

School of Chemical and Physical Sciences

Te Wānanga Matū

# First Year Online Labs On Screen Experiments

Screen experiments

Agar

Titration



This resource has been developed in partnership with Learning Science and the University of Bristol



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CAPITAL THINKING.  
GLOBALLY MINDED.  
MAI I TE IHO KI TE PAE



VICTORIA UNIVERSITY OF  
WELLINGTON  
TE HERENGA WAKA

# On Screen Experiments

## [Royal Society of Chemistry](#)

**Titration** – Gives the students the opportunity to conduct their own their own titration experiment on a computer or table. This resource also includes a redox titration experiment

**Aspirin** – Gets students running their own organic synthesis on a computer or tablet. This resource also features an in-depth practical guide and a set of worksheets covering the theory

# Titration On Screen Experiment

Experiments home Titration home Log out

## Screen experiments

Logged in as: cjd  
Badges earned 0 / 4

Titration

### Titration level 1

Score: 300 / 1000

Determine the concentration of hydrochloric acid in a contaminated stream by performing a strong acid - strong base titration.

Continue level >  
Restart this level >  
Download lab book

### Titration level 2

Determine the amount of aspirin in a batch of tablets by performing a weak acid - strong base titration.

### Titration level 3

Determine the concentration of ammonia in a consignment of hair product by performing a strong acid - weak base titration.

### Titration level 4

Determine the amount of iron in a batch of diet supplement tablets by performing a redox titration.

### Colours of phenolphthalein indicator

Alkaline End-point

100 cm<sup>3</sup> 100 cm<sup>3</sup>

True False

1. The phenolphthalein indicator is not affected by the pH of the solution.  True  False

2. The phenolphthalein indicator changes colour close to the point of neutralisation which shows the end-point of the titration.  True  False

3. When adding acid to base the phenolphthalein indicator changes colour from colourless to pink at the end of the titration.  True  False

Well done, you have answered each statement correctly.  
Click "Finish" to continue.

→ Finish

### Acids and alkalis

Points available 100

Sodium hydroxide solution (NaOH(aq)) pH 12-14

Hydrochloric acid solution (HCl(aq)) pH 0-2

Water (H<sub>2</sub>O(l)) pH 7

pH Scale

correct pH range for each solution.  
The pH scale can be used to show whether a solution is acidic, alkaline or neutral. An indicator can show us how acidic or alkaline a solution is by relating a colour change to a specific pH range.  
Hint: Click on the pH scale box to help you determine the correct pH.

Check

Acids and alkalis  
Points available 100

Titration: level 1  
Total points 200

### Acids and alkalis

Points available 100

Titration: level 1  
Total points 200



# Titration On Screen Experiment

## Weighing NaOH

Measuring Mass  
Points available 100

Titration: level 1

Total points 300

Well done. This is the amount of sodium hydroxide that you will use to make your standard solution.

The mass has been saved to your lab book.

Click "Finish" to continue.

Finish

Measuring Mass  
Points available 100

Titration: level 1

Total points 300

# Titration On Screen Experiment

Dissolve the sodium hydroxide with distilled water. Transfer it to the volumetric flask (which has already been rinsed with distilled water) and make up the solution to exactly  $250.0 \text{ cm}^3$ . Remember to rinse the beaker so that all of the sodium hydroxide goes into the flask.

Standard solution  
Points available 100

Titration: level 1  
●●●●●●●●

Total points 400

Dissolve the sodium hydroxide with distilled water. Transfer it to the volumetric flask (which has already been rinsed with distilled water) and make up the solution to exactly  $250.0 \text{ cm}^3$ . Remember to rinse the beaker so that all of the sodium hydroxide goes into the flask.

Standard solution  
Points available 100

Titration: level 1  
●●●●●●●●

Total points 400

## Preparing NaOH standard solution

Dissolve the sodium hydroxide with distilled water. Transfer it to the volumetric flask (which has already been rinsed with distilled water) and make up the solution to exactly  $250.0 \text{ cm}^3$ . Remember to rinse the beaker so that all of the sodium hydroxide goes into the flask.

Standard solution  
Points available 100

Titration: level 1  
●●●●●●●●

Total points 400

Dissolve the sodium hydroxide with distilled water. Transfer it to the volumetric flask (which has already been rinsed with distilled water) and make up the solution to exactly  $250.0 \text{ cm}^3$ . Remember to rinse the beaker so that all of the sodium hydroxide goes into the flask.

