

12<sup>TH</sup> PHYSICS IMPORTANT PROBLEMSCURRENT  
ELECTRICITY

**EXAMPLE 2.1** Compute the current in the wire if a charge of 120 C is flowing through a copper wire in 1 minute.

**EXAMPLE 2.3** A copper wire of cross-sectional area  $0.5 \text{ mm}^2$  carries a current of 0.2 A. If the free electron density of copper is  $8.4 \times 10^{28} \text{ m}^{-3}$  then compute the drift velocity of free electrons.

**EXAMPLE 2.4** Determine the number of electrons flowing per second through a conductor, when a current of 32 A flows through it.

**EXAMPLE 2.5** A potential difference across  $24 \Omega$  resistor is 12 V. What is the current through the resistor?

**EXAMPLE 2.6** The resistance of a wire is  $20 \Omega$ . What will be new resistance, if it is stretched uniformly 8 times its original length?

**EXAMPLE 2.10** Two resistors when connected in series and parallel, their equivalent resistances are  $15 \Omega$  and  $56 \frac{15}{16} \Omega$  respectively. Find the values of the resistances.

**EXAMPLE 2.13** **VERY VERY IMPORTANT** If the resistance of coil is  $3 \Omega$  at  $20^\circ\text{C}$  and  $\alpha = 0.004/^\circ\text{C}$  then determine its resistance at  $100^\circ\text{C}$ .

**EXAMPLE 2.14** Resistance of a material at  $20^\circ\text{C}$  and  $40^\circ\text{C}$  are  $45 \Omega$  and  $85 \Omega$  respectively. Find its temperature coefficient of resistivity.

**EXAMPLE 2.16** Two electric bulbs marked  $20 \text{ W} - 220 \text{ V}$  and  $100 \text{ W} - 220 \text{ V}$  are connected in series to 440 V supply. Which bulb will get fused? (less imp)

**EXAMPLE 2.17** A battery has an emf of 12 V and connected to a resistor of  $3 \Omega$ . The current in the circuit is 3.93 A. Calculate (a) terminal voltage and the internal resistance of the battery (b) power delivered by the battery and power delivered to the resistor

**EXAMPLE 2.23** In a Wheatstone's bridge  $P = 100 \Omega$ ,  $Q = 1000 \Omega$  and  $R = 40 \Omega$ . If the galvanometer shows zero deflection, determine the value of S.

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**EXAMPLE 2.24** What is the value of  $x$  when the Wheatstone's network is balanced?  $P = 500 \Omega$ ,  $Q = 800 \Omega$ ,  $R = x + 400$ ,  $S = 1000 \Omega$

**EXAMPLE 2.25** In a meter bridge experiment with a standard resistance of  $15 \Omega$  in the right gap, the ratio of balancing length is 3:2. Find value of the other resistance.

**EXAMPLE 2.27 VERY VERY IMPORTANT**

Find the heat energy produced in a resistance of  $10 \Omega$  when 5 A current flows through it for 5 minutes.

**IV Numerical problems**

2. Lightning is good example of natural current. In lightning, there is  $10^9$  J energy transfer across the potential difference of  $5 \times 10^7$  V during a time interval of 0.2 s.

3. A copper wire of  $10^{-6} \text{ m}^2$  area of cross section, carries a current of 2 A. If the number of free electrons per cubic meter in the wire is  $8 \times 10^{28}$ , calculate the current density and average drift velocity of electrons.

4. The resistance of a nichrome wire at  $20^\circ\text{C}$  is  $10 \Omega$ . If its temperature coefficient of resistivity of nichrom is  $0.004/^\circ\text{C}$ , find the resistance of the wire at boiling point of water. Comment on the result. **VERY VERY IMPORTANT**

7. An electronics hobbyist is building a radio which requires  $150 \Omega$  in her circuit. But she has only  $220 \Omega$ ,  $79 \Omega$  and  $92 \Omega$  resistors available. How can she connect the available resistors to get the desired value of resistance?

14. In a potentiometer arrangement, a cell of emf 1.25 V gives a balance point at 35 cm length of the wire. If the cell is replaced by another cell and the balance point shifts to 63 cm, what is the emf of the second cell?

