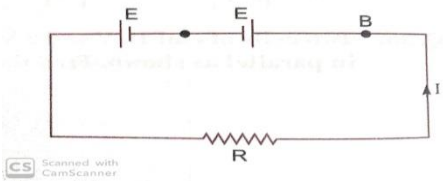
Class: XII **SUB: Physics**

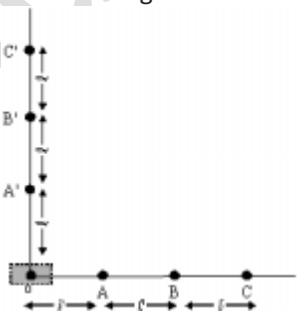
Work Sheet

1. The magnetic flux linked with the closed circular loop of radius 20 cm and resistance 2 ohm at any instant of time is Φ=4t+3
   Where Φ is in milliweber and 't' is in sec.
   Find (i) flux linked with a loop at t=3 s
   (i) Induced emf at t=2 s and
   (ii) Plot a graph between (a) Φ and t (b) Ɛ and t
2. Find the ratio of potential differences that must be applied across the parallel and the series combination of two capacitors C_1 and C_2 with their capacitances in the ratio 1:2 so that energy stored in the two cases, becomes the same.
3. Draw a labelled diagram of moving coil galvanometer. Describe briefly its principle and working.
4. A galvanometer of resistance 80Ω, shunted by a resistance of 20Ω is joined in series with a resistance of 200 Ω and a cell of emf 1.5 V. What is the sensitivity of the galvanometer if it shows a deflection of 30 division?
5. Two cells of same emf Ɛ but internal resistance r_1 and r_2 are connected in series to an external resistor R as given in fig. What should be the value of R so that the potential difference across the terminals of first cell becomes zero.



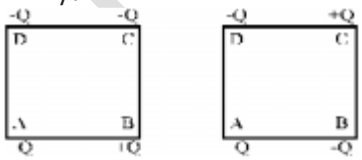
6. The instantaneous current in an ac circuit is I= 0.5 sin314 t, what is (i) rms value and (ii) frequency of the current.
7. Draw a labelled diagram of an ac generator. Obtain the expression for the emf induced in the rotating coil of N turns each of cross-sectional area A , in the presence of a magnetic field B.
8. Keeping the voltage of the charging source constant, what would be the percentage change in the energy stored in a parallel plate capacitor if the separation between its plates were to be decreased by 10%?
9. 2The following data was obtained for the dependence of the magnitude of electric field, with distance, from a reference point O, within the charge distribution in the shaded region.

Field Point	A	B	C	A'	B'	C'
Magnitude of electric field	E	E/8	E/27	E 2	E 16	E/64

10. 

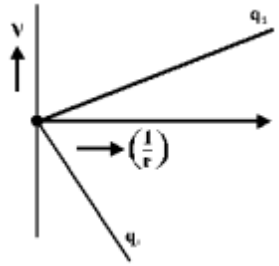
11. (i) Identify the charge distrubution and justify your answer.
    (ii) If the potential due to this charge distribution, has a value V at the point A, what is its value at the point ?

12. Four point charges are placed at the four corners of a square in the two ways (i) and (ii) as shown below. Will the (i) electric field (ii) Electric potential, at the centre of the square, be the same or different in the two configrations and why?



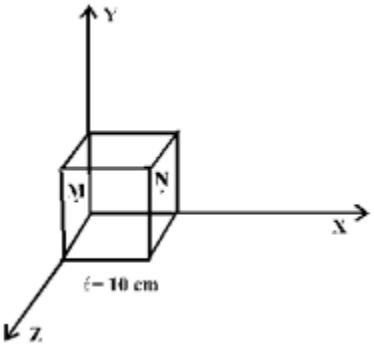
13. The two graphs drawn below, show the variation of electrostatic potential (V) with (r being distance of the fieldpoint from the point charge) for two point charges q1 and q2.

Class: XII **SUB: Physics**



`(i) What are the signs of the two charges?
(ii) Which of the two charges has a larger magnitude and why?

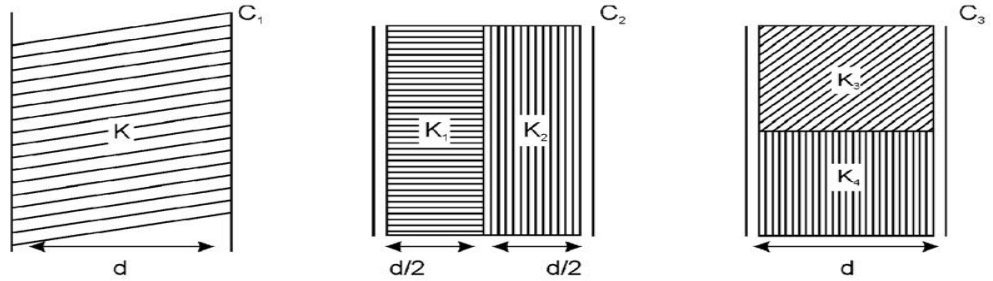
14. .Electric field in the above figure is directed along + X direction and given by Ex = 5Ax + 2B, where E is in NC-1 and x is in metre, A and B are constants with dimensions Taking $A = 10 NC^{-1}m^{-1}$ and B = 5NC-1 calculate.
(i) the electric flux through the cube.
(ii) net charge enclosed within the cube.



