PHYSICS

BOOKS - CHHAYA PHYSICS (BENGALI ENGLISH)

ELECTRIC ENERGY AND POWER

Numerical Examples

1. 2 A current was sent through a coil of resistance 100Ω for 30 min .Determine the amount of heat

produced , the quantity of charge passed and the amount of work doen.

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2. Two separate circuits are made with resistances r_1 and r_2 connected to the same storge battery . What should be the interal resistance (r) of the storage battery for which an equal amount of heat is produced in the exteranal circuits ?

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3. A heating coil of resistance 5Ω is connected to a cell . The internal resistance of the cell is 20Ω Calculate the value of the shunt to be introduced , so that , the energy consumed in the heating coil will be $\frac{1}{19}$ th of the previous value .

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4. The rate of energy consumed in 5Ω resistance [shown in Fig . 3 .3] is $10J.\ s^{-1}$ .What will be the rate of energy consumed in 4Ω resistance ?

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5. Water boils in an electric kettle in 10 minutes after being switched on .How will you modify the heating coil to boil water is 5 minutes using the same source of power ?

6. The maximum power rating of a 20Ω resistor is 2.0kW. (that is this is the maximum power the resistor can dissipate (as heat) without melting or changing in some other undesirable way). Would

you connect his resistor directly across a 300V d.c. source of negligible internal resistance?

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7. Three resistors of equal resistances when connected in series across a voltage souce , dissipate 100 watt of power. What would be the power dissipated . If the resistors are connected in parallel across the same source of emf?

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8. The coil of a heater connected to a 200 V line , con-sumes a power of 100 W . The coil is divided into two equal parts . The two parts are combined in parallel and connected to a 200 V line . What will be the power consumed by the new combination ?

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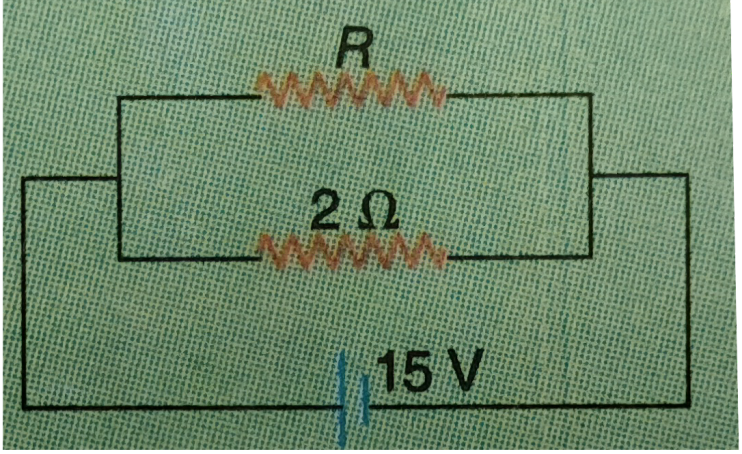
9. The power consumed in the circuit show in the fig . 3.6 is 150 W . What is the value of R ?



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10. A cell of emf 1.5 V and of internal resistance 0.1Ω when connected with a resitor and an ammeter of negligible resistance in series , the ammeter shows a 2.0 A steady current .

Find (i) the rate of energy dissipated within the cell

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11. A cell of emf 1.5 V and of internal resistance 0.1Ω when connected with a resitor and an ammeter of negligible resistance in series , the ammeter shows a 2.0 A steady current .

Find (ii) the power consumed in the resistor .

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12. A balanced Wheatstone bridge has resistances $100\Omega, 10\Omega, 500\Omega \text{ and } 50\Omega$ repectively in its four

arms. Determine the ratio of powers consumed in its different arms.

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13. A factory requires a power of 90 kW. The energy is tranmitted to the factory through a 2.5Ω line wire .If 10 % of the power generated is lost in transmission , calculate

The trasmission line current

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14. A factory requires a power of 90 kW. The energy is tranmitted to the factory through a 2.5Ω line wire .If 10 % of the power generated is lost in transmission , calculate

The trasmission line current

the potential difference at the power genrating station

the potential drop due to line resistance .

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15. A factory requires a power of 90 kW. The energy is tranmitted to the factory through a 2.5Ω line wire .If 10 % of the power generated is lost in transmission , calculate

The trasmission line current

the potential drop due to line resistance .

