BBC TERRIFIC SCIENTIFIC

Student worksheets

Power: How much does my school use?

Power

Pack includes:

- Electric Detectives sheet (print double sided)
- Power Health Check sheet (print double sided)
- Power Smart Quiz
- Two week challenge Power record sheet
- How to read a meter
- Make a heat box
- Electricity use exercise
- My greatest switch twitch
- Cross curricular ideas for History, Literacy and Maths

Become an electric detective!

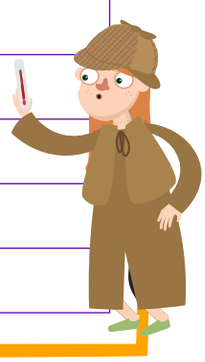
Look around school. Which devices use electricity? Are those devices on, off or on standby? Do they need to be on or are they just costing your school money?

1. Problem electrical devices detected				
Week 1			Week 2	
Device	**Location**	**Note**	**Solved? (Y/N)**	**Note (How?)**
Light	Class 5	Left on at break-time!	?	Light now switched off when room empty

It's not just electric devices which make your school less power efficient.
Can you find any other problems?

2. Other problems detected

Week 1			Week 2	
Device	**Location**	**Note**	**Solved? (Y/N)**	**Note (How?)**
Window open	Top corridor	Heating is on!	?	The window has stayed shut



Power health check
How is your school doing?

Look around school. Which devices use electricity? Are those devices on, off or on standby? Do they need to be on?

Please select the option that best matches the situation in your school. If you don't know the answer ask someone in your school who can help you with the answer. (e.g. caretaker, secretary)

	Never 2	Sometimes 1	Always 0
Are the windows open when the heating is on?			
Are the external doors kept open in winter?			
Is there a draft from the windows or doors?			
Are classrooms too hot in the winter?			
Are corridors warmer than the classrooms?			
Is the hall/dining room heated when the space is not being used?			
Are the radiators ever covered or blocked by furniture?			
Are additional plug-in electric heaters used anywhere in the school?			
Are lights off when no one is in a classroom?			
Are lights left on in corridors when they are not being used?			
When only one person is in a classroom are **all** the classroom lights on?			

	Never 2	Sometimes 1	Always 0
Are the lights in the hall/dining room off when the space is not being used?			
When the cleaners are working are lights on across the building?			
Are external lights left on out of school hours?			
Are the projectors and smart boards left on standby out of school hours?			
Are computers left on when not in use?			
Are monitors on standby when not in use?			
Is frost allowed to build up in the fridges and freezers?			
Is the school photocopier left on standby out of school hours?			
Are any of the hot water taps in the school dripping/left on by mistake?			

Now add up your scores and find out how power efficient your school is. Count your answers as follows: **2** for each **never, 1** for each **sometimes, 0** for each **always.** Add up your scores to get your Medal:

Score less than 25 = **Bronze** Medal
Score between 25 and 32 = **Silver** Medal
Score between 33 and 40 = **Gold** Medal

How did you do?

Bronze - Time to spring into action and use all of your Electric Detective skills to improve efficiency!

Silver - Pretty good but there is still some Electric Detective work to be done!

Gold - Your school is really efficient already but there will still be some improvements you can make.

Power smart quiz

Read out the scenarios below and discuss which one you think is the most efficient and why?

If you are cold, is it more efficient to...?	In the summer if you are hot, is it more efficient to...?	To save power, is it more efficient to...?
A) Put on a jumper B) Turn the heating on C) Eat a hot chilli D) Stay in bed all day	**A) Open a window** **B) Take off some clothing** C) Turn on an electric fan D) Go swimming	**A) Wash up in a bowl of water** B) Wash up under a running tap C) Not do any washing up D) Use paper plates for all meals
To heat your house, is it more efficient to...?	**In the winter if you are hot, is it more efficient to...?**	**To save power, is it better to...?**
A) Keep your heating on low all day **B) Put a timer on your heating and have it come on when you are home**	A) Open a window B) Turn on an electric fan **C) Turn down your heating** D) Cover your radiators with washing	**A) Dry your clothes on a washing line outside** **B) Dry your clothes on a clothes airer inside** C) Dry your clothes in a tumble dryer
To brighten up your room, is it more efficient to...?	**To save power, is it more efficient to...?**	**To save power, is it more efficient to...?**
A) Open the curtains in daylight B) Put a light on C) Wear a torch on your head D) Line your walls with tin foil	A) Leave a light on, even when you are not in the room **B) Switch lights off when you leave the room**	A) Charge your mobile phone and leave it on **B) Charge your mobile phone and take it out straight away?** C) Doesn't matter, it won't make any difference D) Use carrier pigeons to communicate
To save power, is it better to...?	**To help heat a room more efficiently, is it better to...?**	**To help heat a room more efficiently, is it better to...?**
A) Turn computer monitors off when you are not in the room B) Leave everything on standby C) Leave the everything on as usual	A) Cover your radiators with washing B) Leave your windows and doors open C) Close your windows and doors **D) Ensure all radiators are uncovered**	**A) Close the curtains after dark** B) Leave the curtains open after dark C) Wallpaper your windows
To save power, is it better to...?	**To save power, is it better to...?**	**To save power, is it better to...?**
A) Keep the tap running whilst you brush your teeth B) Use a mug of water whilst you brush your teeth **C) Only run the tap when you rinse your tooth brush**	A) Boil a whole kettle of water at a time **B) Only boil as much water as you need at the time** C) **Drink cold drinks**	A) Leave all electrical devices plugged in, even when you are not using them **B) Only plug things in when you want to use them** C) Charge your devices at your friend's house