Magnification of the volume level

Standard solution  
Points available 100

Titration: level 1  
●●●●●●●●

Total points 400

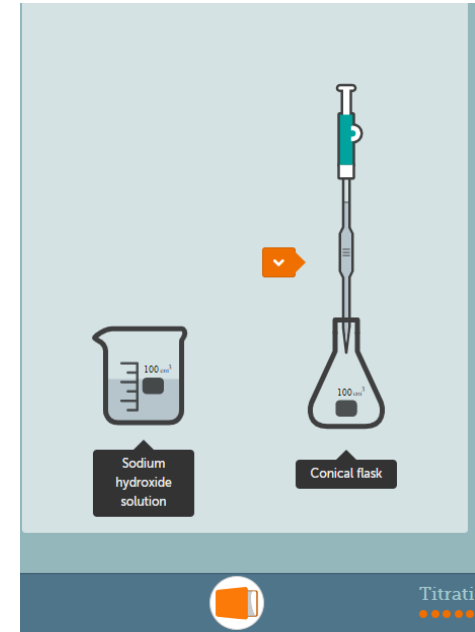
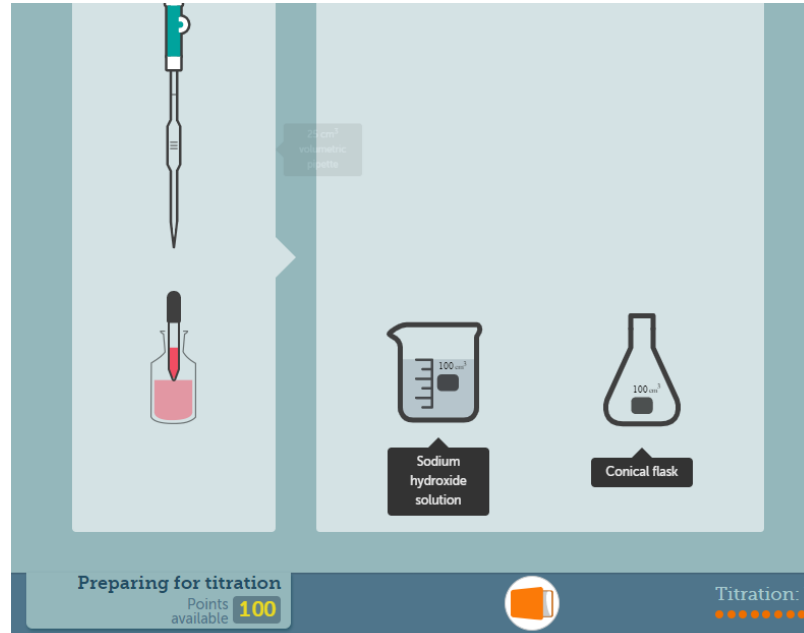
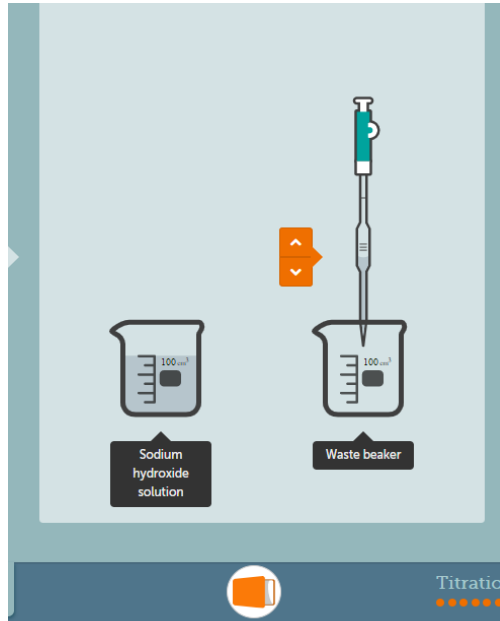
# Titration On Screen Experiment

## Calculating concentration of NaOH standard solution

The interface is divided into several sections:

