Physics

1. (a) State Hooke's law. Show the elastic limit and the yield point on a stress-strain diagram.
   (b) The mass m is released from rest from point A at a height of 1 m. If the coefficient of friction between m and the surface is 0.4, find the distance on the horizontal section that the mass travels before coming to rest.
   (c) A sprint of force constant 19.6 N/m hangs vertically. Body of mass 0.2 kg attached to its free end and then released. Find the frequency and amplitude of vibration.

2. (a) Explain why both longitudinal and traverse waves can propagate in solids but only longitudinal waves can propagate in gases.
   (b) The sheer modulus of copper is 4.83 x 10^{10} N/m^2. Its density is 8.93 x 10^3 kg/m^3. Calculate the transverse wave velocity of sound in the metal.
   (c) Two sound waves of wavelength 0.825 m and 0.825 travelling in air when superposed produce 5 beats per second. Calculate the velocity of sound in air.

3. (a) Distinguish between an irreversible and reversible process.
   (b) A household refrigerator is to be maintained at -3^{0}C the exhaust pipes are in a room at 27^{0}C. If the power output of the refrigerator is 60W. Calculate the rate at which it extrats heat from the refrigerator.
   (c) 10 gm of water at 0^{0}C is made into superheated steam at 500 K at atmospheric pressure. Calculate the change in entropy of water. The latent heat of vaporisation is 549 cal/gm, C_p is 1 cal/gm and C_p (vapour) is 0.5 cal/gm.

4. (a) A magnet of magnetic moment 1.00 A-m^2 is suspended freely in a magnetic field intensity of 4 x 10^{-5} kgm^2, calculate the time period of the oscillation.
   (b) Calculate the total intensity of the earth's magnetic field at a point on the surface of the earth where magnetic latitude is λ. Assume that the magnetic moment of the earth's magnet is M and earth's radius is R.
   (c) How is the magnetic length of a magnet determined?

5. (a) How can a milliammeter having resistance 10 ohms and capacity to carry current upto 0.25 mA be converted into a voltmeter reading upto volts?
   (b) In the circuit each condenser has a capacitance shown in the figure. Calculate the effective capacitance between the points A and B.
   (c) What is the standard cell? Where is it used?

6. (a) State Fleming's rule.
   (b) A straight conductor of length 2 meters is moving with a velocity of 3m/sec at right angle to a magnetic field of induction 9 x 10^{-5} Wb/m^2. Calcualate e.m.f developed between its ends.
   (c) An alternating e.m.f e=150sin377t is applied between the terminals of an electric bulb where filament has a resistance of 1500 ohms. Calculate the r.m.s current in the filament and the frequency of A.C

7. (a) What is the position and image when an object is placed at infinity in front of a concave lens.

(b) A concave mirror has a radius of curvature 16 cm. Find the position , nature and size of the image when an object 5 mm high is placed 20 cm from the mirror.

(c) Describe Young's double slit experiment. Calculate the distance between two successive bright bands in this experiment.

8. (a) Newton's rings are formed between a plane surface of glass and a lens. The diameter of the fifth black ring is 9 mm. When sodiumlight (= 5893 A^0) is used and the light passes through the air film at an angle of 30^0 to the normal. Find the radius of the glass lens.

(b) Describe a method to determine the velocity of light.

(c) Define resolving power of a telescope.

9. (a) The work function of a metal is 4.14 eV. Calculate the photo-electric threshold wavelength.

(b) Describe an experiment by which the discrete nature of the energy levels in atom can be established.

(c) Compute the wavelength of the shortest wavelength line in the Lyman series. Take Rydberg constant R= 1.097×10^{-1} m^{-1}.

10. (a) Describe experiments to show that electrons hebave both as wave and particles.

(b) Describe the phenomena of thermionic emission. How does the thermionic current in a diode vaccum tube depend on the voltage between the anode and the cathode?

(c) The half life of C^{14} is 5600 years. If a sample of wood contains 5 mg of C^{14} when cut from a tree, how much of C^{14} will remain in the sample after 10000 years?