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16. Electrical energy is transmitted at the rate of 2.2 MW through the line wire . The resistance of the line wire is 25Ω .Calculate the percentaage of

heat dissipation of the electrical energy for each line voltage :

22000 V

110 kV

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17. Electrical energy is transmitted at the rate of 2.2 MW through the line wire . The resistance of the line wire is 25Ω .Calculate the percentaage of heat dissipation of the electrical energy for each line voltage :

110 kV

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18. In a house there are 10 lamps of 40 W each , 5 fans of 80 W each and a TV set of 80 W . They run for 6 hours a day . Find the consumption of electrical in a month of 30 days . What is its value in BOT unit ?

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19. In an evening college there are 100 bulbs of 60 W each , 80 bulbs of 100W each and 70 fans of 100

W each . They run for 5 h , 4 h and 4 h respectively per day . If each kW . H costs Rs. 0.50 , calculate the electric bill of the college for a month .

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20. In a hous there are 20 lamps of 60 W each 10 fans which operate in 0.5A current . If main power supply is 220V , expense per kW h is 50 pise and each appliance runs 6 h per day then calculate the electric bill of November .

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21. There are six 40 W and two 100 W lamps , four 40 W fans and a 1000 W electric heater in a house .If in April , each lamp runs for 5 hours a day , each fan 15 hours a day and the heater 2 hours a day , what will be the electric bill for that month ? It may be supposed that the main supply voltage is 200 V and cost of each BOT unit = Rs. 1.50.

Which one of the give three wires of rating 5 A , 10 A and 15 A will be appeopeiate for connection in the main switch ?

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22. The power of a small electric motor is $\frac{1}{8}$ HP . If it is con-nected to 220V supply line , how much current will it draw ? If the motor runs for 80 h , what will be the cost for BOT Unit is Rs 0.7 ?

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23. A heating coil of resistance 100Ω is connected for 30 min to 220 V . By this time determine

(i) amount of charge flowing

(ii) amount of electrical energy consumed

(iii) amount of heat greanerted .Determine the

cost of consumed electrical energy if 1 kW . h costs R.s 1 .

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24. A 220 V -60W electric bulb is connected in 220 V line . What is the resistance of the filament of the bulb , when it is tured on ?

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25. The resistance of a hot tungsten filament is about 10 times that in its normal state . What will

be the resistance of a 100W-200V tungsten lamp in its normal state ?

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26. The main meter of a house is marked 10 A-220V. How many 60 W electric lamps can used safely in this line ?

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27. A 220 V - 100W electric lamp fuses above 150 W power . What should be the maximum tolerable

voltage for the lamp ?

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28. In order to run a 60V- 120W lamp in 220V dc line , a resistor of what minimum magnitude should be placed in series with it ?

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29. Draw a household circuit having a 1200 w toaster , a 1000 W oven a 800 W heater and a 1500 W cooler . The circuit has a heavy duty wire

and a 20 A circuit breaker . Will the circuit breaker trip ,if all the appliances are operted simultaneously in a 200 V supply voltage ?

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30. Two lamps of 200 W and 100 w are connected in series in 200 V mains . Assuming the resistance of the two lamps to remain unchanged , calculate the power consumed by each of them .

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31. Two electric bulbs each designed to operate with a power of 500 W in a 220 V line are connected in series in a 110 V line . What will be the power generated by each bulb ?

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32. If the supply voltage drop from 220 V to 200 V , what would be percentage reduction in heat produced by a 220V - 1000W heater ? Neglect the change of resistance. If the change of resistance is taken into consideration would the reduction of

heat produced be smaller or larger than the previously calculated value ? Explain.

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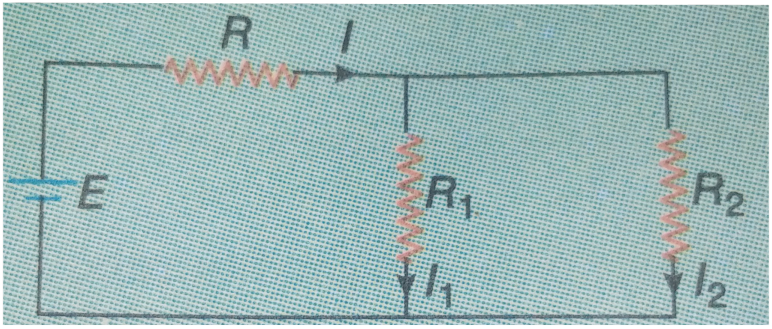
33. the emf of the cell , E =20 V . Rating of each resistance R_1 and R_2 is $1W - 100\Omega$. What should be the minimum value of the resistance R in the circuit gt Also fond its minimum watt rating

.



