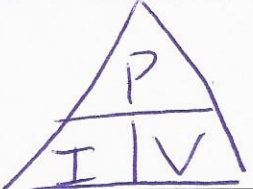# Review for formula, circuit and resistance test

Formula Questions

1. Fill in the table giving the symbol and unit(s) for each.

Current intensity	Potential difference	Voltage	Resistance	Power	Energy	Time
I	V	V	R	P	E	t
A	V	V	Ω	W	J	s

2. Give the formula and then the triangles for each.

Potential difference	Power	Energy 1	Energy 2
$V = RI$	$P = IV$	$E = Pt$	$E = IVt$

3. Give the conversions

W to kW $\div 1000$ J to kWh $\div 3\,600\,000$ sec to hrs $\div 3\,600$

J to kJ $\div 1000$ sec to min $\div 60$ min to sec $\times 60$

hrs to sec $\times 3600$

4. How much power did an electric lawn mower use if it used 45 000 J of energy in the 50 minutes it took to mow the lawn?

$$P = \frac{E}{t} \qquad \frac{4500}{(50 \times 60)} = \boxed{15 W}$$

5. How much time was a fish tank on when it needed 0.5 A, 100 V and 45 000 J of energy?

$$t = \frac{E}{IV} \qquad \frac{4500}{(.5 \times 100)} = \boxed{900\ S}$$

6. A man used the computer for 7 hours and used 500 W of power. How much energy did it take to use the computer for seven hours?

$$E = Pt \qquad 500 \times 7 \times 3600 = \boxed{12\,600\,000\ J}$$

7. A radio is on for 150 minutes and has 450 W of power. What is the energy in kWh?

$$E = Pt \qquad \frac{450 \times 150 \times 60}{3\,600\,000} = \boxed{1.12\ kWh}$$

8. If a TV used 7 000 J of work and 90 W of power. How many hours did you watch TV for?

$$t = \frac{E}{P} \qquad \frac{7000}{90} = \frac{77.8}{3600} = 0.02 \text{ hrs}$$

9. An electric radiator with a resistance of 40 Ω is connected to a 220 V circuit for 1.00 hour. What is the power of this radiator?

   A) 1.21 kW   B) 5.50 kW   C) 19.8 kW   D) 1 210 kW

$$P = IV \qquad \frac{5.5 \times 220}{1000} = 1.21 kW \qquad I = \frac{V}{R} \quad \frac{220}{40} = 5.5A$$

10. On an electric heater are written the following specifications : 110 V - 550 W. What is the resistance of this heater?

   A) 61 Ω   B) 22 Ω   C) 5 Ω   D) 0.20 Ω

$$R = \frac{V}{I} \quad \frac{110}{5} = 22\Omega \qquad I = \frac{P}{V} \quad \frac{550}{110} = 5A$$

11. While having breakfast, you notice the following information on the specification plate of the toaster:

   120 V
   6 A
   60 Hz

You also note that this toaster toasts the bread in 1.5 minutes.
What quantity of electrical energy is consumed by the toaster's element to toast the bread?
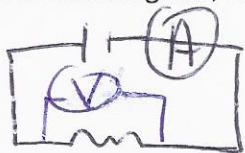
   A) 720 J   B) 1 080 J   C) 10 800 J   D) 64 800 J

$$E = IVt \qquad 120 \times 6 \times 1.5 \times 60 = 64800 J$$

12. During a lab experiment, you have to assemble a circuit based on the following information:
   The circuit is composed of a 6.0-V battery connected to a 10-Ω resistor. It includes an ammeter and a voltmeter connected to the resistor terminals.

a) Draw the circuit diagram, including the measuring instruments.

b) What values will the ammeter and voltmeter display?