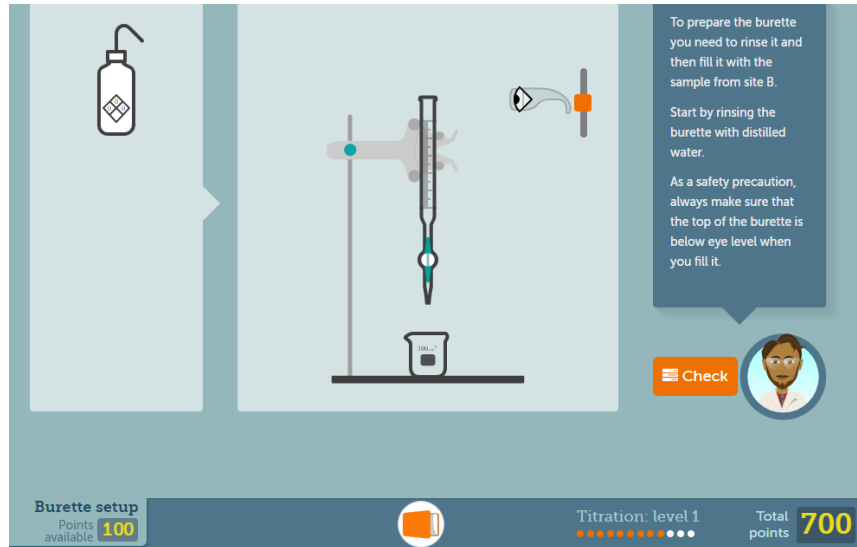
- Top Left:** A triangular diagram showing the relationship between Mass (g), Amount of substance (mol), and Molar Mass (g mol<sup>-1</sup>). Below it is a text box: "Amount of substance (mol) = ". To the right are buttons for "Mass", "Volume", "Amount of substance", "Concentration", "Density", and "Molar mass".
- Top Right:** A formula box: 
$$\text{concentration, } c \text{ (mol dm}^{-3}\text{)} = \frac{\text{amount of substance, } n \text{ (mol)} \times 1000}{\text{volume, } V \text{ (cm}^3\text{)}}$$
 Below this are input fields: "amount of NaOH (mol) = ", "volume of NaOH (cm<sup>3</sup>) = ", and "concentration of NaOH (mol dm<sup>-3</sup>) = ".
- Bottom Right:** A calculation area showing the steps: 
$$\text{Concentration, } c \text{ (mol dm}^{-3}\text{)} = \frac{0.0250 \times 1000}{250.0} = 0.10$$
- Far Right:** A green feedback box: "Well done. You have calculated the concentration (mol dm<sup>-3</sup>) of the NaOH(aq) solution. Click 'Finish' to continue." with a "Finish" button.
- Bottom Bar:** A navigation bar with a "Check" button, a character icon, and a progress indicator. On the left, it says "Alkali concentration" with "Points available 100". On the right, it says "Titration: level 1" with a progress bar and "Total points 500".

# Titration On Screen Experiment



Transferring NaOH solution into conical flask  
Rinsing pipette  
Addition of indicator

# Titration On Screen Experiment



The screenshot shows the 'Rinsing burette' step. On the left, there is a bottle of distilled water. In the center, a burette is mounted on a stand over a beaker. An eye icon indicates the correct eye level for filling. On the right, a text box provides instructions: 'To prepare the burette you need to rinse it and then fill it with the sample from site B. Start by rinsing the burette with distilled water. As a safety precaution, always make sure that the top of the burette is below eye level when you fill it.' Below the text box is a 'Check' button and a character icon. At the bottom, a status bar shows 'Burette setup' with 100 points available, 'Titration: level 1' with a progress indicator, and 'Total points 700'.

To prepare the burette you need to rinse it and then fill it with the sample from site B.

Start by rinsing the burette with distilled water.

As a safety precaution, always make sure that the top of the burette is below eye level when you fill it.