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34. If a 220 V -1000 w lamp is connected in 110 V line then what will be the power consumed by it ?

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35. 2.2 kW power is supplied through a line of 10Ω resistance under 22000 V voltage differnce . What is the rate of heat dissipation in the line ?

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36. The potential differnce between the two ends of an electric lamp is decrased by 1 % . Neglecting the change in its resistance , calculate the percentage increase or decrease in the power of the lamp .

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37. 15 kW power is supplied through a line of 0.5Ω resistance under 250 V potential difference .Fimd the efficiency of the supply in percentage .

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38. Two incandescent lamps (25 W , 120 V) and (100W , 120 V) are connnected in series across a 240 V supply . Assuming that the resistances of the lamps do not vary with current ,find the power dissipated in each lamp after the connection .

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Section Related Questions

1. What do you mean by mechanical equivalent of heat ?

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2. State Joule's law for heating effect of electric current .

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3. What do you mean by J = 4.2 / cal for electric field ?

Watch Video Solution

4. why is Joule's constant named as mechenical equivalent of heat ?

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5. Define electrical energy and electrical power. Give their respective SI unit also.

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6. Define BOT unit of electrical energy .

Watch Video Solution

7. Express BOT unit in joule .

8. Express BOT unit in calorie . (J = 4.2 /cal)

9. Show that, the unit of the product of potential differnce and current is the same as that for power .

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10. How are lamps ,fan etc . Connected in domestic electrical connection - in series combination or parallel combination ? Give reasons for ypur answer .

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11. What do you mean by 5 A fuse ?

Watch Video Solution

12. What are the units of electrical power ? What are the relations of power with potential difference , current and resistance ?

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13. A fuse has radius r and the highest safe current through it is I .show that $I \propto r^{3/2}$.

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14. What do you mean by the voltage rating of an electrical equipment ?

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15. What is the voltage rating of a home appliance ?

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16. What do you mean by the watt rating of an electrical equipment ?

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17. An electrical equipment is marked with 200 V -1000W . What informations do you get from it ?

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18. Prove that , the equivalent or total power for a parallel combinations of acertain number of electrical appliances is greater than the power of each of them .

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19. Prove that , the equivalent or total power for a series combination of a certain number of electrical appliances is less than the power of each of them .

Or, prove that , for the different electrical appliances connected in series , power consumption will be lesser for the appliances of higher watt rating .

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20. What do you mean by watt rating of a resistor ?

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21. What do you mean by the statement 'rating' a resistor is $1W - 100\Omega$?

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Higher Order Thinking Skill Hots Questions

1. Among emf , energy ,power and charge , which one has the unit A.s ?

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2. How are lamp , fan etc . Connected in domestic electrical connection - in series combination or parallel combination ? Give reasons for your answer.

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3. The speed of an electric fan is reduced with the help of a regulator . What will happen in the energy consumption ?

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4. Is the filament of the lamp marked '240V-1000W' thin or thick comparison to the filament of the lamp marked '240 V-100W ' ?

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5. A series combination of a 60 W and a 100 W lamp is connected to the main line.which lamp will glow brighter and why ?

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6. A heater coil is cut into two equal parts and only one part is now used in the heater . What is the percentage of increase or decrease in the rate f productu=ion of heat ?

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7. A few wires of same dimension but of different specific resistances are connected in parallel and than this parallel combination is connected to a battery . In which wire will the rate of production of heat due to Joule effect be maximum?

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8. The specific resistance of the material of a sonducting wire is ρ and current through cross sectional area of the wire (I,e., current decsity) is J . What is the power cousumed per unit volume of the wire ?

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9. A few electric bulbs are connected in series to the 220 V mains . One bulb fused , the remaining bulbs are again put in series and connected to the same supply of 220 V. In which case will the bulbs glow brighter and why ?

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10. Three resistances of equal value are connected in four different combinations as shown in

Arrange them in ib=ncreasing order of power dissipation .

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11. A heater coil has been cut into two equal parts and one coil is used as heater . What is the percentage change in heat generation ?

