1 EFFECTS OF ELECTRIC CURRENT

TEXT BOOK QUESTIONS & ANSWERS

(Text book Page No : 7)

1. Some electrical devices are shown in the house of the child. What are they?

Ans.
- Electric bulb
- Electric fan
- Mixi
- Induction cooker
- Microwave oven
- Storage battery
- Inverter

(Text book Page No : 8)

2. Write down the energy changes in the following devices with respect to their use.

Ans.

Device	Use	Energy change
Electric bulb	to get light	Electrical energy → light energy
Induction cooker	to get heat	Electrical energy → Heat energy
Storage battery (while charging)	to store current	Electrical energy →Chemical energy
Electric stove	to get heat	Electrical Energy → Heat energy
Electric fan	to get wind	Electrical energy → Mechanical energy
Microwave oven	to get heat	Electrical energy → Heat energy
Mixer grinder	for grinding	Electrical energy → Mechanical energy

3. which are the devices that give heating effect of electric current?

Ans.
- Electric iron
- Electric stove
- Microwave oven
- Heating coil
- Induction cooker

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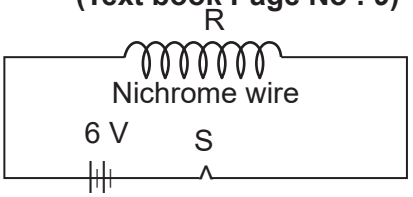
4.



(i) How does the nichrome wire become red hot while passing electricity through the circuit?

Ans. Due to the resistance of Nichrome wire.

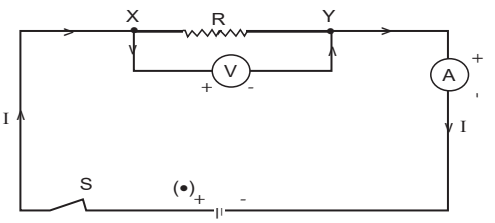
(ii) In this case which form of energy was converted into heat energy?

Ans. Electrical energy

(iii) How does this energy change occur?

Ans. This is based on the concept that energy can neither be created nor be destroyed. It can only be converted from one form to another (Law of Conservation of Energy)

5.



If the ammeter shows a current IA on applying a potential difference V across the resistor of resistance R Ω,

Current, $I = \frac{Q}{t}$

Then, the charge that flows through the conductor in t second,

Q = ……coulomb.

Ans. Q = I × t coulomb

(Text book Page No : 10)

6. Factors influencing the heat developed when a current passes through a conductor.

Ans.
- Electric current
- Resistance of the conductor
- Time of current flow

(Text book Page No : 11)

7. Complete the following table on the basis of Joule's Law.

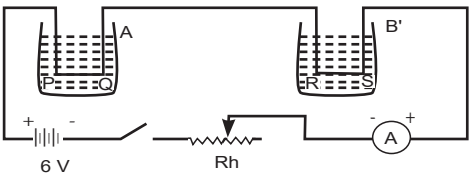
Ans.

Resistance of conductor R(Ω)	Intesity of Current (A)	Time for which current flows t(s)	Heat generated I^2Rt (J)	Change in Heat (H)
2R	I	t	$2I^2Rt$	Twice (2H)
R	2 I	t	$4I^2Rt$	Four times (4H)
$\frac{R}{2}$	I	t	$\frac{I^2Rt}{2}$	Half
R	$\frac{I}{2}$	t	$\frac{I^2Rt}{4}$	Quarter $(\frac{R}{4})$
R	I	2t	$2I^2Rt$	Twice (2H)
R	I	$\frac{t}{2}$	$\frac{I^2Rt}{2}$	Half $(\frac{H}{2})$

8. Analyse the table and find out the factor that influences heat the most.

Ans. Intensity of current

9. Experiment



(i) Of the water in beakers A and B which one got heated more? Why?

(ii) What change is observed in the temperature of water in both the beakers when the current is increased using the rheostat?

(iii) What was the change that happened to the temperature of water in both the beakers on increasing the time?

Ans. (i) Beaker A. Since nichrome has high resistance, more heat is produced.

(ii) As the current increases, the heat produced increases.

(iii) Temperature is also increased

10. Heat generated = 2400 J

If 4.2J is one calorie then H = …… calorie

Ans. $H = \frac{2400}{4.2} = 571.42$ calorie

(Text book Page No : 12)

11. Let's find out the heat developed in 3 minutes by a device of resistance 920 Ωworking under 230 V.

(i) Is there any difference in the amount of heat energy thus obtained?

(ii) How this problem can be solved using the relation, H = VIt.

Ans. V = 230V, R = 920Ω,

t = 3 × 60 sec

$I = \frac{V}{R} = \frac{230}{920} = 0.25$ A

$H = I^2Rt = 0.25^2 \times 920 \times 3 \times 60$

= 10350 J

(i) No

(ii) $I = \frac{V}{R} = \frac{230}{920} = 0.25$ A

H = VIt = 230 × 0.25 × 3 × 60 =10350 J

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12. Let's calculate the heat developed when 3 A current flows through an electric iron box designed to work under 230 V.

Ans. V = 230 V, I = 3 A,

t = 30 min = 30 × 60 = 1800 s

H = VIt = 230 × 3 × 1800

= 1242000 J = 1242 kJ

13.

Heater - B
Working voltage : 230 V Resistance : 460 Ω Working time : 5 minute
$H = \frac{V^2t}{R} = \frac{230^2 \times 300}{460} = 34500$ J

(i) Why does the heater having low resistance get heated more?

(ii) In which way does the change in resistance influence the heat developed?

(iii) Find out the current in the heaters A and B and compare the heat developed.

Ans. (i) Intensity of electric current is high.

(ii) As resistance decreases heat increases.

(iii) $I = \frac{V}{R}$

Heater A : $I = \frac{230}{1150} = 0.2$ A

Heater B: $I = \frac{230}{460} = 0.5$ A

In heater B, heat generated is large.

(iv) How do the resistors bring about a change in the current in the circuit?

Ans. As resistance increases, current decrease.

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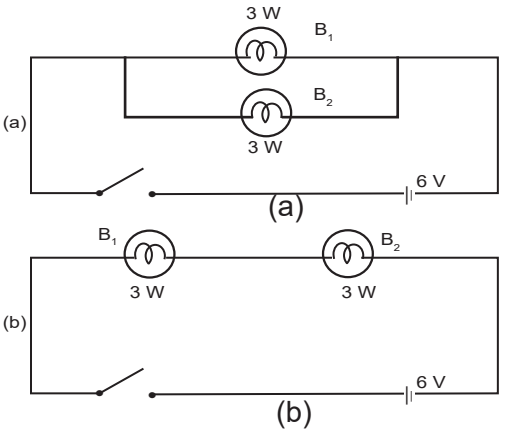
14. Consider the fig (a) & (b).



(i) In which circuit does the bulb glow with high intensity?

Ans. Circuit A

(ii) Remove one bulb from each circuit. What do you observe?

Ans. In fig (a) : the other bulb glows

In fig (b) : bulb does not glow

(iii) Why do the bulbs in Fig (a) glow with maximum brightness?

Ans: Low resistance

(Text book Page No : 15)

15. Analyse the table and tick (✓) the best

Ans.

Mode of connection of resistance	Effective Resistance	Voltage obtained in each resistance	Current through each resistance
2.2 Ω 1 Ω	increases ✓ / decreases	same / diferent ✓	same ✓ / different
2.2 Ω 1 Ω	increases / decreases ✓	same ✓/ different	same / different ✓

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16. Complete Table 1.6 by analysing Tables 1.4 and 1.5.