How did you do? (Sensible answers marked)

0-8 Look out...there are lots of power pilferers all around you. How can you save electricity in your home or school?

9-10 Getting there...You clearly know it is important to save electricity - where else could you do the switch twitch?

11-15 You are super power smart! Keep it up!

Get the Switch Twitch!

- Listen to the Switch Twitch song / watch the video on our website. Can you come up with your own words?
- Share your class doing the Switch Twitch dance with us! #TerrificScientific

VERSE 1

I do a meter reading

I don't like what I'm seeing

We got to save the planet

It's up to human beings

Electricity!

Turn it off

Standby TV?

Turn it off!

Is the heating on with the windows open?

TURN - IT - OFF!

BRIDGE:
We're wasting...

Milliwatts and Kilowatts.

We're using every hour...

the Megawatts and Gigawatts.

We got to save some power.

So do the...

CHORUS:

Switch! Twitch!

Switch! Twitch!

Switch! Twitch!

Switch Twitch
(And hit the flicky switch!)

Switch! Twitch!

Switch! Twitch!
And hit the flicky …. switch!

Switch! Twitch!

VERSE 2

Lights turned on

… in an empty class?

Turn them off

… you do the maths!

Electric Detectives …

We're on the case

To switch and twitch …

In - every - place

Repeat BRIDGE

Repeat CHORUS

Your school is wasting power

Switch! Twitch!

Kilowatts every hour!

Switch! Twitch!

I'm serious you gotta to change!
(Switch! Twitch!)

Switch! Twitch!

Bad habits you re-arrange

Switch! Twitch!

Just do a Switch Twitch
(Switch! Twitch!)

Switch! Twitch!

And hit the flicky flick!

Power record sheet

Please complete every school day for two weeks.

Begin each week afresh, no need to count electricity used over the weekend.

School name:_____

When was the school built?:_____Number of children in your school?:_____

Day	Temperature outside	Temperature inside	Cloud Cover: Is the sky clear, are there some clouds, or lots of clouds	Electricity meter reading (kWh) AM	Electricity meter reading (kWh) PM	Daily total electricity usage (kWh)
Monday						
Tuesday						
Wednesday						
Thursday						
Friday						
						Week one total = ____kWh
Monday						
Tuesday						
Wednesday						
Thursday						
Friday						
						Week two total = ____kWh

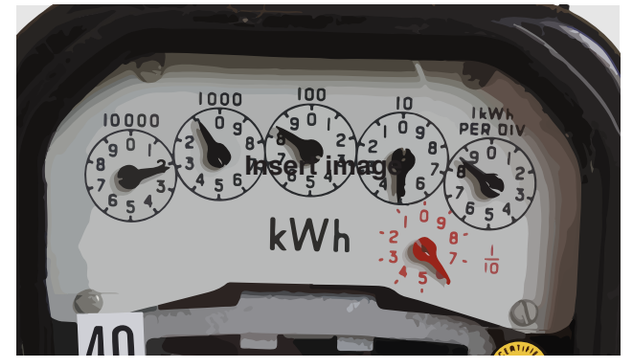
NOTE: If you have a 'smart' meter it might add up the daily kWh total for you, but please still record the morning and afternoon values.

How to read a meter

Electricity consumption is measured in kilowatt hours. Read the meter from left to right, ignore the figures in red or on red dials, or digits past the decimal point. **Practice reading meters by reading these below...**

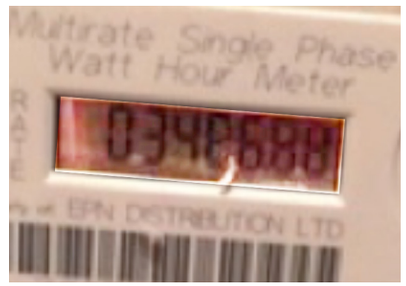
Digital meters
Meter reading: 2307 kWh

Electronic meters
Meter reading: 476106 kWh

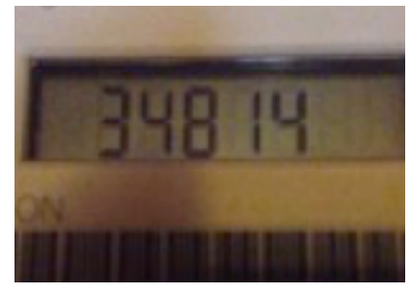


Dial Meters
Meter reading: 208 78. If the dial is between numbers, write down the lower number.