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12. Two electric bulbs of 50 W and 100 W are connected with mains in series then which bulb will glow brighter ?

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13. Two electric bulbs of 50 W and 100 W are connected in mains once in

(ii) prallel combi-nation . Which bulb will glow brighter in each case ?

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14. when conneceted to 200 V mains suply ,has power pieces , which P_1 . Now the wire is cut into two equal pieces , which are connected in parallel to the same supply . Power dissipation in this case is P_2 . What is te ratio of P_2 and P_1 ?

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15. Power consumed in resistance $R_3 is P_3$ Determine the power consumed in resistances R_1 and R_2 .

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16. A generating station is supplying electric power P at voltage V to a factory through a cable of resistance R . Show that the loss of power in the connecting cable is inversely proportional to V^2.

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17. Prove that total produced in different resistors of the circuit is minimum when the current is divided into a number of braches .

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Exercise Multiple Choice Question

1. Which quantity expresses the work done by an electrical machine ?

A. VI

B. Vit

C. I^2R

D. $\frac{I^2Rt}{J}$

Answer: B

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2. A.s is a unit of

A. emf

B. energy

C. power

D. charge

Answer: D

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3. Which one is the unit of power ?

A. A.s

B. W.h

C. $\frac{A^2}{\Omega}$

D. $A^2\Omega$

Answer: D

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4. Two bulbs are marked 220V - 100 W and 110 V-100W. The ratio of the resistances of the two bulbs is

A. $1:4$

B. $1:2$

C. $2:1$

D. $4:1$

Answer: D

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5. A fuse wire of length l and radius r is connected in series with a circuit . The safe currrent that can pass through the circuit is proportinal to

A. r^3

B. $r^{\frac{3}{2}}$

C. $l^{-\frac{3}{2}}$

D. l^{-1}

Answer: B

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6. The ration of the restistances of 100 W and 40 W bulbs of the same rated voltage is

A. $2:5$

B. $5:2$

C. $25:4$

D. $4:25$

Answer: A

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7. If power dissipated in the 0ω resistor in the circuit shown is 36 W, the potential difference across the 2Ω resistor is

A. 4 V

B. 8 V

C. 10 V

D. 2 V

Answer: C

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8. 1 BOT unit is equal to

A. 3600 W

B. 3600 J

C. $3.6 \times 10^6 W$

D. $3.6 \times 10^6 J$

Answer: D

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9. BOT unit is a unit of

A. charge

B. energy

C. power

D. efficiency

Answer: B

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10. 1 BOT unit is equal to

A. 1 W. h

B. 1000 W .h

C. $\frac{1}{1000} W . h$

D. $\frac{1}{1000} V . A$

Answer: B

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Exercise Very Short Answer Type Questions

1. A current I flows through a potential drop V across a conductor . What is the rate of heat production ?

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2. A small heating element connected to 10 V dc supply draws a current of 5 A . Find the electric power supplied to the heater .

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3. A 220 V - 1000 W electric heater is connected in parallel with a 220 V - 60 W electric heater is connected in parallel with a 220 V - 60 W electric lamp and , the co

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4. Two wires having resistances R and 2R are coneected in series . If current is allowed to pass through the combination , what will be ratio of power consumed in the two resistances ?

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5. Two wires having resistances R and 2R are coneected in parallel . If current is allowed to pass through the combination , what will be ratio of power consumed in the two resistances ?

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6. A 240 V - 1000 W lamp and a 240 V - 100 W lamp - which of these two has a thinner filament ?

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7. Two resistances , each of magnitude 2Ω are connected in series and a potential difference of 2 V is applied at the two ends of the combination . What is the power of the combination?

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8. Two resistances , each of magnitude 2Ω are connected in parallel and a potential difference of 2 V is applied at the two ends of the combination . What is the power of the combination?

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9. what is the resistances each of an electric bulb marked 220 V -100 W in incandescent state ?

