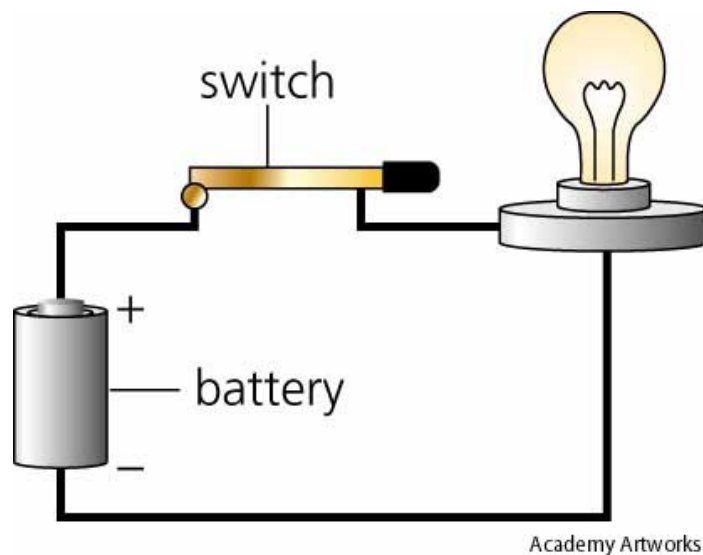
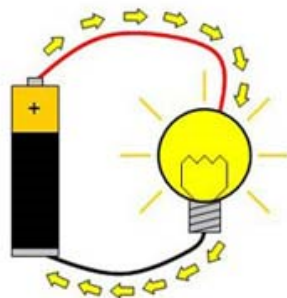


Electricity Formulas

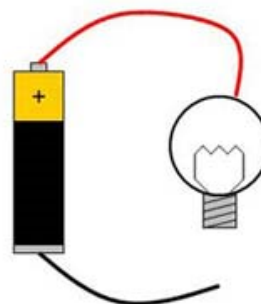
Circuit def: Movement of electrons through a closed pathway.



Closed circuit



Open circuit



Variables

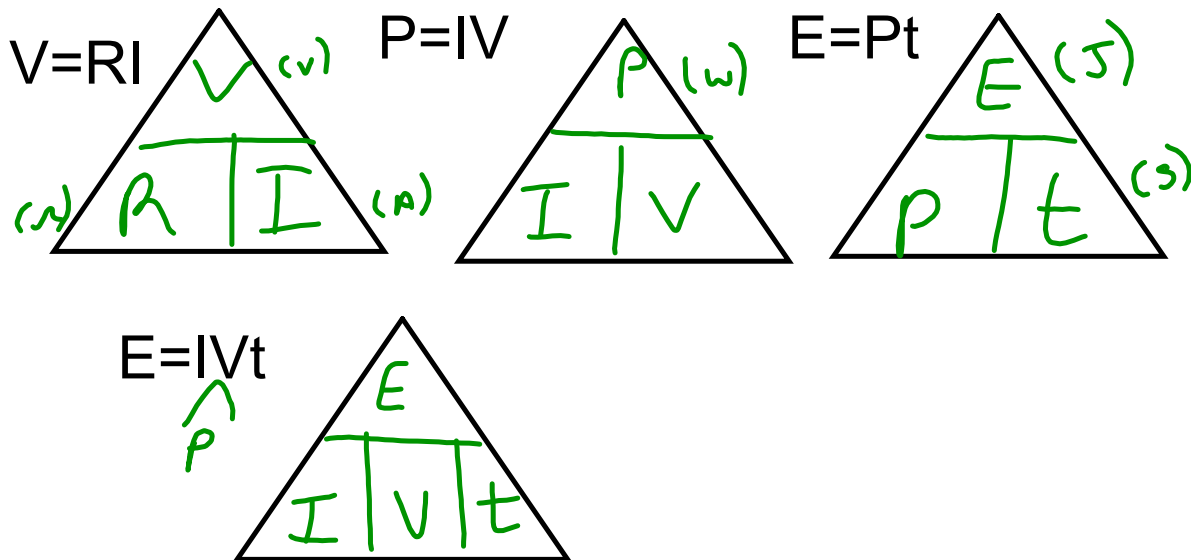
	Definition	Symbol	Unit
Current intensity	Electron flow in a circuit	I	A amps
Potential Difference	Provides the push given to electrons to travel in the circuit.	V	V volts
Resistance	Opposes current flow	R	Ω ohms
Power	The amount of work an electrical device can perform in one second	P	W watt
Energy	The power an electrical appliance uses and the amount of time it is used for	E	J joule
Time	The amount of time a device is being used for	t	s seconds

Conversions:

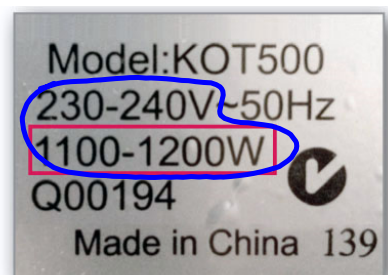
Minutes to seconds $\times 60$ Seconds to minutes $\div 60$ Hours to seconds $\times 3600$ Seconds to hours $\div 3600$ W to kW $\div 1000$ kW to W $\times 1000$ J to kJ $\div 1000$ J to kWh $\div 3600000$