Ans.

Resistors in series	Resistors in parallel
1.Effective resistance increases	1. Effective resistance decreases
2. The current through each resistor is same.	2. The current through each resistor is different. It gets divided as per the value of resistors
3. The potential difference across each resistor is different. It gets divided as per the value of resistors.	3. The potential difference across each resistor will be the same
4. Each resistor cannot be controlled by separate switch.	4. Each resistor can be controlled by using separate switches.

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17. 10 resistors of 2 Ω each are connected in parallel. Calculate the effective resistance.

Ans. $\frac{1}{R} = 10 \times \frac{1}{R} = 10 \times \frac{1}{2} = 5$

$\Rightarrow \quad R = \frac{1}{5} = 0.2\ \Omega$

(Text book Page No : 19)

18. A few heating appliances are shown in the fig(1.8). Examine any one of them & answer the following questions. Record the answers in the science diary.

(i) Name the part in which electrical energy changes into heat energy.

(ii) Which material is used to make this part?

(iii) What are the peculiarities of such substances?

Ans. (i) Heating coil (ii) Nichrome:

It is an alloy of nickel, chromium and iron.

(iii) • High resistivity • High melting points

• Ability to remain in red hot condition for a long time without getting oxidized.

• Thermal expansion is negligible.

(Text book Page No : 20)

19. Which are the circumstances that cause high electric current, leading to the melting of fuse wire?

Ans. Overloading and short circuit

20. How is the fuse wire connected to a circuit? In series/ parallel?

Ans. In series

21. You know that according to Joule's Law, more heat will be produced when electric current is increased. What happens to the fuse wire due to this?

Ans. Fuse wire melts

22. When heat is generated, why does the fuse wire melt?

Ans. The fuse wire has a low melting point.

23. When the fuse wire melts, the circuit is broken. What happens to the current in the circuit?

Ans. The flow of current in the circuit stops.

24. Why is the fuse used in a circuit called safety fuse? Explain.

Ans. The current in the circuit may increase due to reasons such as short circuit, overload, or any problems in the insulation. As the higher temperature produced in the circuit due to these reasons the fuse wire melts and the flow

of current stops. Thus the circuit and the appliances are protected.

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25. When a fuse wire is included in a household wiring, what are the precautions to be taken?

Ans.• The ends of the fuse wire must be connected firmly at appropriate points.

• The fuse wire should not project out of the carrier base.

• Use the fuse wire of proper amperage.

26. You might have noticed the marking of 500 W on an electrical appliance. What does it indicate?

Ans. It indicates the power of the instrument. The amount of energy consumed by an electrical appliance in unit time is its power.

27. What is the unit of power?

Ans. Watt (W)

(Text book Page No : 22)

28. If $R = \frac{V}{I}$ What will be P ?

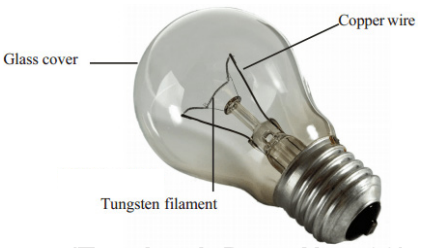
$P = I^2R = I^2 \times$ …… = …….

Ans.$P = I^2R = I^2 \times \frac{V}{I} = VI$

29. A current of 0.4 A flows through an electric bulb working at 230 V. What is the power of the bulb?

Ans.V = 230 V, I = 0.4 A

$P = VI = 230 \times 0.4 = 92$ W



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30. What happens if the interior of the bulb is not evacuated?

Ans. When the filament tungsten comes in contact with the air in the heated condition, it undergoes oxidation.

31. Why is the bulb filled with an inert gas or nitrogen?

Ans. To prevent the vaporization of filament.

32. What are the advantages of using tungsten as a filament?

Ans.• High resistivity

• High melting point

• High ductility

• Ability to emit white light in the white-hot conditions

(Text book Page No : 24)

33. Nichrome is not used as filament in incandescent lamps. Why?

Ans. It can remain only in red hot condition but it can't give light.

34. Touch a filament lamp after it has been is lit for a short period of time. What do you feel?

Ans. It gets heated.

35. What are the other types of lamps working on electricity? List them.

Ans.• Discharge lamp • Fluorescent lamp

• Arc lamp • CFL • LED

(Text book Page No : 25)

36. What are the advantages of using discharge lamps instead of incandescent lamps?

Ans. Loss of electricity in the form of heat is less, more life span, no shadow formation, more light is obtained, less consumption of electricity.

37. What are the factors to be considered when you select a bulb?

Ans. Efficiency, energy consumption, low energy loss, less environmental pollution.

38. Which are the lamps that are mostly used? Why?

Ans. Advantages of LED :

Low energy consumption

Low energy loss

Less environmental pollution.

39. What are the peculiarities of LED bulbs.

Ans.• LED's are Light Emitting Diodes.

• As there is no filament, there is no loss of energy in the form of heat.

• Since there is no mercury in it, it is not harmful to environment

• Very small

• It requires only small amount of power.

• No filaments

LET US ASSESS

1. Fuse wire is to be used by understanding the amperage correctly. Write down the amperage of the fuse wires that are currently available in the market.

Ans. Amperage is the ratio of the power of an equipment to the voltage applied.

Amperage of available fuse : 0.1 A, 0.2 A, 0.5 A, 1.5 A, 3 A, 5 A, 10A etc.

2. 0.5 A current flows through an electric heating device connected to 230 V supply.

a. The quantity of charge that flows through the circuit in 5 minutes is

i. 5 C ii. 15 C iii. 150 C iv. 1500 C

b. How much is the resistance of the circuit?

c. Calculate the quantity of heat generated when current flows in the circuit for 5 minutes.

d. How much is the power of the heating device connected to the circuit if we ignore the resistance of the circuit wire?

Ans. a. $Q = I$

$t = 0.5 \times 5 \times 60 = 150$ C

b. $R = \frac{V}{I} = \frac{230}{0.5} = 460\ \Omega$

c. $H = I^2Rt$

$= 0.5^2 \times 460 \times 5 \times 60 = 34500$ J

d. $P = V I = 230 \times 0.5 = 115$ W

3. According to Joule's Law, the heat generated due to the flow of current is $H = I^2 Rt$. Will the heat developed increase on increasing the resistance without changing the voltage? Explain.

Ans. Heat decreases.

Reason $H \alpha \frac{1}{R}$

4. The table shows details of an electric heating device designed to work in 230 V. Complete the table by calculating the change in the heat and power on changing the voltage and resistance of the device. Analyze the table and answer the following questions.

Operating voltage	Resistance of the device (R)	Current flowing in the device I= V/R
230 V	57.5 Ω	4A
230 V	11.5 Ω	2A
230 V	230 Ω	1A
115 V	57.5 Ω	2A
460 V	57.5 Ω	8A

Heat generated per second Heat, H = V x I x t	Power given by the device P = V x I or P = H/t	Reason for the change in power
920 J	920 W	Difference in resistance
460 J	460 W	Difference in resistance
230 J	230 W	Difference in resistance
230 J	230 W	Difference in voltage
3680 J	3680 W	Difference in voltage

a.How does the voltage under which a device works affect its functioning?

b. What change happens to power on increasing the resistance without changing the voltage?

c. What change is to be brought about in the construction of household heating devices in order to increase their power?

Ans.a.As voltage increases, power increases

b. Power decreases

c. Decrease the resistance and increase the current.

5. a. Complete the table based on the amperage of the fuse wire.

