

Dear Students,

There are two parts to this set. There is a set based on Electricity and another set on Periodic properties. If the topic 'Electricity' is yet to be taught in your class, please do not solve the corresponding set now. You can solve it after the topic has been covered in your class.

Set on 'Periodic properties' is to be solved by all.

P1. Three sides of a triangle contain three identical resistors. Calculate the effective resistance across any two vertices if each resistor has value

(i) $8\ \Omega$ (ii) $15\ \Omega$ (iii) $R\ \Omega$.

P2. Four sides of a quadrilateral contain identical resistors. Compute the effective resistance across (a) any two adjacent vertices and (b) any diagonal if each resistor has a value of

(i) $25\ \Omega$ (ii) $80\ \Omega$ (iii) $R\ \Omega$.

P3. In $\triangle ABC$ a resistor of $10\ \Omega$ is connected between points A and B , that of $20\ \Omega$ is connected between points B and C and $40\ \Omega$ is connected between points C and A . Compute the effective resistance across each pair of points.

P4. In $\square ABCD$ a resistor of $10\ \Omega$ is connected between points A and B , that of $20\ \Omega$ is connected between points B and C , $40\ \Omega$ is connected between points C and D and that of $80\ \Omega$ across points D and A . Compute the effective resistance across each pair of points.

P5. Three resistors of values $5\ \Omega$, $10\ \Omega$ and $20\ \Omega$ are connected across a battery of $70\ \text{Volt}$. Compute

(i) Effective resistance, current flowing through the circuit and voltage drop across each resistor if they are connected in series.

(ii) Effective resistance, current flowing through each branch and voltage drop across each resistor if they are connected in parallel.

P6. A $36\ \text{Volt}$ battery is connected across $12\ \Omega$ resistance. Calculate the heat produced in $15\ \text{second}$. Express your answer in Joule and Calorie.

P7. An electric kettle is rated $350\ \text{Watt}$, $220\ \text{Volt}$. It is used to heat water for $30\ \text{second}$. Assuming that the voltage is $220\ \text{Volt}$, calculate the heat produced. Express your answer in Joule and

Calorie.

P8. Calculate the work done in bringing a 15 millicoulomb charge from infinity to a point at which the potential is 20 Volt?

P9. Electricity is supplied at Rs. 4.5 per unit of consumption. In a hostel, each room has 1 fan of rating 80 Watt, 1 tube of rating 40 Watt, a 25 Watt table lamp and a 15 Watt night lamp. The average use of each room is as follows. Fan is used for 10 hours per day, tube is used for 6 hours per day, table lamp for 1.5 hours/day and night lamp for 8 hours/day. Calculate the bill of the hostel for the month of July if it has 180 students in same number of rooms.

P10. A particle with charge 120 millicoulomb is taken from point P at 60 Volt to point Q at 150 Volt. Calculate the work done.

P11. Two students, A and B , were performing experiments to verify Ohm's Law. They measured voltage applied and corresponding current flowing through the circuit. They plotted graphs (V-I graphs for different values of V and I) and wrote equations representing graph. A came up with an equation $V = (5 \times I) + 2$. B claimed that her line was parallel to that of A but her equation did not have any constant term.

(i) What equation did B write?

(ii) Who must have made a mistake in arriving at equation? Justify your answer.

(iii) What is the value of the resistance in the experiment?

(iv) If the applied voltage was 8 Volt, calculate the corresponding current.

P12. A wire of some metal is being used. How will the resistance change if

(i) Its length is halved. (ii) Its diameter is doubled.

(iii) Its length is doubled and diameter is halved.

P13. Three identical bulbs are connected in parallel across a battery. The current drawn from the battery is 4.5 Ampere. If one of the bulbs gets fused, what will the total current drawn?

P14. A wire of resistance $R \Omega$ is cut into four identical pieces. These pieces are connected in three different ways. Calculate the equivalent resistance in each case.

(i) All the four pieces are in parallel.

(ii) Two pairs of two pieces in parallel and pieces in a pair in series.

(iii) Three pieces in parallel and the fourth in series with the three.

P15. A current passing through a resistor for some time produces 200 cal. of heat. How much will be the heat if (i) current is doubled for the same time (ii) time is doubled for the same current?

P16. Three resistors of values $8\ \Omega$, $12\ \Omega$ and $24\ \Omega$ are given. Connect them in such a way that the equivalent resistance is $16\ \Omega$.

(i) What will be the minimum and maximum equivalent resistance using these three resistors?

(ii) What will be the minimum and maximum if the condition is that two resistors must be in parallel and the third in series with these two?

P17. A bulb draws 48 Watt power when connected to a 18 Volt battery. What will be the power drawn if it is connected to a 12 Volt battery?

P18. A bulb is rated as 100 Watt, 240 Volt. What will be its resistance when it is put on? If the voltage is dropped to 180 Volt, what will be the current drawn and power consumed by the bulb?

P19. An electric heater with rating $\frac{1}{2}$ KW and 250 Volt is used to heat 20 liter water. How long will you have to heat the water so that its temperature increases from 20°C to 48°C ?

P20. If two resistors R_1 and R_2 are connected in parallel, show that the effective resistance is necessarily less than the sum of the two resistances.

Documentary of the Week: As we are working with electricity, lets watch the story of electricity and lives of some great minds at the following two URLs. We suggest that you watch these documentaries with your parents.

Story of Electricity:

[http : //www.youtube.com/watch?v = CHC8AbQROvc](http://www.youtube.com/watch?v=CHC8AbQROvc)

Nikola Tesla:

[http : //www.youtube.com/watch?v = eoY7mbm5ng](http://www.youtube.com/watch?v=eoY7mbm5ng)

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