

**Kandi Raj College**  
**Department of Physics**  
**5<sup>th</sup> Semester Internal Examination 2021**  
**Duration-10.30 am-4.30 pm**

**Paper: Quantum mechanics (PHY-H-CC-T-11)**

**Answer Any Five Questions.**

**5×2=10**

1. What is blackbody radiation? What is Planck radiation formula?
2. What is de-Broglie hypothesis? Explain.
3. Derive the linear momentum of a photon.
4. What are the limitations of old quantum theory?
6. What do you understand by wave particle dualism?
7. Using Heisenberg uncertainty principle show that electron cannot stay inside the nucleus.

**Paper: Solid State Physics (PHY-H-CC-T-12)**

**Answer Any Five Questions.**

**5×2=10**

1. How many atoms are there in SC, BCC and FCC unit cells? Calculate the packing fractions for these structures.
2. Determine the Miller indices of a plane that makes an intercept of 3A, 4A and 5A on the co-ordinate axes of an Orthorhombic crystal with a:b:c = 1:2:5.
3. Polonium has a cubic unit cell of side 3.42Å. If the atomic weight and density of Po are 210 and 8.72g/cm<sup>3</sup> respectively, show if the unit cell is SC, BCC or FCC.
4. Why are X-rays used for the crystal structure analysis?
5. State Bragg's law of X-ray diffraction and its importance in crystal structure analysis.
6. Show that the reciprocal lattice to the SC direct space lattice of lattice constant **a** is itself an SC lattice of constant  $\frac{2\pi}{a}$ .

**Paper: Classical dynamics (PHY-H-DSE-T-1)**

**Answer Any Two Questions.**

**2×5=10**

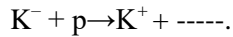
1. What are generalized coordinates? What is constrained motion? What are holonomic constraints?
2. Prove that  $\int (T - V)dt$  is stationary.
3. Derive Lagrange's equation of motion  $\frac{d}{dt} \left( \frac{\partial L}{\partial \dot{q}} \right) - \frac{\partial L}{\partial q} = 0$ .

**Paper: Nuclear and Particle physics (PHY-H-DSE-T-2)**

**Answer any Ten Questions:**

**10x1=10**

1.. Identify the unknown particle in the following reaction :



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  ${}_{20}\text{Ca}^{40}$  is---

i) 15.6MeV ii) 0 eV iii) 1.5MeV iv)  $1.6 \times 10^{-18}$  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  $\beta$ - decay .

11. When  ${}_{3}\text{Li}^7$  is boambarded with  ${}_{1}\text{H}^2$  , the product nucleus is ----

i)  ${}_{4}\text{Be}^8$  ii)  ${}_{2}\text{He}^4$  iii)  ${}_{3}\text{Li}^6$  iv) none of these