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10. A 2Ω resistance is connected to a source of constant emf . Another 2Ωresistance is connected in parallel to the previous one . The power consumed in the circuit becomes ..... . [Fill in the balnk]

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11. Two resistance are connected in series . If current is made to pass through the combination , power consumed in the large resistance will be ..... . [Fill in the blank]

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12. Two resistance are connected in parallel . If current is made to pass through the combination , power consumed in the large resistance will be ..... . [Fill in the blank]

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13. A 220 V - 100 W lamp and 220 V - 60 W lamp are connected in parallel . If current is made to pass through the combination , the brightness of the first lamp will be .....[Fill in the blank]

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14. A 220 V - 100 W lamp and 220 V - 60 W lamp are connected in series . If current is made to pass through the combination , the brightness of the first lamp will be .....[Fill in the blank]

Watch Video Solution

15. An electrical lamp os marked 240 V - 60 W . What is the resistance of the lamp on incandescent state ?

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16. A 220 V - 60 W electric lamp os connected to 220 V supply line . Determine the resistance of the lamp in incandescent state .

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17. Which one of two electrical appliances ,rated 100 W - 200 V and 60W-200 V, would have a higher resistance ?

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18. What is the largest voltage you can safely put across a $98\Omega, 0.5W$ resistor ?

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Exercise Short Answer Type Questions I

1. What precaution has to be take to run a 220 V - 600 W heater safely in a 440 V line ?

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2. Why is Joule's constant called the mechanical equivalent of heat ?

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3. Show that, the unit of the product of electric current and potential difference is identical ot the unit of power .

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4. In dometic electric writing , are the lamps ,fans etc connected is series on in parallel ? Explain your answer .

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5. What should you do to run a 220 V - 600 W appliance using a 400 V mains ?

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6. Two bulbs of power 60 W and 100 W , joined in series , are connected to the electric mains . Which one of these two will glow brighter , and why ?

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Exercise Short Answer Type Questions Ii

1. Two electric bulbs A and B are marked 220 V , 40W and 220 V , 60 W respectively . Which of the

two has a higher resistance ? Which bulb will glow brightly if they are connected series ?

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2. A 60 W electric bulb connected in series with a room heater is further connected across the mains . If 60 W bulb is now replaced by 100 W bulb , will the heat produced by heater be smaller , remain the same or be larger and why ?

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3. An electric heater connected in parallel with an electric bulb is switched on . Explain why the bulb becomes dim . Why dimness decreases after sometime ?

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Problem Set I

1. Ratio of the cross sectional areas of two wires A and B made up of the same material is 1 : 4 . If the Wires are connected across the same potential

difference , find the ratio of heat produced in them .

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2. When an exteranal resistance is connected to a battery of emf 80 V , an ammeter records 200 mA . If A voltmeter is connected to the two ends os the external resistance ,it records 60 V . Determine the rate of supply of energy by theresistance .

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3. An electric bulb is marked 100 w - 230 V . How much energy is produced in 20 miutes when operted at 230 V ?

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4. A current of 5 A flows through an electric press of resistance 44Ω. What is the erergy consumed by the press in 5 minutes ?

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5. An electric bulb rated for 500 watt at 100 volt is connected to a 200 volt supply line . How much resistance has to be joined in seresies with the bulb so that , the bulb delivers 500 watt ?

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6. Two resistances 2Ω and 6Ω are connected in parallel and the combination is then connected to a source of emf 12 V . How much power is consumed in each resistance ?

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7. Two resistances 2Ω and 6Ω are connected in series and the combination is then connected to a source of emf 12 V . How much power is consumed in each resistance ?

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8. If the voltage of supply line drops to 180 V , what will be the power consumed by lamp marked as 220V - 60W ? Neglect the change of resistance with temperature .

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9. Two electric lamps marked 110V- 60W and 110V - 100W are connected in series and the combination is connected to 220 V mains what will be effective power of the lamps ? What will happen due to the above connection ?

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10. Each of two electric lamps of power 500 W is designed to work in 220 V line . If the lamps are connnected in series and the combination is

connected to 110 V line , what will be the power of each lamp ?

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11. In a Wheststone bridge $P = 20\Omega, Q = 10\Omega, R = 10\Omega$ and $S = 5\Omega.$. What is the ratio of power consumed in Q and R resistance ?

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12. An electric heater is marked 110 V - 550 W and it is to be used in 200 v mains .How much resistance is to be added in series the heater ?

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13. An electrical circuit contanis an electrical appliance od reasistance 20Ω in a certain part of it . A shunt of resistance 5Ω is connected in parallel with the appliance . If the main current of the circuit remains unchanged , ehat will be the fractions of the rate of consumption of power in

the appliance with respect to that of the initail rate ?