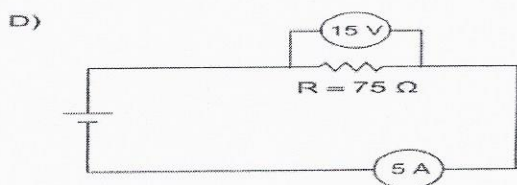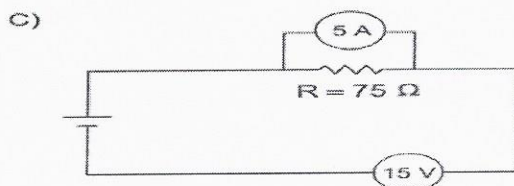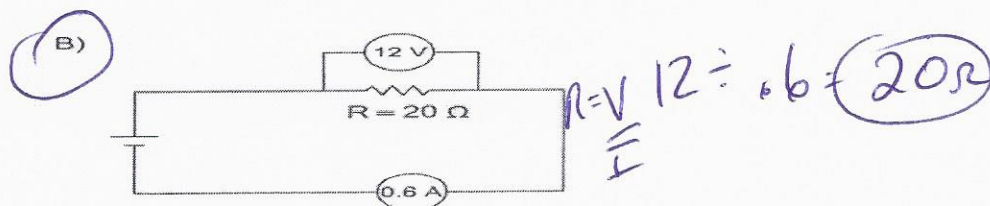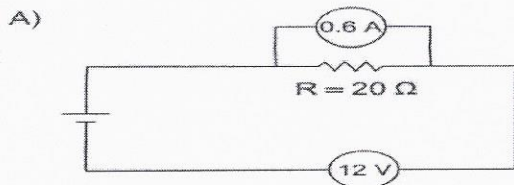$$V = 6.0V \qquad I = \frac{V}{R} = \frac{6}{10} = 0.6A$$

c) How much energy will the resistor release in one minute's work?

$$E = IVt \qquad .6 \times 6 \times 1 \times 60 = 216 J$$

13. Your younger brother's computer game console does not work anymore. You decide to open it up to fix it and notice that the resistor must be replaced. You know that when the console operates with a 9-V battery, the current intensity is 1.2 A. What is the value of the resistor to be replaced?

$$R = \frac{V}{I} = \frac{9}{1.2} = 7.5\,\Omega$$

14. Which circuit diagram shows the correct connections for the measuring instruments and the correct readings given the resistance value indicated?

A)

(0.6 A)
R = 20 Ω
(12 V)

B)

(12 V)
R = 20 Ω
(0.6 A)

$$R = \frac{V}{I} \quad 12 \div .6 = 20\,\Omega$$

C)

(5 A)
R = 75 Ω
(15 V)

D)

(15 V)
R = 75 Ω
(5 A)

$$\frac{15}{5} = 3\,\Omega \quad X$$

15. A mother has decided to charge her 4 children for the energy they waste by leaving electrical appliances on uselessly. Below is a table showing the wasted energy each child accumulates.

Accumulation of wasted energy

	Appliances	Total Powers used	Total Time on	
Child 1	TV, computer and radio	8.0 kW	48 hrs	8000 × 48 × 3600 =
Child 2	Computer and radio	1 400 W	3 500 min	1400 × 3500 × 60 =
Child 3	Lights, computer	5.2 kW	55 hrs	5200 × 55 × 3600 =
Child 4	Lights, computer and TV	1 800 W	3 400 min	1800 × 3400 × 60

Using the information above determine which child will pay the most money.