Electrical device	Operating voltage (V)	Power of the device (P)
Water heater	230 V	4370 W
Air conditioner (AC)	230 V	3335 W
Television (LED - TV)	230 V	57.5 W
Computer (laptop)	230 V	28.75 W

Current through the circuit I = P/V	The amperage of the fuse to be used in the circuit (A)
19 A	20 A
14.5 A	15 A
0.25 A	0.3 A
0.125 A	0.2 A

b. The amperage of the fuse wire used in a circuit that works on 230 V is 2.2 A. If so the power of the device is

i. less than 300 W

ii. 300 W to 500 W

iii. between 500 Wand 510 W

iv. more than 510 W

Ans. iii. between 500 W and 510 W

6. A 230 V, 115 W filament lamp works in a circuit for 10 minutes,

a. What is the current flowing through the bulb?

b. How much is the quantity of charge that flows through the bulb in 10 minutes?

Ans. a. $I = \frac{P}{V} = \frac{115}{230} = 0.5$ A

b. $Q = I \times t = 0.5 \times 10 \times 60 = 300$ C

7. An electric heater conducts 4 A current when 60 V is applied across its terminals. What will be the current if the potential difference is 120 V?

Ans. $R = \frac{V}{I} = \frac{60}{4} = 15\Omega$

If the voltage is changed to120 V,

Current, $I = \frac{V}{R} = \frac{120}{15} = 8$ A

8. Three resistors of 2Ω, 3Ω and 6Ω are given in the class.

a. What is the highest resistance that you can get using all of them?

b. What is the least resistance that you can get using all of them?

c. Can you make a resistance 4.5Ω using these three? Draw the circuit.

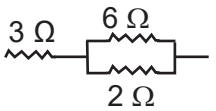
Ans. a. Highest resistance,

$R = R + R + R = 2 + 3 + 6 = 11\ \Omega$

b. Least resistance

$$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} = \frac{1}{2} + \frac{1}{3} + \frac{1}{6}$$

$$\frac{1}{R} = \frac{3 + 2 + 1}{6} = \frac{6}{6} = 1\ \Omega$$

c. Yes 

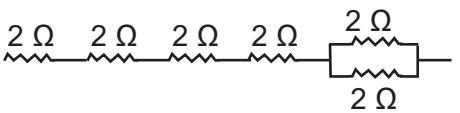
When 6Ω and 2Ω are connected in parrellel,

$$\frac{1}{R} = \frac{1}{6} + \frac{1}{2} = \frac{4}{6} = \frac{2}{3}$$

$$\Rightarrow R = \frac{3}{2} = 1.5\ \Omega$$

Now total resistance $= 3\Omega + 1.5\Omega = 4.5\Omega$

9. A girl has many resistors of 2 Q each. She needs a circuit of 9 Q resistance. For this draw a circuit with the minimum number of resistors.

Ans. 

In parallel connection,

$$\frac{1}{R} = \frac{1}{2} + \frac{1}{2} = 1 \Rightarrow R = 1\Omega$$

Now total resistance $= 2 + 2 + 2 + 2 + 1 = 9\Omega$

10. 

If a bulb is lit after rejoining the parts of a broken filament, what change will occur in the intensity of the light from the lamp? What will be the change in the power of the bulb?

Ans.• Intensity of bulb increases. Here current increases as the length is decreased.

- Power increases.

11. Which of the following does not indicate the power of a circuit?

a. I^2R b. VI c. IR^2 d. V^2/R

Ans.c. IR^2

12. How much will be the power of a 220 V, 100 W electric bulb working at 110 V?

a. 100W b. 75 W c. 50 W d. 25 W

Ans. d. 25 W

$$R = \frac{V^2}{P} = \frac{220 \times 220}{100} = 484\ \Omega$$

$$\therefore \text{New } P = \frac{V^2}{R} = \frac{110 \times 110}{484} = 25\ W$$

13. Which of the following should be connected in parallel to a device in a circuit?

a. voltmeter b. ammeter c. galvanometer

Ans. a. voltmeter

14. When a 12 V battery is connected to resistor, 2.5 mA current flows through the circuit. If so what is the resistance of the resistor?

Ans. $R = \frac{V}{I} = \frac{12}{2.5\ mA} = \frac{12 \times 1000}{2.5} = 4800\ \Omega$

15. If 0.2Ω, 0.3Ω, 0.4 Ω, 0.5 Ω, and 12Ω resistors are connected to a 9 V battery in parallel, what will be the current through the 12 Ωresistor?

Ans. $I = \frac{V}{R} = \frac{9}{12} = 0.75\ A$

16. How many resistors of 176 Ω should be connected in parallel to get 5A current from 220 V supply?

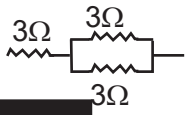
a. 2 b. 3 c. 6 d. 4

Ans. $R = \frac{V}{I} \Rightarrow \frac{176}{n} = \frac{220}{5} \Rightarrow n = 4$

17. Depict a figure showing the arrangement of three resistors of 3 Ω in a circuit to get an effective resistance of

(i) 9 Ω (ii) 4.5 Ω

Ans. i. 

ii. 

EXTENDED ACTIVITIES

1. Analyse and describe the working of a microwave oven.

Ans. Microwave oven is a device which uses heating effect of electric current. It produces heat without a heating coil. The heat is generated as a result of microwave radiations.

2. How does an arc lamp help in rescue operations?

Ans. It emits light with high intensity.

3. With the help of teachers and the Internet find out the following

   a. What is the percentage of nickel, chromium and iron in Nichrome?

   b. How much is the melting point of nichrome in degree Celsius?

   c. How much is the resistivity of Nichrome?

   d. Does the result of your observation justify the use of nichrome as a heating element?

Ans. a. 61 % Ni, 15% Cr, 24% Fe

   b. 1350°C

   c. $(1.0 – 1.5) \times 10^{-6}\ \Omega m$

   d. 1. Yes. It has high resistivity

   2. High melting points

   3. Ability to remain in red hot condition for a long time without getting oxidized.

   4. Thermal expansion is negligible.

4. Analyse the merits and demerits of the following lamps and find out which is best in the group. Justify your answers.

   a. filament lamp b. fluorescent lamp

   c. arc lamp d. CFL e. LED bulb

Ans. a. Filament lamp :

Demerits : Loss of energy as heat.

Merits : Work in both DC and AC.

b. Fluorescent lamp:

Demerits : Cause environmental pollution,

Merit : Produce more light

c. Arc lamp:

Demerits : Carbon rods are to be changed frequently.

Merit : Intense light is produced.

d. CFL:

Merit: Produce more light at low power.

Demerits : Cause environmental pollution,

e. LED Bulb :

Merit : No environmental pollution, low energy consumption, long life.

The best lamp is LED.

ADDITIONAL QUESTIONS & ANSWERS

1. Complete the table based on the effects of electric current and energy change.

Electric appliance	Energy change (electrical energy →)	Effect of electric current
Bulb	.....a.....	Lighting effect
Electric Fan	Mechanical Energy	.....b.....
Electric Iron box	.....c.....	Heating effect
Storage battery (While charging)	Chemical Energy	....d.....

Ans.a. Light energy b. Mechanical effect

c. Heat energy d. Chemical effect

2. Given below questions are related with heating of an electric iron box. Answer them.

a. Which is the part that produces heat in an electric iron?

b. Which nature of this part is made use in the above situation?

c. What is the relation between intensity of electric current and heat energy generated?

d. What are the factors that affect the heat generated in such heating appliances?

e. What is the relation connecting these factors with the heat generated?

f. What is this law known as?

g. Name a device that works on this law used for ensuring safety in electric circuits?

