CBSE 12th Physics 2017 Unsolved Paper
Delhi Board

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TIME - 3HR. | QUESTIONS - 26

THE MARKS ARE MENTIONED ON EACH QUESTION

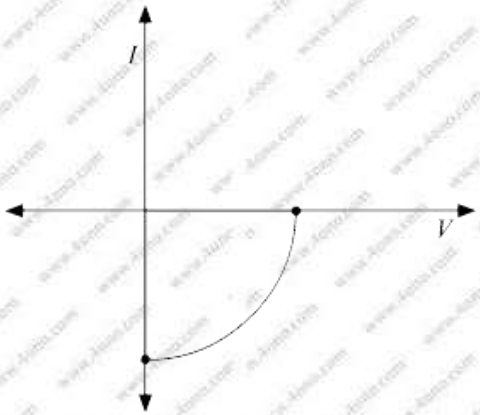
SECTION – A

Q.1. Does the charge given to a metallic sphere depend on whether it is hollow or solid? Give reason for your answer. *1 marks*

Q.2. A long straight current carrying wire passes normally through the centre of circular loop. If the current through the wire increases, will there be an induced emf in the loop? Justify. *1 marks*

Q.3. At a place, the horizontal component of earth's magnetic field is B and angle of dip is 60°. What is the value of horizontal component of the earth's magnetic field at equator? *1 marks*

Q.4. Name the junction diode whose I-V characteristics are drawn below: *1 marks*



Q.5. How is the speed of em-waves in vacuum determined by the electric and magnetic field? *1 marks*

SECTION - B

Q.6. How does Ampere-Maxwell law explain the flow of current through a capacitor when it is being charged by a battery? Write the expression for the displacement current in terms of the rate of change of electric flux. *2 marks*

Q.7. Define the distance of closest approach. An α-particle of kinetic energy 'K' is bombarded on a thin gold foil. The distance of the closest approach is 'r'. What will be the distance of closest approach for an α-particle of double the kinetic energy? *2 marks*

OR

Write two important limitations of Rutherford nuclear model of the atom.

Q.8. Find out the wavelength of the electron orbiting in the ground state of hydrogen atom. *2 marks*

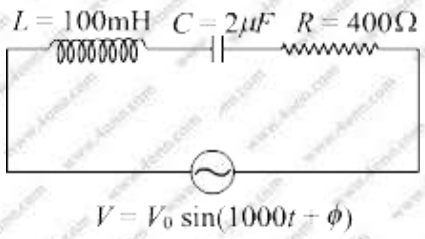
Q.9. Define the magnifying power of a compound microscope when the final image is formed at infinity. Why must both the objective and the eyepiece of a compound microscope has short focal lengths? Explain. *2 marks*

Q.10. Which basic mode of communication is used in satellite communication? What type of wave propagation is used in this mode? Write, giving reason, the frequency range used in this mode of propagation. *2 marks*

SECTION - C

Q.11. (i) Find the value of the phase difference between the current and the voltage in the series LCR circuit shown below. Which one leads in phase : current or voltage ?

(ii) Without making any other change, find the value of the additional capacitor C1, to be connected in parallel with the capacitor C, in order to make the power factor of the circuit unity. *3 marks*



Q.12. Write the two processes that take place in the formation of a p-n junction. Explain with the help of a diagram, the formation of depletion region and barrier potential in a p-n junction. *3 marks*

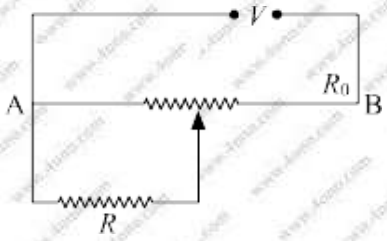
Q.13. (i) Obtain the expression for the cyclotron frequency. *3 marks*

(ii) A deuteron and a proton are accelerated by the cyclotron. Can both be accelerated with the same oscillator frequency? Give reason to justify your answer.

Q.14. (i) How does one explain the emission of electrons from a photosensitive surface with the help of Einstein's photoelectric equation? *3 marks*

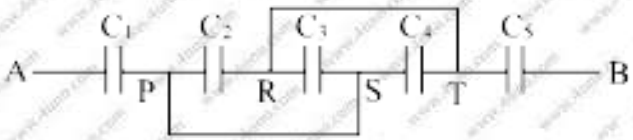
(ii) The work function of the following metals is given : Na 2.75 ev, K = 2.3 eV, Mo = 4.17 eV and Ni = 5.15 eV. Which of these metals will not cause photoelectric emission for radiation of wavelength 3300 Å from a laser source placed 1 m away from these metals? What happens if the laser source is brought nearer and placed 50 cm away?

Q.15. A resistance of R draws current from a potentiometer. The potentiometer wire, AB, has a total resistance of Ro. A voltage V is supplied to the potentiometer. Derive an expression for the voltage across R when the sliding contact is in the middle of potentiometer wire. *3 marks*



Q.16. Define the term 'amplitude modulation'. Explain any two factors which justify the need for modulating a low frequency base-band signal. *3 marks*

Q.17. (i) Find equivalent capacitance between A and B in the combination given below. Each capacitor is of 2 μF capacitance. *3 marks*



(ii) If a dc source of 7 V is connected across AB, how much charge is drawn from the source and what is the energy stored in the network?

