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PHYSICS

Ans 1:- (a) Electrical resistance - ohm

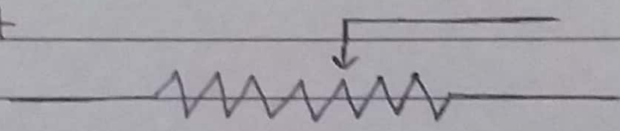
(b) Resistivity - ohm - meter

Ans 2:- One ohm is the resistance of a conductor such that when a potential difference of 1 volt is applied to its ends and a current of 1 ampere flows through it.

Ans 3:-

Resistance	Resistivity
• Resistance is the property of a conductor to resist the flow of charges through it.	• Resistivity is the electrical resistance per unit length and per unit of cross-sectional area.

Ans 4:- (a) Rheostat



(b) Closed key

Ans 5:- The rate at which the work is being done in an electrical circuit is called electrical power.

The SI unit is Watts (W).

Ans 6:- Current (I) = 0·2 A

Time (t) = 5 hours = (3600 × 5) sec.

$$\text{Current} = \frac{\text{Charge}}{\text{Time}}$$

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

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$Q = I \times t$

$= 0.2 \times 3600 \times 5$

$Q = 3600$ coulomb.

Ans 7:-

$V = 12V$

$I = 2.5mA = 2.5 \times 10^{-3} \times 10 = 25 \times 10^{-4}$

$R = ?$

$R = \frac{V}{I}$

$R = \frac{12}{25 \times 10^{-4}}$

$R = \frac{12 \times 10^{4}}{25}$

$R = \frac{12 \times \cancel{10000}^{\cancel{2000}\ 400}}{\cancel{25}_{\cancel{5}\ 1}}$

$R = 4800$ ohms.

Ans 8:- (1) In series

Total resistance in series $= R_1 + R_2$

$= 2 + 2$

$= 4$ Ohm

Potential difference (V) = 12V

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

$= \frac{12}{4} = 3$ Ampere

Power $= V \times I$

$= 12 \times 3$

$= 36$ Watts.

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(2) In parallel

$\frac{1}{R_1} + \frac{1}{R_2} = \frac{1}{R_a}$ (where R_a is the total resistance)

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

$\frac{2}{2} = \frac{1}{R_a}$

~~Ra~~ R_a = 1 Ohm

Voltage (V) = 12 V

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

= 12 Ampere.

Power = V X I

= 12 X 12 = 144 W

Ratio = 1 : 4

Ans 9:- Power $\propto$ $\frac{1}{\text{Resistance}}$

$\therefore$ Lesser the power more is resistance

For first lamp:-

$P = \frac{(V)^2}{R}$

$R = \frac{V^2}{P} \Rightarrow \frac{\overset{1210}{4840\cancel{0}}}{4\cancel{0}}$

R = 1210 Ohm

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For lamp two:

$P = \frac{(V)^2}{R}$

$R = \frac{V^2}{P} \Rightarrow \frac{48400}{60}$ (806.6)

R = 806.6 ohm.

∴ Electric lamp having 40W; 220V has a higher resistance.

∴ The lamp having less resistance will glow brighter, i.e., lamp 2.

Ans 10:- (a) A month has approximately 30 days.
So according to data present in question,
The electricity consumption of one day is:-

(i) Refrigerator = (400 X 10) = 4000 W

(ii) 2 Fans = (2 X 80 X 12) = 1920 W

(iii) 6 Tubes = (6 X 18 X 6) = 648 W

Total = (4000 + 1920 + 648) = 6568 W = 6.568 KW
= 6.6 units

Electricity consumption of one month = 6.6 X 30
= 198 units

Total cost = 198 X 3 = ₹594

(b) Resistance (R) = 20 Ω
Current (I) = 5 A
Time (t) = 30 sec.

Heat = $I^2 \times R \times t$

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$H = 5^2 \times 20 \times 30$
$H = 25 \times 600$
$H = 15000 J$
$H = 1.5 \times 10^4 J$

Q.11:- Ammeter is always connected in series with a resistive element ~~due~~ to because due to low resistance act like short circuit there are chances of ammeter to get damaged.

Q.12:- Copper and Aluminium wires are used as connecting wires because they have low resistivity and high conductivity.

Q.13:- Tungsten metal is used as filament of electric lamps because tungsten can sustain high temperatures and it has high melting point and also has high resistivity.

Q.14:- When a electric charge (Q) moves against a potential difference (V) then amount of work done is:

$$W = V \times Q \quad \text{--- (1)} \qquad \left(\because V = \frac{W}{Q}\right)$$

Using $V = I \times R$ --- (2)
~~Substituting eq^n (1) & (2)~~
$Q = I \times t$ --- (3) $\left(\because I = \frac{Q}{t}\right)$

Put (2) and (3) in (1)
$W = (I \times R)(I \times t)$
$W = I^2 R t$
$W = H$ ($\because$ Heat produced)

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$\boxed{H = I^2 R t}$

This reaction is called Joules law of heating.

Q-15 (a) Derivation of series Resistance

Let R_1, R_2, R_3 be three resistors combined in series with a potential difference (V) and current passing through it be (I)

$V_1 = I \times R_1$

$V_2 = I \times R_2$

$V_3 = I \times R_3$

$(V_1 + V_2 + V_3) = I(R_1 + R_2 + R_3)$

Replacing V_1, V_2, V_3 by (V)

$\frac{V}{I} = R_1 + R_2 + R_3$

$\boxed{V = IR_e}$

Derivation of Parallel Resistance

Let R_1, R_2, R_3 be three resistances connected in parallel with a potential difference (V)

$I_1 = V/R_1$

$I_2 = V/R_2$

$I_3 = V/R_3$

$I_1 + I_2 + I_3 = V/R_1 + V/R_2 + V/R_3$

Replacing $I_1 + I_2 + I_3$ by I

$I = V(1/R_1 + 1/R_2 + 1/R_3)$

$V/R_e = V(1/R_1 + 1/R_2 + 1/R_3)$ $(\because I = V/R_e)$

$\boxed{\frac{1}{R_e} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}}$

Hence Proved

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