H. S. C. PHYSICS - II

TTime : 2 Hours) **Question Paper : September 2009** **(Max. Marks : 40**

⁂ **Note : Refer to Question Paper March 2008.** ⁂

Data : $\epsilon_0 = 8.85 \times 10^{-12}$ C^2/Nm^2 ; Planck's constant : h $= 6.63 \times 10^{-34}$ Js ; Mass of proton : m $= 1.67 \times 10^{-27}$ Kg, Velocity of light in vacuum $: 3 \times 10^8$ m/s.

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Q. 1. Select and write the most appropriate answer from the given alternatives for each sub-question. **[8]**

(i) The absolute refractive index of air is .... **(1)**

    (a) 0   (b) 0.95   (c) 1   (d) ∞

(ii) The temperature of hot junction, at which the direction of thermo e.m.f. reverses is called ...... **(1)**

    (a) inversion temperature   (b) neutral temperature

    (c) critical temperature   (d) Curie temperature.

(iii) A moving coil galvanometer of resistance 'G' gives full scale defleiction for certain current. The shunt resistance required to convert it to measure a current 'n' times of initial current is ...... **(1)**

    (a) (n - 1) G   (b) $\dfrac{G}{n-1}$ (c) $\dfrac{(n-1)}{G}$ (d) nG

(iv) In series L-C-R circuit, at resonance, applied e.m.f. and the current are .... **(1)**

    (a) Out of phase.   (b) in phase.

    (c) differ in phase by $\dfrac{\pi}{4}$ radian.   (d) differ in phase by $\dfrac{\pi}{2}$ radian.

(v) The energy of an electron in nth Bohr orbit is proportional to .... **(1)**

    (a) n^2 (b) n   (c) $\dfrac{1}{n}$ (d) $\dfrac{1}{n^2}$

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(vi) Oscillator is a device which converts energy from .... **(1)**

    (a) a.c. to d.c.   (b) d.c. to a.c.   (c) a.c. to a.c.   (d) d.c. to d.c.

(vii) The magnetic induction at a point P on the axis is 54 times the magnetic induction at point Q on the equator of a short magnetic dipole. The ratio of distances of P and Q from the centre of the dipole is ...... **(1)**

    (a) 1 : 27   (b) 1 : 3   (c) 3 : 1   (d) 27 : 1

(viii) The photoelectric threshold wavelength of a certain metal is 3315 A. U. Then its work function is .... **(1)**

    (a) 6×10^{-19} J   (b) 7.286×10^{-19} J   (c) 9×10^{-19} J   (d) 9.945×10^{-19} J

Q. 2. (A) Attempt any ONE : **[8]**

  (i) A voltmeter of resistance 500 Ω can measure a maximum voltage of 5 Volt. How can it be made to measure a maximum voltage of 100 Volt? **(2)**

  (ii) Calculate the de-Broglie wavelength of proton, if it is moving with the speed of 2×10^5 m/s. **(2)**

(B) Attempt any TWO :

  (i) Describe how a potentiometer is used to compare the e.m.f.s of two cells by connecting them separately. **(3)**

  (ii) What is resolving power of an optical instrument? Explain Rayleigh's criterion for central maximum. **(3)**

  (iii) With the help of circuit diagram describe an experiment to study photoelectric effect. **(3)**

Q. 3. (A) Attempt any ONE : **[8]**

  (i) Define line communication and state its types. **(2)**

  (ii) Derive an expression for electric intensity at a point outside a charged sphere. **(2)**

(B) Attempt any TWO :

  (i) Derive an expression for magnetic potential at any point due to a short magnetic dipole. **(3)**

  (ii) State the postulates of Bohr's theory of hydrogen atom. Write down necessary equations. **(3)**

  (iii) While using T.G., state the adjustments required in presetting. Describe the working principle of tangent galvanometer. **(3)**

Q. 4. (A) Attempt any TWO : **[8]**

  (i) What are eddy currents? State any two applications of eddy currents. **(2)**

  (ii) Explain the principle of satellite communication. **(2)**

  (ii) State and explain Seebeck effect. **(2)**

(B) Attempt any ONE :

  (i) With neat circuit diagram, explain p - n junction diode as full wave rectifier. Draw necessary graphs. **(4)**

  (ii) What is polarisation of light? State and explain Brewster's law. **(4)**

Q. 5. Attempt any TWO : **[8]**

  (i) A parallel plate capacitor has circular plates, each of diameter 20 cm separated by a distance of 2 mm. The potential difference between the plates is maintained at 360 V. Calculate its capacitance and charge. What is the intensity of electric field between the plates of the capacitor? (Given : K = 1). **(4)**

  (ii) In a biprism experiment the slit is illuminated by a light of wavelength 4800 A.U. The distance between slit and biprism is 20 cm and the distance between biprism and eye piece is 80 cm. If the distance between virtual sources is 3 mm, determine the distance between the 5th bright band on one side of the central band and 5th dark band on other side. **(4)**

  (iii) A rectangular coil of length 0.5 m and breadth 0.4 m has resistance of 5 Ω. The coil is placed in a magnetic induction of 0.05 T and its direction is perpendicular to the plane of the coil. If the magnetic induction is uniformly reduced to zero in 5 milli seconds, find the e.m.f. and current induced in the coil. **(4)**