


Name:			
Enrolment No:			
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 is permitted.			
S. No.	Section A Short answer questions/ MCQ/T&F (20Qx1.5M= 30 Marks)	Marks	COs
Q1	The composition of gases in He-Ne laser is 60% He and 40% Ne. Is this statement true or false?	1.5	CO1
Q2	Wavefronts find applications in LASIK surgery. 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. $n_1 \cos \theta_1 = n_2 \tan \theta_2$ $n_1 \sin^{-1} \theta_1 = n_2 \sin^{-1} \theta_2$	1.5	CO1
Q4	In longitudinal waves, the particles vibrate perpendicular to the direction of wave propagation. Is this statement true or false?	1.5	CO1
Q5	Holography can employ incoherent light sources. Is this statement true or false?	1.5	CO1
Q6	Define radioactivity	1.5	CO2
Q7	Which nuclear radiation is electromagnetic in nature?	1.5	CO2

	a. alpha rays b. beta rays c. gamma rays d. cosmic rays		
Q8	Define mass number of an element.	1.5	CO2
Q9	Electromagnetic force includes only magnetic effects. Is this statement true or false?	1.5	CO2
Q10	A step up transformer increases the output voltage. Is this statement true or false?	1.5	CO2
Q11	X-Rays cannot undergo diffraction. Is this statement true or false?	1.5	CO3
Q12	Define a unit cell.	1.5	CO3
Q13	Illustrate Bragg's law of diffraction.	1.5	CO3
Q14	State the wavelength range of X-Rays.	1.5	CO3
Q15	The lattice axes of tetragonal lattice are equal. Is this statement true or false?	1.5	CO3
Q16	The wavefunction ψ 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. $\lambda=ph$ b. $\lambda=p/h$ c. $\lambda=h/p$ d. None of the above	1.5	CO4
Q18	Decreasing the radius of a spherical particle from bulk to nanoscale increases its surface to volume ratio. Is this statement true or false?	1.5	CO4
Q19	2D nanostructures are characterized by charge confinement in one dimension. Is this statement true or false?	1.5	CO4
Q20	The uncertainty principle is valid for macroscale objects. Is this statement true or false?	1.5	CO4
Section B (4Qx5M=20 Marks)			
Q 1	Consider a helium–neon laser in which the loss is known to be 0.05 m^{-1} . The laser has an actual plasma tube length of 20	5	CO1

	cm. One mirror is 99.9% reflecting, and the output coupler is 95% reflecting. Calculate the threshold gain for the tube.		
Q2	<ul style="list-style-type: none"> a. State Coulomb's law of electrostatics. b. If two static charges +3C and +10C are separated by a distance of 5 mm. Compute the electric field experienced by +10C due to +3C charge. 	2.5+2.5=5	CO2
Q3	Describe the various Bravais lattices.	5	CO3
Q4	<ul style="list-style-type: none"> a. Find the wavelength of an electron which is moving at a speed of 2×10^6 m/s. b. Calculate the kinetic energy of an electron that is moving with a wavelength of 2.42 nm. 	2.5+2.5=5	CO4
Section C (2Qx15M=30 Marks)			
Q 1	Discuss the various radioactive decay processes with suitable examples.	15	CO2
Q2	Explain how you can determine the crystal structure of a solid material.	15	CO3
Section D (2Qx10M=20 Marks)			
Q 1	<ul style="list-style-type: none"> a. Find the Lorentz force of a charge 2.5C in an electric field of 5 N/C and magnetic field of 7.25 T moving with a velocity 1.5m/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	<ul style="list-style-type: none"> a. Define wavefunction and state its properties along with importance. b. What is fundamental difference between the time dependent and time independent Schrodinger equations? 	5+5=10	CO4