)

b) Show that the rotational energy spectrum of an odd-A nuclei satisfies the condition  $(E_{k+2}-E_k)/(E_{k+1}-E_k)=2+1/(k+1)$  where  $E_k$  is the band head energy. (4)

c) Write briefly on isospin formalism. (4)

d) Explain the eight fold ways. (4)

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**PGIIS - O 1508 B-2K13**  
**M.Sc. IIIrd Semester (Non-CBCS) Degree Examination**  
**Physics**  
**(Materials Science -I)**  
**Paper - 3.4**  
**(Old)**

Time : 3 Hours

Maximum Marks : 80

*Instructions:*

1. Answer any **six** questions of **12** marks each
2. Question **No.9** is compulsory

- 1 a) Discuss the scope of materials science and give the classification of engineering materials  
b) Discuss levels of structure in materials (6+6)
- 2 a) Discuss the factors promoting non-crystallinity in solids  
b) Write a note on metals and alloys (6+6)
- 3 a) Describe solution method of crystal growth  
b) Write a note on polycrystals (8+4)
- 4 a) Explain the edge and screw dislocations with suitable diagrams and state their properties  
b) Write a note on Surface imperfections (8+4)
- 5 a) What are solid solutions? State and explain Hume-Rothery rules  
b) Write a note on single and multiphase solids (8+4)
- 6 a) State and explain Gibb's phase rule  
b) Draw Pb-Sn phase diagram and explain various phases in it. (4+8)

- 7 a) Discuss the growth and overall transformation kinetics  
b) Write a note on glass transition (8+4)
- 8 a) Set up Fick's laws of diffusion and explain  
b) Give an account of applications of diffusion (8+4)
- 9 Write notes on any **two** of the following (4+4)  
a) Ionic solids  
b) Gel method of crystal growth  
c) Lever rule  
d) Kirkindal effect

**PGIIS -O 1510B-2K13**  
**M.Sc. IIIrd Semester (Non CBCS) Degree Examination**  
**Physics**  
**(Biophysics-I)**  
**Paper -3.4**  
**(Old)**

Time : 3 Hours

Maximum Marks :80

- Note :**
1. Answer any **six** questions of **12** marks each
  2. Question number **9** is compulsory

1. Discuss the 'cell doctrine' giving justification for the cell as basic unit of life. (12)
2. What do you mean by biological energy flow? Explain with a neat diagram the mechanism of photosynthesis. (12)
3. Define membrane permeability and obtain an expression for the coefficient of permeability for a membrane of finite thickness. (12)
4. What is meant by transport process across the membrane? Distinguish between passive and active processes. (12)
5. Why do you classify sensory organs as transducers? Give a brief account of the chemical receptors (12)
6. Discuss the mechanism of visual perception with a relevant diagram of a vertebral 'visual receptor' (12)
7. Describe the immune system and comment upon the immunological memory (12)
8. What are codons? Discuss the importance of 'genetic code' in transformation of genetic information. (12)

9. Answer any **two** of the following.

a) Explain mechanistic view (4)

b) Discuss enthalpy function (4)

c) Explain the mechanism of sound perception (4)

d) Write a note on transgenic systems. (4)

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