BSC. PART - II EXAMINATION - 2010

PHYSICS HONOURS PAPER IV

Answer Q. No 1 which is compulsory and two from of each Group-A and Group-B

1. Choose the correct answer form the following :

(a) If T is the time period of galvanometer and λ is logarithmic decrement, then the galvanometer will be ballistic when :

(i) T is large and λ is small (ii) T is small and λ is large
(iii) T is large and λ is large (iv) T is small and λ is small

(b) The time constant of a circuit is the time in which the current dacays by
(i) 25% (ii) 37% (iii) 50% (iv) 63%

(c) Rejector circuits in A.C are
(i) Parallel resonant circuits (ii) Series resonant circuits
(iii) Both of these (iv) None of these

(d) The Threshold wave-length for a metal is 6800A, its work function will be :
(i) 1.827 ev (ii) – 0.1827ev (iii) 18.27 ev (iv) 1827 ev

(e) The splitting of spectral lines under the effect of a magnetic field is called :
(i) Zeeman effect (ii) Bohr effect (iii) Stark effect (iv) Heisenberg effect

(f) Bohr magnetron is the unit of : (i) Angular momentum (ii) Magnetic di-pole
(iii) Both of these (iv) None of these

(g) The selection rule applied in pure rotational spectrum is
(i) $\nabla J = 0, \pm 1, \pm 2$ (ii) $\nabla j = 0, \pm 2$ (iii) $\nabla S = 0, \pm 1$ (iv) $\nabla L = 0, \pm 1$

(h) In an electro-magnetic field :
(i) $\vec{E} \times \vec{H} = 0$ (ii) $\vec{E} \cdot \vec{H} = 0$ (iii) $\vec{E} + \vec{H} = 0$ (iv) $\frac{\vec{E}}{\vec{H}} = 0$

(i) Which of the following represents Brewster's law?
(i) $\frac{\sin\theta i}{\sin\theta r} = \frac{n_2}{n_1}$ (ii) $\frac{\sin\theta p}{\sin\theta p} = \frac{n_2}{n_1}$ (iii) $\frac{\sin\theta p}{\sin\theta r} = \frac{n_2}{n_1}$ (iv) None of these

(j) Lorentz Gauge transformation is given by :
(i) $\text{div}\,\phi = -\frac{\partial \vec{A}}{\partial t}$ (ii) $\text{div}\,\phi = \frac{\partial \vec{A}}{\partial t}$ (iii) $\text{grad}\,\phi = -\frac{\partial \vec{A}}{\partial t}$ (iv) None of these

GROUP-A

2. Explain Peltier and Thomson Coefficients. Apply thermodynamics to obtain relations for these coedfficients.
3. An alternating e.m.f. $E = E_0 \equiv$ is applied to the ends of a Series Circuit containing a resistance (R). inductance (L) and a capacitance (C) Calculate the current in the circuit. Deduce the condition in which electrical resonance occurs.
4. Establish Einstein's photo-electric equation. Describe an experiment to verify this equation.
5. Explain vector model of atom How the distribution of electrons in different shells and subshells are explained on the basis of quantum numbers?

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GROUP-B

6. Write Maxwell's fields equation in a conducting medium. Obtain the wave solutions for $\vec{E}$ and $\vec{B}$. Discuss the depth of penetration.
7. Prove Laws of Reflection and Refractions of light on a plane on the basis of electro-magnetic theory.
8. Define scalar potential (ϕ) and vector potential $\left(\vec{A}\right)$ for an electro-magnetic field. Show that under suitable conditions they satisfy the following inhomogeneous equations:

   (i) $\left(\nabla^2 - \frac{1}{C^2}\cdot\frac{\partial^2}{\partial t^2}\right)\vec{A} = \mu_0$ (ii) $\left(\nabla^2 - \frac{1}{C^2}\cdot\frac{\partial^2}{\partial t^2}\right)\phi = -\frac{\rho}{\epsilon_0}$

9. Discuss the theory of vibration rotation spectrum of a diatomic molicule. Explain the effect of isotopes on the spectrum.

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