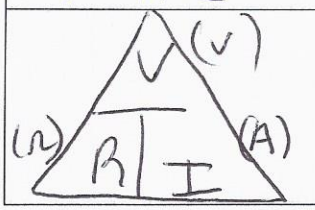
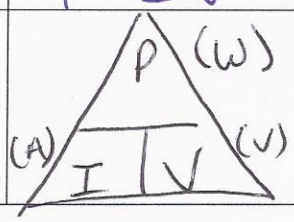
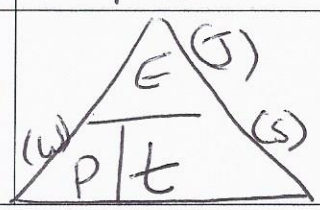
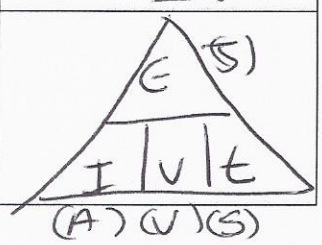
Review for formula, circuit and resistance test

Formula Questions

1. Give the formula and then the triangles for each. Include the units.

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

2. Give the conversions

W to kW $\div 1000$ J to kWh $\div 3\,600\,000$ sec to hrs $\div 3600$

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

hrs to sec $\times 3600$ kW to W $\times 1000$

3. 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?

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

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

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

5. 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?

$E = Pt$ $500 \times 7 \times 3600 =$ 12 600 000 J

6. It takes 15 minutes to cook a cup of rice in Marisa's old microwave oven. With her new microwave oven, which has the same interior dimensions, it now takes 13 minutes to cook a cup of rice. Which of the following statements is true concerning the amount of energy required to cook a cup of rice and the power of Marisa's new microwave in comparison with the old oven?

A) The same amount of energy is required, and the new oven is less powerful.
B) The same amount of energy is required, and the new oven is more powerful.
C) Less energy is required, and the new oven is less powerful.
(D) Less energy is required, and the new oven is more powerful.

7. 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

$P = IV$ $\frac{5.5 \times 220}{1000} = 1.2\ kW$ $I = \frac{V}{R} = \frac{220}{40} = 5.5A$

8. 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

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

9. 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

$E = IVt$ $120 \times 6 \times 1.5 \times 60 = 64\,800J$

10. 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- What values will the ammeter and voltmeter display?

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

b- How much energy will the resistor release in one minute's work?

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

11. 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 ×1000	48 hrs
Child 2	Computer and radio	1 400 W	3 500 min
Child 3	Lights, computer	5.2 kW × 1000	55 hrs
Child 4	Lights, computer and TV	1 800 W	3 400 min

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

(1) $8000 \times 48 \times 3600 = 1\,382\,400\,000J$

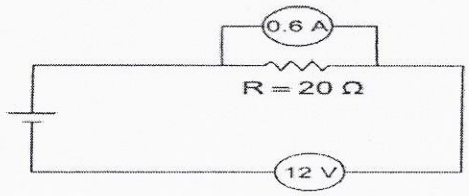
(2) $1400 \times 3500 \times 60 = 294\,000\,000J$

(3) $5200 \times 55 \times 3600 = 1\,029\,600\,000J$

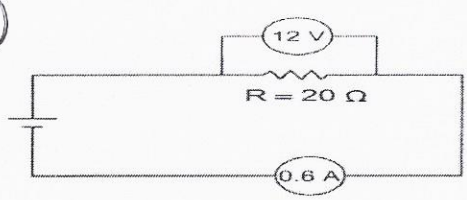
(4) $1800 \times 3400 \times 60 = 367\,200\,000J$

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

A)

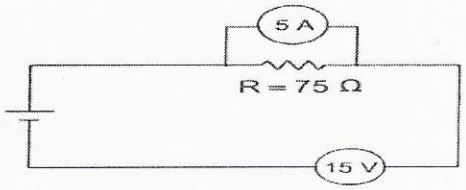


B)



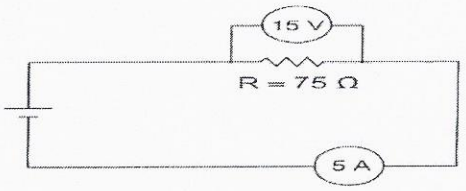
$R = \frac{V}{I}$ $\frac{12}{.6}$ = 20Ω

C)



$I = \frac{V}{R}$ $\frac{60}{2}$ = 30A

D)



$\frac{15}{5}$ = 3Ω

P = IV
30 × 60 = 1800W

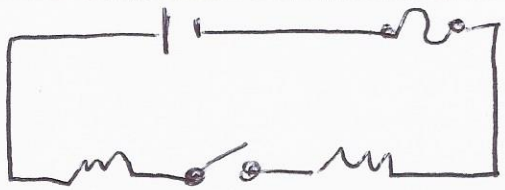
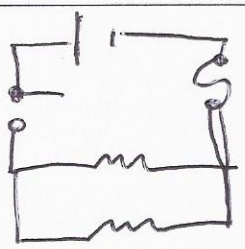
13. An electric circuit has a total resistance of 2 Ω. This circuit is connected to a source will work with a minimum power of 1700 W and a maximum power of 2 200 W. The source can provide four different voltages, namely 30 V, 60 V, 90 V and 120 V. Which of these voltages will fall between the minimum and maximum amount of power?

