CBSE 12th Physics 2007 Unsolved Paper
Delhi Board

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TIME - 3HR. | QUESTIONS - 30

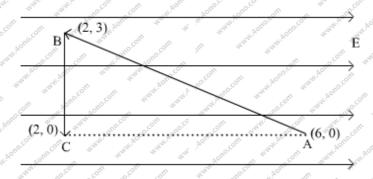### THE MARKS ARE MENTIONED ON EACH QUESTION

SECTION - A

Q.1. A concave lens of refractive index 1.5 is immersed in a medium of refractive index 1.65. What is the nature of the lens? *1 mark*

Q.2. Define Capacitive reactance, Write its S.I. Units. *1 mark*

Q. 3. Two spherical bobs, one metallic and the other of glass, of the same size are allowed to fall freely from the same height above the ground. Which of the two would reach earlier and why? *1 mark*

Q. 4. The carrier wave is given by
   C (t) = 2sin (8π t) volt.
   The modulating signal is a square wave as shown. Find modulation index. *1 mark*

Q.5. A 10 V battery of negligible internal resistance is connected across a 200 V battery and a resistance of 38 Ω as shown in the figure. Find the value of the current in circuit. *1 mark*

Q.6. Write the relationship between angle of incidence 'i', prism 'A' and angle of minimum deviation for a triangular prism. *1 mark*

Q.7. State de-Broglie hypothesis. *1 marks*

Q.8. Under what condition does a biconvex lens of glass having a certain refractive index actas a plane glass sheet when immersed in a liquid? *1 marks*

SECTION - B

Q.9. Write the expression for Lorentz magnetic force on a particle of charge 'q' moving with velocity $\vec{v}$ in a magnetic field $\vec{B}$. *2 mark*

Q.10. What is sky wave communication? Why is this mode of propagation restricted to the frequencies only up to few MHz? *2 mark*

Q.11. A test charge 'q' is moved without acceleration from A to C along the path from A to B and then from B to C in electric field E as shown in the figure. (i) Calculate the potential difference between A and C. (ii) At which point (of the two) is the potential more and why? *2 mark*

Q.12. An electric dipole is held in a uniform electric field.
 (i) Show that the net force acting it is zero.
 (ii) The dipole is aligned to the field. Find the work done in rotating it through the angle of 180. *2 mark*

Q.13. A capacitor of capacitance 'C' is being charged by connecting it across a dc source along with an ammeter. Will the ammeter show a momentary deflection during the process of charging? If so, how would you explain this momentary deflection and the resulting continuity of current in the circuit? Write the expression for the current inside the capacitor. *2 mark*

Q.14. Draw typical output characteristics of an n-p-n transistor in CE configuration. Show how these characteristics can be used to determine output resistance. *2 mark*

Q.15. Describe briefly, with the help of a circuit diagram, how a potentiometer is used to determine the internal resistance of a cell. *2 mark*

Q.16. Write the functions of the following in communication systems: *2 mark*
 (i) Transmitter
 (ii) Modulator

Q.17. Considering the case of a parallel plate capacitor being charged, show how one is required to generalize Ampere's circuital law to include the term due to displacement current. *2 mark*

Q.18. A small telescope has an objective lens of focal Length 150 cm and eyepiece of 5 cm. What is the magnifying power of the telescope viewing distant in normal adjustment?

If this telescope is used to view a 100 m tall tower 3 km away. what is height of the image O\of the tower formed by the objective lens? *2 mark*

SECTION - C

Q.19. Two heating elements of resistances R_1 and R_2 when operated at a constant supply of voltage, V, consume powers P_1 and P_2 respectively. Deduce the expressions for the power of their combination when they are, in turn, connected in (i) series and (ii) parallel across the same voltage supply. *3 marks*

Q.20. A convex lens made up of glass of refractive index 1·5 is dipped, in turn, in (i) a medium of refractive index 1·65, (ii) a medium of refractive index 1·33.
  (a) Will it behave as a converging or a diverging lens in the two cases?
  (b) How will its focal length change in the two media? *3 marks*

Q. 21. While travelling back to his residence in the car, Dr. Pathak was caught up in a thunderstorm. It became very dark. He stopped driving the car and waited for thunderstorm to stop. Suddenly he noticed a child walking alone on the road. He asked the boy at his residence. The boy insisted that Dr. Pathak should meet his parents. The parents expressed their gratitude to Dr. Pathak for his concern for safety of the child. *3 marks*

  Answer the following questions based on the above information:
  (a) Why is it safer to sit inside a car during a thunderstorm?
  (b) Which two values are displayed by Dr. Pathak in his actions?
  (c) Which values are reflected in parents' response to Dr. Pathak?
  (d) Give an example of a similar action on your part in the past from everyday life.

Q.22. (a) Why photoelectric effect cannot be explained on the basis of wave nature of light? Give reasons.
  (b) write the basis features of photon picture of electromagnetic radiation on which Einstein's photoelectric equation is based. *3 marks*

Q.23. Draw a plot of potential energy of a pair of nucleons as a function separation. Mark the regions where the nuclear force is (i) attractive and (ii) repulsive. Write any two characteristic features of nuclear forces. *3 marks*

Q.24. You are given three lenses L_1, L_2 and L_3 each of focal length 20 cm. An object is kept at 40 cm in front of L_1, as shown. The final real image is formed at the focus 'I' of L_3. Find the separations between L_1, L_2 and L_3. *3 marks*

Q.25 (a) Obtain the expression for the energy stored per unit volume in a charged parallel plate capacitor.
  (b) The electric field inside a parallel plate capacitor is E. Find the amount of work done in moving a charge q over a closed rectangular loop a b c d a. *3 marks*

Q.26. A hollow cylindrical box of length 1m and area of cross-section $25 cm^2$ is placed in a three-dimensional coordinate system as shown in the figure. The electric field in the region is given by $\vec{E} = 50\, x\, \hat{\imath},$ where E is in NC^{-1} and x is in metres.
Find: *3 marks*
   (i)   Net flux through the cylinder.
   (ii)   (ii) Charge enclosed by the cylinder.

Q.27. A metallic rod of length 'l' is rotated with a frequency v with one end hinged at the centre and the other end at the circumference of a circular metallic ring of radius r, about an axis passing through the centre and perpendicular to the plane of the ring. A constant uniform magnetic field B parallel to the axis is present everywhere. Using Lorentz force, explain how emf is induced between the centre and the metallic ring and hence obtain the expression for it. *3 marks*

SECTION - D

Q.28. With the help of a suitable ray diagram, derive the mirror formula for a concave mirror. *5 marks*

Q.29. Draw a schematic of a cyclotron. explain briefly how it works and how it is used to accelerate the charged particles.
  (i) Show that time period of ions in a cyclotron is independent of both the speed and radius of circular path.
  (ii). what is resonance condition? how it used to accelerate the charged particles?
  5 marks

Q.30. (i) With the help of a labelled diagram, describe briefly the underlying principle and working of a step up transformer. *5 marks*
  (ii) Write any two sources of energy loss in a transformer.
  (iii) Aster up transformer converts a low input voltage into a high output voltage. Does it siolate law of conservation of energy? Explain.