1   2   3   4

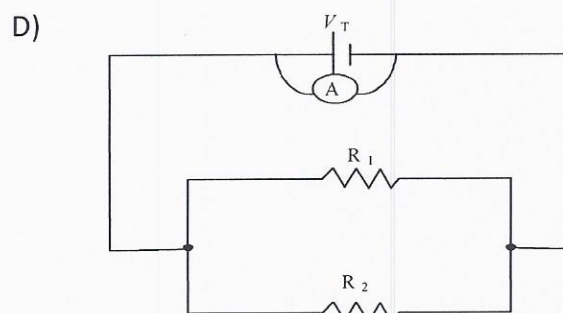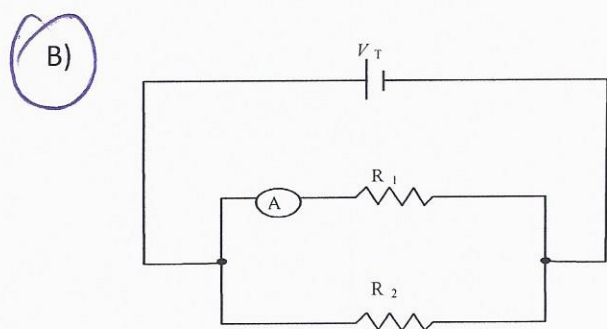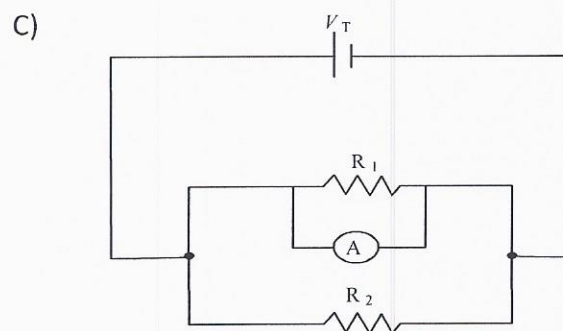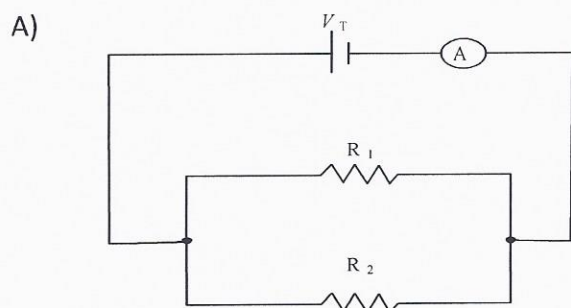1 382 400 000 J   294 000 000 J   1 029 600 000 J   367 200 000 J

Child 1

Circuit Questions

1. Draw a series and parallel circuit, each with two resistors. Include a switch and a fuse for the controlling the whole circuit.

Series	Parallel
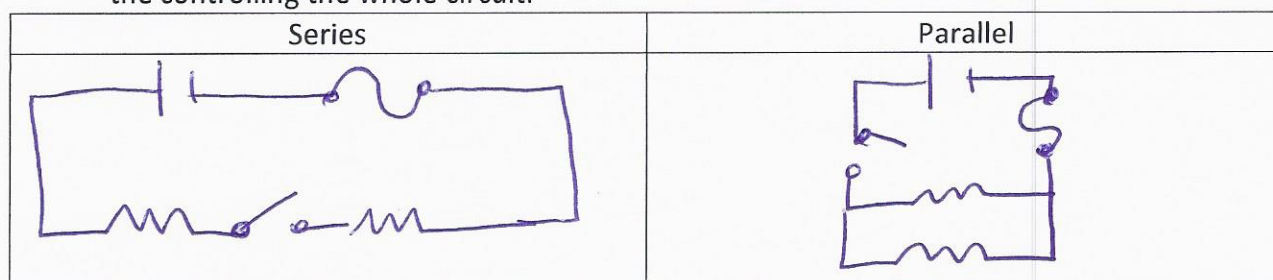
2. Which of the following diagrams correctly shows where the ammeter (A) must be placed to measure the current flowing through resistor R_1?
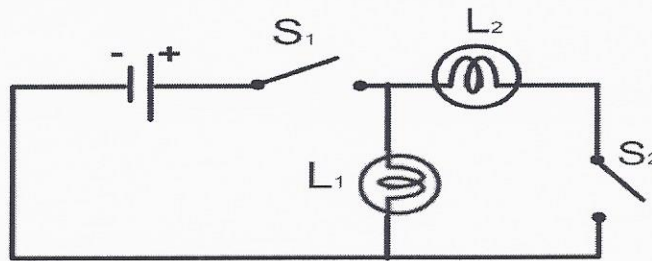
A)

C)

B)

D)

3. Draw a circuit with three light bulbs which has the following specifications:
   - A switch for light bulb 2 can be open and light bulb 1 and 3 will still be on.