A) 30 V B) 60 V C) 90 V D) 120 V

AC odd are not bt 1700 & 2200W

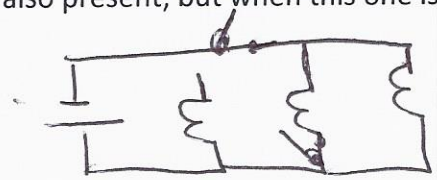
Circuit Questions

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
	

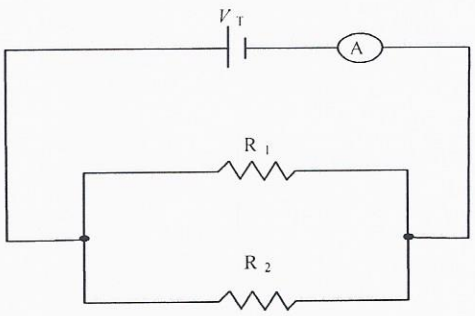
2. Draw a circuit with three light bulbs which has the following specifications:
   - A switch for light bulb 2 can be open and light bulb 1 and 3 will still be on.

Another switch is also present, but when this one is open light bulb 1 is on, but light bulb 2 and 3 are off.

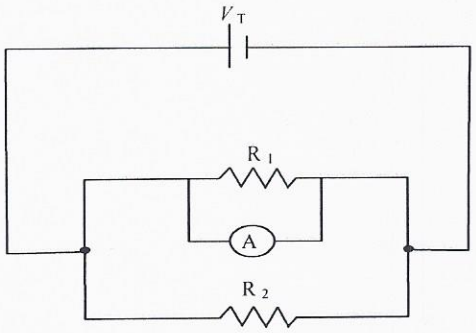


3. Which of the following diagrams correctly shows where the ammeter (A) must be placed to measure the current flowing through resistor R_1?

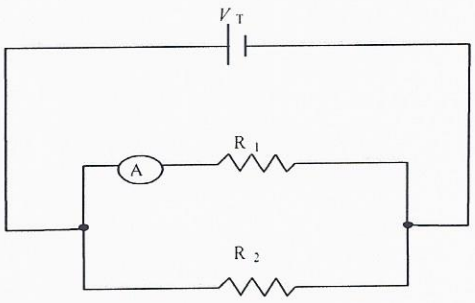
A)



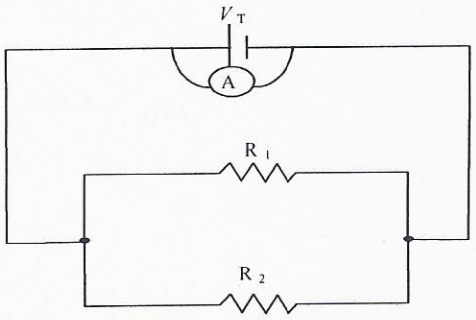
C)



B)

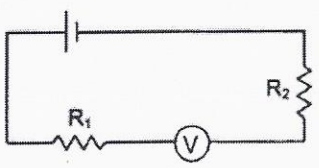


D)

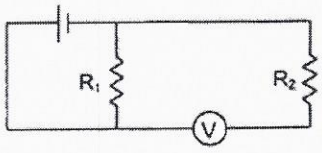


4. Four electric circuit diagrams are given below.
   You wish to measure the potential difference across the terminals of resistor R2.
   Which diagrams show a correctly connected voltmeter?

