

Sample	Concentration (g/L)	Conductivity (mS/cm)
A	2.00	
B	4.00	
C	6.00	
Battery sample		

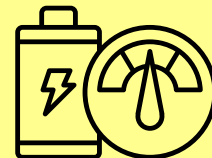
1. Make up dilutions from the stock solution
2. Record the conductivity of the solutions
3. Plot a calibration graph of concentration vs conductivity
4. Measure conductivity of battery sample
5. Use the graph to find the concentration of the battery sample

Concentration on the X-Axis  
 Conductivity on the Y-Axis

Was the prototype  
 battery tampered  
 with?

## The story:

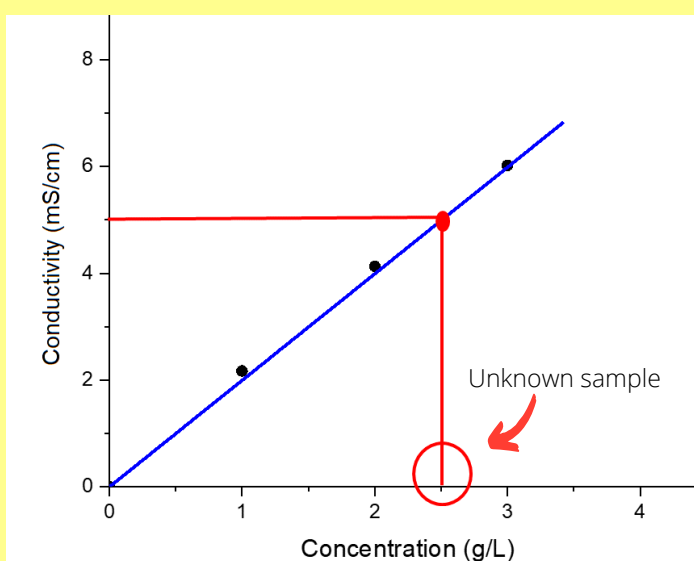
- Prototype battery for smartphones caught on fire
- What happened?
- Concentration of electrolyte? **Part 1: quantitative analysis: Calibration graph**
- Is there a contaminant present? **Part 2: qualitative analysis: ion exchange**



## Definitions/keywords:

- **Ion:** atom or group of atoms which has either lost or gained electrons and has therefore a charge.
- **Electrolyte:** medium containing ions that is electrically conducting through the movement of ions, but not conducting electrons.
- **Conductivity:** measure of a material's ability to conduct an electric current.
- **Resistance:** measure of the opposition to current flow in an electrical circuit.

### Part 1: Calibration graph



### Part 2: Ion exchange

Iron



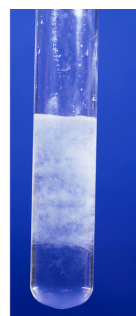
$$\text{FeCl}_3 + 3\text{NaOH} \longrightarrow \text{Fe}(\text{OH})_3 + 3\text{NaCl}$$

Copper



$$\text{CuCl}_2 + 2\text{NaOH} \longrightarrow \text{Cu}(\text{OH})_2 + 2\text{NaCl}$$

Aluminium



$$\text{AlCl}_3 + 3\text{NaOH} \longrightarrow \text{Al}(\text{OH})_3 + 3\text{NaCl}$$

## The suspects



Dr. Blue was researching the battery casing which needs to be **strong**, they previously worked for a different battery company.



Dr. Yellow was researching ways to make the electrodes more **conductive**, she was spotted having an argument with the manager last week.



Dr. Purple was researching ways to make the battery much **lighter** for efficiency, he was fired from a previous job for unknown reasons.