Ans. a. Heating coil

b. High resistivity and high melting point

c. As electric current increases, heat energy increases.

d. Electric current, Resistance, time

e. $H = I^2 Rt$

f. Joules law g. Safety fuse

3. Incandescent lamp, discharge lamp, C.F.L, LED lamp, arc lamp are given for observation (Otherwise, make use of their pictures)

Answer the following questions after observing them.

a. Which metal is used to make filament of an incandescent lamp? What are the advantages of using this metal as a filament?

b. Name the lamps which belong to the group of discharge lamp.

c. The color of the light depends on the gas inside the discharge lamp. Which gases are to be filled for getting white light and yellow light?

d. Which lamps are harmful to environment because of the presence of mercury in it?

e. Which lamp is used in rescue work during night time and used in searchlights?

Ans. a. Tungsten.

Advantages of tungsten are high ductility, high resistivity and high melting point

b. Fluorescent lamp, CFL, LED, Arc lamp.

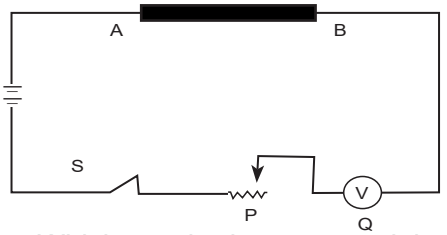
c. For white light – Mercury

For yellow light- Sodium Vapour

d. Fluorescent lamps

e. Arc Lamp

4. Observe the circuit diagram given below and answer the following questions.



a. Which are the instruments labeled as P and Q in the diagram?

b. If you replace the copper wire AB with a Nichrome wire of same length and area of cross section.

i. What change would you notice in the reading on the device Q? Why?

ii. What will happen to the heat produced in the conductor? Explain with reference to Joule's Law.

Ans. a. P- Rheostat. Q- Ammeter.

b. i. Reading will decrease.

As the resistance increases current decreases.

ii. Because of Nichrome's high resistivity, the current in the circuit will decrease. According to Joules law $H = I^2 Rt$. As the amount of current decreases, the amount of heat generated also decreses.

5. Write down the names of four types of lamps working on the lighting effects of electricity.

Ans. Discharge lamp, Fluorescent lamp, LED, Arc lamp.

6. Two types of lamps are given below.

1. Discharge lamp 2. Filament lamp.

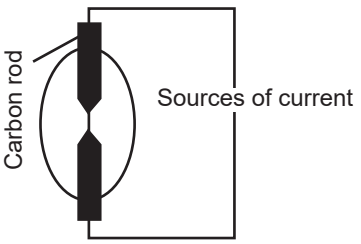
a. If nitrogen gas is filled in each lamp, what change will happen to their working?

b. Why is it said that the use of filament lamp must be controlled?

Ans. a. Nitrogen filled discharge lamp will give red light, but in a filament lamp nitrogen is filled to reduce the evaporation of the filament.

b. In a filament lamp, major part of the electrical energy is lost as heat energy.

7.



a. Identify the device shown in the picture.

b. How are such devices used in rescue ope-rations?

Ans. a. Arc lamp

b. Light intensity in an Arc lamp is very high compared to other lamps, so Arc lamps are helpful in rescue operations even in adverse climatic conditions.

8. A 800W electrical device is designed to work in 200V. What will be its power if the device is working in 100 V?

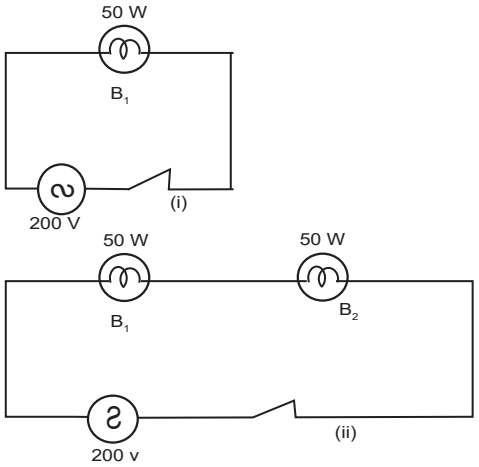
Ans. Resistance of the appliance

$$R = \frac{V^2}{P} = \frac{200 \times 200}{800} = 50\ \Omega$$

Power when connected in 100 V

$$P = \frac{V^2}{R} = \frac{100 \times 100}{50} = 200\ W$$

9. Bulbs marked 200V and 500W are shown in the picture.



a. Calculate the resistance of each bulb in the circuit.

b. What is the power with which the bulb in circuit 1 glows?

c. What is the power of the bulb in circuit 2? Why?

d. How is the power and resistance of an electrical device related to each other when the voltage is the same?

Ans. Resistance of $B_1 = \frac{V^2}{P}$

$$= \frac{200 \times 200}{50} = 800\ \Omega$$

Resistance of B_2 = 800 Ω

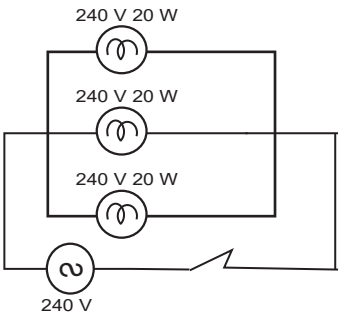
b. 50 W

c. Since the 50 W bulbs are in series current will be equal and voltage will be half. Since P = VI, Power also will

become half.

d. $P = \frac{V^2}{R}$

10. Electric bulbs are connected in a 240V supply line are shown in the figure.



a. What is the total wattage of appliances used in the circuit?

b. Calculate the amperage of the fuse to be used in the circuit.

Ans. a. P = 20 W + 20 W + 20 W = 60W

b. Amperage = $\frac{\text{Wattage}}{\text{Voltage}} = \frac{60\ W}{240\ V} = \frac{1}{4}\ A$

11. Given below are the steps in the working of a fluorescent lamp. Arrange them in the proper order.

a. Ultraviolet rays are produced

b. Visible light is emitted.

c. Fastly moving electrons collide with the unionized molecules of mercury.

d. Due to electric current thorium oxide coated heating element becomes red hot.

Ans. (d) - (c) - (a) - (b)

12. Correct the mistakes, if any:

a. Amperage decreases in proportion to the decrease in the area of cross-section of the conductor.

b. Connecting appliances in a circuit beyond its power capacity is short circuit.

c. It is to reduce the heat loss that electric lamps are filled with inert gases.

Ans. b. It is overloading.

c. Inert gases are filled in filament lamps to reduce the rate of evaporation.

13. Power of an electric heater working in 230 V is 1000 W. Calculate the heat produced if the current passes for 5 minutes through the circuit.

Ans. Heat = P × t

= 1000 × 5 × 60

= 300000 J

14. An electric bulb has marking 110 V, 100 W on it.

a. How much energy is used per second by the circuit?

b. What is the resistance of electric bulb?

Ans. a. 100 J

b. $P = \frac{V^2}{R}$

$\Rightarrow R = \frac{V^2}{P} = \frac{110 \times 110}{100} = 121\Omega$

15. Fill up the blanks by finding the suitable relationship.

Nichrome	Heating oil	High melting point
Alloy of tin and lead	....(A)....	Low melting point
Tungsten	Filament	....(B)....

Ans. A = Fuse wire B = High melting point

16. If the resistance of two soldering irons working in 250 V are 500 Ωand 750 Ω.

a. Calculate which one of these will carry more current.

b. Find out which soldering iron has more power.

c. Calculate the heat produced in 5 minutes in the soldering iron having resistance 750 Ω.