Memorize

Formulas and triangles used



Rating plates: Information given on electrical appliances that allows its power and energy to be calculated





Practice

1. What is the resistance of a circuit if the potential difference is 25 V and the current is 3 A?

$$R = \frac{V}{I} = \frac{25}{3} = 8.3 \Omega$$

2. A radio is on for 2 hours and has 700 W of power. How much energy was used in J?

Energy was used in J?

$$E = Pt \quad 700 \times 2 \times 3600$$

$$(5040000 \text{ J})$$

3. A radio is on for 2 hours and has 700 W of power. What is the energy in kJ and kWh?

$$\begin{array}{l} E \text{ Pt} \\ \frac{700 \times 2 \times 3600}{1000} \\ = 5040 \text{ kJ} \end{array} \quad \begin{array}{l} E = \text{Pt} \\ \frac{700 \times 2 \times 3600}{3600 \text{ s}} \\ 1.4 \text{ kWh} \end{array}$$

4. How much power did it take to use a microwave for 90 seconds and consumed 70 000 J of energy?

$$P = \frac{E}{t} = \frac{70.000}{90} = 777.8 \text{ W}$$

5. A hairdryer is used for 20 minutes a day. It runs on 190 V and 3 A. How much energy is used in J ?

$$E = IVt \quad 3 \times 190 \times 20 \times 60$$

$$(684000 \text{ J})$$

6. How much energy in kJ does a computer use if it is on for 3 hours and uses 200 V and 2.0 A.

$$E = Ivt \quad \frac{2 \times 200 \times 3 \times 3600}{1000} = 4320 \text{ kJ}$$

7. If a computer used 950 000 J of energy and 100 W of power. How long did you use the computer for?

$$t = \frac{E}{p} \quad \frac{950000}{100} = 9500 \text{ s}$$

8. If a TV used 950 000 J of energy and 90 W of power. How many hours did you watch TV for?

$$t = \frac{E}{P} = \frac{950000}{90} = \frac{10555.6}{3600} = 2.9 \text{ hr}$$

9. How much power did it take when a dishwasher ran for 55 minutes and consumed 50 000 J of energy?

$$P = \frac{E}{t} = \frac{50000}{(55 \times 60)} = 15.2 \text{ W}$$

10. A hairdryer uses 220 V and 7 A. If the hairdryer used 525 000 J of energy, how much time did you use it for in minutes?

$$t = \frac{E}{IV} \left(\frac{525000}{(220 \times 7)} = \frac{340.9}{60} \right) \quad (5.7 \text{ min})$$

Past exam questions

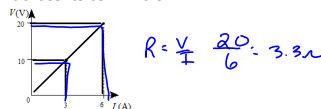
1. Some characteristics of appliances are listed in the table below:

Appliance	Characteristic	$E = Pt$	$E = IVt$
1	120 V, 10 A	$E = IVt$	
2	240 V, 6 A	$E = IVt$	
3	120 V, 1500 W	$E = Pt$	
4	240 V, 1.8 kW	$E = Pt$	

If each appliance is used for the same amount of time, which appliance uses the most electric energy?

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

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.



What is the resistance of this circuit element?

- A) 2Ω B) 0.5Ω **C) 3.3Ω** D) 100Ω

3. A mother has decided to charge her children for leaving appliances on uselessly. Below is a table showing the wasted energy each child accumulates.

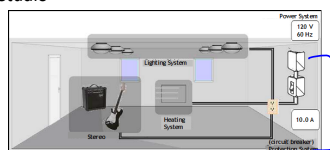
	Appliances	Total Powers used	Total Time on
Child 1	TV, computer and radio	4.0 kW	48 hrs
Child 2	Computer and radio	1400 W	3 500 min

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

Child 1 $E = Pt$ Child 2
 $4000 \times 48 \times 3600$ $1400 \times 3500 \times 60$
 (691200000 J) **(294000000 J)**

4. Eric wants to convert a room in his house into a music studio. Below is the layout of the electric installations and the rating plates on the appliances in the room.

Layout of Electrical Appliances in the Music Studio



Here is the information on the rating plates for the heating system and the stereo system in the room:

Heating system 120 V 60 Hz 720 W	Stereo 120 V 60 Hz 360 W
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Here is the information on the rating plates for the two lighting systems available:

Incandescent lighting system 120 V 60 Hz 480 W	Compact fluorescent lighting system 120 V 60 Hz 110 W
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a- Calculate the maximum electrical power that can be attributed to the lighting system.

$P = 120 \times 10 = 1200 \text{ W}$

b- Which lighting system should be installed in the electrical circuit of the music studio? Justify your choice using mathematical reasoning.

compact lights because only have 120W left for lights & Incandescent
 \therefore in use 480W