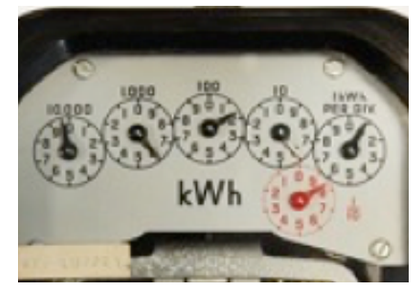
A:



B:



C:



D:

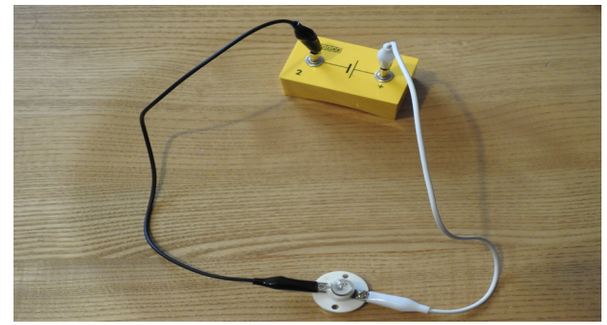
Answers: A:12211 kWh B: 03426 C: 34814 kWh D: 96161

Make a heat box

You will need to make two of these... one with insulation and one without insulation.

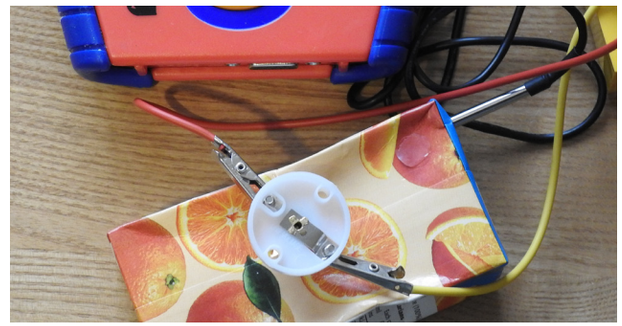
Step 1
Empty and wash out a small 200ml juice carton. Leave it to dry overnight.

Step 2
Ask your teacher to cut a small cross into the front of the juice carton. This is where your light bulb will go. Leave it to dry overnight.



Step 3
Make a series circuit – using a 1.5v bulb in a bulb holder, 1.5 v D size battery and two wires with crocodile clips at the end.

Step 4
Insert the bulb into the cross on your juice carton. Check that your circuit works.



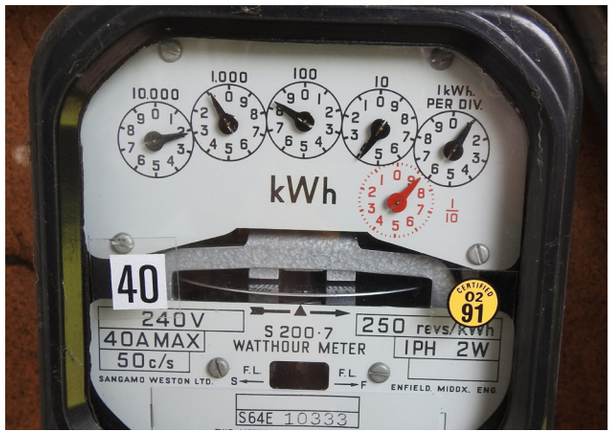
Step 5
A) Insert the temperature probe into the straw hole of the juice carton and attach to data logger. **OR**
B) Insert thermometer into the straw hole of the juice carton.

Step 6
If you are going to insulate your juice carton, wrap it tightly with insulation material – cotton wool, tin foil, bubble wrap all work well. Check your circuit is working before you insulate your box.

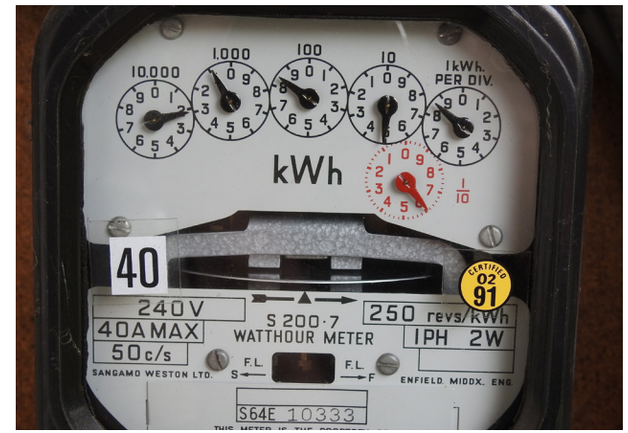
Electricity use PDF

How much electricity was required today in our Terrific Scientific house?