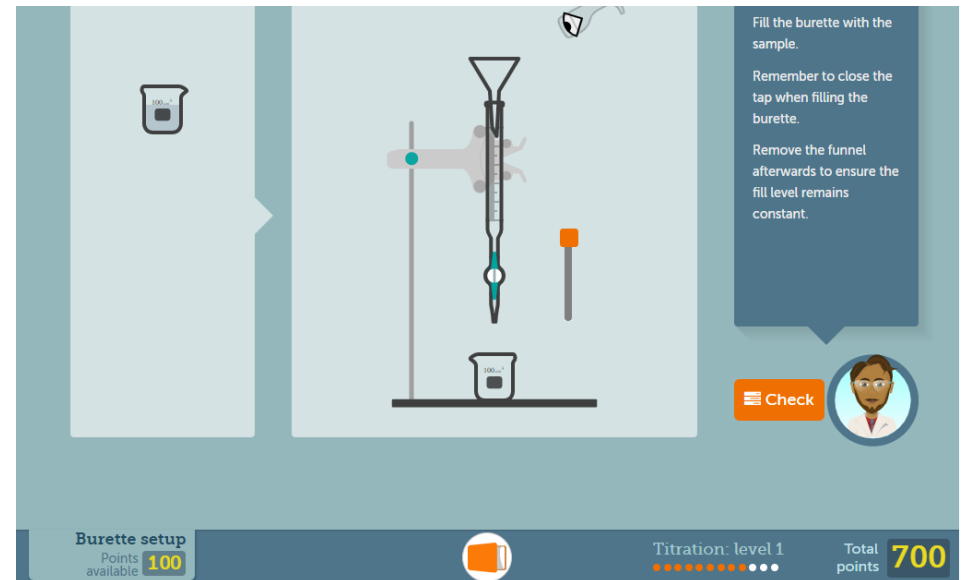
Check

Burette setup  
Points available 100

Titration: level 1

Total points 700

## Rinsing burette



The screenshot shows the 'Adding HCl solution to the burette' step. On the left, there is a beaker containing a sample. In the center, a funnel is placed over the burette, which is mounted on a stand over a beaker. An eye icon indicates the correct eye level. On the right, a text box provides instructions: 'Fill the burette with the sample. Remember to close the tap when filling the burette. Remove the funnel afterwards to ensure the fill level remains constant.' Below the text box is a 'Check' button and a character icon. At the bottom, a status bar shows 'Burette setup' with 100 points available, 'Titration: level 1' with a progress indicator, and 'Total points 700'.

Fill the burette with the sample.

Remember to close the tap when filling the burette.

Remove the funnel afterwards to ensure the fill level remains constant.

Check

Burette setup  
Points available 100

Titration: level 1

Total points 700

## Adding HCl solution to the burette

# Titration On Screen Experiment

4x zoom

Reset

Start

Stop

Sample site B

Trial	1st accurate titration	2nd accurate titration
Final reading (cm <sup>3</sup> )		
Initial reading (cm <sup>3</sup> )	10.00	
Volume added (cm <sup>3</sup> )		
Average volume added (cm <sup>3</sup> )		

4x zoom

Help reading a burette

4x zoom

Sample site B

Trial	1st accurate titration	2nd accurate titration	
Final reading (cm <sup>3</sup> )	26.45	24.85	
Initial reading (cm <sup>3</sup> )	10.00	8.05	8.15
Volume added (cm <sup>3</sup> )	16.45	16.80	
Average volume added (cm <sup>3</sup> )			

That's right. You've correctly identified the end-point of the titration.  
Click 'Next' to continue.

Next

Titration experiment  
Points available 90

Titration: level 1  
Total points 800

Carrying out the titration  
Trial run and then multiple runs

4x zoom

Sample site C

Trial	1st accurate titration	2nd accurate titration	
Final reading (cm <sup>3</sup> )	36.00	37.60	36.10
Initial reading (cm <sup>3</sup> )	9.05	9.55	8.05
Volume added (cm <sup>3</sup> )	26.95	28.05	28.05
Average volume added (cm <sup>3</sup> )	28.05		

4x zoom

Help reading a burette

Titration experiment  
Points available 90

# Aspirin On Screen Experiment

## Screen experiments

Aspirin

Logged in as:   
 Badges earned 2 /

**Aspirin level 1**  
Score: 890 / 900  
Prepare your own aspirin, learn about the procedure and work out how much you produced.

Continue level >  
Restart this level >  
Download lab book  
Unlocked activities >

**Aspirin level 2**  
Purify crude aspirin by recrystallisation and use thin layer chromatography.

**Aspirin level 3**  
Explore variables for the synthesis of aspirin. Can you determine the optimal conditions?

**Aspirin level 4**  
Investigate the effect of different reagents. Which is the best for industrial scale production?

Aspirin screen experiment: Background

ROYAL SOCIETY OF CHEMISTRY

0:01 / 1:41

Watch this video about aspirin and then click on the "Next" button to review your knowledge.