Ans. a. $I = \frac{V}{R}$

Current through 500 Ω, $I_1 = \frac{250\ V}{500\ \Omega} = \frac{1}{2}\ A$

Current through 750 Ω, $I_2 = \frac{250\ V}{750\ \Omega} = \frac{1}{3}\ A$

$\therefore I_1 > I_2$

b. Soldering iron has less resistance

c. $H = \frac{V^2t}{R} = \frac{250^2 \times 300}{750} = 25000\ J$

17. Two bulbs of 500 W and 100 W are connected parallel in a circuit of 250 V.

a. Which bulb will have more brightness?

b. Through which bulb is current greater?

c. Find out the resistance of filaments in each bulb.

d. Which of these two bulbs will glow with more brightness if they are connected in series? Explain the reason.

Ans. a. 500 W Bulb

b. Bulb which has power 500 W

c. For 500 W bulb,

$R = \frac{V^2}{P} = \frac{250 \times 250}{500} = 125\ \Omega$

For 100 W Bulb

$R = \frac{V^2}{P} = \frac{100 \times 100}{250} = 40\ \Omega$

d. 100 W bulb

Current will be the same in series and high resistance bulb will shine more brightly.

18. Fill in the blanks suitably using the relationship in the first pair,

a. Filament : High melting point

Fuse : ……

b. Nitrogen filled discharge lamp : Red

…….... : Blue

Ans. a. Low melting point

b. Hydrogen used in discharge lamp

19. Choose and write the facts related to LED lamps from the given list.

a. Require only a small quantity of power.

b. UV rays are produced due to electric discharge.

c. Not harmful to environment since there is no mercury.

d. Intense light is produced when high voltage is applied.

Ans. a, c

20. Using the relation from the first pair, complete the other.

Filament : Tungsten

Heating coil : .....

Ans. Nichrome

21. Which of the given material has the highest resistivity?

a. Nichrome

b. Copper

c. Aluminium

d. Silver

Ans. a. Nichrome

22. What is the color of the light emitted by discharge lamp filled with nitrogen when it works ?

Ans. Red

23. Using the relation from the first pair, complete the other.

Fuse wire : low melting point

Tungsten : ……..

Ans. High melting point

24. Which among the following is the special characteristics of a material to be used as a heating coil in a electric heating device?

    a. Low melting point

    b. High resistivity

    c. Large area of cross section

    d. Low resistance

Ans. High resistivity

25. Which material is used as filament of bulb?

Ans. Tungsten

26. Find out the odd one from the following also write the reason.

    [long glass tube, Mercury vapor, Fluorescent coating, Thin tungsten filament]

Ans. Thin tungsten filament.

Others are parts of a fluorescent lamp.

27. If we apply 230 V for a device having 230 V and 400 W, what will happen the power of the device ?

    (increases, decreases, doesn't change)

Ans.decreases.

28. In incandescent lamp nichrome is not used as filament. Choose the reason from the following

    a. Glows brightly

    b. It emit white light when it is in hot condition. ,

    c. It can remain only in red hot condition but it can't give light.

Ans. c

29. Find out the odd one which is not suitable for the advantages of LED.

    a. It requires only a small quantity of power.

    b. It is not harmful to environment.

    c. Ultraviolet fays are formed due to discharge.

Ans. c

30. A 400 W electrical device is designed to work in 100 V. What will be its power if the device is working in 100 V?

Ans. Resistance of the appliance

$$R = \frac{V^2}{P} = \frac{100 \times 100}{400} = 25\ \Omega$$

Power when connected in 100 V

$$P = \frac{V^2}{R} = \frac{100 \times 100}{25} = 400\ \Omega$$

31. An electric bulb marked 500 W, 250 V is connected to a 250 V supply.

    a. Find the electric current through the circuit.

    b. Calculate the resistance of the bulb.

Ans. a. P = 500 W, V = 250 V

$$P = V I$$

$$I = \frac{P}{V} = \frac{500}{250} = 2A$$

b. $$R = \frac{V}{I} = \frac{250}{2} = 125\ \Omega$$

32. What are the advantages of fluorescent lamps over incandescent lamps.

Ans.1. Saves electrical energy to a greater extent.

2. The inconvenience caused by shadow is minimized.

3. The life of fluorescent lamp is about 5 times that of incandescent lamps.

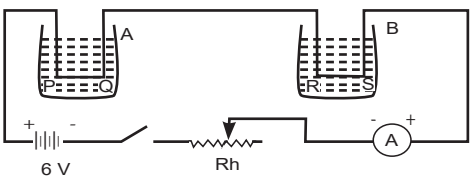
33. Complete the table suitably.

Gas-filled in the discharge lamp	Colour
Hydrogen	(a)
(b)	Orange-red
Nitrogen	(c)
(d)	Green

Ans. a. Blue b. Neon

c. Red d. Chlorine

34. In figure, Beakers A and B contain 100 ml water. PQ is a nichrome wire and RS is a copper wire of same length and diameter.



a. Water in which beaker will be at higher temperatures? What is the reason?

b. If the current is doubled using the rheostat, what happens to the quantity of heat produced in the wire PQ?

Ans. a. Beaker A, since the combination is series, the current remain same. As nichrome has high resistance, more heat is produced in it. ($H = I^2 Rt$)

b. Heat produced becomes 4 times.

Heat $H = I^2 Rt$, Heat increases by 4 times as current is squared.

35. Classify the following as those suitable for fluorescent lamps and for arc lamps.

a. The main part is carbon rods.

b. The heating coil is coated with thorium oxide.

c. used in searchlights.

d. more harmful for the environment.

e. more intense light.

f. ultraviolet rays are produced.

Ans. Arc lamps: a, c, e

Fluorescent lamps : b, d, f

36. Find out the relation and complete the missing parts.

i. Tungsten :… (A) …. : high melting point

ii. Alloy of suitable metals : fuse wire: …….(B)……..

iii ..(C).. heating coils : high melting point

Ans. A. Filament B. Low melting point

C. Nichrome

37. The filament of a filament lamp is broken. It is rejoined and is lit again.

a. What happens to the intensity of light from it? Describe the reason behind.

b. Incandescent lamps are filled with nitrogen at low pressure. What is the advantage of doing so?

c. You are given two filament lamps of resistance 750Ω and 1000Ω. Of these, which has more power?

Ans. a. Increases.

Because resistance decreases and current increases when length decreases.

b. Nitrogen doesn't expand over change in temperature. At normal temperature it behave as a inert gas.

c. 750 Ω

38. Choose the appropriate items from the box.

Nichrome, Tungsten, Fuse Wire, Nitrogen

a. Which is used as heating coil ?

b. Which is an alloy of tin and lead?

c. Which is used as filament ?

Ans. a. Nichrome

b. Fuse wire

c. Tungsten

39. a. What is meant by amperage ?

b. An appliance of power 690 W is used in a branch circuit. If the voltage is 230 V, what is its amperage?

Ans. a. Amperage is the ratio of the power of an equipment to the voltage applied.

b. $A = \frac{P}{V} = \frac{690}{230} = 3\ A$

40. Analyse the table and fill it suitably.

Electric current intensity is made three times	Heat produced becomes ...(1)...
In a circuit, fuse wire is connected in	...(2)
Electric current intensity is reduced to 1/4	Heat produced be comes ...(3)...

Ans. (1) 9 times [$\because H = I^2 Rt$]

(2) Series

(3) 1/16 times [$\because H = I^2 Rt$]

41. An electric heater working at 230 V produces 1000 J energy in one second.

a. What is the power of the lamp ?

b. Calculate the resistance of the ating coil used in it.

c. Calculate the heat generated by it when it works for 5 minute.

