QB365 Student Learing Managemnet System
Exam Name: Pre Quarterly - Practice
Std: 12th Standard - Physics
Chapter: Current Electricity, Electromagnetic Induction, Moving Charges and Magnetism, Electrostatic Potential and Capacitance, Alternating Current, Electric Charges and Fields, Magnetism and Matter

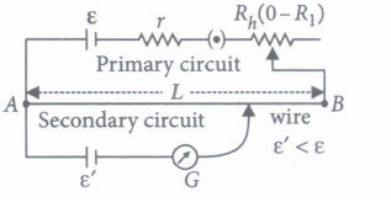
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Questions:

Case Study Questions

1. There are several magnetic materials like diamagnetic materials, paramagnetic materials and ferromagnetic materials.When a diamagnetic material is placed in a magnetising, field, then it gets feebly magnetised in a direction opposite to the magnetising field. It is weakly repelled by magnetic field. The field (B) inside the diamagnetic material is less than magnetising field (H).
A paramagnetic material is weakly attracted by the magnetic field. The field (B) inside the paramagnetic material is slighly greater than the magnetising field. A ferromagnetic material is aparamagnetic material which acquire very high magnetism in external magnetic field. It is strongly attracted by the magnetic field.
The relative permeability of magnetic material is given by μ_r, =X +1,where X is susceptibility of the material.
(i) When a diamagnetic material is placed in a magnetic field, then how it is oriented?
(ii) The value of magnetic field B and the magnetic intensity H in magnetic material are found to be 6.28 x 10^{-2}T and 100 Am^{-1}, respectively. Determine the value of relative permeability and magnetic susceptibility of the magnetic material.
(iii) Mention the three difference between diamagnetic substances and paramagnetic substances.
(iv) Which types of materials are called soft ferromagnets. Give any two examples of such materials.

2. The potentiometer is an apparatus used for measuring the emf of a cell or potential difference between two points in an electrical circuit accurately. It is also used to determine the internal resistance of a primary cell. The potentiometer is based on the principle that, if V is the potential difference across any portion of the wire of length 1 and resistance R, then V∝l or V=klV∝l or V=kl where k is the potential gradient. Thus, the potential difference across any portion of the potentiometer wire is directly proportional to the length of the wire of that portion. The potentiometer wire must be uniform. The resistance of the potentiometer wire should be high.



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(i) Which one of the following is true about the potentiometer?
(a) Its sensitivity is low
(b) It measures the emf of a cell very accurately
(c) It is based on the deflection method
(d) None of the above
(ii) Sensitivity of a potentiometer can be increased by
(a) decreasing potential gradient along the wire
(b) increasing potential gradient along the wire
(c) decreasing current through the wire
d) increasing current through the wire
(iii) A potentiometer is an accurate and versatile device to make electrical measurements of EMF because the method involves
(a) potential gradients
(b) a condition of no current flow through the galvanometer
(c) a combination of cells, galvanometer and resistances
(d) cells
(iv) In a potentiometer experiment, the balancing length is 8 m, when the two cells E_1 and E_2 are joined in series. When the two cells are connected in opposition the balancing length is 4 m. The ratio of the e. m. f. of two cells (E_1/E_2) is
(a) 1: 2
(b) 2: 1
(c) 1: 3
(d) 3: 1

5 Marks

3. In an evening Ashok and his friends were sitting in a park. They saw a bird was sitting on a high voltage wire. But as soon as the current was passed through the wire, the bird sitting on it flew away. All gave their opinions for the reason behind it. But their opinions were not properly balanced. At last Ashok explained the reason behind it.
(a) What are the value displayed by Ashok?
(b) Why as soon as the current passed through a high voltage wire, the bird sitting on it flew away?

4. A series LCR circuit with R = 20 Ω, L = 1.5 H and C = 35 μF is connected to a variable-frequency 200 V ac supply. When the frequency of the supply equals the natural frequency of the circuit, what is the average power transferred to the circuit in one complete cycle?

5. You are given three capacitors of 2 μF, 3 μF, 4 μF, respectively.
(i) Form a combination of all these capacitors of 13 equívalent capacitance $\frac{13}{3}\mu$F.
(ii) What is the maximum and minimum value of the equivalent capacitance that can be obtained by connecting these capacitors?