Another switch is also present, but when this one is open light bulb 1 is on, but light bulb 2 and 3 are off.
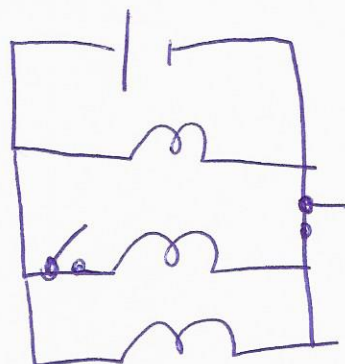
4. The diagram below shows a circuit made of two light bulbs, two switches and a power source.


Which of the following statements about this circuit is TRUE?

	S1	S2	L1	L2
A)	Opened	Closed	Off	On
B)	Closed	Opened	Off	On
C)	Closed	Opened	On	Off
D)	Opened	Closed	On	Off

5. On the circuit provided. Place the following on the circuit: /4
   - A voltmeter to measure voltage from the power supply, (Vs).
   - A voltmeter measuring voltage for resistor 2, (V$_2$).
   - An ammeter measuring current intensity for resistor 1, (A$_1$).
   - An ammeter measuring the current intensity from the power source, (As).
   - A fuse which controls the whole circuit.
   - A fuse which controls resistors 2, 3 and 4.
   - A switch for resistor 1.
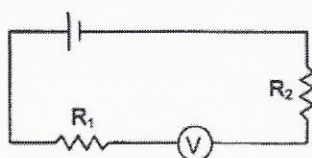   - A switch for resistor 3 and resistor 4 together.
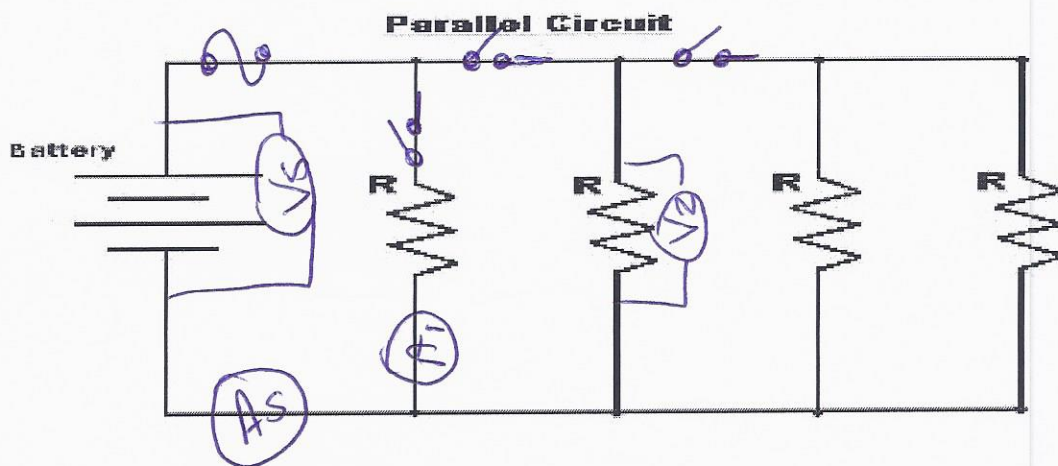
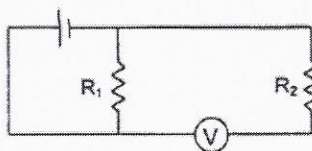6. Four electric circuit diagrams are given below.
   You wish to measure the potential difference across the terminals of resistor R2.
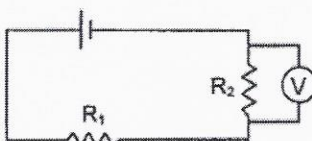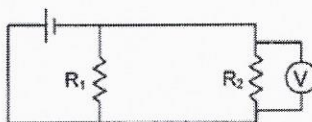   Which diagrams show a correctly connected voltmeter?