Ans. a. $P = \frac{H}{t} = \frac{1000}{1} = 1000\ W$

b. $R = \frac{V^2}{P} = \frac{230^2}{1000} = 52.9\ \Omega$

c. H = Pt = 1000 x 5 x 60 = 300000 J

42. Write down the reasons for the following statements.

a. Don't throw unwanted fluorescent tubes.

b. Nichrome is not used as filament in incandescent lamps.

c. Fuse wire is melt when electric current increased.

d. Why is the incandescent filled with an inert gas or nitrogen?

Ans. a. It contains mercury which causes several environmental problems.

b. It can remain only in red hot condition but it can't give light.

c. Fuse wire has low melting point.

d. To prevent the vaporization of filament.

43. Name the factors influencing the heat developed, when current passes through a conductor.

Ans. 1. Intensity of electric current (Current) (I) – When the current is doubled, heat becomes four times. When the current is halved, heat is reduced to 1/4.

2. Resistance of the conductor (R) – When the resistance is doubled, without any change in the current, then the heat produced is also doubled. But in normal case, when the resistance is doubled, current is reduced by half. So heat is also reduced to 1/2.

3. Time of flow of current (t) – When the time is doubled, heat is also doubled.

44. Name the factors influencing the power of an electrical device.

Ans. Resistance (R) – When the resistance increases, power decreases. (When the resistance is doubled, power is halved)

Voltage (V) – When the voltage increases, power also increases. (When the voltage is doubled, power becomes four times and when the

voltage is halved, power is reduced to 1/4)

45. What are the peculiarities of Nichrome.

Ans. 1. High resistivity.

2. High melting point.

3. Ability to remain in red hot condition for a long time without getting oxidised

46. What is safety fuse? What is its principle? What it is made up of?

Ans. ● Safety fuse is a device which protects us and the appliances from danger when an excess current flows through the circuit.

● Safety fuse is a device that works on the heating effect of electric current.

● Fuse wire, an alloy of tin and lead, is the main part of safety fuse.

47. Name the circumstances that cause high electric current in a circuit.

Ans. ● Over loading - A circuit is said to be overloaded if the total power of all the appliances connected to it is more than what the circuit can withstand.

● Short Circuit - If the positive and the negative terminals of a battery or the two wires from the mains come into contact without the presence of a resistance in between, they are said to be short- circuited.

48. What are the precautions to be taken, while connecting a fuse wire in a circuit?

Ans. 1. The ends of the fuse wire must be connected firmly at appropriate points.

2. The fuse wire should not project out of the carrier base.

3. Use fuse wire of appropriate amperage.

4. Fuse wire is connected in series.

49. Write the electrical devices which converts eiectrical energy to mechanical energry.

• Electric Iron

• Soldering Iron

• Loud Speaker

• Electric Mixie

Ans. Loud Speaker, Electric mixie

50. Nichrome wires are used as heating coil. Write any two reasons for the same.

Ans. High resistance, High melting point

51. Why does a heater having low resistant heating coil gets heated more ? Explain.

Ans. As the resistance decreases, intensity of electric current increases. So more heat energy is produced.

52. The heat generated in a current carrying conductor can be explained by a famous law.

(a) Write the name of this law.

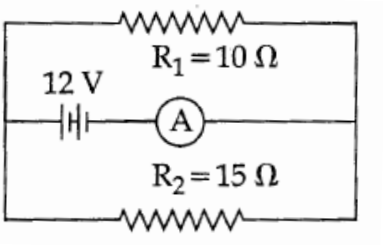
(b) Write the mathematical equation for this law' explain each letters used in the equation.

Ans. (a) Joule's Law

(b) $H = I^2Rt$

H - Heat energy in (J), I - Intensity of electric current in (A), R- Resistance in (Ω) t – time in (s)

53. Analyse the given circuit



(a) How are the resistors connected' in the above circuit ?

(b) What will be the current shown in the ammeter ?

(c) Calculate the current through the resistor R_1?

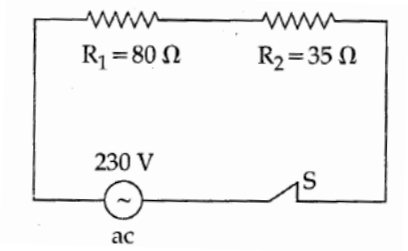
Ans. (a) In parallel

(b) I = V/R = 12/6 = 2 A

$$R = \frac{R_1R_2}{R_1 + R_2} = \frac{10 \times 15}{10 + 15} = \frac{150}{25} = 6\ \Omega.$$

(c) Current in R_1 = V/R = 12/10 = 1.2 A

54. Observe the figure.



(a) Calculate the total resistance in the circuit. [Neglect the resistance of connection wires]

(b) Calculate the heat generated in this circuit in 5 minutes.

(c) If one more resistance of 50 ohms is connected in series what happens to the heat generation.

Ans. (a) 115 Ω

(b) I = V/R = 230/115 = 2 A

$H = I^2Rt = 2^2 \times 115 \times 5 \times 60$ J = 4 x 115 x 300 J = 138000 J

(c) Resistance increases heat energy increases

55. (a) An electric bulb of 60W power is connected on 240 V mains. Write the current through the bulb.

[4A, 2A, ½ A, ¼ A]

(b) How is the safety fuse connected in a branch circuit ?

(c) Explain the working of a safety fuse.

Ans. (a) 1/4 A (b) In series.

When the current that flows into the circuit exceeds the permissible limit while overload and short circuit, the heat generated becomes excessive. Since more heat is generated in unit time than the heat transmitted, the fuse wire melts. Safety fuse is a device which protects us and the appliances from danger when an excess current flows through the circuit.

56. Three resistors of 10Ω, 15Ω, and 5Ω are connected in parallel. Find their equivalent resistance.

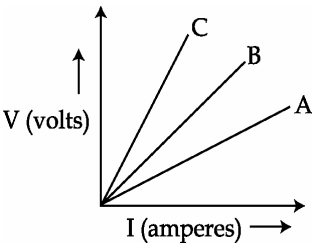
Ans.
$$\frac{1}{R_p} = \frac{1}{10} + \frac{1}{15} + \frac{1}{5}$$
$$= \frac{3 + 2 + 6}{30} = \frac{11}{30}$$
$$\therefore R_p = \frac{30}{11}\ \Omega.$$

57. How many 40 W bulbs can be safely connected in a parallel circuit which is drawing current through a 5A fuse from a 220 V supply ?

Ans. P = VI = 220 × 5 W

No. of bulbs = $\frac{220 \times 5}{40}$ = 27.5 or 27 bulbs

58. Three V-I graphs are drawn individually for two resistors and their series combination. Out of A, B, C which one represents the graph for series combination of the other two. Give reason for your answer.



Ans. We know that in series combination,

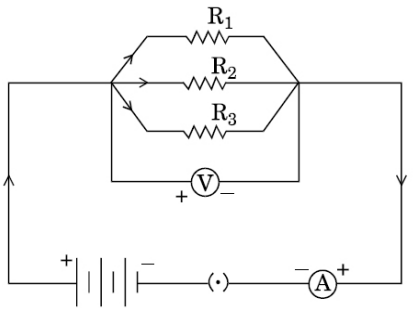
resultant resistance is always greater than the individual resistances. In the given graph, C is showing maximum resistance (as slope of V-I graph gives resistance), thus C represents the resultant series combination of the other two.