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14. Two wires of same measurements are taken . The ratio of specific resiatance of the wires 1 : 2 . The two wires are first connected in parallel and then in series These tow combinations are alternately connected to the same supply line . What will be the ratio of powers consumed by the two wires in the two cases ?

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15. The ratio of resitance in the fourn arms of a Wheatstone bridge is 3 : 1 : 12 : 4 . What is the ratio of the powers consumed in the arms of the bridge ?

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16. A fuse wire of radius 0.1 mm can withstand a maximum current of 1 A . What is the minimum radius of a fuse wire , made of the same meatal ,

that should be used to run a 220 V - 100 W heater using a 220 V mains ?

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17. Two electric lamps marked 110V- 60W and 110V - 100W are connected in series and the combination is connected to 220 V mains what will be effective power of the lamps ? What will happen due to the above connection ?

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18. A 110V -550W hearter is to be used with a 220V mains. What is the minimum value of resisrance that should with the heater? Find out the power of the whole circuit in that situation.

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19. How many 60 W bulbs may be safely run on 220 v using a 5 A fuse?

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20. If 10 bulbs of 40 each and 3 of 100w each run on the average for 5 hours a day, calculater the monthly bill.1 bot unit costs Rs2. (1 month = 30 d)

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21. In a house there are 10 lamps of 40 W each , 5 fans of 80 W each and a TV set of 80 W . They run for 6 hours a day . Find the consumption of electrical in a month of 30 days . What is its value in BOT unit ?

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22. The main meter of a house contains a 5A fuse. 4 lamps rated 220V- 60 w run in the house . Under this condition , can a heater rated 220 V - 1000W be used ? What minimum number of lamps should be switched of to run the heater safely ?

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Problem Set Ii

1. An electric kettle has two coils when one of the coils is switched on, the kettle can boil water inside it in 12 minutes to boil. When the coil are connected in

series

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2. An electric kettle has two coils when one of the coils is switched on, the kettle can boil water inside it in 12 minutes to boil.when the other coil is switched on it took 24 minutes o boil.If the coils

are connected in

parallel and is swiched on , find the times taken for boiling of water.

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3. A 200 V dc genrator sends electrical energy to a distant factory through a 10km long wire . Resistance of the wire per km is 0.04Ω .If tranmission line current is 150A , what is the efficiency of supplied energy ? If this amount of energy is tranmiited through 500V , find the change in efficiency ?

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4. If a heater is connected to 100 V , the power delivered is 100 W . Connecting 10Ω resistance in series with the heater and a resistance to the same 100 V line .waht should be the value of R to obtain 62.5 W power in the heater ?

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5. Two wires of resistances $6\Omega \text{ and } 9\Omega$ are connected in series and this combination is

connected to another wire of

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6. A house is fiited with 2 lamps rated 60 w , 2 lamps rated 100 W each 3 fans rated 40 W each . If all the appliances run simultaneously by 200 V supply voltage , determine the magnitude of current that will be drawn from the mains . If each lamp works 5 h and each fan 15 H daily , calculate the monthly expenditure . (1 month = 30 d , cost of 1 BOT unit Rs . 2)

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Entrance Corner Assertion Reason Type

1. Statement I : Electric current is distributed in differenent branches of a circuit in such a way , that the total heat evolved in the circuit is the lowest .

Statement II : The transformation of electrical energy into heat energy in a circuit is less probable than its transformation into other forms of energy .

A. Statement I is true , Statement II is true , Statement II is a correct explanation for Statement I

B. Statement I is true , Statement II is true , Statement is not a correct explanation for statement I

C. Statement I is true , Statement II is false

D. Statement I is false , Statement II is true

Answer: C

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2. Statement I : An external circuit can draw a maximum power of 9 W from a source of emf V and internal resistance 1Ω .

Statement II : The condition , for which an external circuit of resistance R draws the maximum power from a source of internal reistance r , is R =r

A. Statement I is true , Statement II is true , Statement II is a correct explanation for Statement I

B. Statement I is true , Statement II is true , Statement is not a correct explanation for

statement I

C. Statement I is true , Statement II is false

D. Statement I is false , Statement II is true

Answer: A

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3. Statement I : the power consumed would be 50 w by each of tow 200 v -100 w lamps ,when their series combination is driven by a potential difference of 200 V .