1)

3)

2)

4)

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

7. The following electric circuit consists of a power supply, VT, connected to three resistors (R1, R2 andR3). Which of the following circuit diagrams shows the correct connection for an ammeter A that measures the current flowing through resistor R1?

A)
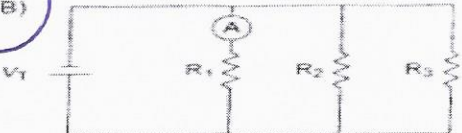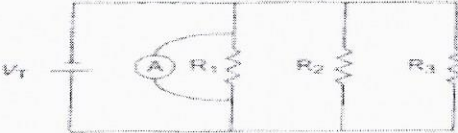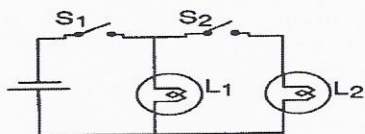
C)

B)

D)

8. An electrical circuit consists of a power source, two switches (S_1 and S_2) and two light bulbs (L_1 and L_2). The following table shows what happens to both light bulbs:

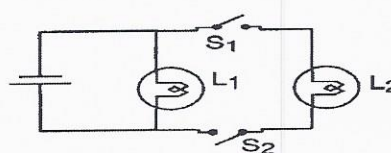| Switch		Light Bulb	
S_1	S_2	L_1	L_2
open	open	out	out
closed	open	bright	out

Which of the following circuit diagrams illustrates the results shown in the table above?
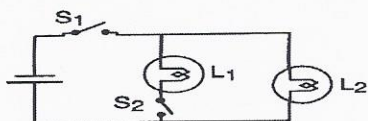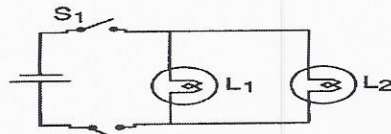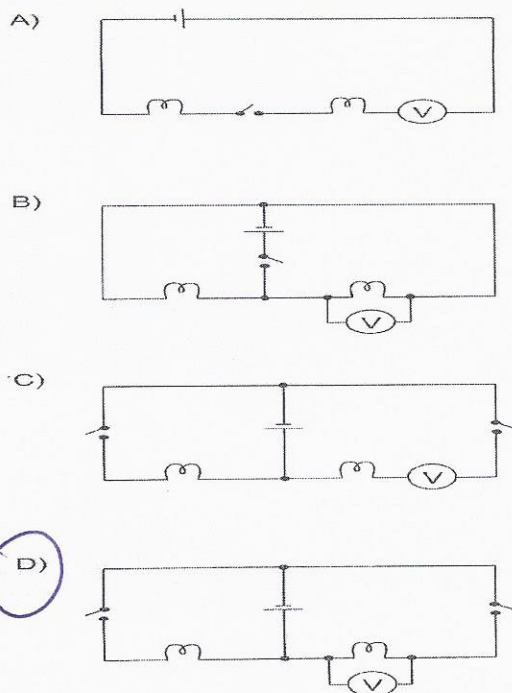
A)

C)

B)

D)

9. Which of the diagrams below illustrates the following two features?
   - Each light bulb is controlled separately
   - A potential difference (voltage) measurement is taken on one of the two light bulbs.

A)

B)

C)

D)

Resistance section

1. The following table gives the characteristics of four electrical conductors.

Conductor	Length	Diameter	Temperature
F_1	1 m	2 mm	-20°C
F_2	3 m	2 mm	50°C
F_3	1 m	1 mm	50°C
F_4	3 m	1 mm	-20°C

Which is the best electrical conductor?