Look at the meter at the beginning of the day and the end of the day...How much electricity was required in kWh?



Morning



Evening

Morning meter reading	Afternoon meter reading	Total amount of electricity used today
_____kWh	_____kWh	_____kWh

Answer: 17 kWh

My greatest switch twitch poster

Tell us about your most effective power saving idea. You could write new lyrics for the switch twitch song, poem, rap, draw a picture, take photographs, write a story or newspaper report. Share it using **#TERRIFICSCIENTIFIC**

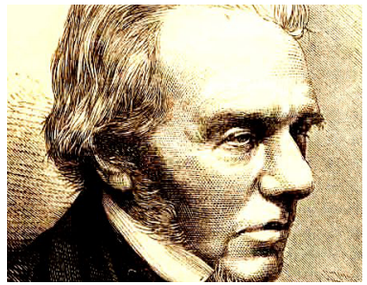
First name:_____Age:_____

Cross curricular ideas

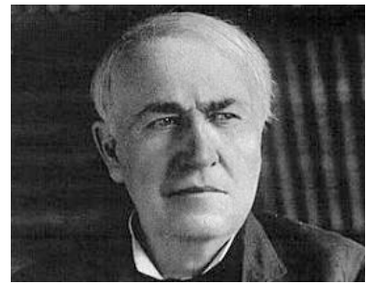
History – Find out about one of the amazing electric pioneers!

How has their work changed the world in which we live? How will you tell other people about them?

Anders Celsius
Inventor of the Celsius temperature scale

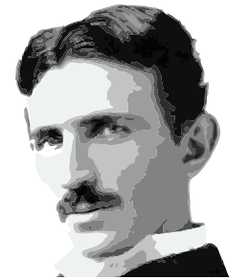


Michael Faraday
Inventor of the electric motor



Thomas Edison
Inventor of the light bulb

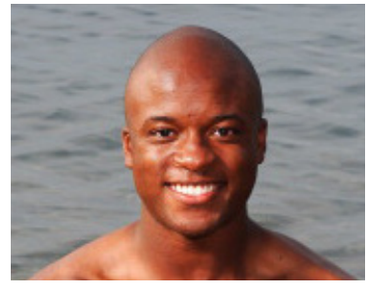
Ada Lovelace
Mathematician whose discoveries lead to computers



Nikola Tesla
Best known for developing the modern alternating current (AC) electrical supply system

Garret Morgan
Inventor of the smoke hood circa 1912

Hertha Ayrton
Helped us to understand electric currents



John Dabiri
Inventor of a new, highly efficient Vertical Wind Farm

Edith Clark
First female electrical engineer

Jerry Lawson
Inventor Video Game Cartridge

Literacy: Hunt out those power pilferers!

1. Design an advertising campaign to convince people to banish their power pilferers. It could be an informative leaflet, a poster, an advert.

2. Whatever you create it should be persuasive and informative. So think about what people need to know. Be as convincing as you can be!

3. What is a power pilferer?

4. Why should we care about them?

5. Write your own words to the SWITCH TWITCH song about turning off all those unused devices on standby.

Maths challenge: Terrific Scientific electricity bill

JOULES POWER COMPANY | **Electricity Statement**

Terrific Scientific House, UK | **Customer reference: AOK1**

Meter Number: 0001

2 February 2017	Meter reading	19125 kWh
18 May 2017	Meter reading	19378 kWh
1 August 2017	Meter reading	21667 kWh

Cost of Electricity (2542kWh x 11.6p) **£294.87**

Standing Charge

2 February – 1 August 2017

181 days at 24p per day **£43.44**

Total **£338.31**

Vat at 5%

Total including VAT **£355.22**

Electricity bills:

1. Between which months did we have the biggest electricity cost?

2. How much did the electricity cost between February and May (in £)?

3. We would like to get cheaper electricity. Look at the table below. Which deal is the cheapest? How much money could we save on our bill?

Company	Price electricity per kWh	Standing charge
Joules power	11.6p per kWh	24p per day
Watt power	11.3p per kWh	25p per day
Edison electric	11.8p per kWh	21p per day

kWh is a unit of energy used by suppliers to calculate your gas and electricity bills. One kWh refers to 1,000 watts (or 1 kilowatt) of use for an hour. One kWh will power a 100-watt light bulb for 10 hours.

Standing Charge is a daily cost that pays for your electricity meter and being connected to the electricity network.

Heat box template