

B. Sc DEGREE END SEMESTER EXAMINATION - JULY 2021
SEMESTER 2 : COMPLEMENTARY PHYSICS FOR B Sc CHEMISTRY
COURSE : 19U2CPHY04 : MECHANICS AND SUPERCONDUCTIVITY
(For Regular - 2020 & Improvement / Supplementary 2019 Admissions)

Time : Three Hours

Max. Marks: 60

PART A

Answer any 8 (2 marks each)

1. Define centripetal force and give one example.
2. On what factors M.I of a body depend?
3. Distinguish between tangential acceleration and central acceleration.
4. What are forced oscillations?
5. What do you mean by damped oscillation?
6. Define the term wavelength.
7. What is meant by energy density and energy flux of a wave?
8. A tuning fork of unknown frequency gives four beats per second, when sounded with another of frequency 256 Hz. The fork is now loaded with a piece of wax and again 4 beats per second are produced. Calculate the frequency of the unknown fork
9. Give three properties exhibited by superconductors.
10. Give the differential equation for a forced harmonic oscillator? Discuss the involved terms
(2 x 8 = 16)

PART B

Answer any 6 (4 marks each)

11. A stone tied to the end of a string 80cm long is whirled in a horizontal circle with a constant speed. If the stone makes 14 revolutions in 25s, what is the magnitude and direction of acceleration of the stone?
12. A uniform meter scale is of mass 120 g. What is its M.I if the scale is rotated about an axis perpendicular to its length and passes through a) the center and b) the 75 cm mark.
13. A wheel is making revolutions about its axis with uniform angular acceleration. Starting from rest it attains 200 rev/s in 5 seconds. Find the angular acceleration and the angle turned during this time.
14. A mass of 1 kg is suspended from a spring of force constant 10^3 N/m and damping coefficient 5 Ns/m. The spring is driven by a periodic force of peak value 10 N and frequency double the natural frequency of the system without damping. Calculate the amplitude of vibration.
15. The equation of motion of a damped harmonic oscillator is given by $d^2x/dt^2 + 2dx/dt + 5x$. Find period and frequency.
16. A tuning fork of frequency 512 Hz produced a plane wave in air having amplitude 0.5×10^{-3} mm. Calculate the energy density and the intensity of the wave. Velocity of sound in air 332m/s and density of air is 1.29 kgm^{-3} .
17. A progressive harmonic wave is given by $y = 10\sin \pi(0.01x - 2t)$, where y and x are expressed in cm and time t in seconds. Calculate amplitude, frequency, velocity and the phase difference between two points 100 cm apart.
18. The transition temperature of an element with an average mass of 200 amu is 4K. Determine the transition temperature of its isotope having the atomic mass 206 amu.
(4 x 6 = 24)

PART C

Answer any 2 (10 marks each)

19. Discuss an experiment to determine the acceleration due to gravity using a symmetrical compound pendulum.
20. Derive an expression for moment of Inertia of a hollow cylinder about a) its own axis b) axis passing through the center and perpendicular to its own axis.
21. Set up the differential equation for a forced harmonic oscillator. Explain the contribution of various terms involved. obtain the condition for resonance.
22. What is Meissner Effect? Show that the superconductors exhibit perfect diamagnetic behavior. Distinguish between type I and type II superconductors.

(10 x 2 = 20)