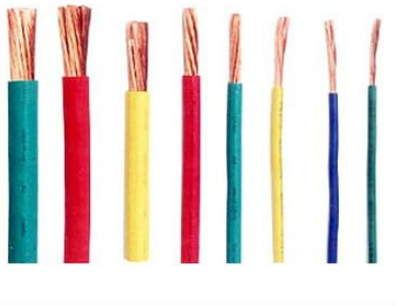
Resistance and Conductance

resistors (insulators)	conductors
Are materials which slow down or stop the flow of electrons.	Are materials which allow the flow of electrons
resistors, plastic, glass, ceramic, tungsten, wood and distilled water	metals, acid, salt water and base.

A good conductor is a poor resistor and a good resistor is a poor conductor.

Factors which influence conductors and resistors

	resistance	conductance
type of wire	—	Copper Cu
length of wire	longer	shorter
diameter of wire	thinner	thicker
temp. of wire	warmer	colder

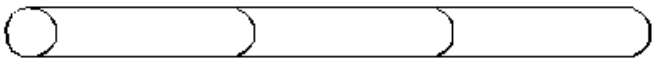


Best conductive wire would be:

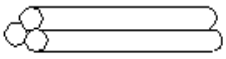
There are six electrical wires made of the same substance and having the same length : three have a diameter of 1.5 mm while the other three have a diameter of 3.0 mm. They are placed either end to end to increase the length of the wire or parallel to one another to increase the surface area of the wire. Which three-wire arrangement offers the least resistance to the flow of electric current?

A)

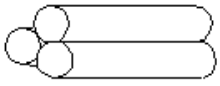
B)



C)



D)

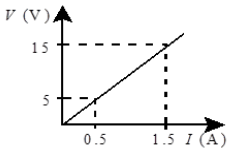


Resistance tables and graphs notes

a- Finding the resistance when resistance graph is given.

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

1. The following graph illustrates the change in potential difference (voltage), *V*, as a function of the current intensity, *I*, in a circuit.



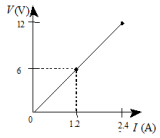
$\frac{15}{1.5}$ or $\frac{5}{.5}$

10Ω

What is resistance of this circuit?

A) 0.1 Ω B) 3.0 Ω C) 10.0 Ω D) 15.0 Ω

2. The following graph illustrates the change in the current intensity, *I*, in a circuit element as a function of the potential difference (voltage), *V*, across its terminals.



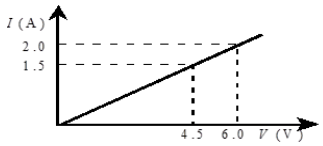
$\frac{6}{1.2} = 5\Omega$

What is the resistance of this circuit element?

A) 0.20 Ω B) 5.0 Ω C) 7.2 Ω D) 28.8 Ω

b- Finding resistance when conductance graph is given.

3. The following graph illustrates the change in the current intensity, *I*, in a circuit as a function of the potential difference (voltage), *V*, across its terminals.



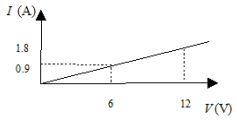
$R = \frac{V}{I}$ $\frac{6}{2} = 3\Omega$

$\frac{4.5}{1.5} =$

What is the resistance, of this circuit?

A) 0.33 Ω B) 0.75 Ω C) 1.33 Ω D) 3.00 Ω

4. The following graph illustrates the change in electric current intensity, *I*, as a function of potential difference (voltage) *V*, for a given resistor.



$\frac{6}{.9} = 6.7\Omega$

According to this graph, what is the resistance of this resistor?

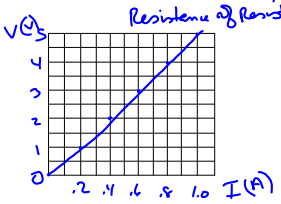
A) 0.15 Ω B) 5.4 Ω C) 6.7 Ω D) 21.6 Ω

C- Finding resistance using a table given.

1. Use the table to make a resistance graph and find the resistance of the resistor.

Voltage (V)	0	1	2	3	4	5
Intensity (A)	0	0.2	0.4	0.6	0.8	1.0

Resistance of Resistor graph

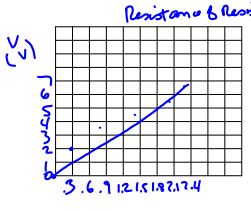


$R = \frac{V}{I}$ $\frac{5}{1} = 5\Omega$

2. Use the table to make a resistance graph and find the resistance of the resistor.

Voltage (V)	0	2	3.5	4.3	5.1	6.5
Intensity (A)	0	0.3	0.8	1.4	1.9	2.2

Resistance of Resistor graph



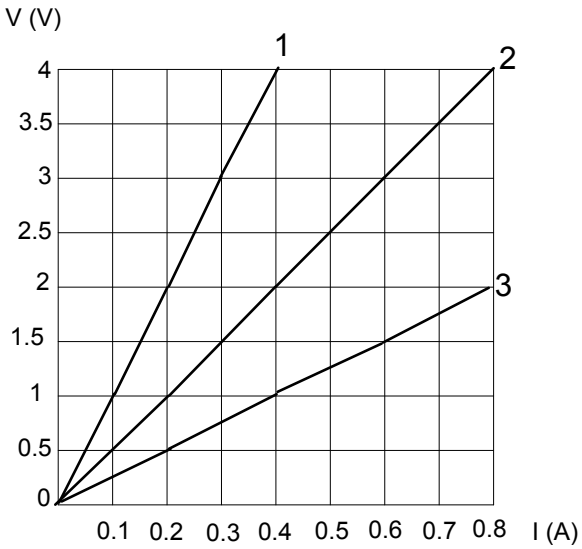
$R = \frac{V}{I}$ $\frac{6.5}{2.2} = 3\Omega$

$\frac{5.1}{1.9} = 2.7\Omega$

$\frac{4.3}{1.4} = 3.1\Omega$

Harder past exam questions

1. The following graph describes the behavior of three resistors subjected to different voltages.



Which is the resistor you would use as the best conductor? Justify your answer using calculations.

$R = \frac{V}{I}$ 1 $\frac{2}{.2} = 10\Omega$ 2 $\frac{2}{.4} = 5\Omega$ 3 $\frac{2}{.8} = 2.5\Omega$

#3 because most resistor.

2. A student was asked to vary the current intensity in this circuit and to measure the potential difference (voltage) across the terminals of each resistor for each value of *I*t.
The student made the following observations:

I_t(A)	V_1(V)	V_2(V)
2	6	8
4	12	16
6	18	24
8	24	32

A) For each resistor, draw a **graph** showing current intensity *I* as a function of the potential difference (voltage) *V* across the terminals of that resistor.
B) Calculate the resistance of each graph in order to determine the resistance of each resistor. 1 2 $R = \frac{V}{I}$ $\frac{6}{2} = 3\Omega$ $\frac{8}{2} = 4\Omega$
C) Given this data and using graphs, determine which resistor has the greatest conductance. Graph 1 has least change in voltage. Resistor.