Name: **Enrolment No:**	UPES UNIVERSITY OF TOMORROW

UPES

End Semester Examination, December 2024

Course: Physics for Health Sciences

Semester : 1st

Program: B. Tech Biomedical Engineering/Biotechnology/Food Technology

Duration : 3 Hours

Course Code: PHYS 1039 **Max. Marks: 100**

Instructions: Attempt all the questions. Use of non-programmable scientific calculator in permitted.

S. No.	Section A Short answer questions/ MCQ/T&F (20Qx1.5M= 30 Marks)	Marks	COs
Q1	Define wavefronts in wave optics.	**1.5**	**CO1**
Q2	Optical fibers work on the principle of total internal reflection. Is this statement true or false?	**1.5**	**CO1**
Q3	Which of the following describes Snell's law of refraction? a. $n_1\cos\theta_1 = n_2\cos\theta_2$ b. $n_1\sin\theta_1 = n_2\sin\theta_2$ c. $n_1\cos\theta_1 = n_2\tan\theta_2$ d. $n_1\sin^{-1}\theta_1 = n_2\sin^{-1}\theta_2$	**1.5**	**CO1**
Q4	In transverse waves, the particles vibrate parallel to the direction of wave propagation. Is this statement true or false?	**1.5**	**CO1**
Q5	Holography can employ coherent light sources. Is this statement true or false?	**1.5**	**CO1**
Q6	State the law of radioactive decay.	**1.5**	**CO2**
Q7	Define the half life of a radioactive nucleus.	**1.5**	**CO2**
Q8	Illustrate the symbolic representation of any element.	**1.5**	**CO2**

Q9	Electromagnetic force includes only magnetic effects. Is this statement true or false?	**1.5**	**CO2**
Q10	A step down transformer decreases the output voltage. Is this statement true or false?	**1.5**	**CO2**
Q11	Extrinsic semiconductors do not involve doping. Is this statement true or false?	**1.5**	**CO3**
Q12	Define a unit cell.	**1.5**	**CO3**
Q13	Define the mass action law.	**1.5**	**CO3**
Q14	Hard X-Rays have more penetrating power. Is this statement true or false?	**1.5**	**CO3**
Q15	The lattice angles of cubic lattice are orthogonal. Is this statement true or false?	**1.5**	**CO3**
Q16	Ψ^2 gives the probability density of finding a particle within a defined space. Is this statement true or false?	**1.5**	**CO4**
Q17	Which of the following describes dual nature of matter? a. λ=ph b. λ=p/h c. λ=h/p d. None of the above	**1.5**	**CO4**
Q18	Define the term Nanoscience.	**1.5**	**CO4**
Q19	1D nanostructures are characterized by charge confinement in two dimensions. Is this statement true or false?	**1.5**	**CO4**
Q20	State the uncertainty principle.	**1.5**	**CO4**
	Section B **(4Qx5M=20 Marks)**		
Q 1	a. Define acceptance angle of an optical fiber with the help of a diagram. b. Calculate the numerical aperture of an optical fiber if the acceptance angle is 11.5°.	**2.5+2.5=5**	**CO1**
Q2	a. State Faraday's law of electromagnetic induction. b. Calculate the induced emf produced due to a coil of 100 turns with the magnetic flux changing at rate of 5 Wb/s.	**2.5+2.5=5**	**CO2**
Q3	Describe the various Bravais lattices.	**5**	**CO3**

Q4	Show that an electron cannot exist inside the nucleus of an atom?	**5**	**CO4**
	Section C **(2Qx15M=30 Marks)**		
Q 1	Discuss the various radioactive decay processes with suitable examples.	**15**	**CO2**
Q2	a. Discuss how quantum theory can explain the phenomenon of atomic spectra. Take the example of hydrogen atom. b. What is the energy and frequency of radiation emitted due to de-excitation of an electron from n=2 to n=1 state in a hydrogen atom? Which spectral series does this emission correspond to? Calculate the same for a He atom.	**10+5=15**	**CO4**
	Section D **(2Qx10M=20 Marks)**		
Q 1	a. Find the Lorentz force of a charge -10C in an electric field of 20 N/C and magnetic field of 5 T moving with a velocity 10m/s. Assume the charge is travelling perpendicular to the magnetic field. b. If the electric field is switched off, what is the distance travelled by the charge within the field? Assume mass of the charge to be 10^{-23} kg.	**5+5=10**	**CO2**
Q2	a. An electron is confined in a 1D potential well of length 0.5 nm. Calculate the ground state and next excited state energies of the electron. Also, draw the wavefunction profiles of electrons in these two states and comment on the probability of finding the electron over the entire length of the well. b. Discuss the importance of various quantum numbers.	**5+5=10**	**CO4**