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

2. A circuit consists of a power supply, a light bulb and two terminals that can be connected to a rod. The copper rods illustrated below are inserted into the circuit one at a time. The rods are the same temperature, but they have different dimensions.

1.

3.

2.

4.
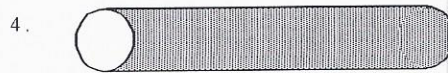
Which rod will offer the least resistance to the flow of electric current?

A) rod 1   B) rod 2   C) rod 3   D) rod 4

3. The electrical power of a fridge is 1 250 W when it operates with a current intensity of 25 A.

   a- Determine the resistance of the fridge.

   b- The graph below illustrates the potential difference as a function of the current applied across the terminals of two appliances, one of which is the fridge mentioned above. Choose whether Appliance #1 or Appliance #2 corresponds to the resistance of the fridge. Justify your choice showing calculations.
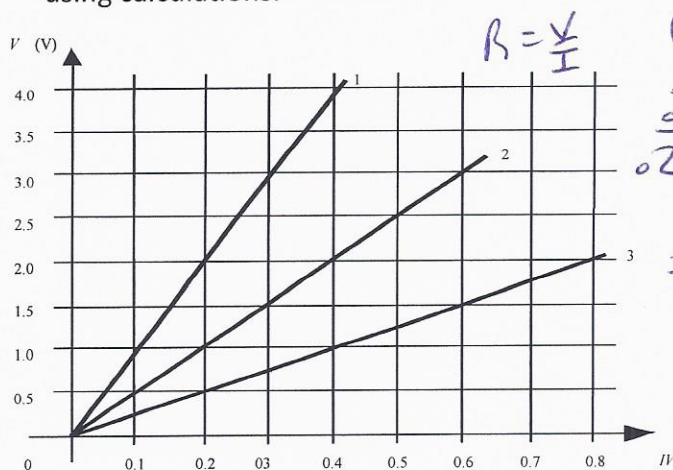
V

80 ┈┈┈┈┈┈┈┈┈ Appliance #1

40 ┈┈┈┈┈┈┈┈┈ Appliance #2

20
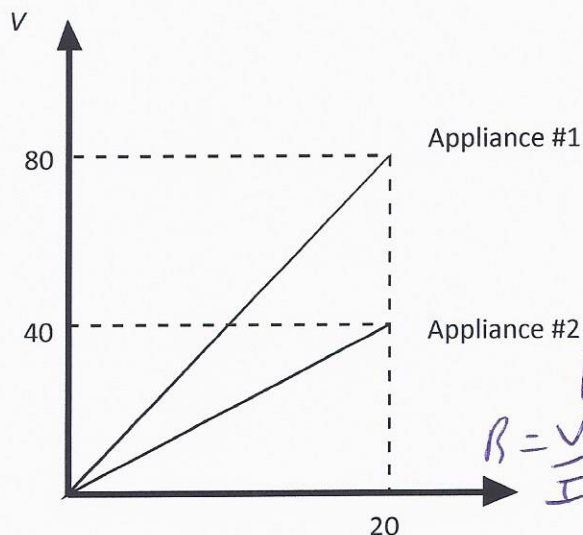
$$a) R = \frac{V}{I} \frac{50}{25} = \boxed{2\Omega}$$

$$V = \frac{P}{I} = \frac{1250}{25} = 50 V$$

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

$$\underline{app1} \qquad \underline{app2}$$

$$\frac{80}{20} = 4\Omega \qquad \frac{40}{20} = \boxed{2\Omega}$$

$$\boxed{appliance \#2}$$

4. The following graph describes the behavior of three resistors subjected to different voltages. Which is the resistor would you use as the best conductor? Justify your answer using calculations.

V (V)

4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5

0   0.1   0.2   03   0.4   0.5   0.6   0.7   0.8   *IV*

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

① ② ③

$$\frac{2}{.2} = 10\Omega \qquad \frac{2}{.4} = 5\Omega \qquad \frac{2}{.8} = 2.5\Omega$$

#3 is the best conductor because it is the weakest resistor.