3 Marks

6. In an experiment of calibration of voltmeter, a standard cell of emf 1.1 V is balanced against 440 cm of potentiometer wire. The potential difference across the ends of a resistance is found to balance against 220 cm of the wire. The corresponding reading of voltmeter is 0.5 volt. Find the error in the reading of voltmeter.

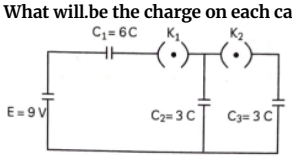
7. A series LCR circuit with $C = 80\ \mu F,\ L = 5.0\ H$ and $R = 40\Omega$ is connected to a variable frequency 240 V a.c. source. Calculate
(i) angular frequency of the source which drives the circuit in resonance.
(ii) current at the resonating frequency.
(iii) rms pot. drop across the capacitor.

8. (i) How is the electric field due to a charged parallel plate capacitor affected, when a dielectric slab is inserted between the plates fully occupying the intervening region?
(ii) A slab of material of dielectric constant K has the same area as the plates of a parallel plate capacitor but has thickness $\frac{1}{2}$ d, where d is the separation between the plates. Find the expression for the capacitance when the slab is inserted between the plates.

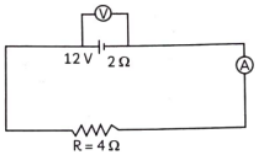
9. Current in a circuit falls from 5.0 A to 0.0 A in 0.1 s. If an average emf of 200 V induced, give an estimate of the self-inductance of the circuit.

10. At a hydroelectric power plant, the water pressure head is at height of 300 m and the water flow available is 100 m^3/s. If the turbine generator efficiency is 60%, estimate the electric power available from the plant. (Take, g = 9.8 m/s^2)

11. In the circuit shown in figure initially K_1 is closed and K_2 is open. What are the charges on each capacitors. Then K_1 was opened and K_2 was closed (order is important), What will.be the charge on each capacitor now? (C = 1 μF)



12. (A) The potential difference applied across a given resistor is altered so that the heat produced per second increases by a factor of 9. By what factor does the applied potential difference change?
(B) In the figure shown, an ammeter A and a resistor of 4 Ω are connected to the terminals of the source. The emf of the source is 12 V having the internal resistance of 2 Ω.



Calculate the voltmeter and ammeter readings.

2 Marks

13. Two wires A and B have same lengths and material, have their cross sectional areas 1:4, what would be the ratio of heat produced in these wires when the voltage across each is constant

14. A dipole, with a dipole moment of magnitude p, is in stable equilibrium in an electrostatic field of magnitude E. Find the work done in rotating this dipole to its position of unstable equilibrium.

15. The resistance of the platinum wire of a platinum resistance thermometer at the ice point is 5 Ω and at steam point is 5.23 Ω. When the thermometer is inserted in a hot bath, the resistance of the platinum wire is 5.795 Ω. Calculate the temperature of the bath.

16. A magnet is 0.10 m long and its pole strength is 12 Am. Find the magnitude of B at a point on its axis at a distance of 0.2 m from it.

17. What is the mutual inductances of a pair of coils if a current change of 6 ampere of 200 turns with flux 12 x 10^{-4} Wb per turn?

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Multiple Choice Question

18. Current carrying wire produces
(a) Only electric field (b) Only magnetic field (c) Both electric and magnetic field (d) None of the above

19. An e.m.f. is produced in a coil, which is not connected to an external voltage source. This can be due to
(a) the coil being in a time varying magnetic field (b) the coil moving in a time varying magnetic field (c) the coil moving in a constant magnetic field
(d) the coil is stationary in external spatially varying magnetic field, which does not change with time

20. A proton and an alpha particle both enter a region of uniform magnetic field B, moving at right angles to the field B. If the radius of circular orbits for both the particles is equal and the kinetic energy acquired by proton is 1 MeV, the energy acquired by the alpha particles will be :
(a) 1 MeV (b) 4 MeV (c) 0.5 MeV (d) 1.5 MeV