Next



Well done. You have learnt about the background of aspirin and have collected more points. Click 'Finish' to continue.

Finish

Comprehension

Points available 90

Aspirin: level 1

Total points 100

asthma  
eczema

Aspirin is commonly used to provide pain relief but also may be used to treat heart disease.

1 million  
1 billion

Around 100 billion aspirin tablets are produced every year.

halogenation  
hydrolysis

The type of reaction which takes place in the synthesis of aspirin is esterification.

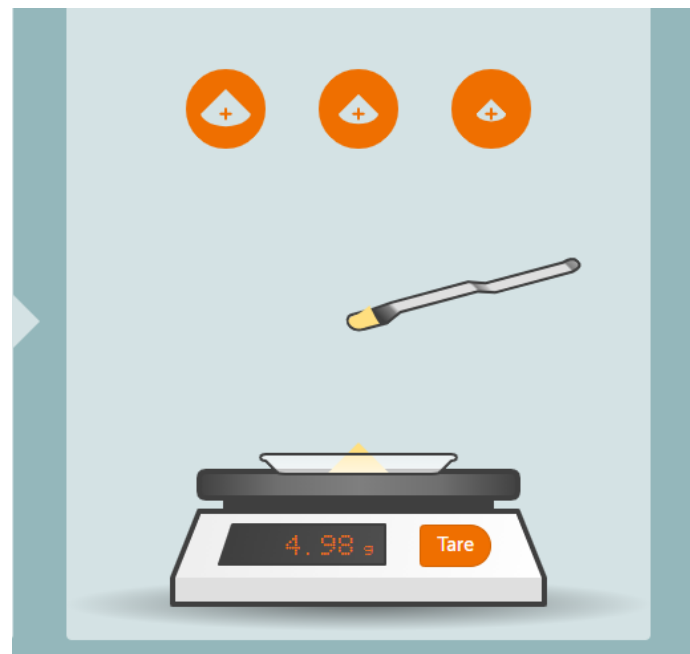
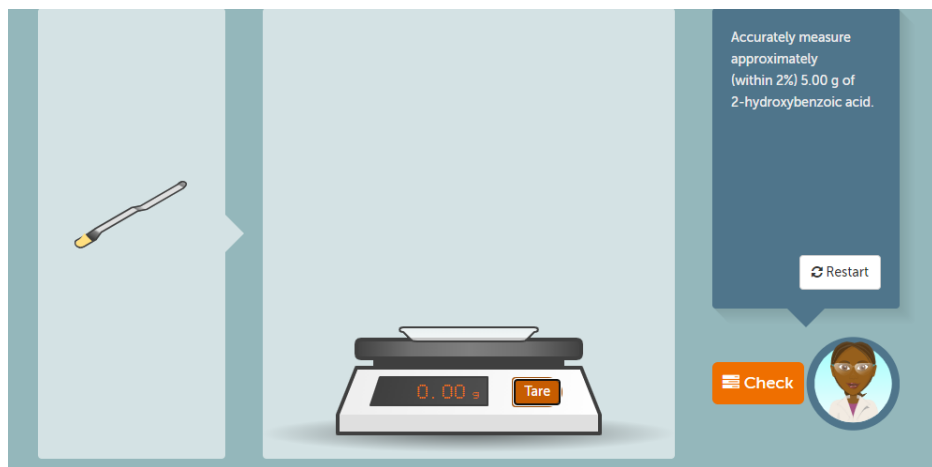
oxidising  
flammable

Ethanoic anhydride can also be categorised using the hazard symbol shown which means irritant.

