



# PHYSICS

## BOOKS - BINA LIBRARY PHYSICS

### (ASSAMESE ENGLISH)

## QUESTION PAPER 2013

### Exercise

1. Define one electron volt.



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2. State Gauss's Law of electrostatics.



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3. Write the expression for Lorentz force acting on a charged particle.



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4. What step can be taken to achieve high revolving power of a telescope?



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5. Find the dimestion of Planck's constant.



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6. What is the change of atomic number  $Z$  of a nucleus when it emits a  $\beta$  particle?



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7. Differentiate between analog signal and digital signal.



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8. What is a transducer?



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9. What is an electric dipole? Find an expression for the torque acting on an electric dipole placed in an external uniform electric field.



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10. If electric field  $E = 0$  in a region do you think potential at the region should also be zero? Justify your answer.



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**11.** What is electrostatic shielding? How can it be achieved?



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**12.** What is meant by potential at a point? Find an expression for potential at a point due to a point charge.



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**13.** A 400 pF capacitor is charged by a 100V battery. How much electrostatic energy is stored by the capacitor?



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**14.** State Kirchoff's laws of current electricity.



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**15.** Establish the following relation for current flowing through a circuit containing an

external resistance  $R$ , a battery of e.m.f  $E$  and internal resistance  $r$ .

$$I = \frac{E}{R + r}$$



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**16.** A charged particle enters a magnetic field with a velocity  $v$  in a direction perpendicular to the field. Find an expression for the radius of the circular path of the particle.



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17. What is Curie temperature of a ferromagnetic material? Give one example of a ferromagnetic material.



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18. What are hard ferromagnetic and soft ferromagnetic materials? Give one example of each.



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**19.** Draw diagram to show formation of virtual image by a concave mirror.



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**20.** A coil of self inductance  $20\text{mH}$  is connected to an a.c source of  $220\text{v}$  and of frequency  $50\text{Hz}$ . What is the inductive reactance and r.m.s current in the circuit?



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21. State the basic processes involved in the generation of e.m.f. in a solar cell when light falls on it.



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22. What is energy band gap of a semiconductor? What range of energy band gap of semiconductors is suitable for using in solar cells.



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**23.** How do you define mobility of a charge carrier in a conductor? Establish the following relation for mobility.

$$\mu = q\tau / m$$



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**24.** Show that the angular frequency of a charged particle moving in a circular path in a magnetic field is independent of its velocity.



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25. Find the following expression for the magnetic moment of an electron moving in a circular path

$$\mu_c = \frac{e}{2m_e} L$$

Where  $L$  is the angular momentum of the electron about the nucleus,  $e$  and  $m_e$  are its charge and mass.



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**26.** Write down the four Maxwell's equations.



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**27.** The electric field of an e.m. wave is given by

$$E_y = 40 \sin\left(\frac{2\pi}{2}x - 2\pi \times 10^8 t\right) \text{ where } E \text{ is}$$

in  $V/m$ ,  $t$  in seconds, and  $x$  is in meters. Find

Frequency of the e.m. wave.



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**28.** How is a wavefront defined? State Huygen's principle of propagation of light wave.



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**29.** Establish the following relation for total deviation  $\delta$  of a ray light refracted through a traingular glass prism.

$$\delta = i + e - A$$

Where  $i$  is the angle of incidence,  $e$  is the

angle of emergence and  $A$  is the angle of the prism.



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**30.** In a young's double slit experiment two slits are made one millimeter apart and the screen is placed one meter away. What is the fringe separation when monochromatic light of wavelength  $500\text{nm}$  is used?



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**31.** In a young's double slit experiment two slits are made one millimeter apart and the screen is placed one meter away. What is the fringe separation when monochromatic light of wavelength 500nm is used?



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**32.** In a series LCR circuit in which  $R = 3\Omega$ ,  $L=25\text{mH}$  and  $C = 800\mu\text{F}$  a sinusoidal a.c. voltage of peak value 250 V is applied. Find frequency at which resonance occurs



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**33.** In a series LCR circuit in which  $R = 3\Omega$ ,  $L=25\text{mH}$  and  $C = 800\mu\text{F}$  a sinusoidal a.c. voltage of peak value 250 V is applied. Find current in the circuit at resonant condition.



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**34.** A rectangular coil of turns  $n$  and area  $A$  is rotating with angular velocity  $\omega$  in a uniform

magnetic field  $B$ . Find an expression for the e.m.f generated in the coil.



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**35.** What is step up and step down transformer? To transfer electric energy from generating station initially step up transformer is used. Why?



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**36.** What is photoelectric effect? Why is photoelectric current proportional to the intensity of incident radiation?



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**37.** Why is modulation necessary?



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**38.** A message signal of frequency 10KHz and peak voltage 10 volts is used to modulate a carrier wave of frequency 1 MHz and peak voltage 20 volts. Determine its modulation index.



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**39.** Establish the lens maker's formula for a biconvex lens.



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**40.** Describe Young's double slit experiment and determine the conditions for obtaining bright and dark fringes.



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**41.** Draw diagrams to show how a p-n junction is

forward biased Draw V-I characteristics of the diode in both conditions and show in it break

down voltage. Mention one important use of Zener diode.



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**42.** How is the mass of an electron determined?



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**43.** State Bohr's postulates regarding Bohr's model of the hydrogen atom.



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**44.** Derive an expression for the radius of the first orbit of the electron of the hydrogen atom.



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**45.** State one drawback of Rutherford's model of the atom. What modifications of Rutherford's model were suggested by Bohr?



State two limitations of Bohr's model of the atom.



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