202: Principles of electrical science  
**Worksheet 7: Resistivity**

**Answer guide**

1. If a coil of cable 50m in length has a conductor resistance of 0.275Ω, calculate the value for 800m of the same cable.

4.4Ω

1. Calculate the resistance of a single core copper cable 200m long and 25mm2 CSA. Take the resistivity of copper to be 17.2 x 10-9 ohm/metre3.

0.138Ω

1. Determine the resistance of 150m of single copper cable whose CSA is 10mm2. Take the resistivity of copper to be 17.2 x 10-9 ohm/metre3.

0.258Ω

1. Calculate the resistance of 75m of single aluminium cable whose CSA is 4mm2. Take the resistivity of aluminium to be 26.5 x 10-9 ohm/metre3.

0.5Ω

1. Find the CSA of a single copper cable 500m long, which carries a current of 2.5 amperes and has a volt drop of 3.58 volts. Take the resistivity of copper to be 17.2 x 10-9 ohm/metre3.

6mm2

1. Calculate the resistance of a 4mm2 CSA twin copper cable feeding a motor 150m away. Take the resistivity of copper to be 17.2 x 10-9 ohm/metre3.

0.645Ω

1. Calculate the resistance of 100m of the following sizes of twin copper cables. Take the resistivity of copper to be 17.2 x 10-9 ohm/metre3:

|  |  |
| --- | --- |
| 1. 1mm2 | 0.86Ω |
| 1. 1.5mm2 | 0.57Ω |
| 1. 2.5mm2 | 0.34Ω |
| 1. 4mm2 | 0.22Ω |
| 1. 6mm2 | 0.14Ω |
| 1. 10mm2 | 0.09Ω |

1. Complete the following table.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Resistance (R) | Ω | 0.5 | 0.02 | 0.585 | 0.172 |
| Resistivity (ρ) | Ω/m | 17.2E-9 | 28.4E-9 | 17.2E-9 | 17.2E-9 |
| Length (l) | M | 29 | 4.23 | 85 | 250 |
| CSA (a) | mm2 | 1.0 | 6.0 | 2.5 | 25 |

1. A motor takes 45A from a 230v supply. A twin aluminium cable 40m in length feeds the motor, each core having a CSA of 16mm2. Calculate the voltage at the motor terminals. Take the resistivity of aluminium to be 26.5 x 10-9 ohm/metre3.

224.0375 volts

1. Two cables have equal resistance but one has a CSA 2.5 times larger than the other. How much longer is the thicker cable than the thinner cable?

2.5 times

1. An immersion heater takes a current of 13A and is fed through a twin cable, each core having a CSA of 2.5mm2. If the conductors are made of copper and have a resistivity of 17.2 x 10-9 Ω/m3, calculate the greatest length of cable which may be used, if the cable voltage drop is not to exceed 11.5 volts.

64.3m