

#### 4 Factors that affect Conductivity

##### 1) Type or Nature of the Wire:

the type of material affects conductivity  
 e.g. Cu > Ni Cr.

##### 2) Cross-sectional area (thickness or diameter or gauge):

↑ thickness = ↑ conductivity

↑ gauge # = ↓ conductivity

##### 3) Length of the wire:

↑ l = ↓ conductivity

##### 4) Temperature of the wire:

↑ T = ↓ conductivity

depends on the material and its T.

the resistance offered by a 1m length of a material with a "thickness" of 1m<sup>2</sup>

1 Certain materials are good conductors of electricity while others are good insulators.

Which one of the following materials is the best insulator?

- A) The human body  $\approx 2 \Omega m$
- B) The ground on which we live
- C) The air that we breathe
- D) The water that we drink

→ = highest "resistivity"

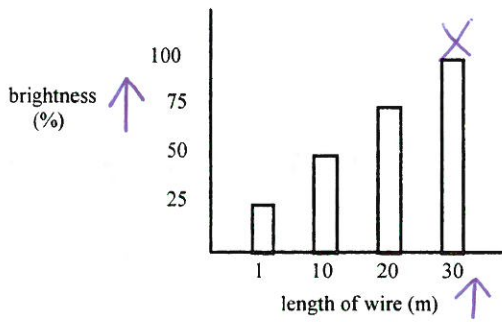
glass  $\approx 10^{10-14} \Omega m$   
 air  $\approx 1.3 \times 10^{16} \Omega m$   
 water  $\approx 2 \times 10^1 \Omega m$   
 ground  $\approx 10-1000 \Omega m$

"thickness" of 1m<sup>2</sup>

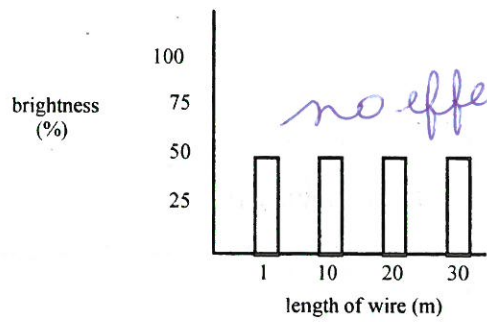
During an experiment a student had to determine if the length of a copper wire influences the conductance. To do this he used the luminous intensity of an electric bulb in a circuit. Which of the following graphs best represents the results he obtained?

low light

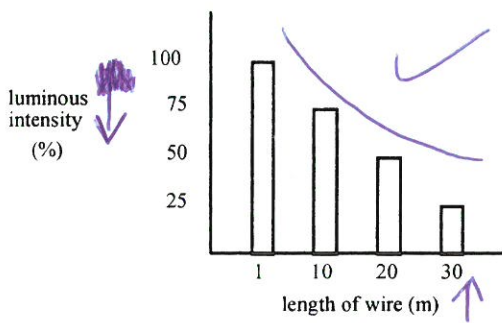
~~A)~~



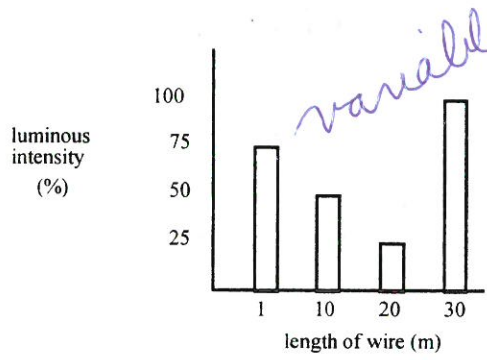
~~C)~~



B)



D)



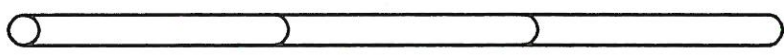
3

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)~~



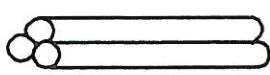
*skinny & long*

~~B)~~



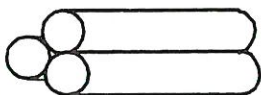
*fat but long*

~~C)~~



*short but skinny*

D)