59. In the circuit given below, the resistors R_1, R_2 and R_3 have the values 10Ω, 20Ω and 30Ω respectively, which have been connected to a battery of 12 V. Calculate

(a) the current through each resistor,

(b) the total circuit resistance, and

(c) the total current in the circuit.



Ans. Given :

$R_1 = 10\ \Omega$; $R_2 = 20\ \Omega$; $R_3 = 30\ \Omega$

According to Ohm's law, V = IR. Given V = 12 V

(a) Current through resistor

$$R_1 : I_1 = \frac{V}{R_1} = \frac{12}{10} = 1.2\ A$$

Current through resistor

$$R_2 : I_2 = \frac{V}{R_2} = \frac{12}{20} = 0.6\ A$$

Current through resistor

$$R_3 : I_3 = \frac{V}{R_3} = \frac{12}{30} = 0.4\ A$$

(b) $$\frac{1}{R} = \frac{1}{10} + \frac{1}{20} + \frac{1}{30}$$

$$\frac{1}{R} = \frac{11}{60}$$

$$\Rightarrow R = \frac{60}{11} = 5.45\ \Omega$$

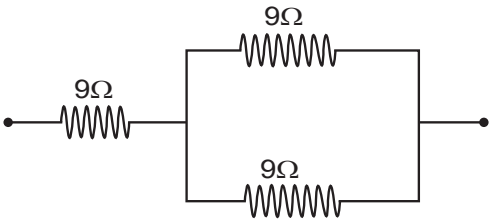
(c) The total current in the circuit is

$$I = I_1 + I_2 + I_3$$

$$= 1.2 + 0.6 + 0.4 = 2.2\ A$$

60. Show how would you join three resistors, each of resistance 9 Ω so that the equivalent resistance of the combination is (i) 13.5 Ω, (ii) 6 Ω

Ans. (i)



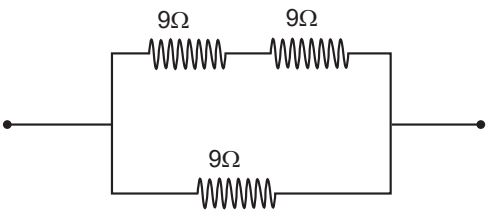
Two 9 ohm resistors in parallel connected to one 9 ohm in series

$$\frac{1}{R_P} = \frac{1}{9} + \frac{1}{9} = \frac{2}{9}$$

$$\Rightarrow R_p = \frac{9}{2}\ \Omega = 4.5\ \Omega$$

$$\therefore \quad R = 9\Omega + 4.5\ \Omega = 13.5\ \Omega$$

(ii)



Two 9 ohm resistors in series connected to one 9 ohm in parallel.

$$R_s = 9\Omega + 9\Omega = 18\Omega$$

$$\frac{1}{R_p} = \frac{1}{18} + \frac{1}{9} = \frac{3}{18}$$

$$\Rightarrow \quad R_p = 6\Omega$$

61. Three resistors of 1 Ω, 2 Ω and 3 Ω

are connected in parallel in a circuit. If 1 Ω resistor draws a current of 1 A, find the current through the other two resistors.

Ans. All the resistors are in parallel, hence the voltage, across each resistor is same.

Voltage across 1Ω resistor

= 1R = 1A x 1Ω = 1V

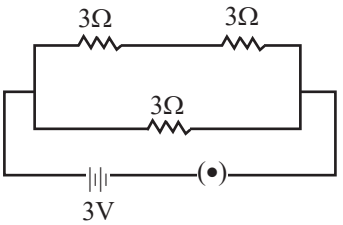
∴ Current through 2 Ω resistor

$= \frac{V}{R} = \frac{1}{2} = 0.5A$

∴ Current through 3 Ω resistor

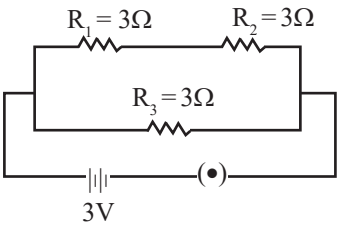
$= \frac{V}{R} = \frac{1}{3} = 0.33A$

62. Three resistors of 3Ω each are connected to a battery of 3V as shown. Calculate the current drawn from the battery.



Ans. $R_{12} = R_1 + R_2$

$= 3\Omega + 3\Omega = 6\Omega$

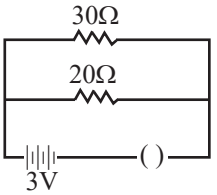


Now $R_{123} = \frac{R_{12} \times R_3}{R_{12} + R_3}$

$= \frac{6 \times 3}{9} = 2\Omega$

Now, $I = \frac{V}{R} = \frac{3}{2} = 1.5A$

63. Study the following circuit and calculate the energy drawn from the battery in 10 s. **(2015)**



Ans. $\frac{1}{R_p} = \frac{1}{30} + \frac{1}{20} = \frac{5}{60} = \frac{1}{12}$

$\Rightarrow R_p = 12\ \Omega$

Given, $V = 3V$

$\Rightarrow I = \frac{V}{R} = \frac{3}{12} = 0.25\ A$

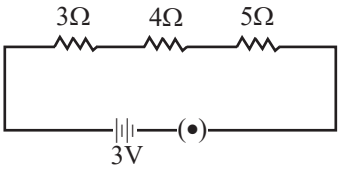
Now, $E = p \times t = V \times I \times t$

$= 3 \times 0.25 \times 10 = 7.5\ J$

64. Study the following circuit and calculate the potential difference across 5Ω resistor

Ans. $R_S = 3 + 4 + 5 = 12\ \Omega$

$I = \frac{V}{R} = \frac{3}{12} = 0.25\ A$



Since the resistors are connected in series, the same current flows through all the resistors.

So P.D across 5Ω resistor,

V = IR = 0.25 x 5Ω = 1.25 V

65. Three resistors of 2 Ω each are connected to a battery of 3V as shown. Calculate the current drawn from the battery.

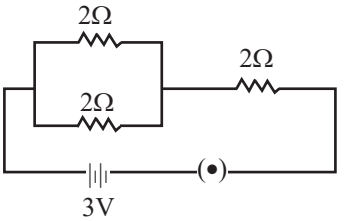
Ans. For the 2 resistors which are connected in parallel,

$\frac{1}{R} = \frac{1}{2} + \frac{1}{2} = 1$

$\Rightarrow R = 1\Omega$

Now total resistance of the system

= 1Ω + 2Ω = 3 Ω



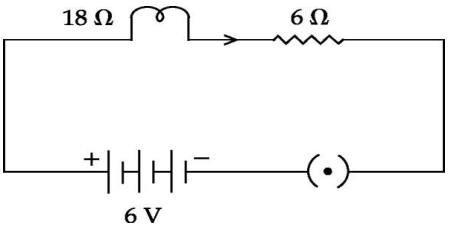
$\therefore I = \frac{V}{R} = \frac{3}{3} = 1\ A$

66. In the given circuit calculate :

(i) the total resistance of the circuit,

(ii) current flowing through the circuit,

(iii) potential difference across the lamp and the resistor.



Ans. (i) Total resistance $R = R_1 + R_2 = 18 + 6 = 24\Omega$

(ii) $I = V/R = 6/24 = 0.25\ A$

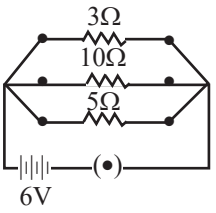
(iii) Potential difference across the lamp,

$V_1 = IR_1 = 0.25 \times 18 = 4.5\ V$

P.D. across the resistor,

$V_2 = IR_2 = 0.25 \times 6 = 1.5\ V.$

67. Two wires A and B are of equal length and have equal resistance. If the resistivity of A is more than that of B, which wire is thicker and why?



