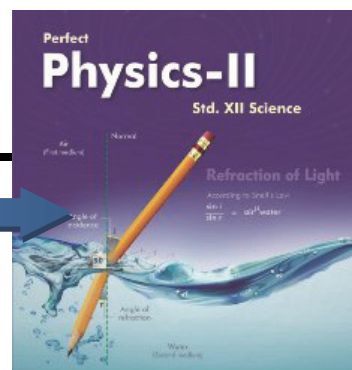# BOARD QUESTION PAPER: MARCH 2014
PHYSICS – II (12th Sci., HSC, Maharashtra)

Note:

i.   All questions are compulsory.
ii.   Neat and well labelled diagrams must be drawn wherever necessary.
iii.   Figures to the right indicate full marks.
iv.   Use of only logarithmic table is allowed.
v.   All symbols have their usual meaning unless otherwise stated.

## SECTION – II

Q. 5. Attempt any SIX : [12]

i.   Show that the orbital magnetic dipole moment of a revolving electron is $\dfrac{eVr}{2}$.

ii.   Describe the construction of photoelectric cell.

iii.   For a glass plate as a polariser with refractive index l.633, calculate the angle of incidence at which light is polarised.

iv.   The susceptibility of magnesium at 300 K is 2.4×10^{-5}. At what temperature will the susceptibility increase to 3.6×10^{-5}?

v.   Draw a neat labelled diagram for Davisson and Germer experiment, for diffraction of electron wave.

vi.   Explain the terms : (a) Transmitter and (b) Receiver in communication system.

vii.   A metal rod $\dfrac{1}{\sqrt{\pi}}$ m long rotates about one of its ends perpendicular to a plane whose magnetic induction is 4×10^{-3} T. Calculate the number of revolutions made by the rod per second if the e.m.f. induced between the ends of the rod is 16 mV.

viii.   Find the wave number of a photon having energy of 2.072 eV.
        Given : Charge on electron = 1.6×10^{-19} C,
                Velocity of light in air = 3×10^{8} m/s,
                Planck's constant = 6.63×10^{-34} J-s.

Q. 6. Attempt any THREE : [9]

i.   State Ampere's circuital law. Obtain an expression for magnetic induction along the axis of toroid.

ii.   Calculate the radius of second Bohr orbit in hydrogen atom from the given data.
        Mass of electron = 9.1×10^{-31} kg
        Charge on the electron = 1.6×10^{-19} C
        Planck's constant = 6.63×10^{-34} J–s.
        Permittivity of free space = 8.85×10^{-12} C^2/Nm^2

iii.   Explain the working of P-N junction diode in forward and reverse biased mode.

iv.   A network of four capacitors of 6 µF each is connected to a 240 V supply. Determine the charge on each capacitor.
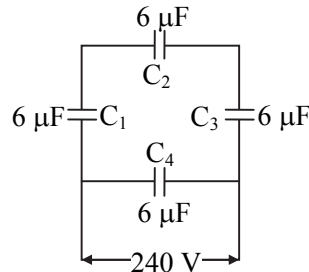
Q.7. A.   Describe biprism experiment to find the wavelength of monochromatic light. Draw the necessary ray diagram for magnified and diminished images of virtual sources.

B.   If the difference in velocities of light in glass and water is 2.7×10^7 m/s, find the velocity of light in air.
(Refractive index of glass = 1.5, Refractive index of water = 1.333)   **[7]**

OR

A.   State the principle of a transformer. Explain its construction and working. Derive an expression for the ratio of e.m.f.s in terms of number of turns in primary and secondary coil.

B.   Two diametrically opposite points of a metal ring are connected to two terminals of the left gap of meter bridge. The resistance of 11 Ω is connected in right gap. If null point is obtained at a distance of 45 cm from the left end, find the resistance of metal ring.   **[7]**

Q. 8. Select and write the most appropriate answer from the given alternatives for each sub-question: **[7]**

i.   Intensity of electric field at a point close to and outside a charged conducting cylinder is proportional to _____.
(r is the distance of a point from the axis of cylinder)

(A) $\dfrac{1}{r}$ (B) $\dfrac{1}{r^2}$

(C) $\dfrac{1}{r^3}$ (D) r^3

ii.   When a hole is produced in P-type semiconductor, there is _____.
(A)   extra electron in valence band.
(B)   extra electron in conduction band.
(C)   missing electron in valence band.
(D)   missing electron in conduction band.

iii.   The outermost layer of the earth's atmosphere is _____.

(A)   stratosphere   (B)   mesosphere

(C)   troposphere   (D)   ionosphere

iv.   Accuracy of potentiometer can be easily increased by _____.

(A)   increasing resistance of wire   (B)   decreasing resistance of wire

(C)   increasing the length of wire   (D)   decreasing the length of wire

v.   When electron in hydrogen atom jumps from second orbit to first orbit, the wavelength of radiation emitted is λ. When electron jumps from third orbit to first orbit, the wavelength of emitted radiation would be _____.

(A) $\dfrac{27}{32}\lambda$ (B) $\dfrac{32}{27}\lambda$

(C) $\dfrac{2}{3}\lambda$ (D) $\dfrac{3}{2}\lambda$

vi.   An ideal voltmeter has _____.

(A)   low resistance   (B)   high resistance

(C)   infinite resistance   (D)   zero resistance

vii.   The resolving power of telescope of aperture 100 cm for light of wavelength 5.5×10^{-7} m is _____.

(A) $0.149 \times 10^{+7}$ (B) $1.49 \times 10^{+7}$

(C) $14.9 \times 10^{+7}$ (D) $149 \times 10^{+7}$