Question 1: What is the SI unit of charge?

Answer: The SI unit of charge is coulomb.

Question 2: How many electrons constitute a charge equal to 1 C?

Answer: 1 Coulomb of charge has 6.25×10^{18} electrons.

Question 3: State ohm's law.

Answer: When temperature and other physical parameters remain constant, the current flowing through a conductor is directly proportional to the potential difference across its ends.

Question 4: Which effect of current is used in the following appliance? a) electric bulb b) immersion rod c) electric iron d) galvanometer

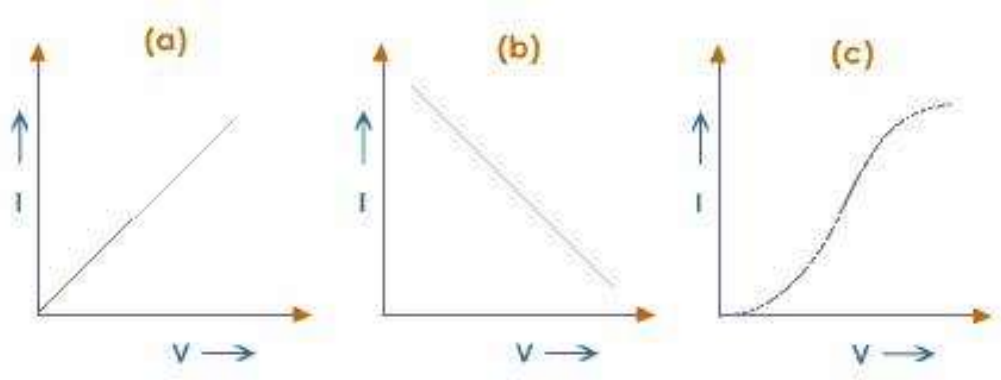
Answer: For electric bulb, immersion rod and electric iron, heating effect of current is used. For galvanometer magnetic effect of current is used.

Question 5: Define watt and watt hour.

Answer: Watt is the unit of power. If 1 joule of energy is consumed in 1 second, we say the power of the device is 1 watt. Watt hour is the unit of energy. If a device with a power 1 watt works for 1 hour 1 watt hour amount of energy is consumed.

Question 6: Which of the following graphs depict ohm's law.

Answer:



Graph (a) represents ohm's law since a straight line which shows that 'I' is directly proportional to 'V' (i.e., ohm's law).

Question 7: Two coils have a combined resistance of 25 when connected in series and a resistance of 4 when connected in parallel. What is the resistance of each coil?

Answer: Let the resistance be R_1 and R_2, and R_s represents resistances in series and R_p represents resistance in parallel.

According to the given data

$R_1 + R_2 = R_S = 25\ \Omega$ _____(1)

$$\frac{1}{R_1} + \frac{1}{R_2} = \frac{1}{R_p} = \frac{1}{4}$$

$$\frac{R_2 + R_1}{R_1 R_2} = \frac{1}{4}$$ _____(2)

$R_1 + R_2 = 25$

$R_1 R_2 = 100$

$(R_1 - R_2)^2 = (R_1 + R_2)^2 - 4 R_1 R2$

$= 25^2 - 4 (100)$

$= 625 - 400$

$= 225$

$R_1 - R_2 = 15$

$R_1 + R_2 = 25$

Adding $2R_1 = 40$

$R_1 = 20\ R_2 = 5$

Question 8: On what factor's does the heating effect of current depend on.

Answer: The heating effect of current depends on

- The square of the amount of current flowing
- The resistance of the wire and
- The time of flow of current

Question 9: Name the instrument that measures the potential difference across the ends of a current carrying conductor. How is the instrument connected to the circuit?

Answer: Voltmeter measures the potential difference across the ends of a conductor. It is connected in parallel across the element through which current flows due to a certain potential difference.

Question 10: When are several resistors in a circuit said to be connected in parallel?

Answer: Several resistors are said to be connected in parallel when the potential difference across the resistors remain the same.

Question 11: Two bulbs have ratings 100 W, 220 V and 60 W, 220 V respectively. Which one has a greater resistance?

Answer: $P=VI=\frac{V^2}{R}$

For the same V, R is inversely proportional to P. Therefore, the bulb 60 W, 220 V has a greater resistance.

Question 12: A torch bulb has a resistance of 1Ω when cold. It draws a current of 0.2 A from a source of 2 V and glows. Calculate

(i) the resistance of the bulb when glowing and

(ii) explain the reason for the difference in resistance.

Answer: (i) When the bulb glows:

V = I R ---- Ohm's law

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

$$= \frac{2}{0.2}$$

$$= 10\Omega$$

(ii) Resistance of the filament of the bulb increases with increase in temperature. Hence when it glows its resistances is greater than when it is cold.

Question 13: Calculate the resistance of 1 km long copper wire of radius 1 mm.

(Resistivity of copper = 1.72 x 10^{-8} Ω m)

Answer: L = 1 km = 1000 m

R = 1 mm = 1 x 10^{-3} m

$$A = \pi r^2$$

$$= 3.14 \times \left(1 \times 10^{-3}\right)^2$$

$$\rho = 1.72 \times 10^{-8} \Omega m$$

$$\text{Resistance of the wire } R = \rho\frac{L}{A}$$

$$R = 1.72\times10^{-8}\times\frac{1000}{3.14\times\left(10^{-3}\right)^2}$$

$$R = 5.5\Omega$$

Question 14: When a potential difference of 2 V is applied across the ends of a wire of 5 m length, a current of 1A is found to flow through it. Calculate: (i) the resistance per unit length of the wire (ii) the resistance of 2 m length of this wire (iii) the resistance across the ends of the wire if it is doubled on itself.

Answer: (i) V = I R ----- Ohm's law

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

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

$$= 2\Omega$$

$$\text{Resistance per unit length} = \frac{2\Omega}{5m} = 0.4\Omega m^{-1}$$

(ii) Resistance of 2 m length of the wire = 0.4 x 2
= 0.8Ω

(iii) When the wire is doubled on itself:

(1) the area of cross-section is doubled. If A is the original C.S. area, now it is 2 A.

(2) The length becomes half i.e. $\frac{L}{2}$

$$\text{Resistance of this wire} = R' = \rho\frac{L/2}{2A}$$

$$= \rho\frac{L}{4A}$$

$$= \frac{1}{4}.\ \rho\frac{L}{A}$$

But $\rho\frac{L}{A} = 2\Omega$ (calculated in (i))

$$\therefore R' = \frac{1}{4}\times2\Omega$$

$$= 0.5\Omega$$