Pre ISC Examination 2017-2018

Std. : XII
Subject : PHYSICS

Full Marks : 70
Time : 3hrs.+15min.

Part - I (Compulsory)
(Section A)

Q1) (a) Select the correct alternative from the choices given : **[1x5]**

(i) A body has a positive charge of 8×10^{-19}C. If has :

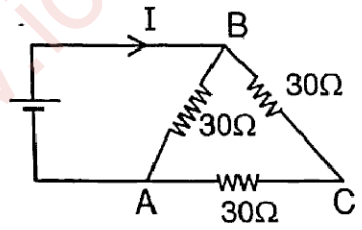
(a) an excess of 5 electrons. (b) a deficiency of 5 electrons.

(c) an excess of 8 electrons. (d) a deficiency of 8 electrons.

(ii) A parallel plate capacitor has a capacitance of 50 μF in air and 110 μF when immersed in an oil the dielectric constant ϵ_r of the oil is :

(a) 0.45 (b) 0.55 (c) 0.10 (d) 2.20

(iii) The current I in the circuit is



(a) $\frac{1}{45}$ A (b) $\frac{1}{15}$ A

(c) $\frac{1}{10}$ A (d) $\frac{1}{5}$ A

(iv) In Young's double slit experiment, if the slit widths are in the ratio 1:9 the ratio of the intensity at minimum to that at maximum will be

(a) 1 (b) $\frac{1}{9}$ (c) $\frac{1}{4}$ (d) $\frac{1}{3}$

(v) An electron of mass m when accelerated through a potential difference of v has de Broglie wavelength λ. The de Broglie wavelength associated with a proton of mass M accelerated through the same potential difference will be :

(a) $\frac{\lambda m}{M}$ (b) $\lambda\sqrt{\frac{m}{M}}$ (c) $\frac{\lambda M}{m}$ (d) $\lambda\sqrt{\frac{m}{M}}$

(B) Answer the following questions briefly and to the point. **[7x1]**

(i) Is potential gradient a scalar quantity ? Explain.

(ii) How can the sensitivity of a potentiometer can be increased ?

(iii) A conductor of length 'L' is bent in the form of a circle and a current I is allowed to flow through it. What should be the magnetic field strength at its centre ?

(iv) Write down the expression for torque acting on a magnet suspended in a uniform magnetic field. When this torque is maximum & minimum ?

(v) What is optical path ? How is it related to refractive index of a given material ?

(vi) State the law of Malus ?

(vii) Name any one material used as a moderator in a nuclear reactor.

Part - II (Section B)

Answer all questions

Q2) Define potential energy of two charge system calculate the potential energy of two protons separated by a distance of 1mm in terms of electron volt. [2]

Q3) Write the formula for drift velocity of electron in a conductor when it is connected by a cell of voltage 'v'. What is the effect of increasing temperature on drift velocity.

Q4) Explain the effect of temperature on resistance for conductors and semiconductor writing the suitable formula. [2]

Q5) Briefly explain the following terms. [2]

(i) Angle of dip at a place on earth.

(ii) Susceptibility of a magnetic substance.

Or

What do you understand by electromagnetic wave Represent Graphically the formation of electromagnetic waves.

Q6) Explain self induction. Derive unit & dimension of self inductance. [2]

Q7) The power of two lenses are +5D & — 3D. Find the focal length of combination & its nature when they are kept in contact. [2]

Q8) Define angular dispersion and dispersive power of material of a prism. [2]

Or

Define resolving power of a telescope giving its suitable formula. Mention the terms used in the formula.

Q9) State the law of stationary state and quantum condition related to Bohr's atomic model. [2]

Q10) In Becquerrel rays, which particles have maximum penetrating power and why ? [2]

Q11) Write two factors justifying the need of modulation for transmission of a signal. [2]

Q12) Draw a diagram to show how NAND gates can be combined to obtain an OR gate. [2]

(Section C)

Q13) Define electric potential at a point in electric field of a given charge. Also derive its expression for a point charge. [3]

Q14) A parallel plate capacitor of 20 μF is connected across a source of constant voltage of 30V. Without

disconnecting the source, a dielectric (k=4) is introduced to fill the space between two plates of the capacitor. Calculate.

(a) charge before dielectric is introduced. [3]

(b) charge after the dielectric is introduced.

(c) Energy drawn from the source during the introduction of dielectric.

Q15) The resistance of a galvanometer is 50Ω. It is converted into (a) a voltmeter using 10 KΩ resistor (b) an ammeter using 10mΩ resistor. Calculate the resistance of voltmeter and ammeter upto 2 significant figure.

Q16) Establish the lens maker's formula $\frac{1}{f} = (\mu - 1)\left(\frac{1}{r_1} - \frac{1}{r_2}\right)$ where the symbols have their usual meaning. [3]

OR

Where should an object be kept on the principal axis of a convex lens of focal length 20 cm, in order to get an image, which is double the size of the object.

Q17) State Brewester's law & prove it. An unpolarised light is incident over a surface ($\mu = \sqrt{3}$). Find the polarising angle of incidence and angle of refraction.

Q18) Establish the Einsteins photo electric equation. What do you mean by stopping potential. Draw a graph between stopping potential & the frequency of incident photon. [3]

OR

Derive the formula for de-Broglie wavelength for an electron moving through a potential difference V. What conclusions can be drawn by Davisson & Germer experiment.

Q19) For radioactive disintegration of a radioactive substance show that $N = Noe^{-\lambda t}$, where the terms have their usual meaning. [3]

(Section D)

Q20) Derive the relation for alternating voltage & hence current in a coil rotating uniformly inside uniform magnetic field. In what time interval the current will grow to half of its peak value starting from zero if frequency of a.c in 50 Hz.

OR

(200 V, 50Hz) AC is applied with LCR circuit. The circuit consists of an inductive reactance $X_L = 50\Omega$, Capacitive reactance $X_c = 50\ \Omega$ & a resistance 10 Ω Calculate the following :

(i) Impedance of the circuit.

(ii) Potential difference across L & R.

(iii) Resonant frequency.

(iv) Power consumed by the circuit.

Q21) Draw a neat & Labelled ray diagram for the formation of image in a compound microscope Derive the formula for its magnification. [5]

OR

Draw a neat and labelled diagram of an experimental set up of Young's double slit experiment to study the interference of light & derive the expression for fringe width.

Q22) Give the working of n-p-n transistor as an amplifier in Common emitter mode. Define current gain, voltage gain & power gain. [5]

OR

Derive the expression for energy possessed by an electron in an orbit on the basis of Bohr's atomic model. Mention at least two limitations of Bohr's atomic model.