flame

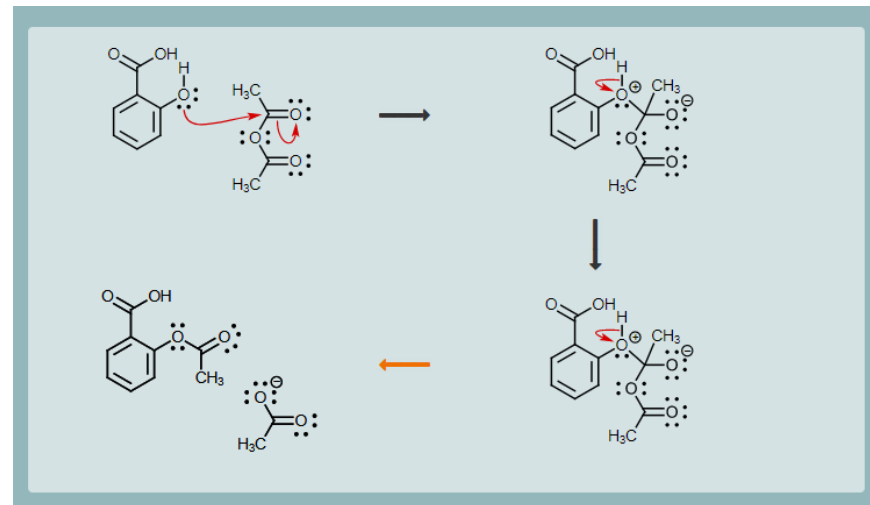
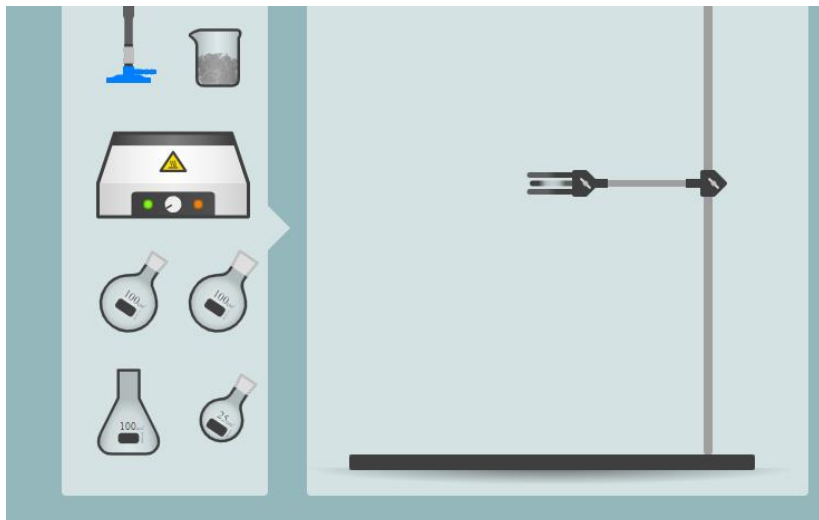
Ethanoic anhydride is a corrosive chemical. The hazard symbol for corrosive is:

