

DAV BR PUBLIC SCHOOL, Bina(M.P.)
HALF YEARLY EXAMINATION 2024-25

PRACTICE PAPER

Class-XII

Subject-Physics

Time allowed-3 hrs

MM-70

General Instructions:

Read the following instructions very carefully and strictly follow them:

- (i) This question paper contains 35 questions. **All** questions are **compulsory**.
- (ii) This question paper is divided into **five** sections - **A, B, C, D** and **E**.
- (iii) In **Section A** - Questions no. **1** to **18** are multiple choice(MCQ) type questions, carrying **1** mark each.
- (iv) In **Section B** - Questions no. **19** to **25** are Very Short Answer(VSA) type questions, carrying **2** marks each.
- (v) In **Section C** - Questions no. **26** to **30** are Short Answer(SA) type questions, carrying **3** marks each.
- (vi) In **Section D** - Questions no. **31** and **32** are case-based questions, carrying **4** marks each.
- (vii) In **Section E** - Questions no. **33** to **35** are Long Answer(LA) type questions, carrying **5** marks each.
- (viii) There is no overall choice. However, an internal choice has been provided in 2 questions in Section B, 2 questions in Section C, 3 questions in Section D and 2 questions in Section E.

Section-A

1. Kirchoff's current law is based on the law of conservation of:
a) charge b) energy c) mass d) none of these
2. The electromagnetic radiation used for eye surgery is:
a) Infrared b) UV rays c) X-rays d) Microwave
3. The strength of the magnetic field at a distance r from a long straight current carrying wire is B . The field at the distance $r/2$ will be:
a) B b) $2B$ c) $B/2$ d) $B/4$
4. If the back emf induced in a coil when current changes from 1A to 0A in 1 millisecond is 5V. The self inductance of the coil is:
a) 5H b) 1H c) $5 \times 10^{-3} \text{H}$ d) $5 \times 10^3 \text{H}$
5. A magnetic needle kept in a non uniform magnetic field experiences:
a) A force only b) A torque only c) A force and a torque both d) None of these
6. A closely wound solenoid of 800 turns and area of cross-section $2.5 \times 10^{-4} \text{ m}^2$ carries a current of 3.0 A, its magnetic moment is:
a) 0.6 JT^{-1} b) 6 JT^{-1} c) 1.2 JT^{-1} d) Zero

7. The capacitance of a parallel plate capacitor is $10 \mu\text{F}$. When a dielectric plate is introduced in between the plates its potential becomes $1/4^{\text{th}}$ of its original value. What is the value of the dielectric constant of the plate introduced?
 a) 40 b) 2.5 c) 0.4 d) 4
8. In vacuum the wavelength of EM wave of frequency $5 \times 10^{19} \text{ Hz}$ is:
 a) $6 \times 10^{-12} \text{ m}$ b) $3 \times 10^{-8} \text{ m}$ c) $1.6 \times 10^{11} \text{ m}$ d) $1.6 \times 10^{-11} \text{ m}$
9. What is the value of current in a wire if the radius of the wire is doubled and drift velocity gets halved?
 a) $i/2$ b) $2i$ c) i d) $i/4$
10. The magnetic flux linked with is given by an equation ($\Phi = 5t^2 + 2t + 3$). The induced emf in the coil at the third second will be:
 a) 54 units b) 32 units c) 40 unit d) 65 units
11. Which one of the following has relative magnetic permeability between 0 and 1:
 a) Aluminium b) Alnico c) water d) sodium
12. Name the electromagnetic waves, also known as heat waves
 a) radio waves b) microwaves c) x - rays d) infrared waves
13. The correct formula for the speed of EM waves in vacuum is:
 a) $c = B_0/E_0$ b) $c = E_0B_0$ c) $c = E_0/B_0$ d) $c = 1/(\sqrt{E_0B_0})$
14. At resonance the impedance in series LCR circuit is:
 a) maximum b) 0 c) infinity d) minimum

For questions 15 to 18, two statements are given, one labeled assertion(A) and other reason(R). Select the correct answer to this question from the option as given below .

- (a) If both A and R are true and the R is correct explanation of A.
 (b) If both A and R are true but R is not the correct explanation of A.
 (c) If A is true but R is false .
 (d) If both A and R are false .

15. Assertion (A) - Magnetic poles cannot be separated by breaking a bar magnet into two pieces .

Reason (R) - When a magnet is broken into two pieces, the magnetic moment will be reduced to half.

16. Assertion (A) - Lenz's law does not violate the principle of conservation of energy .

Reason(R) - Induced emf never opposes the change in magnetic flux that causes the emf.

