PHYSICS

BOOKS - CENGAGE PHYSICS (HINGLISH)

Current Electricity

Question Bank

1. The current (in ampere) through a copper wire having cross sectional area $2mm^2$ Given:

$E = 8.5 \times 10^{-3} \frac{V}{m}$

$\rho = 1.7 \times 10^{-8} ohmm$

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2. In the circuit shown in the figure, key K_1 is open. The charge on capacitor C in steady state is q_1. Now the key is closed and at steacty state charge on C is q_2 If the ratio of charges $\frac{q_1}{q_2} = c\frac{m}{n}$, then find (mn).

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3. Find out the potential difference (in volt) between points A and B, as shown in the figure '(##CEN_KSR_PHY_JEE_CO20_E01_003_Q02##)'

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4. In the circait saown below, the inggnitude of current (in ampere) that flows from'a to b when switch S is closed, is '(##CEN_KSR_PHY_JEE_CO20_E01_004_Q03##)'

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5. First a set of n equal resistors of R each are connected in series to a battery of emf E and internal resistance R. A current I is observed to flow. Then, the n resistors are connected in parallel to the same battery. It is observed that the current is increased 10 times. What is 'n'?

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6. Equivalent resistance (in ohm) between points A and B will be

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7. In the figure shown, the potentiometer wire of length $l = 100cm$ and resistance $9ohm$ is joined to a cell of emf $E_1 = 10V$ and $\int emalresis\tan cer\_(1)=1$ ohm . $A\neg hercellofemf$E_(2)=5 V and $\int ernalresis\tan cer\_(2)=2$ ohm $isco\cap ectedasshown.\ Thegalvanometer$G $willshownodef \leq ctionwhenthe \leq n > h(\in cm)$ A C` is

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8. A room has an AC which. runs for $5h$ a day at a voltage of $220V$. The wiring of the room consists of.Cu of 1 mm radius and a length of $10m$. The power consumption per day is 10 commercial units. What percentage of it goes in the joule heating of wires? $\left(\rho_{cal} = 1.7 \times 10^{-8} ohmm\right)$.

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9. In the figure show, if the equivalent resistance between points A and B is x then find 5x. (Given: $R = 2ohm$)

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10. Four ammeters with identical internal resistance r and a resistor R are conmected to a current source as given. If reading of A_1 and A_2 is $3A$ and $5A$, respectively, then the rcading of

A_4 (in ampere) is

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11. The deflection of a moving coil galvanometer falls from 60 divisions to 12 divisions for the same value of current in the circuit, when a shunt of $12ohm$ is connected. If the resistance (in ohm) of the galvanometer is G, then find the value of $\left(\frac{G}{6}\right)^{\frac{1}{3}}$.

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12. For the armangement of the potentiometer shown in the figure, the balance point is obtained at a distance $75(\sim cm)$ frǒm A when the key k is open. The second balarice point is obtained at $60(\sim cm)$ from A when the key k is closed. Find the internal resistance (in ohm) of the battery E_1

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13. A resistance of 2Ω is connected across one gap of a metre-bridge(the length of the wire is 100 cm) and an unknown resistance, greater than 2Ω, is connected across the other gap. When these resistances are interchanged, the balance points shifts by 20 cm. Neglecting any corrections, the unknown resistance is

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14. The circuit given below shows seven ideatical bulbs (A to G) connected through a bettery of

emf $200(\sim V)$. The bulbis are rated as $200V, 100W$. The power dissipated in the bulb which glows brightest is given by P watt. Find the value of $\frac{2}{3}\sqrt{P}$.

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15. Theemfofcellis $9V$ andits intemal resistance is unknown. The resistances of the meters are also unknown. When the switch S is closed, the measured current increases to twice of previous value and the reading of voltmeter decreases to

half of the original value. The ratio $\frac{R_V}{R}$, where R_V is the resistance of the voltmeter, is

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16. In the given circuit diagram, if ideal ammeter is connected between points A and B, its reading is $5A$. if ammeter of resistance $3ohm$ is connected between A and B, its reading is 3 A. Reading of ideal voltmeter is $\frac{90}{n}$ volt, if it is connected between A and B. Find the value of'n.

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17. Find the potential difference $|\text{left}V_s - V_A right|$ (in volt) between the plates of the capacitor C shown in the figure, if the sources have emfs $E, = 4V$ and $E_2 = 1V$ and the resistances are equal to $R_1 = 10ohm, R_2 = 20ohm$ and $R_3 = 30ohm.$ The internal resistances of the sources are neglectable

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18. For the circuit showing, all wires have same resistance and equivalent resistance between points A and B is R. Now, if the keys are closed, then the equivalent resistance becomes $\frac{xR}{3}$, Find x.

