**Department of Physics, Forman Christian College (A Chartered University)**

**MPhil Admission Test Sample**

1. A wave traveling along a string is described by Y(x, t) = (0.00327 m) sin (72.1x - 2.72t),in which the numerical constants are in SI units (72.1 rad/m and 2.72 rad/s).What is the transverse velocity u of the string element at x =22.5 cm at time t =18.9s?

2. An observer at rest near the source of the sound of frequency 684 Hz. Another source of the sound of 676 Hz moving toward the observer at 2 n/s. If the speed of the sound waves in air is 340 m/s, then what is the beat frequency heard by the observer.

3. What will be the total energy of an artificial satellite circling round the earth in an orbit of radius R?

4. A gas at 27°C in a cylinder has a volume of 4 litre and pressure 100 N/m$^2$. Gas is compressed at constant temperature so that the pressure is 150 N/m$^2$. Calculate the change in volume.

5. $$C = 3kN_A\left(\frac{h\nu}{kT}\right)^2 \frac{e^{h\nu/kT}}{(e^{h\nu/kT}-1)^2}$$

Einstein's formula for the molar heat capacity C of solids is given above. Calculate the specific heat at high temperatures.

6. As a mercury atom absorbs a photon of energy, an electron in the atom changes from energy level d to energy level e. Determine the energy of the absorbed photon in electron volts.

7. A free particle with initial kinetic energy $E$ and de Broglie wavelength λ enters a region in which its potential energy is $V$. What is the particle's new de Broglie wavelength?

8. The photoelectric work function for Na surface is 2 volt. Calculate the longest wavelength of light that will eject photoelectrons from Na surface.

9. A rock of mass m is dropped to the ground from a height h. A second rock, with mass 2m, is dropped from the same height. When the second rock strikes the ground, what is its kinetic energy?

10. A cube has a constant electric potential V on its surface. If there are no charges inside the cube, find the potential at the center of the cube.

11. A particle moves in a circular path of radius r with speed v. It then increases its speed to 2v while traveling along the same circular path. The centripetal acceleration of the particle has changed by what factor?

12. A coil having inductance of 0.14 henry and resistance 2 ohm is connected across 110 volt at 25 Hz. Find the current in the coil.

13. If a magnetic induction of 0.6 T produces a flux of 0.6 weber through a single turn coil of area 2 m2, find the angle between the direction of the magnetic induction and normal to the coil.

14. Obtain the Miller indices of a plane with intercepts at a,b/2,, 3c in a simple unit cell. Draw a neat diagram showing the plane.

15. An X-ray tube operates at 18 kV. Find the maximum speed of electron striking the target.