21. A condenser is charged to double its initial potential. The energy stored in the condenser becomes x times, where x =
(a) 2 (b) 4 (c) 1 (d) 1/2

22. Gauss's law helps in
(a) determination of electric force between pint. charges (b) situations where Coulomb's law fails (c) determination of electric field due to symmetric charge distributions
(d) determining electric potential due to symmetric charge distributions

23. Two identical metallic spheres having charges +4q and -2q are placed with their centres r distance apart. Force of attraction between the spheres is F. If the two spheres are brought in contact and then placed at the same distance r apart, the force between them
(a) F (b) F/2 (c) F/4 (d) F/8

24. An electron is projected along the axis of a circular conductor carrying the same current. Electron will experIence
(a) a force along the axis. (b) a force perpendicular to the axis (c) a force at an angle of 4° with axis (d) no force experienced.

25. A magnet of dipole moment M is aligned in equilibrium position in a magnetic field of intensity B. The work done to rotate it through an angle θ with the magnetic field is
(a) MB sin θ (b) MB cos θ (c) MB (1 - cos θ) (d) MB(1 - sin θ)

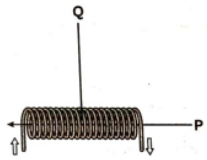
26. Series ac circuit has inductance L, resistance R and angular frequency co, the quality factor Q is
(a) $\left(\frac{\omega L}{R}\right)^2$ (b) $\frac{\omega L}{R}$ (c) $\frac{R}{\omega L}$ (d) $\left(\frac{R}{\omega L}\right)^2$

27. Two small balls each having a positive charge Q coulombs are suspended by two insulating strings of equal length L metres from a hook fixed to a stand. The whole set up is taken in a satellite into space where there is no gravity (state of weightlessness). The angle between the two strings and magnitude of the tension will be respectively:
(a) $180°, \frac{1}{4\pi\varepsilon_0}\cdot\frac{Q^2}{(2L)^2}$ (b) $90°, \frac{1}{4\pi\varepsilon_0}\cdot\frac{Q^2}{L^2}$ (c) $180°, \frac{1}{4\pi\varepsilon_0}\cdot\frac{Q^2}{2L^2}$ (d) $90°, \frac{1}{4\pi\varepsilon_0}\cdot\frac{Q^2}{4L^2}$

28. In a given region, electric potential varies with position as $V(x) = 3 + 2x^2$.
Identify which of the following statements is correct.
(a) Potential difference between the two point x = 2 and x = -2 is 2 V. (b) A charge of 1 C placed at x = 2 experiences a force of 6 N.
(c) The force experienced by the above charge is along +x -axis. (d) The electric field in the given region is non-uniform along x-axis.

29. An air filled parallel plate capacitor has capacity C. If distance between plates is doubled and it is immersed in a liquid then capacity becomes twice. Dielectric constant of the liquid is:
(a) 1 (b) 2 (c) 3 (d) 4

30. When we move magnetic compass from point P to Q then which of the following statement is true?

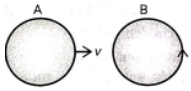


(a) The deflection of the magnetic needle at P and Q will be in the same direction. (b) The deflection of the magnetic needle at P and will be in the opposite directions.
(c) The deflection of the magnetic needle at P and Q will be perpendicular to each other.
(d) The deflection of the magnetic needle at P and Q will be inclined at 45° with respect to each other.

31. A magnetic needle is kept in a non-uniform magnetic field. It experiences:

(a) a force and a torque. (b) a force but not a torque. (c) a torque but not a force. (d) neither a torque nor a force.

32. There are two coils A and B as shown in Figure. A current starts flowing in B as shown, when A is moved towards B and stops when A stops moving. The current in A is counter clockwise. B is kept stationary when A moves. We can infer that:



(a) there is a constant current in the clockwise direction in A. (b) there is a varying current in A. (c) there is no current in A.
(d) there is a constant current in the counter clockwise direction in A.

33. A 300 Ω resistor and a capacitor of $\left(\frac{25}{\pi}\right)\mu$F are connected in series to a 200 V- 50 Hz AC source. The current in the circuit is:

(a) 0.1A (b) 0.4 A (c) 0.6 A (d) 0.8 A

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QUESTION BANK 365