

Shruti Khatori

VISHWA BHARATI PUBLIC SCHOOL (DWARKA)

Half-Yearly (2017-2018)

CLASS: XII

TIME: 3hrs

SUB: PHYSICS

DATE: 18-9-2017

M.M: 70

NOTE: (i) All questions are compulsory. Choice is internal.

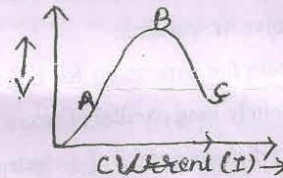
(ii) This question paper consists of 26 questions and 5 pages.

Section A

Q.1-Q.5 carry 1 mark each.

- ✓ 1. What is electric flux through a cube of side 1 cm which encloses an electric dipole.
- ✓ 2. Graph showing variation of current vs voltage for a material GaAs is shown in figure. Identify region of :-

- (i) negative resistance
(ii) Where Ohm's law is obeyed.

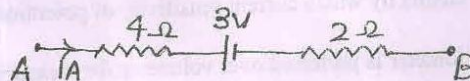


3. In which situation is there a displacement current but no conduction current.
- ✓ 4. Write the underlying principle of transformer.
- ✓ 5. Name the part of em-wave used for photography during haze and fog.

Section B

Q.6-Q.10 carry 2 marks each.

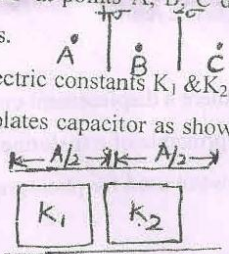
- ✓ 6. Show that electric field intensity $\vec{E} = -\frac{dV}{dr}$
- ✓ 7. Figure below represent a part of closed circuit. Find potential difference between points A&B.



8. A cyclotron freq. is 10 MHz. What should be the operating mag. field for acc. Protons? If radius of dees is 60cm. Calculate K.E (in MeV) of proton beam produced by accelerator.
9. The susceptibility of a magnetic material is 2.6×10^{-5} . Identify the type of magnetic material and state its two properties.
10. Calculate Q factor of a series LCR circuit with $L=2.0\text{M}$, $C=2\mu\text{F}$ and $R=10\Omega$. Mention significance of Q-factor in LCR circuit.

Section C

Q.11 – Q.22 carry 3 marks each.

11. A resistance of 200Ω and capacity of $15\mu\text{F}$ are connected in series to a 220V, 50Hz a.c source. Calculate current in circuit & RMS value of voltage across register & capacitor. Is the algebraic sum of these voltage more than source Voltage? If yes resolve the paradox.
12. Obtain the expression for E.F at points A, B, C due to two opposite charged thin infinitely long parallel plates.
13. Two dielectric slabs of dielectric constants K_1 & K_2 are filled in between two plates, each of area A, of parallel plates capacitor as shown in fig. Find net capacitance of capacitor.
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14. (i) Derive expression for drift velocity of free electrons. Hence deduce Ohm's law.
(ii) How drift velocity of \hat{e} in metallic conductor vary with increase in temperature.
15. Two cells of emfs E_1 & E_2 and internal resistance r_1 & r_2 are connected in parallel. Derive expression for (i) emf. (ii) internal resistance of a single equivalent cell which can replace combination.
16. (a) State underlying Principle of potentiometer.
(b) Write two factors by which current sensitivity of potentiometer can be increased.
(c) Why potentiometer is preferred over voltmeter for measuring emf of a cell.

17. (i) State Biot-savart's law. Using this law find expression for M.F at centre of circular coil of N-turns, radius r, carrying current I.

(ii) Sketch magnetic field for a circular loop, clearly indicating direction of field.

18. (i) Obtain expression for cyclotron frequency.

(ii) A deuteron & proton accelerated by cyclotron, can both be accelerated with same frequency? Give reason to fulfil your answer.

19. A circular coil of 20 turns & radius 10 cm is placed in uniform magnetic field of 0.10T normal to the plane of coil. If current in coil is 5A, What is (i) torque in coil

(ii) Total force on coil (iii) Average force on each \hat{e} in coil due to magnetic field

(The coil is made of cross section area 10^{-5}m^2 & free \hat{e} density 10^{29}m^{-3} .)

20. (a) Obtain expression for magnetic energy stored in solenoid in terms of magnetic field B, area A and length l of a solenoid.

(b) How does this magnetic energy compare with electrostatic energy stored in capacitor.

21. Show diagrammatically two different arrangements used for winding primary and secondary coils in transformer. Assuming transformers to be ideal one. Write expression for

(i) Output voltage to input voltage.

(ii) Output current to input current in terms of n_s and n_p .

22. Write the expression for Ampere's circuital law in terms of conduction current & displacement current. Mention situation when there is

(i) Only conduction current and no displacement current.

(ii) Displacement current and no conduction current.

Section D

Q.23 carry 4 marks

23. Sushil is in the habit of charging his mobile and then leaving the charger connected through mains with the switch on. When his sister Asha pointed it out to him, he replied there is no harm as mobile is disconnected. Asha then explained to him and convinced him, how energy was still being wasted as charger is continuously consuming energy.

(i) What value did Asha display in convincing her brother.

(ii) What measure in your view should be adopted to minimize the wastage of electric energy in your household.

(iii) Imagine an electric appliance of 2W left connected to mains 20 hrs. Estimate the amount of electrical energy wasted.

Section E

Q.24 – Q.26 carry 5 marks each.

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

(b) A circular coil of X-sectional area 200 cm^2 and 20 turns are rotated about vertical diameter with $\omega = 50 \text{ rad s}^{-1}$ in a uniform field of magnitude $3.0 \times 10^{-2} \text{ T}$. Calculate maximum value of emf in coil.

25. (a) Distinguish the magnetic properties of diamagnetic, paramagnetic & ferromagnetic in terms of (i) Susceptibility (ii) Magnetic permeability.

(iii) Give an example of each of these materials.

(b) Draw field lines due to external magnetic field near (i) diamagnetic, (ii) paramagnetic (iii) ferromagnetic.

OR

Derive the expression for power dissipated in a series LCR circuit. Explain the phenomenon of resonance in series LCR circuit.

26. (a) Define equipotential surface. Why E.F at any point on the equipotential surface directed normal to surface?

(b) Draw equipotential surface for an electric dipole. Why does a separation b/w successive surface get wider as distance from charge increases.

(c) For this dipole, draw a plot showing variation of V versus x , where x ($x \gg 2a$) is distance from pt. charge $-q$ along line joining two charges.

OR

Describe the working principle of moving coil galvanometer. Draw a labelled diagram of moving coil galvanometer also derive expression of current sensitivity. Why is it necessary to use (i) radial magnetic field (ii) cylindrical soft iron core in a galvanometer.

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