

## Lesson 4 Solutions

Chart 1

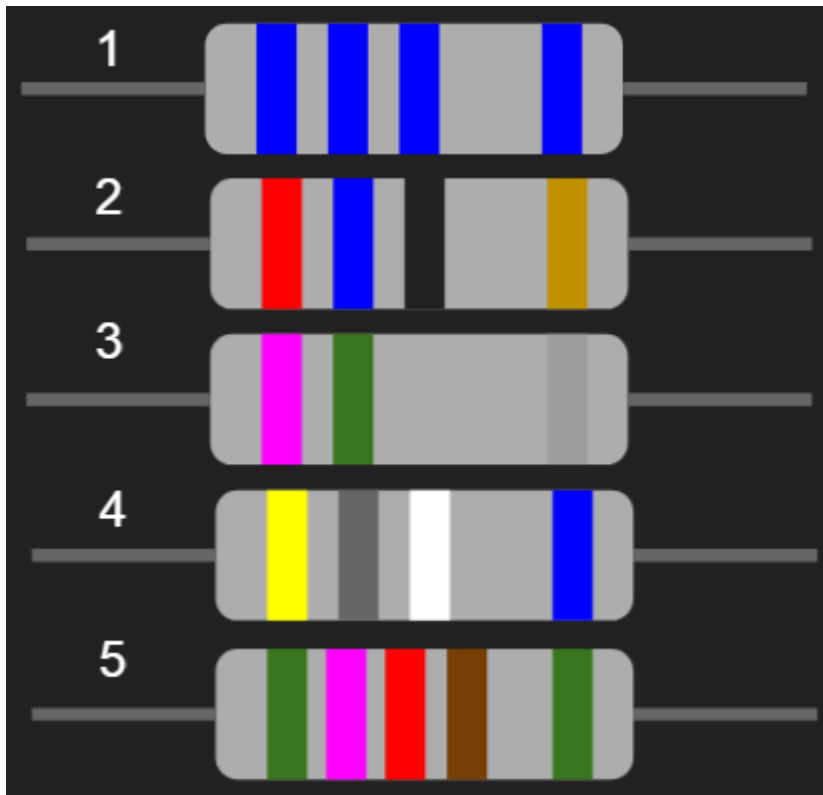
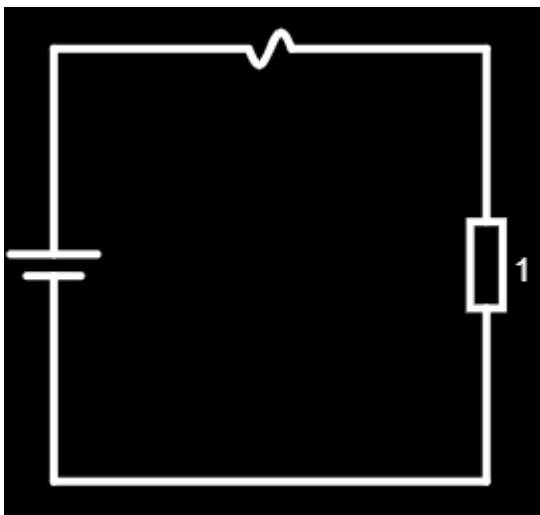


Chart 2



1) Which is the resistance of resistor 1 in Chart 1?

Use color codes

66M $\pm$ 0.25% (66.000.000) ohms

2) Which is the resistance of resistor 3 in Chart 1? Keep in mind the multiplier is the last bar on the left, the rest to its left are numbers.

Use color codes

700k $\pm$ 5% (700.000) ohms

3) Which is the resistance of resistor 5 in Chart 1? Keep in mind the multiplier is the last bar on the left, the rest to its left are numbers.

Use color codes

5720 $\pm$ 0.5% ohms

4) Given the circuit in Chart 2 and the following values:

- 9V battery
- 10 Ohm resistor
- 0.5A max current for the fuse

Will the fuse burn?

Use Ohm's law

Yes

5) Given the circuit in Chart 2 and the following values:

- 12V battery
- 50 Ohm resistor
- 0.5A max current for the fuse

Will the fuse burn?

Use Ohm's law

No

6) Will resistor 2 in Chart 1 burn when connected to a 9V battery, knowing that its maximum power is 0.5W?

Use color codes, Ohm's law and the power formula

No

7) Will resistor 4 in Chart 1 burn when connected to a 10GV battery, knowing that its maximum power is 5GW?

Use color codes, Ohm's law and the power formula

No

8) The mayor of Berlin wants to build a new power line from the power plant in Leipzig.

We know the following:

- The distance between the two cities is 190km.
- The resistivity of copper is  $1.68 \cdot 10^{-8}$ .
- The diameter of the wire is 20mm
- The area of a circle is  $A = \pi \cdot r^2$ , where r is the radius (half diameter)

Which resistance will the full line have?

Use Pouillet's law

10.17 ohms

9) The mayor of Dallas wants to build a new power line from the power plant in Houston.

We know the following:

- The distance between the two cities is 239.1 miles
- The diameter of the wire is 0.5 inches.
- In 1km, there are 0.621371 miles
- In 1inch, there are 25.4mm.

If the power plant outputs 1kV, which current will run through the line?

Use Pouillet's law and Ohm's law

19.6456 amperes

10) If we connect a 1mV battery to a wire of 10cm and 1mm<sup>2</sup> area, made of an unknown material, and we see that the current running through is 0.0917A, can you tell which material the wire is made of?

a) Copper (resistivity of  $1.68 \cdot 10^{-8}$ )

b) Tin (resistivity of  $1.09 \cdot 10^{-7}$ )

c) Iron (resistivity of  $9.70 \cdot 10^{-8}$ )

d) Lead (resistivity of  $2.20 \cdot 10^{-7}$ )

Use Pouillet's law, solving the equation for resistivity ( $\rho$ )

11) If we connect a 0.5mV battery to a wire of 1cm and 1mm<sup>2</sup> area, made of an unknown material, and we see that the current running through is 0.2272A, can you tell which material the wire is made of?

a) Copper (resistivity of  $1.68 \cdot 10^{-8}$ )

b) Tin (resistivity of  $1.09 \cdot 10^{-7}$ )

c) Iron (resistivity of  $9.70 \cdot 10^{-8}$ )

d) Lead (resistivity of  $2.20 \cdot 10^{-7}$ )

Use Pouillet's law, solving the equation for resistivity ( $\rho$ )