5. Which of the following would increase the electrical conductivity of a circuit?

   1- A thicker wire   3- A decrease in the temperature of the wire
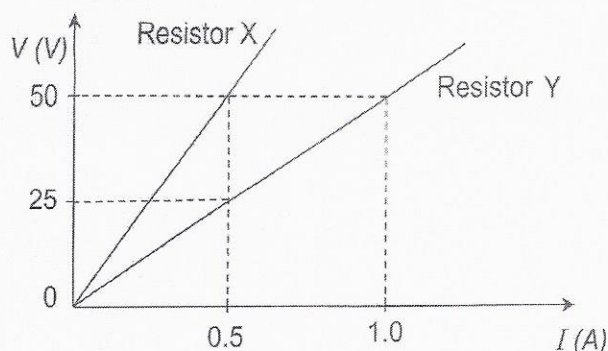   2- A longer wire   4- The use of porcelain wire

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

6. The following graph shows the results of tests conducted in two different resistors.

$R = \dfrac{V}{I}$ ⓧ

$\dfrac{500}{5} = 100\Omega$

Ⓨ

$\dfrac{25}{.5} = 50\Omega$

The statements below are related to this graph.
1 – Resistor X is the better conductor
2 – If the voltage is the same, the greater the current intensity the weaker the resistance value is
3 – The value of the weaker resistor is 50 Ω
Which of the above statements are true?
A) 1 and 2   B) 1 and 3   (C) 2 and 3   D) 1, 2 and 3

7. A laboratory experiment on electricity involved showing the relationship between voltage and the current intensity in two different types of conducting wires (1 and 2). The graph below represents the data collected.

POTENTIAL DIFFERENCE AS A FUNCTION OF ELECTRIC CURRENT INTENSITY

a)

$R = \dfrac{V}{I}$ ①   ②

$\dfrac{4}{.1} = 40\Omega$ $\dfrac{4}{.4} = 10\Omega$

b)
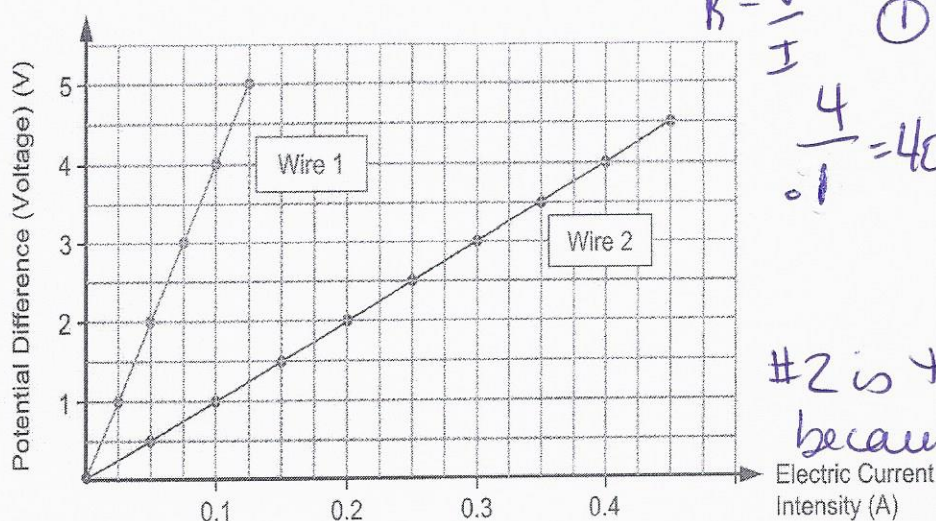
#2 is the best conductor because it is the ~~wa~~ weakest resistor

a) Using this data, calculate the resistance of each wire.
b) Which of the two wires (1 or 2) is the better conductor? Justify your answer. /4