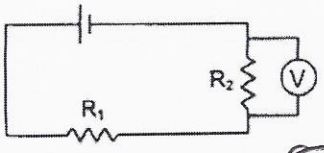
1)



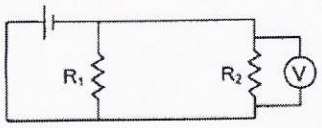
3)



2)

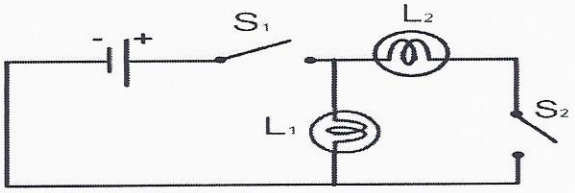


4)



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

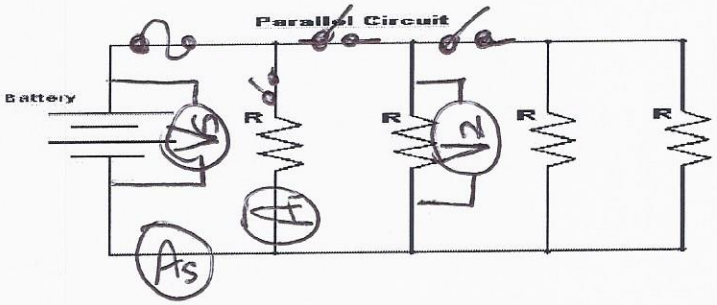
5. The diagram below shows a circuit made of two light bulbs, two switches and a power source.



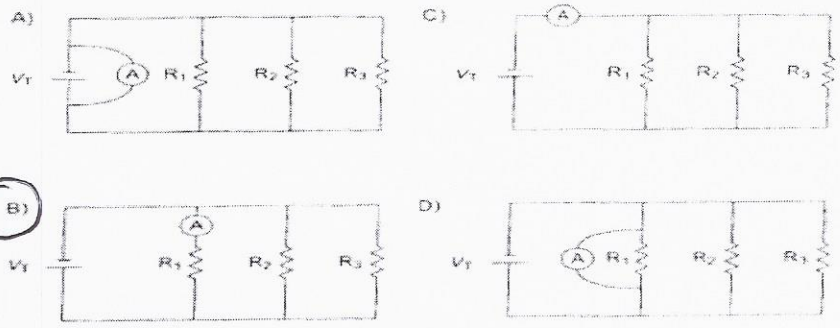
Which of the following statements about this circuit is TRUE?

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

6. 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.



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?

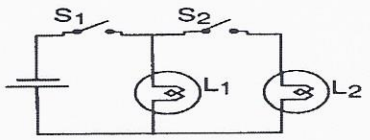


8. An electrical circuit consists of a power source, two switches (S_1 and S_2) and two light bulbs (L_1 and L_2). The following table shows what happens to both light bulbs:

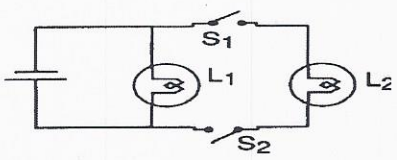
Switch		Light Bulb	
S_1	S_2	L_1	L_2
open	open	out	out
closed	open	bright	out

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

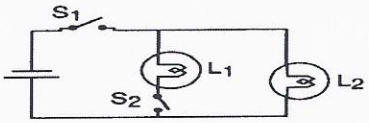
A)



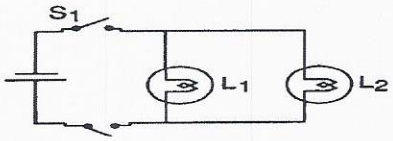
C)



B)

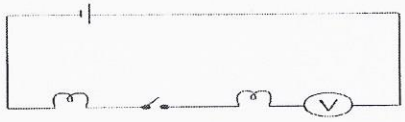


D)

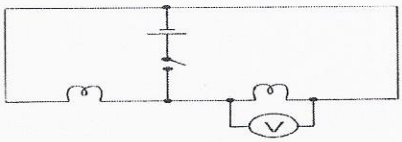


9. Which of the diagrams below illustrates the following two features?
   - Each light bulb is controlled separately
   - A potential difference (voltage) measurement is taken on one of the two light bulbs.

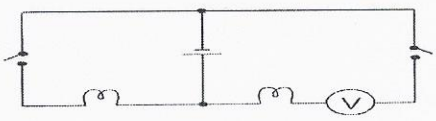
A)



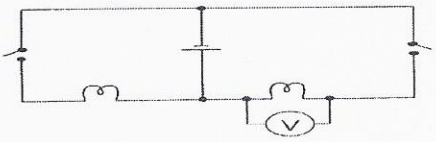
B)



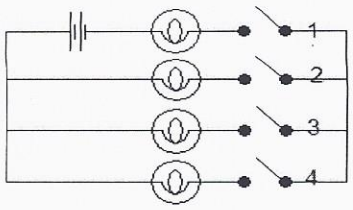
C)



D)



10. The circuit below has a power supply, 4 switched and 4 light bulbs.



Choose the correct answer below that describes the function of the switches.

A) Because of the placement of the switches, switch 4 controls all 4 light bulbs.
B) Because of the placement of the switches, switch 1 controls all 4 light bulbs.
C) Because of the placement of the switches, all the light bulbs are either on or off at the same time.
D) Because of the placement of the switches, all the light bulbs are independent of one another.