# Aspirin On Screen Experiment

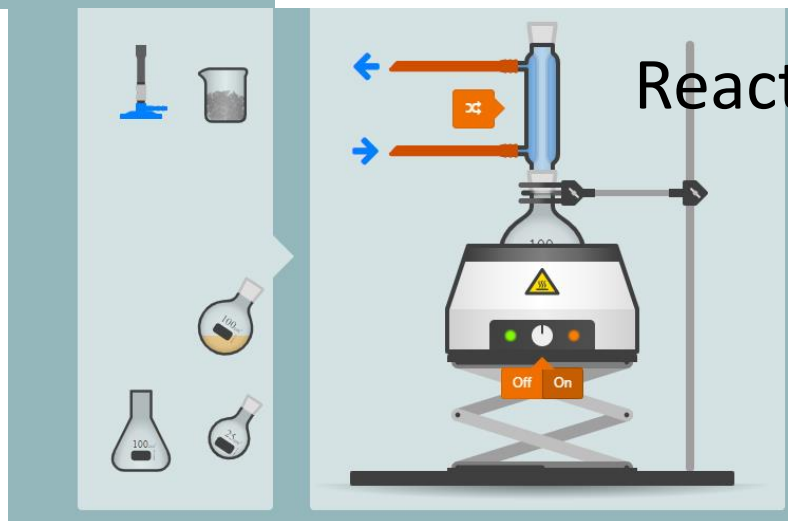


Weighing starting materials

# Aspirin On Screen Experiment

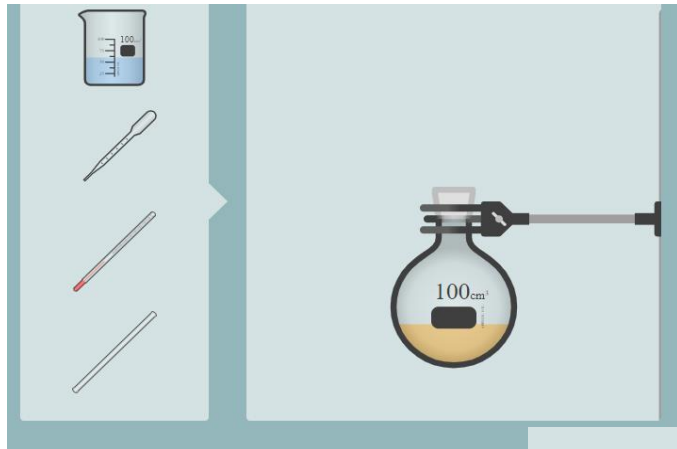


Reflux Set Up



Reaction Mechanism

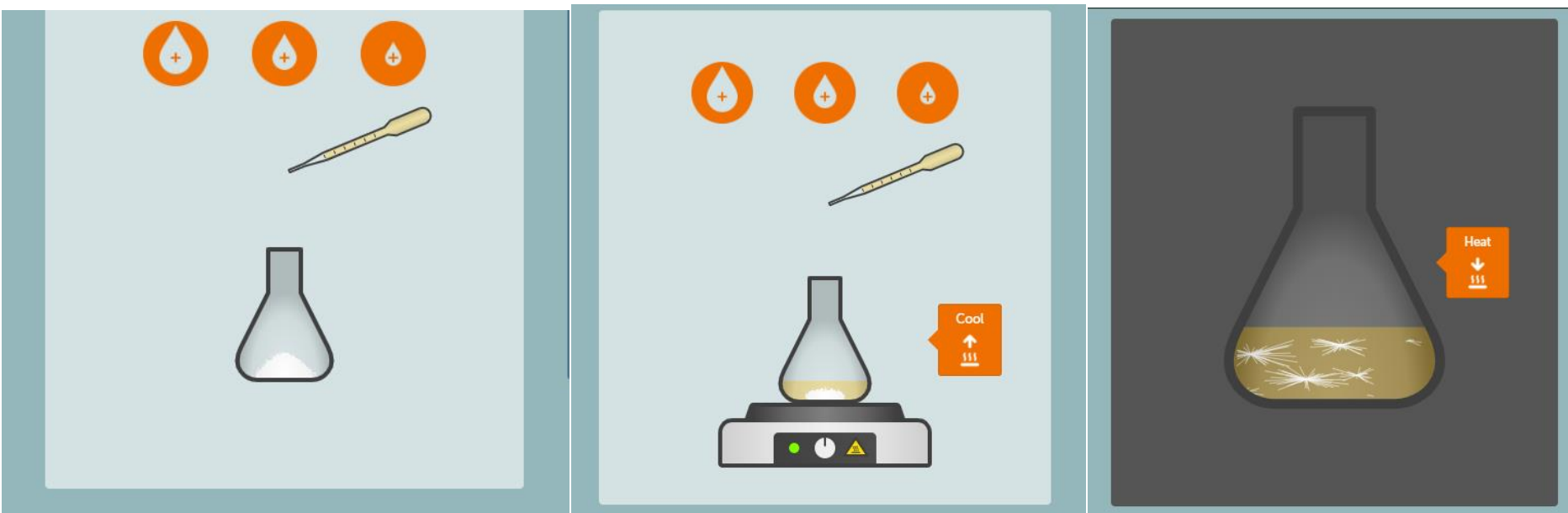