17. Assertion (A) - The same amount of current flows through the filament and line wire but more heat is produced in filament .

Reason(R)- Filament is made of material having high resistance and high melting point.

18. Assertion (A) - Capacity of a conductor is independent of the amount of charge on it.

Reason(R)- Capacitance depends on the dielectric constant of surrounding medium, shape and size of the conductor.

Section-B

19. In a series LCR circuit obtain the condition under which (a) the impedance of the circuit is minimum and (b) wattless current flows in the circuit.
20. Relate electric current and drift velocity of the electrons.
21. A circular metal disc of radius 10 cm rotates at a speed of 20π rad/sec about an axis through its centre, perpendicular to the disc in a uniform magnetic field of 0.2 T perpendicular to the disc. Find the induced emf developed between the axis of the disc and the rim.
22. Derive an expression for an emf induced in a rectangular coil due to the motion of one of its sides in some external magnetic field.
23. Use the Gauss law to find the electric field due to a thin infinitely long uniformly charged metallic sheet.
24. How to convert a galvanometer into an ammeter? Give the formula for value of shunt connected here.

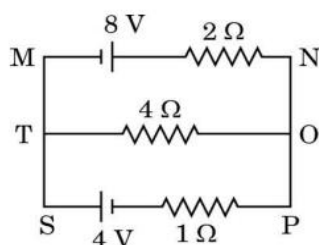
OR

Define (a) Current sensitivity and (b) Voltage sensitivity of a galvanometer with their formulae.

25. Name the device used to change the alternating voltage to a higher or lower value. State any two causes of energy loss in this device and mention the methods to minimise them.

Section-C

26. Two long straight parallel wires separated by 40 cm carrying 10A and 20A current respectively in the same direction. Find the magnitude and direction of the net magnetic field at a point midway between them.
27. Use Kirchoff's rules determine the current flowing through the branches MN, TO and SP in the circuit shown in the figure.



28. A square coil of side 10 cm consists of 20 turns and carries a current of 12A. The coil is suspended vertically and normal to the plane of the coil makes an angle of 30 degree with the direction of a uniform horizontal magnetic field of 0.80 T. What is the magnitude of the torque experienced by the coil?
29. Derive Ohm's law $V = mI / (ne^2TA)$ i by using the concept of drift of electrons.

30. (a) State Kirchhoff's laws.

(b) Draw the circuit diagram of Wheat stone bridge and obtain the condition when no current flows through the galvanometer.

OR

Two cells of emfs E_1 and E_2 and internal resistance r_1 and r_2 respectively are connected in parallel. Find the equivalent EMF and resistance of the combination.

Section-D

31. A series LCR circuit can show the phenomenon of resonance when capacitive reactance is equal to inductive reactance. In this condition, the impedance of the circuit becomes minimum and the amplitude of the current becomes maximum.

(a) What is the value of impedance of an LCR circuit?

(b) State the peak value of AC current.

(c) Give the formula of resonance frequency.

(d) Give the value of impedance of LCR circuit at resonance.

32. Electromagnetic waves are transverse waves which are made up of electric and magnetic field. The spectrum of EM waves is vast. It is extended from radio waves to gamma rays. Its different parts have different wavelengths and frequencies, different uses and different ways of production.

(a) Name the em waves with maximum wavelength.

(b) Give one use of microwaves.

(c) How are gamma rays produced?

(d) Give the range of wavelength of light.

Section-E

33. (a) Distinguish between displacement current and conduction current. Give Ampere-Maxwell equation in this regard.

(b) Suppose that the electric field amplitude of an em wave is $E_0=120$ N and its frequency $\nu_0=50$ Hz. Find B_0 , wavelength λ , angular frequency ω_0 and k .

OR

(a) Derive an expression of mutual inductance of two long coaxial coils of equal length but different cross sectional area wound one over the other.

(b) A series LCR circuit with $R = 20$ ohm, $L= 2$ H and $C= 50$ (μ F) is connected to a 200 V AC source. Find the (a) resonant frequency (b) amplitude of AC current at resonance.

34. (a) State Biot-Savart law.

(b) Find the magnetic field due to a current carrying circular conductor coil.

OR

(a) State Ampere's circuital law and prove it.

(b) Find the magnetic field due to a current carrying solenoid.

35. (a) Define electric flux. Give its SI unit and nature.

(c) A regular hexagon of side 10 cm has a charge $5 \mu\text{C}$ at each of its vertices. Calculate the potential at the centre of the hexagon.

OR

(a) Derive an expression for energy conserved in a parallel plate capacitor.

(b) What do you mean by an equipotential surface?

(c) Draw equipotential surfaces for a point charge.