15. Charges of magnitudes 2 Q & - Q are located at points (a,o,o) and (4a,o,o). Find the ratio of the flux of electric field, due to these charges, through concentric spheres of radii 2a and 8a centered at the origin.

16. A parallel plate capacitor made of circular plates each of radius R = 6 cm has a capacitor C = 100 pF. The capacitor is connected to a 230 V ac supply with a (angular) frequency of 300 rad

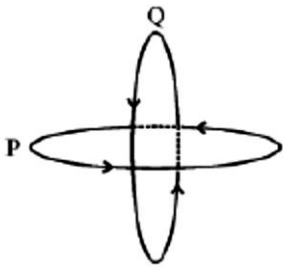
17. Three identical parallel plate (air) capacitors C_1, C_2 C_3 have capacitances C each. The space between their plates is now filled with dielectrics as shown. If all the three capacitors, still have equal capacitances, obtain the relation between the dielectric constants K,K_1, K_2, K_3 and K_4.

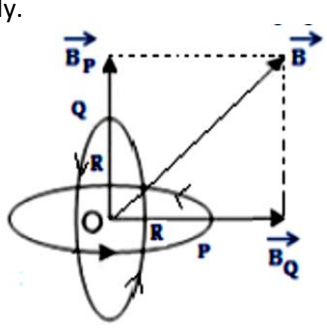


18. Twenty seven spherical drops, each of radius 3mm and carrying 10^{-12}C of charge are combined to form a single drop. Find the capacitance and potential of the bigger drop.

19. In a zener regulated power supply a zener diode with Vz= 6.0 V is used for regulation. The load current is to be 4.0 mA and the unregulated input is 10.0 V. what should be the value of series resistance?
20. Suppose that the electric field amplitude of an electromagnetic wave is E_0 = 120 N/C and that its frequency is 50 MHz (a) Determine B_0 , w , k and λ (b) Find expression for E and B.
21. A horizontal conducting rod 10 m long extending from east to west is falling with a speed 5 m/s at right angles to the horizontal component of the earth's magnetic field , 0.3 x 10^{-4} Wb m^{-2}. Find the instantaneous value of the emf induced in the rod.
22. Two identical coils P and Q each of radius R are lying in perpendicular planes such that they have a common centre.

Find the magnitude and direction of the magnetic field at the common centre of the two coils, if they carry currents equal to I and $\sqrt{3}$ I respectively.





23. . At a place the horizontal component of magnetic field is B and angle of dip is 60^0 . What is the value of horizontal component of the Earth's magnetic field at equator ?
24. An ammeter of resistance 0.8 Ω can measure current up to 1.0 A.
    (i) What must be the value of shunt resistance to enable the ammeter to measure current up to 5.0 A?
    (ii) What is the combined resistance of the ammeter and the shunt ?
25. A conducting U tube can slide inside another U tube maintain electrical contact between tubes. The magnetic field is perpendicular to the plane of paper and is directed inward. Each tube moves towards the other at a constant speed v. Find the magnitude of induced emf across the ends of the tubes in terms of magnetic field B, velocity v and width of the tube. [E = 2BLv, L is width of the tube and 2v relative velocity between the tube]
26. In a series LR circuit, X_L = R and the power factor of the circuit is P_1. When a capacitor with capacitance C such that X_C=X_L is put in series, the power factor becomes P_2. Find out P_1/P_2.
27. Prove that in series LCR circuit, the power dissipitaded depends not only on voltage and current but also on the cosine of the phase angle ϕ between these two
28. A conducting rod 1m length moves with frequency of 50 rev/ sec with one end at the centre and other end at the circumference of a circular ring of radius 1m. A constant magnetic field parallel to the axis present everywhere. What is the emf between the centre and the metallic ring ?
29. A jet plane is travelling west at 450m/s. If the horizontal component of earth magnetic field at that place is 40mT and angle of dip is 30^0, find the emf induced between the ends of the wings having length 30m. [3.12V]
30. An inductor of 200mH , capacitor 500μF , resistor 10 Ω are connected in series with 100V , variable frequency a.c. source. Calculate at which the power factor of the circuit is unity, amplitude of current at that frequency and Q-factor. (50/π Hz , 14.14A, 2)
31. When a series combination of inductance and resistance is connected to 10 V , 50 Hz a.c. source , a current of 1 A flows in the circuit. The voltage leads the current by a phase angle of π/3 radian . Calculate the value resistance and inductance. (50Ω , 0.03H)
32. An LCR series circuit with 100Ω resistance is connected to an a.c. source of 200V and angular frequency 200rad/sec. When only the capacitor is removed, the current leads voltage by 60^0. When only the inductance is removed, the current leads voltage by 60^0. Calculate the current (in A)in the LCR circuit. What is the power dissipated in the circuit. [It is at resonance. 400W]
33. A rectangular conductor, ABCD, is placed in a uniform magnetic field B, directed perpendicular to the plane of the conductor. (i)Obtain an expression, for the emf induced in the arm AB, when the arm is moved towards left with a constant speed 'v'.
    (ii)Deduce an expression for the power spent by external agency.
    (iii) Find the induced emf between the ends of the axle, of length L, of railway carriage travelling on level track with speed 'v', where dip to be θ.
34. A bar magnet M is dropped so that it falls vertically through the coil C. Draw a graph for voltage produced across the coil vs time is .
    (a) Explain the shape of the graph.
    (b) Compare the negative peak andthe positive peak.
    (c) What does the area enclosed by the E – t curve depict ?

