INTERNAL ASSESMENT

KANDI RAJ COLLEGE

DEPARTMENT OF PHYSICS

SEMESTER: 5TH STREAM: Honours (Core)

Paper:[QUANTUM MECHANICS & APPLICATIONS + SOLID STATE PHYSICS + CLASSICAL DYNAMICS + NUCLEAR AND PARTICLE PHYSICS] Time: 6 Hrs.

PAPER CODE: PHY-H-CC-T-11

Full marks: 10

Answer any five questions: **5×2=10**

1. What are the domains of application of Quantum mechanics and classical mechanics?
2. Obtain the linear momentum of a photon.
3. What do you understand by wave particle duality?
4. Write down the De-Broglie hypothesis.
5. What is uncertainty in finding the velocity of an electron if it is located in a size of 10^{-10} m?
6. Write down the physical significance of a wave function.
7. Why Schrödinger equation is not valid for relativistic particles?

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Full Marks: 10

Answer any five questions: **5×2=10**

1. Write two important features of Miller indices of crystal planes.
2. Find the average drift velocity v_x of electrons in a metal is related to the electric field E and collision time 't'.
3. Give the significance of London's equations.
4. Explain Neel's theory of antiferromagnetism.

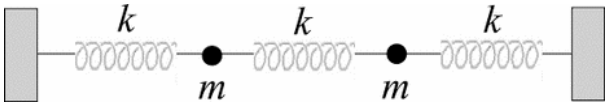
5. The band gap of alloy of semiconductor gallium arsenide phosphide is 1.98 eV. Calculate the wavelength of radiation that is emitted when electrons and holes in this material recombine directly .
6. Show that $P = E\varepsilon_0(\varepsilon_r - 1)$, where P is electric polarisation.

PHY-H -DSE-T-01

Full Marks: 10

Answer any five questions. **(5x2=10)**

1. Set up the Lagrangian for the system of masses shown below and obtain the equations of motion.



2. Starting from the definition of Hamiltonian, obtain Hamilton's equations of motion.
3. What is time dilation? Obtain an expression for the same.
4. What is length contraction? Obtain an expression for the same.
5. Derive the Lorentz velocity transformation equation for the x-direction.
6. Prove that, $\frac{\partial \dot{r}_v}{\partial \dot{q}_\alpha} = \frac{\partial r_v}{\partial q_\alpha}$.

Paper Code - PHY-H-DSE-T-02

Full Marks: 10

Answer any Ten Questions: **10×1=10**

1. Identify the unknown particle in the following reaction :
   $K^- + p \rightarrow K^+ +$ -----.

2. Which of the following is incorrect about nuclear force ?
i) spin dependent ii) charge dependent iii) short range iv) strongest force.

3. Shell model predicted about electric quadrupole moment . Is it true or false ?

4. Calculate the weight(mass) of 1 Curie of Ra.

5. By which one of the following a neutrino could be distinguished from its antiparticle, an anti-neutrino ?
a) rest mass b) charge c) helicity d) spin

6. The energy required to remove the last tightly bound neutron from $_{20}Ca^{40}$ is---
i) 15.6MeV ii) 0 eV iii) 1.5MeV iv) 1.6×10^{-18} eV

7. Which one of the following is an X-ray generator---
A) Bevatron B) Betatron C) Synchro- cyclotron D) Fixed frequency cyclotron

8. What do you mean by soft component of cosmic rays ?

9. Write two differences between stripping and direct reactions .

10. Give an example of inverse β- decay .

11. When $_3Li^7$ is boambarded with $_1H^2$, the product nucleus is ----
i) $_4Be^8$ ii) $_2He^4$ iii) $_3Li^6$ iv) none of these