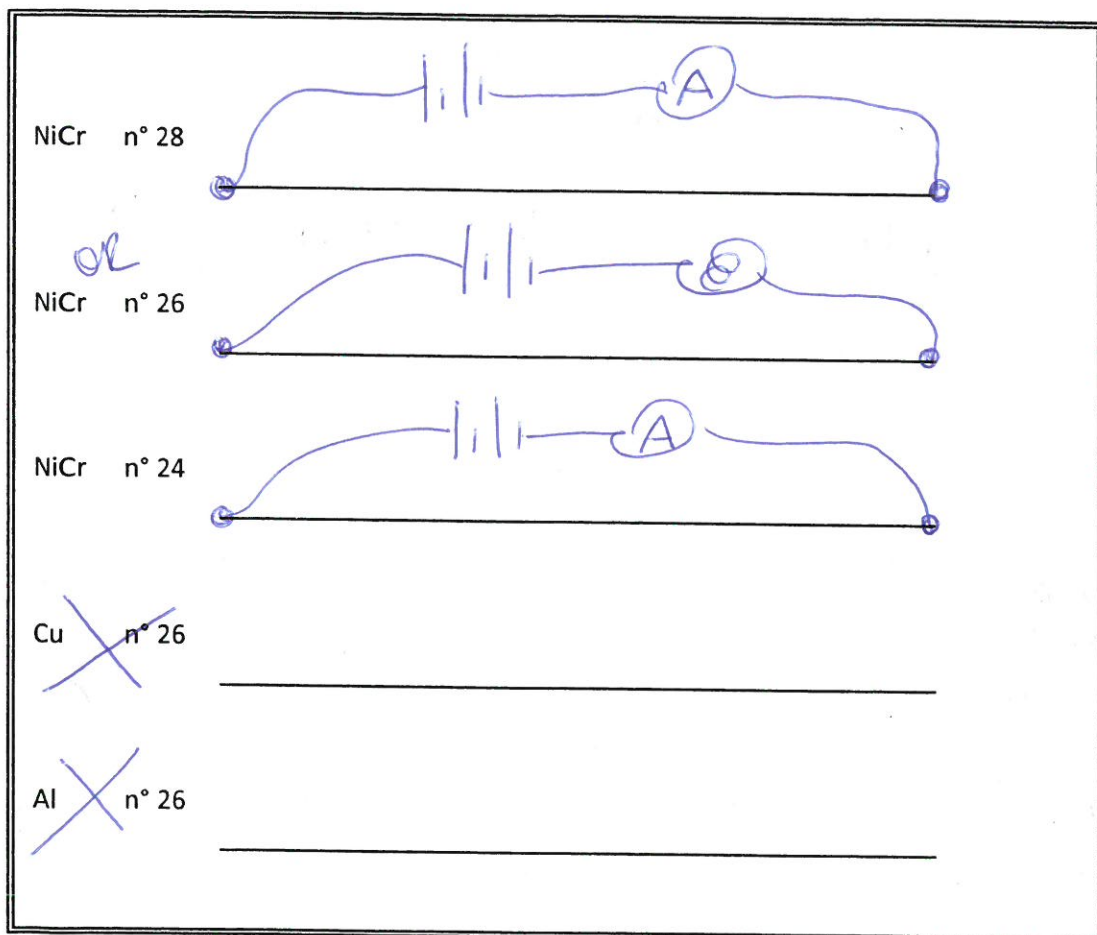
*short & thick*

*= best conductance*

4

You have available the following equipment:

- 1 power supply
- 1 bulb and socket
- wires and alligator clips
- 1 board on which are fixed metal wires, having the same length but different cross-sections and different materials.



- a) Describe a procedure that would allow you to verify the effect of the cross-section on the conductivity of the wire.
- b) Draw a circuit that will allow you to make the appropriate measurements.

5 A substance used in the manufacture of wire that will transport electrical energy should have two of the following properties :

- 1. Good resistance to corrosion ✓
- 2. Poor resistance to corrosion
- 3. Good ductility ✓ *ability to be drawn into wires*
- 4. Poor ductility

Which two properties are they?

- A) 1 and 3
- B) 1 and 4
- C) 2 and 3
- D) 2 and 4

6 The following table gives the characteristics of four electrical conductors ( $F_1$ ,  $F_2$ ,  $F_3$  and  $F_4$ ).

Conductor	Length	Diameter	Temperature
$F_1$	1 m	2 mm	-20°C
$F_2$	<del>3 m</del>	2 mm	-50°C
$F_3$	1 m	<del>1 mm</del>	<del>50°C</del>
$F_4$	<del>3 m</del>	1 mm	-20°C

Which is the best electrical conductor?

*SFCuC*

- A)  $F_1$
- B)  $F_2$
- C)  $F_3$
- D)  $F_4$

*its function*

7 The outer covering of your radio's electrical cord is made of rubber.

Which of the following properties best explains why rubber is used in this way?

- A) It is a good insulator.
- B) It is lightweight.
- C) It is malleable.
- D) It is resistant to corrosion.