35. A metallic rod of length L is rotated at an angular speed ω normal to a magnetic field B. Derive expression for the (i) emf induced in the rod (ii) induced current (iii) heat dissipation , if resistance of coil is R.
36. How does the mutual inductance of a pair of coils change when :
    (a) The distance between the coils is increased ?
    (b) The number of turns in each coil is decreased ?
    (c)A thin iron sheet is placed between the two coil if other factors remaining same ?
    Justify your answer in each case.
37. An inductor 'L' , is connected in series with a bulb 'B' and an a.c. source. Briefly explain how does the brightness of the bulb change, when (i) number of turns of the inductor decreases (ii) an iron piece is inserted in inductor coil (iii) a capacitor of $X_C = X_L$ is included in the circuit ?
38. Does the current in an a.c. circuit lag , lead or remain in phase with the voltage if the frequency 'f' applied to the circuit , when (i) $f = f_r$ (ii) $f < f_r$ (iii) $f > f_r$, where f_r is the resonant frequency ? [in phase, lead, lag]
39. A light bulb is in turn connected in a series (a) across an LR circuit, (b) across an RC circuit, with an AC source. Explain, giving necessary mathematical formula, the effect on the brightness of the bulb in case(a) and (b), when the frequency of the AC source is increased.
40. When a circuit element 'X' is connected across an ac source, a current of √2 A flows through it and this current is in phase with the applied voltage. When another element 'Y' is connected across same ac source, the same current flows but it leads the voltage by π/2 radians. (i) Name the circuit element X and Y. [Resistor, Capacitor]
    (ii)Find the current flows in the circuit when the series combination of X and Y is connected across same ac voltage. [1A] (iii)plot a graph to show the variation of net impedance of series combination with applied angular frequency ω.
41. Write the principle of step up transformer. Write any two major losses in transformer.
42. An a.c. source generating a voltage $V = V_m \sin \omega t$ is connected to a capacitor of capacitance C . Find the current , I , flowing through it. Plot a graph of V and I versus ωt to show the current is π/2 ahead of the voltage.

43. A series LCR circuit is connected to an a-c source of voltage V and angular frequency ω. When only the capacitor is removed, the current lags behind the voltage by phase ϕ and when only inductor is removed, the current leads voltage by the same phase angle. Find the current flowing and average power dissipated in the LCR circuit.
44. A device 'X' is connected to an AC source $V = V_o \sin \omega t$. The variation of voltage, current and power in one cycle is shown in the graph.
45. A series LCR circuit is connected to variable frequency 220 volt source. L = 5H, C = 80 μF and R = 20Ω.
    (a) Determine the source frequency, which driven the circuit to resonance. [50rad/sec]
    (b) Obtain the impedance and current of the circuit at resonance. [20Ω]
    (c) Find the potential drop across each elements. Is the algebraic sum greater than the source voltage ?If yes, resolve the paradox.
46. When 100 V DC is applied across a coil, a current of 1 A flows through it. When 100 V , 50Hz a.c. is applied to the same coil only 0.5 A flows. Calculate (i) resistance of coil (ii)impedance of the coil (iii)inductance of the coil.
47. A plane electromagnetic wave of frequency 50 MHz travels in free space along X – direction. At a particular point in space and time, E = 6.3 j V/m. What is B at this point?
48. A transformer is used to light a 100W and 110V lamp from 220V mains. If the main current is 0.5A, the efficiency of the transformer is approximately:
49. 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 in a uniform magnetic field of magnitude 3×10^{-2} T. Calculate the maximum value of the current in the coil.
50. The magnetic flux linked with a closed circular loop of radius 20 cm and resistance 2 ohm at any instant of time is $\phi = 4t + 3$
    Where ϕ is in millimetre and time t in sec
    Find (i) flux linked with a loop at t = 3s (ii) induced emf at t = 2 s and (iii) plot a graph between (a) ϕ and t (b) emf and t.