For the electric circuit given below calculate:

(i) Current in each resistor,

(ii) Total current drawn from the battery and

(iii) Equivalent resistance of the circuit.

Ans. $R = \rho \frac{l}{A}$

i.e., $A = \rho \frac{l}{R}$

Since l and R of two wires are same, $A \propto \rho$. It is given that $\rho_A > \rho_B$, i.e., A is thicker.

(i) Current in 3Ω resistor,

$I_1 = \frac{V}{R_1} = \frac{6}{30} = 0.2\ A$

Current in 10Ω resistor,

$I_2 = \frac{V}{R_2} = \frac{6}{10} = 0.6\ A$

Current in 5Ω resistor,

$I_3 = \frac{V}{R_3} = \frac{6}{5} = 1.2\ A$

(ii) Total current $= I_1 + I_2 + I_3$

$= 0.2 + 0.6 + 1.2 = 2A$

(iii) $\frac{1}{R_p} = \frac{1}{30} + \frac{1}{10} + \frac{1}{5}$

$= \frac{1 + 3 + 6}{30} = \frac{10}{30} = \frac{1}{3}$

68. Explain the role of an electric fuse joined in series with an electrical appliance. Why should a fuse with a defined rating not be replaced by one with a larger rating?

Ans. • Fuse is used for protecting the appliance(s) due to short circuiting/ overloading.

• Fuses are rated for a certain maximum current. A fuse blows off when a current more than the rated

value flows through it.

• If a fuse is replaced by one with a larger/ higher rating, the appliance may get damaged while the protecting fuse does not burn off.

PREVIOUS YEAR QUESTIONS & ANSWERS

1. Write the energy change taking place in the given devices.

   (a) Incandescent Lamp

   (b) Electric Mixie **(2021)**

Ans. a. Electrical energy to Light Energy

b. Electrical energy to Mechanical Energy

2. (a) Name the part of heating equipment in which the electric energy is converted into heat energy

   (b) Name the substance used to make this part. **(2021)**

Ans. a. heating coil

b. Nichrome

3. Explain the difference between short circuit and overloading. **(2021)**

Ans. **Over loading** : A circuit is said to be overloaded if the total power of all the appliances connected to it is more than what the circuit can withstand.

Short Circuit : If the positive and the negative terminals of a battery or the two wires from the mains come into contact without the presence of a resistance in between, they are said to be short circuited.

4. 2 A current flows through an electric heating device connected to 230 V supply.

   (a) The quantity of charge that flows through the circuit in 5 minutes is :

   (i) 10C (ii) 60C

   (iii) 600C (iv) 6C

   (b) What is the resistance of the device.

   (c) Calculate the power of the heating device. **(2021)**

Ans. a. 600 C

b. $R = \frac{V}{I} = \frac{230}{2} = 115\ \Omega$

c. Power $P = I^2R = 2^2 \times 115$

$= 4 \times 115 = 460$ W

5. The resistances of 4 Ω, 6 Ω and 12 Ω are given to you.

   (a) What is the highest resistance that you can get using all of them ?

   (b) What is the lowest resistance that can be obtained by using the 6 Ω and 12 Ω resistances. **(2021)**

Ans. a. Resistors are connected in series,

$R_1 = 4\ \Omega$, $R_2 = 6\ \Omega$, $R_3 = 12\ \Omega$

Effective resistance,

$R = R_1 + R_2 + R$

$= 4 + 6 + 12 = 22\ \Omega$

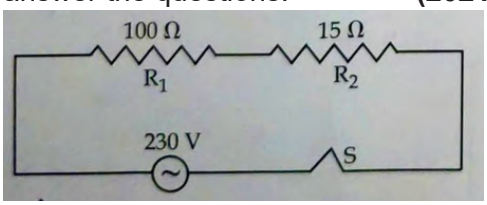
b. Lowest resistance can be obtained by connecting the resistances in parallel

$$R = \frac{R_1R_2}{R_1 + R_2}$$

$$= \frac{6 \times 12}{6 + 12}$$

$= 72/18 = 4\ \Omega$

6. Observe the circuit diagram and answer the questions. **(2021)**



(a) Find the effective resistance of the given circuit.

(b) Calculate the current flowing through this circuit.

(c) What is the heat produced in the 100 Ω resistance if the current flows for 10 minutes?

Ans. a. $R_{effective} = R_1 + R_2$

$= 100 + 15 = 115\ \Omega$

b. Current, $I = V/R = 230/115 = 2A$

(c) $I = 2A$,

$R = 100\ \Omega$,

$t = 10\ min = 10 \times 60 = 600s$

Heat, $H = I^2Rt$

$= 2^2 \times 100 \times 600$

$= 240000J$

7. (a) Write the function of a safety fuse in an electric circuit.

(b) Write any two characteristics of fuse wire.

(c) Write any two precautions to be taken while including fuse wire in a circuit. **(2021)**

Ans. a. Safety fuse is a device which protects us and the appliances from danger. When the current that flows into the circuit exceeds the permissible limit, the heat generated becomes excessive. Because of it's low melting point the fuse wire melts and break the circuit.

b. Fuse wire is an alloy of tin and lead and it has low melting point.

c. The ends of the fuse wire must be connected firmly at appropriate points.

The fuse wire should not project out of the carrier base.

Use fuse wire of appropriate amperage.

Fuse wire is connected in series

8. Specification of two electrical heaters are given below:

Header-A	Header-B
Resistance	Resistance
- 690 Ω	- 460 Ω
Working Voltage	Working Voltage
- 230 V	- 230 V

(a) Which heater require a fuse of higher ampearage?

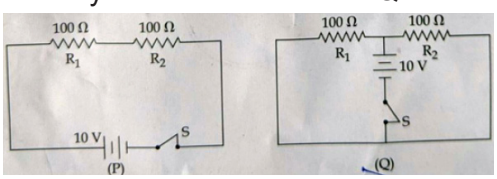
(b) Which of the heaters generate more heat when they work for 5 minutes under the same voltage rating? Explain the reason. **(2020)**

Ans. (a) Heater - B

(b) Heater - B

Because when the resistance decreases current increases so heat increases.

9. Analyse the circuits P and Q.



(a) In which circuit, the resistors get the same voltage? **(2020)**

(b) Calculate the voltage across the resistor R_2 in the circuit (P).

(c) If current due to the applied emf is flowing through these two circuits for a time of 5 minutes, which circuit will produce more heat energy? Explain.

Ans. (a) Q (Since they are connected in parallel)

(b) 5V

(c) Q will produce more heat

Resistance of P = 100 + 100

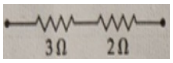
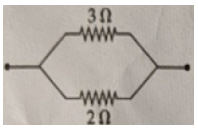
= 200 Ω

Resistance of Q = $\frac{100}{2}$ = 50 Ω

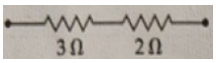
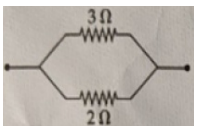
$H = \frac{V^2t}{R}$,

so when resistance decreases heat increases.

10. The following table is prepared for comparing the properties of resistances in different combinations. Rearrange the contents in each column to match them properly. **(2020)**

Connection diagram of resistance	Effective resistance of the circuit	Voltage across each resistor	Current through each resistor
	decreases	same	same
	increases	different	different

Ans.

Connection diagram of resistance	Effective resistance of the circuit	Voltage across each resistor	Current through each resistor
	increases	different	same
	decreases	same	different