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19. The potential (in volt) of point P in the given diagram will be

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20. In the circuit shown, the electromotive force of the battery is $9V$ and its internal resistance is $15ohm$. The two identical voltmeters can be considered ideal: Let V_1 and V_1' be the reading of lst voltmeter when switch is open and closed, respectively. Similarly, let V_2 and V_2' be the

reading of 2 nd voltmeter when switch is open and -closed, respectively. Then $\frac{V_2' - V_2}{V_1 - V_1'} =$

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FIGURE

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21. In a circuit shown, voltmeter reads $3V$ and the ammeter reads $2A$. The emf E (in volt) is

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22. In the circuit shown, the batteries have emf $E_{(t)} = E_2 = 1 \quad (V), E_3 = 2.5V$ and the resistance $R_1 = 10ohm, R_2 = 20ohm$ Capacitance $C = 10\mu F.$ The magnitude of charge (in μC) on the left plate of the capacitor C at steady state is

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23. AB and CD are two uniform resistance wires of lengths 100 cin and $80cm$, respectively, The connections are shown in the figure. The cell of

emf $5V$ is ideal while the other cell of emf E bas an intemal resistance of $2ohm$. A length of $20cm$ of wire CD is balanced by $40cm$ of wire AB. Find the emf E (in volt), if the reading of the ideal ammeter is 2 A. The other connecting wires have negligible resistance.

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24. 50 V battery is supplying' current of $10A$ when connected to a resistor. If the efficiency of

battery at this current is 25 %, then the internal resistance (in ohm) $6f$ the battery is

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25. A capacitor of capacitance $5\mu F$ is connected to a source of constant emf of $200V$ through a resistance of $300(ohm)$ for a long time, as shown in the figure. Then the switch was shifted to contact 1 from contact 2 . The amount of heat generated in the $500ohm$ resistance is H joule. Find the value of $3200H$.

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26. If galvanometer shows no deflection in the given circuit, the vatue of E (in volt) is (All batteries are ideal)

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27. Find the charge (in μC ') on the capacitor of value $2\mu F$ in the figure shown at steady state.

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28. In the given potentio-meter circuit, the resistance of uniform cross - section potentiometer wire AB of length: $1m$ is $10ohm$. When the variable resistance R is $10ohm$, the balance point is obtained for length l as shown, If the variable resistance is doubled, the new balance length is (kl). Find (k).

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29. The value of maximum power (in watt) delivered to R is

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30. A cylindrical solid of length $1m$ and radius $1m$ is connected across a source of emf $10V$ and negligible internal resistance shown in the figure. The resistivity of the rod as a function of x(x meastred from left end) is given by $p = bx$ (where b is a positive constant). Find the electric

field (in SI unit) at point P at a distance $10cm$ from left end.

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31. In the given circuit, the voltmeter records $5V$. The resistance (in ohm) of the voltmeter is :

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32. Calculate the time constant (in second), of the circuit.

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33. For the shown circuit, find the effective resistance (in ohms) between the points A and B. (Given: $R = 5ohm$)

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34. Find n, if the total power dissipated in the circuit is $6n$ watts.

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35. Ideal batterics, two capacitors and five resistors are connected the a circuit as shown. Find the ratio of current in branch BC to that in branch GD at time $t = 1$ s.

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36. In the figure, AB is a wire of uniform cross-section and resistance $8r$. A is an ideal ammeter with a resistance r in series. The cells are of emf E and $2E$ and internal resis. tance r and zero, respectively. Jockey J can be moved freely on wire AB making contact on wire at C. L'ength of AB wire is $1m$. Consider ammeter to be capable of measuring current in cither direction of flow.

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Find the length of AC (in cm) when ammeter shows minimum reading.

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37. In the circuit shown, find the value of current I (in ampere).

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38. Two potentiometer wires w_1 and w_2 of equal length l, connected to a battery of emf e_a and intemal resistance $1ohm$ through two switches s_1 and s_x. A battery'of emf ε is balanced on

these potentiometer wires one by one. The potentiometer wire w_1 is of rcsistance $2ohm$ and balancing length is $\frac{I}{2}$ on it, when only s_1 is closed and s_2 is open. On closing s_2 and opening s_1, the balancing length on w_2 is found to be $\frac{2l}{3}$, If the resistance of potentiometer wire w_2 is given by α olum, then find 6α.

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39. A series RC circuit is formed using a resistance R, a capacitor withoat dielectric

having a capacitance $C = 2F$ and a battery of emf $E = 3V$. The circuit is completed and it, is allowed to attain the steady state. After this, at $t = 0$, half the thickness of the capacitor is filled with a dielectric of constant $K = 2$ as shown in the figure. The system is again allowed to attain a steudy state. What will be the heat generated (in joulc) in the capacitor between $f = 0$ and $t = \infty$?

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FIGURE

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40. An uncharged capacitor of capacitance C is connected in the circuit diagram as shown and switch S is closed at $t = 0$. If the current in branch BC as a function of time is given by: $I = I_0$ (ampere) $e^{\frac{4}{im\mu s}}$, then find the numerical value of $I_0\tau$.

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