11. In which table is each component correctly matched with its electrical function?

	Power supply	Protection	Energy transformation
A)	Switch	Circuit breaker	Battery
B)	Battery	Switch	Motor
C)	Switch	Ceramic disk	Battery
D)	Battery	Fuse	Motor

Resistance section

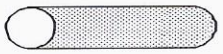
1. The following table gives the characteristics of four electrical conductors.

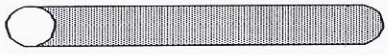
Conductor	Length	Diameter	Temperature
F_1	1 m	2 mm	-20°C
F_2	3 m	2 mm	50°C
F_3	1 m	1 mm	50°C
F_4	3 m	1 mm	-20°C

Which is the best electrical conductor?

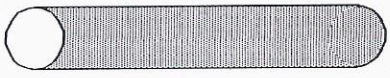
A) F_1 B) F_2 C) F_3 D) F_4

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. 

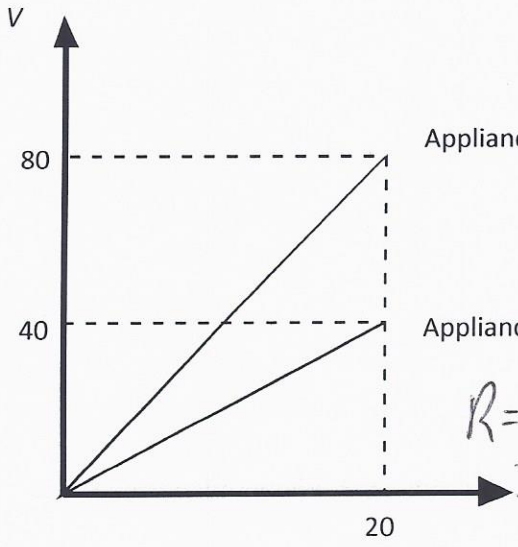
2. 

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 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.



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

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

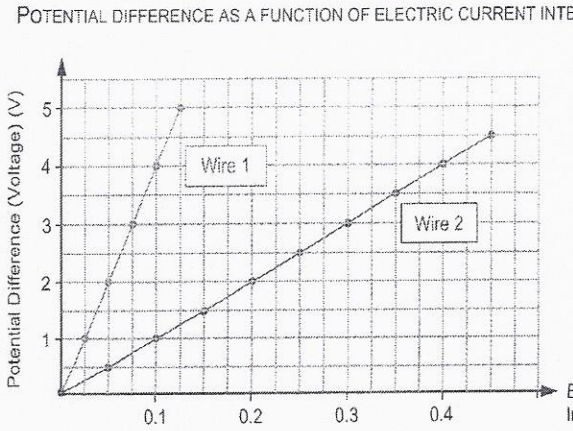
b) App 1 App 2

$R = \frac{V}{I}$ $\frac{80}{20} = 4\Omega$ $\frac{40}{20} = 2\Omega$

appliance #2

4. Which of the following would increase the electrical conductivity of a circuit?
   1- A thicker wire
   2- A longer wire
   3- A decrease in the temperature of the wire
   4- The use of porcelain wire
   A) 3 and 4 B) 1 and 2 C) 2 and 4 D) 1 and 3

5. 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.



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

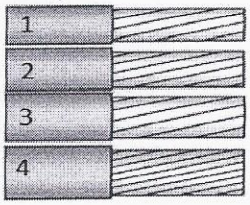
a) Wire 1 Wire 2

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

B is the best conductor because it is the 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.

6. Below is a picture showing various gauge (thicknesses) of wires. Choose the answer that *correctly describes the behavior of the wires.*



(A) Wire 4 is the best conductor because it is the thickest wire.
B) Wire 4 is the worst conductor because it is the thickest wire.
C) Wire 1 is the best conductor because it is the thinnest wire.
D) Wire 2 is a better conductor than wire 3 because it is a thinner wire.

7. Alexandra found two speakers of unknown resistance. She brings them to the lab and connects each speaker to a circuit and takes measurements with a voltmeter, and an ammeter. She then graphs the results.
Shown below are the results obtained.

b) S1 $R = \frac{V}{I}$ $\frac{4}{.08} = 50\Omega$ S2 $\frac{10}{.08} = 125\Omega$

Speaker 1

V (Volts)	I (Amps)
0	0
4	0.08
8	0.16
12	0.24
16	0.32

Speaker 2

V (Volts)	*I* (Amps)
0	0
5	0.04
10	0.08
15	0.12
20	0.16

Speaker 1 better conductor because worst resistor.

a- Graph and label the data appropriately.
b- Determine which speaker has the greatest conductance. Justify your answer.

a) Resistance Graph