very exciting, autonomous space where students can be themselves completely, without judgement (but you must establish this trust first).

Ideally, give students time to make and invest in their notebooks and transform it into a treasured possession.

GCSE Chemistry Lesson

KS3 Curriculum links

Chemistry:

Chemical changes

Energy changes in chemistry

KS3 Lesson plan

Davy Notebook Exhibition: GCSE Chemistry

Time: 1 hour

Lesson objective	To understand how an electric battery works and how Davy used them in his experiments. To understand how Davy built his electric battery and how it was used in his experiments to isolate chemicals. To understand how Davy used electrolysis to isolate chemicals. To understand Davy's contributions to electro-chemistry and the

	periodic table.
Learning outcomes	Understand and identify what a battery cell is, and how it works. Understand how batteries are used in electro-chemistry. Understand how Davy isolated chemicals, and which chemicals he was able to isolate.
Relevant previous knowledge	Electrolysis. Metals and the reactivity series. The Periodic Table.
Resources and set-up required	Lesson plan 10 x coins or metal washers An A4 sized piece of cardboard An A4 sized sheet of aluminium foil Vinegar 1 x LED light Scissors Tape

Lesson breakdown

Part 1 Background and heritage	10 mins	A brief summary of Davy's work with batteries and electrochemistry. Students will also be told the expected learning objectives and outcomes from this lesson.
Part 2 Task 1: Hypothesise how a battery works	10 mins	Students will be asked to think about real-life examples of batteries, and consider how they might function. They will then be challenged to predict how they would construct a battery from the materials provided for the second task.
Part 3: Task 2: Battery Experiment	20 mins	Students will be tasked with constructing chemical cells in order to try and generate enough voltage to power a LED.
Part 4 Task 3	15 mins	Students will answer a series of questions to see whether they have achieved the learning outcomes of this lesson
Part 5 Conclusion	5 mins	This section contains a suggested homework task to follow up on the lesson plan.

KS4: Davy Notebook Exhibition: GCSE Chemistry lesson notes

Part 1: Background and heritage

Key words:	electrical cells	battery	electro-chemistry

Suggested script

Humphry Davy was an important and famous scientist of his time. He worked at the Royal Institution as a Professor of Chemistry. He became interested in chemistry while he was a teenager. He came across an invention by Alessandro Volta of a pile of alternating metal discs which would produce an electric current, which was the first **battery**. Davy built his own version and created the term 'electric **battery**' for it. During his time at the Royal Institution, he built larger batteries and used them to pass electric currents through various chemical materials. This was the new science of **electro-chemistry**, which Davy invented. Using this method, he was able to isolate numerous elements. The elements that Davy isolated are potassium, sodium, calcium, strontium, barium and magnesium.

In this lesson plan, students will learn more about the construction of a **battery**, and how they work. Students will be asked to theorise how they think a **battery** works and will construct their own version of Davy's electrical **battery**. Students will be asked to create a series of **electrical cells** in order to light an LED. They will be asked to predict how many cells will be required to light the cells and give reasons for their predictions. Students will then compare their results with other groups. Finally, they will answer a series of questions about electrical batteries/cells and their relation to Davy's work.

Part 2: Task 1: Hypothesise how a battery works

Suggested script

Think about what devices you use everyday that require batteries. Have you ever thought about how they work? Have a think about whether the batteries that you use in your remote are different to the ones used in your laptop or phone. List what the different types of batteries you have encountered are and discuss in pairs how you think a battery works.

Now watch the following video: https://youtu.be/9OVtk6G2TnQ

Look at the image below and the items that you will be using for your experiment. Using the video you have just watched to help, discuss how you think the materials will go together to create a battery. Have a think about what the function of each of the materials is. Discuss in

your pairs whether this image looks like any battery you have encountered before.

Draw a diagram to demonstrate how you would create a battery from the provided materials. Make sure to label each section of the battery, and give reasons for why you designed the battery in this way.

Part 3: Task 2: Battery Experiment

Suggested script

Today, you are going to build a battery, by creating individual chemical cells. Use the instructions provided at the end of this section of the pack.

Part 2: Task 3

Suggested script

Fill out the question sheet at the end of the pack and go through the answers.

Answers to the question sheet

What is the difference between a chemical cell and a battery?
A cell is a single unit of device that converts chemical energy into electrical energy. A battery is a collection of cells that converts chemical energy into electrical energy.

What is needed for a chemical cell? How does the material used affect the cell?
Two different metals, and an electrolyte. The choice of metal changes the voltage of the cell.

What process did Davy use batteries for? Could you describe this process and think of any examples of how it is used today?
Davy used the batteries he created to isolate elements. This process is called electrolysis, and formed the basis of modern electro-chemistry.

Which elements did Davy manage to isolate with his batteries?
Potassium, Sodium, Calcium, Strontium, Barium and Magnesium

How is Davy's battery different from yours? Can you identify the components of his battery that match with yours?
Davy's battery also consists of a number of chemical cells stacked together. In the image provided, you can see the metal plates that Davy used, with space in between each one for the electrolyte.

Part 5: Conclusion

Suggested Homework Tasks to follow up on this lesson:
Watch the following video https://www.youtube.com/watch?v=7uIIq_Ofzgw
This video explains the process of electrolysis. Using this video, think about how Humphry Davy could have isolated sodium from sodium hydroxide.

Using what you have learnt from this video, find and research 2 examples of how electrolysis is used in our modern day lives. These examples will most likely be examples from industries, such as power companies or farming.

Electro-chemisty is not the only area of science that Davy contributed to. Find and research 2 other ways Davy has contributed to our current scientific knowledge. This can be an invention, or the discovery of something new.

KS4: Task 3: Battery Experiment instructions

Equipment required: (per battery)

- 10 x coins or metal washers
- An A4 sized piece of cardboard
- An A4 sized sheet of aluminium foil
- Vinegar
- 1 x LED light
- Scissors
- Tape

Method:

1. Watch the following video by the Royal Society of Chemistry to construct your own electric battery from coins and cardboard. https://edu.rsc.org/global-experiment/how-to-take-part/investigation-1
2. Predict how many cells you will need to light up your LED
3. Construct one cell and note down whether the LED lights up
4. Repeat step 3, adding a cell to your battery each time, while noting down whether the LED lights up
5. Continue constructing cells until the LED lights up and compare the final number of cells with your initial prediction.
6. See if your initial prediction was true and compare your results with other pairs in your class.

KS4: Question sheet

Answer these questions:

1. **What is the difference between a chemical cell and a battery**

2. What is needed for a chemical cell? How does the material used affect the cell?

3.**What process did Davy use batteries for? Could you describe this process and think of any examples of how it is used today?**

4. **Which elements did Davy manage to isolate with his batteries?**

5. **Take a look at the following image of one of Davy's batteries:**

How is Davy's battery different from yours? Can you identify the components of his battery that match with yours?