Staement II : if P is the power consumed by a

series com - bination of some electrical devices of power $P_1, P_2, P_3, \ldots\ldots$, then , $\frac{1}{P} = \frac{1}{P_1} + \frac{1}{P_2} + \frac{1}{P_3} + \ldots$

A. Statement I is true , Statement II is true , Statement II is a correct explanation for Statement I

B. Statement I is true , Statement II is true , Statement is not a correct explanation for statement I

C. Statement I is true , Statement II is false

D. Statement I is false , Statement II is true

Answer: D

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4. Statement I : A fuse wire of diameter 0 .5 mm can with 0 stand a maximum current of 1 A . For a current of 8 A , a fuse wire made of the same alloy should have a diameter of 2 mm .

Statement II : The radius r of a fuse wire and the maximum safe current I that may pass through it are related as $I \propto r^{3/2}$.

A. Statement I is true , Statement II is true , Statement II is a correct explanation for Statement I

B. Statement I is true , Statement II is true , Statement is not a correct explanation for statement I

C. Statement I is true , Statement II is false

D. Statement I is false , Statement II is true

Answer: A

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5. Statement I : The coil resistance of a 200 V - 100 w electric fan is 20Ω . A power of 5 W is lost as heat when the fan rotates its maximum speed .

Statement II : If , for an electrical device the current is I and the termina potential difference is V , the power consumed - VI .

A. Statement I is true , Statement II is true , Statement II is a correct explanation for Statement I

B. Statement I is true , Statement II is true , Statement is not a correct explanation for

statement I

C. Statement I is true , Statement II is false

D. Statement I is false , Statement II is true

Answer: B

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Entrance Corner Multiple Correct Answers Type

1. An electric conductor has a resistance R and its terminal potential difference is V . If charge Q

passes through it in time t , then the amount of electrical energy transmitted is

A. QV

B. $\frac{Q^2R}{t}$

C. $\frac{V^2t}{R}$

D. $\frac{QV}{t}$

Answer: A::B::C

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2. Each of two electric lamps has a voltage rating V and a watt rating P .If they are joined in series and are connected to a supply line of V volt , then ,

A. current through each $= \frac{P}{V}$

B. current through each $= \frac{P}{2V}$

C. power consumed by each $= \frac{P}{2}$

D. power consumed by each $= \frac{P}{4}$

Answer: B:C

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3. A $10k\Omega$ carbon resistor has a watt rating of 1 W , i. e ., it may be damaged if the power consumed exceeds 1 W which of the floowing currents are safe for the resistor ?

A. 5 mA

B. 8 mA

C. 12 mA

D. 20 mA

Answer: B::D

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4. A fuse wire has a length l and radius r . The maximum safe current through it is

A. proportinal to r^2

B. proportional to $r^{3/2}$

C. inversely proportional to l

D. independent if l

Answer: A::C

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Entrance Corner Comprehension Type

1. Let us take an electrical conductor in which the electrical energy supplied is entirely converted into heat . If , for the conductor , the terminal potential difference = V , the curent through it = I and its resistance = R , then the electrical energy cnsumed in its t is , $W = I^2t$ (from Ohm'slaw $R = \frac{V}{I}$) . So , if thr electrical and the heat energies both are expressed in joule , the heat developed in tiem t is $H = I^2Rt$. However , If H is expressed in the conventional unit calorie , then from the law , W = JH , we may write $H = \frac{I^2Rt}{J}$, where , J = mechanical equivalent of heat

$= 4.2 J. \text{cal}^{-1}$.

The resistance R of a conducting wire depends on its material , its length l and its area of cross section a .The resistivity of the meterial of the conductor is , $\rho = \frac{RA}{l}$.

When more than one heat -producing conductors are kept in series in a circuit , the same current passes through each of them , but as their resistance are f=different in general , the terminal potential differences are also unequal . On the other hand , each conductor has the same terminal potential difference in a parallel combination , however , the curents through them are different .

The terminal potential difference and the currents through two conducting wires are both in the ratio $2:1$ The ratio of the rates of heat evolved in them is

A. $1:1$

B. $2:1$

C. $4:1$

D. $8:1$

Answer: C

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Heat is produced at hte rate of $8\text{cal}.\, s^{-1}$ in a

uniform wire , when its terminal potential difference is 10 V What would be the rate in another wire of the same material , of the same potential difference ?

