OHM'S LAW, RESISTIVITY, TEMPERATURE CO-EFFICIENT

1   A wire carries a current of 1A. How many electrons pass a point in the wire in each second? [6.25×10^{18} electrons]

2   A 40 ohm resistor is to be wound with platinum wire, 0.1 mm in diameter. How much wire is needed ? ($\rho = 11 \times 10^{-8}$ Ω m) [2.85 m]

3.   The resistance of a tungsten wire used in the filament of a 60-watt bulb is 240 Ω when the bulb is hot at a temperature of 2020°C, what would you estimate its resistance at 20°C? (The temperature coefficient of tungsten α= 0.0045/°C). [25.5 Ω]

4.   Find the resistance at 50 °C of a copper wire 2 mm in diameter and 3 m long. ($\rho = 1.6 \times 10^{-8}$ Ω m , α= 0.0039 / °C)? [0.0183 Ω]

5   A car headlight filament is made of tungsten and has a cold resistance of 0.350 Ω. If the filament is a cylinder 4.00 cm long (it may be coiled to save space), what is its radius?. ($\rho = 5.6 \times 10^{-8}$ Ω m) [r = 3.2 x 10^{-9} m]

INTERNAL RESISTANCE OF BATTERY

1   A 9 V battery is connected in series with a load and the terminal voltage is found to be 8 V. Current through the circuit is measured as 5 A. What is the internal resistance of the battery? [0.2 Ω]

2   A battery has an internal resistance of 0.5 Ω and an EMF of 1.5 V. When connected in series to a load resistance, the terminal voltage falls to 1.45 V. What current is flowing in the circuit, and what is the value of the load resistance? [0.1 A, 14.5 Ω]

3   When no current runs through the circuit, the potential difference across the cell is 3 V. The terminal potential difference lowers to 2.8 Volts while current I = 0.37 Ampere is flowing. What is the cell's internal resistance (r)? [0.54 Ω]

4   A battery of 24V is connected to a 10Ω load and current of 2.2 amp is drawn; find the internal resistance of the battery and its terminal voltage. [0.9 Ω , 22 V]

ELECTRICAL POWER AND ENERGY

1   A DC winch motor is rated at 20 A with a voltage of 220 V. When the motor is running at its maximum power, it can lift an object with a weight of 4900 N a distance of 20 m, in 40 s, at a constant speed. (a) What is the power consumed by the motor? (b) What is the power used in lifting the object?. [4400 W , 2450 W]

2   A lamp draws a current of 0.20 A when it is connected to a 240 V source. A lamp is used for 30 minutes. How much energy does it require? [8.64 x 10^4 J]

3   The energy used by the iron for 1 minute is 33 kJ, at a voltage of 220 volts. How large the current is in the iron. [2.5 A]

SERIES AND PARALLEL CIRCUIT

1 You are given three resistors each of 2 ohm. How would you arrange these resistors to obtain the equivalent resistances of
i)   1.5 ohm   ii)   3 ohms   iii)   6 ohm?
Also prove the result mathematically.

2 Find the equivalent resistance of the circuit.
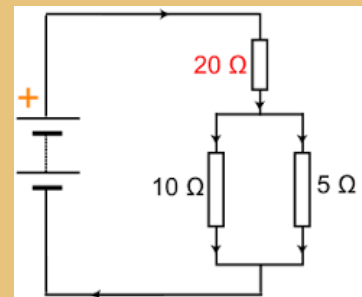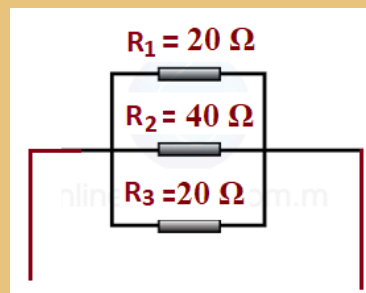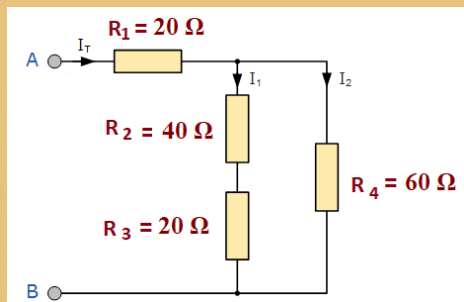
3 A battery with a terminal voltage of 9 V is connected to a circuit consisting of 7Ω, $12\,\Omega$ and $8\,\Omega$ resistors all in series . Assume the battery has negligible internal resistance.Calculate the
(i)   Equivalent resistance (ii) Calculate the potential drop across each resistor

4 Three resistors $R1=8\,\Omega$, $R_2=4\,\Omega$, $R3=12\Omega$ are connected in parallel. The parallel connection is attached to a V=3.00Vvoltage source.
(i) What is the equivalent resistance?
(ii)   Find the current supplied by the source to the parallel circuit

POTENTIOMETER AND KIRCHHOFF'S LAW

1. A potentiometer arrangement, a cell of emf 1.1 volt gives a balance point at 55 cm length of the wire. If a cell is replaced by another cell of emf E, the balance point is obtained at 85 cm. What is the value of E?.   [1.7 V]

2 Find the value of I
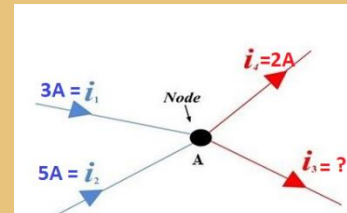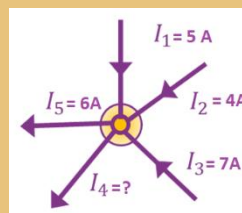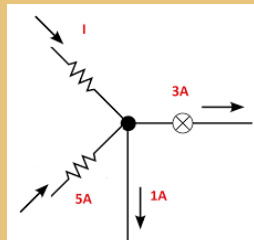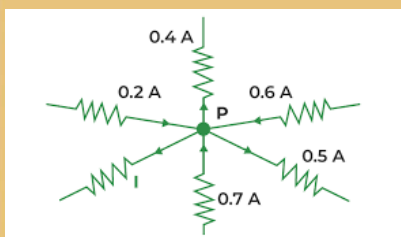
3 By KVL rule find the current flowing through resistance