Q.18. (i) Drive the expression for electric field at a point on the equatorial line of an electric dipole. *3 marks*

(ii) Depict the orientation of the dipole in (i) stable, (ii) unstable equilibrium in a uniform electric field.

Q.19. (i) A radioactive nucleus 'A' undergoes a series of decays as given below: *3 marks*

$$A \xrightarrow{\alpha} A_1 \xrightarrow{\beta} A_2 \xrightarrow{\alpha} A_3 \xrightarrow{\gamma} A_4$$

The mass number and atomic number of A_2 are 176 and 71 respectively. Determine the mass and atomic numbers of A_4 and A.

(ii). Write the basic nuclear process underlying β^+ and β^- decays.

Q.20. (i) A ray of light incident on face AB of an equilateral glass prism, shows minimum deviation of 30°. Calculate the speed of light through the prism. *3 marks*

(ii) Find the angle of incidence at face AB so that the emergent ray grazes along the face AC.

Q.21. For a CE-transistor amplifier, the audio signal voltage across the collector resistance of 2 kΩ is 2 V. Given the current amplification factor of the transistor is 100, find the input signal voltage and base current, if the base resistance is 1 kΩ. *3 marks*

Q.22. Describe the working principle of a moving coil galvanometer. Why is it necessary to use (i) a radial magnetic field and (ii) a cylindrical soft iron core in a galvanometer? Write the expression for current sensitivity of the galvanometer. *3 marks*

Can a galvanometer as such be used for measuring the current? Explain.

OR

(a) Define the term 'self-inductance' and write its S.I. unit.
(b) Obtain the expression for the the mutual inductance of two long co-axial solenoids S_1 and S_2 wound one over the other, each of length L and radii r_1 and r_2 and n_1 and n_2 number of turns per unit length, when a current I is set up in the outer solenoid S_2.

SECTION - D

Q.23. Mrs. Rashmi Singh broke her reading glasses. When she went to the shopkeeper to order new spects, he suggested that she should get spectacles with plastic lenses instead of glass lenses. On getting the new spectacles, she found that the new ones were thicker than the earlier ones. She asked this question to the shopkeeper but he could not offer satisfactory explanation for this. At home, Mrs. Singh raised the same question to her daughter Anuja who explained why plastic lenses were thicker. *4 marks*

(a) Write two qualities displayed each by Anuja and her mother.
(b) How do you explain this fact using lens maker's formula?

SECTION - E

Q.24. (a) Draw a labelled diagram of AC generator. Derive the expression for the instantaneous value of the emf induced in the coil. *5 marks*

(b) A circular coil of cross-sectional area $200\ cm^2$ and 20 turns is rotated about the vertical diameter with angular speed of 50 rad s^{-1} in a uniform magnetic field of magnitude $3.0 \times 10^{-2} T$. Calculate the maximum value of the current in the coil.

OR

(a) Draw a labelled diagram of a step-up transformer. Obtain the ratio of secondary to primary voltage in terms of number of turn and currents in the two coils.

(b) A power transmission line feeds input power at 2200 V to a step-down transformer with its primary windings having 300 turns. Find the number of turns in the secondary to get the power output at 220 V.

Q.25. (a) Distinguish between unpolarized light and linearly polarized light. How does one get linearly polarised light with the help of a polaroid? *3 marks*

(b) A narrow beam of unpolarised light of intensity I_0 is incident on a polaroid P_1. The light transmitted by it is then incident on a second polariod P_2 with its pass axis making angle of 60° relative to the pass axis of P_1. Find the intensity of the light transmitted by P_2.

OR

(a) Explain two features to distinguish between the interference pattern in Young's double slit experiment with the diffraction pattern obtained due to a single slit.

(b) A monochromatic light of wavelength 500 nm is incident normally on a single slit of width 0.2 mm to produce a diffraction pattern. Find the angular width of the central maximum obtained on the screen.

Estimate the number of fringes obtained in Young's double slit experiment with fringe width 0.5 mm, which can be accommodated within the region of total angular spread of the central maximum due to single slit.

Q.26. (i) Derive an expression for drift velocity of electrons in a conductor. Hence deduce Ohm's law. *3 marks*

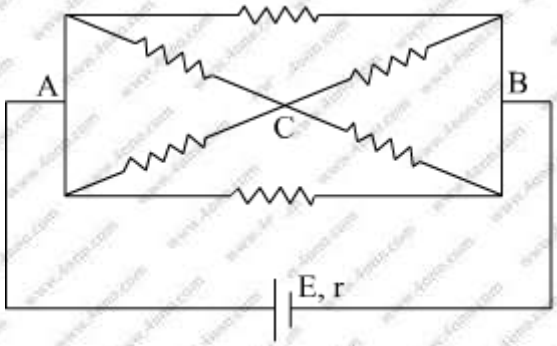
(ii) A wire whose cross-sectional area is increasing linearly from its one end to the other, is connected across a battery of V volts.

Which of the following quantities remain constant in the wire?
(a) drift speed
(b) current density
(c) electric current
(d) electric field

OR

(i) State the two Kirchhoff's laws. Explain briefly how these rules are justified.

(ii) The current is drawn from a cell of emf E and internal resistance r connected to the network of resistors each of resistance r as shown in the figure. Obtain the expression for (i) the current draw from the cell and (ii) the power consumed in the network.



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