A. $32\text{cal}. s^{-1}$

B. $16\text{cal}. s^{-1}$

C. $4\text{cal}. s^{-1}$

D. $2\text{cal}. s^{-1}$

Answer: D

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The first one of two wires ,m of the same meterial

and of equal cross section , is longer than the second . A current through their series combination produces heat in them at the rates h_1 and h_2,respectively .

A. $h_1 = h_2$

B. $h_1 > h_2$

C. $h_1 < h_2$

D.

Answer: B

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Entrance Corner Integer Answer Type

1. A power of 12 W is dissipated when two equal resistaances , joined in parallel , are connected with an electric source . What power is dissipated when they are connected in series with the same source ? (in W) ?

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2. Two electric lamps ,each of powers 60 W , have voltage ratings of 220 V and 110 V respectively . Find the ration of their resistances .

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3. Two electric lamps of power 30 W and 60 W have the same voltage rating . Find the ratio of their resistances .

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4. The power dissipated when three identical cells of negligible internal resistance are connected in series with a wire of length l , is exactly equal to that , when N similar cells are coonected in series

with a wire of length 2 l , of the same meterial and having the same area of cross section . Find the value of N .

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5. The ration of the radii of two fuse wires of the same material is $1:4$. What is the maximum safe current (in A) for the second wire , if that for the first wie is 1 A ?

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Examination Archive Wbchse

1. A parallel combination of three resistors $3\Omega, 4\Omega \text{ and } 5\Omega$ is connected across a battery . Find which resistor will consume more electrical per energy per second .

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2. how much will the power of an electric bulb decrease if the current drops by 0.5 % ?

A. $0.25\ \%$

B. $05\ \%$

C. $1\ \%$

D. $2\ \%$

Answer: C

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3. The rate of heat developed in a resistor R connected to a supply of potential V is H . What will be the rate of heat developed if the potential difference is $V/3$ and the resistance doubled ?

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Examination Archive Wbjee

1. Consider the circuit show in the figure . The value of the resistance X for which the thermal power gernerated in it is practically independent of small variation of its resistance is

A. X = R

B. $X = \frac{R}{3}$

C. $X = \frac{R}{2}$

D. $X = 2R$

Answer: C

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Examination Archive Jee Main

1. In a large building there are 15 bulbs of 40 W , 5 bulbs of 100 W , 5 fans of 80 W and 1 kW . The voltage of the electric mains is 220 V . The minimum capacity of the main fuse of the building will be

A. $8A$

B. $10A$

C. $12A$

D. $14A$

Answer: C

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Examination Archive Aipmt

1. Two cities are 150 km apart . Electric power is sent from one city to another city through copper wires . The fall of potential per km is 8 volt and the averge resistance per km is 0.5Ω .The power loss in the wire is

A. $19.2W$

B. $19.2kW$

C. $19.2J$

D. $12.2kW$

Answer: B

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Examination Archive Neet

1. The charge flowing through a resistance R varies with time t as $Q = at - bt^2$, where a and b are positive constants The total heat produced in R is -

(A) $\frac{a^3R}{3b}$

(B) $\frac{a^3R}{2b}$

(C) $\frac{a^3R}{b}$

(D) $\frac{a^3R}{6b}$

A. $\frac{a^3R}{3b}$

B. $\frac{a^3R}{2b}$

C. $\frac{a^3R}{b}$

D. $\frac{a^3R}{6b}$

Answer: D

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Cbse Scanner

1. A light bulb is rated 100 W for 220 V ac supply of 50 Hz. Calculate

the resistance of the bulb ,

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2. A light bulb is rated 100 W for 220 V ac supply of 50 Hz. Calculate

the rms current throught the bulb

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3. Nichrome and copper wires of same length and same radius are connected in series . Current I is passed through them . Which wire gets heated up more ? Justify you answers .

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4. The potential differnce applied across a give resistor is altered that the heat produced per second increase by a Factor of 9 . By what factor does the applied potentail difference change ?

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5. The current is drawn from a cell of emf E and intenal resistance r connected to the network of resistors each of sistance r as show in the figure . Obtain the expression

the current drawn from the cell

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6. The current is drawn from a cell of emf E and intenal resistance r connected to the network of resistors each of sistance r as show in the figure .

Obtain the expression

the power consumed in the network

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7. Two electric bulbes P and Q have their resistance in the ration of 1 : 2 . They are connected in series acrosse a battery . Find the ratio of the power dissipation in these bulbs .

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