# Aspirin On Screen Experiment



Isolating crude  
aspirin  
via precipitation

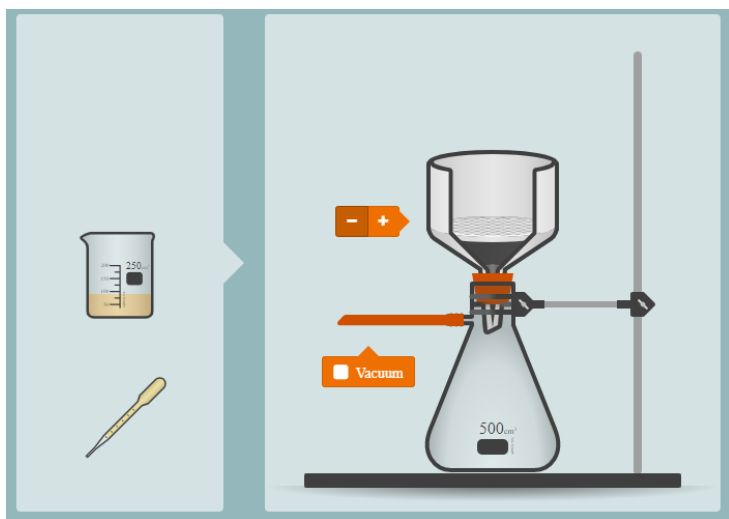


# Aspirin On Screen Experiment

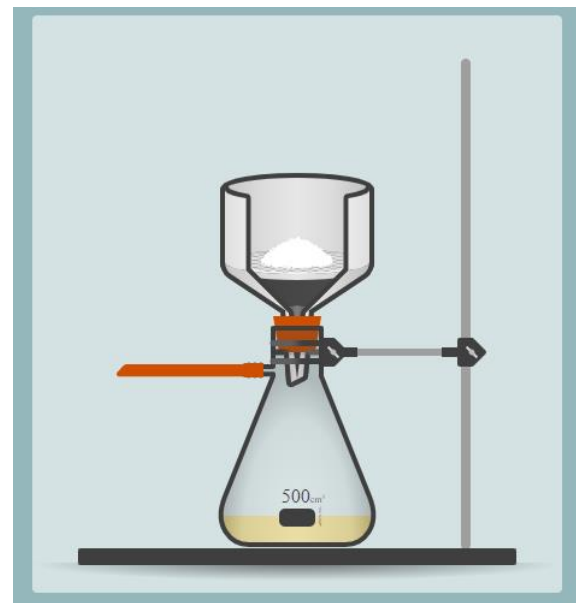
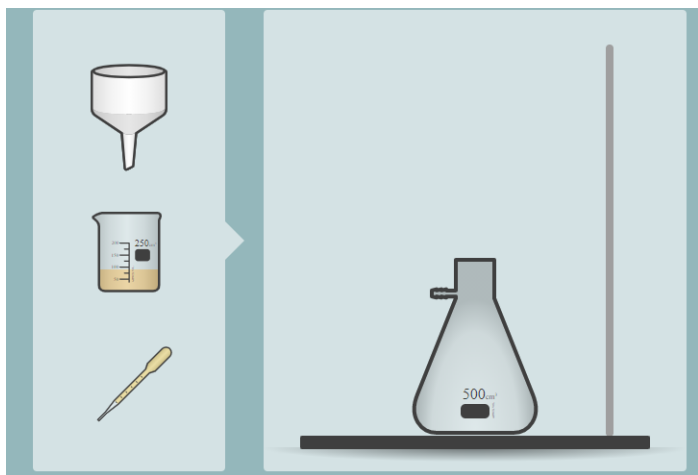


## Recrystallization

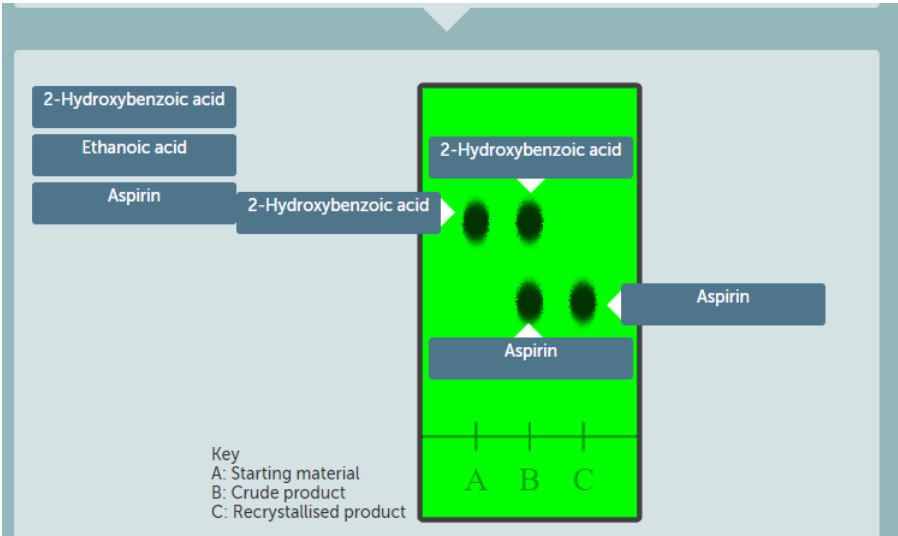
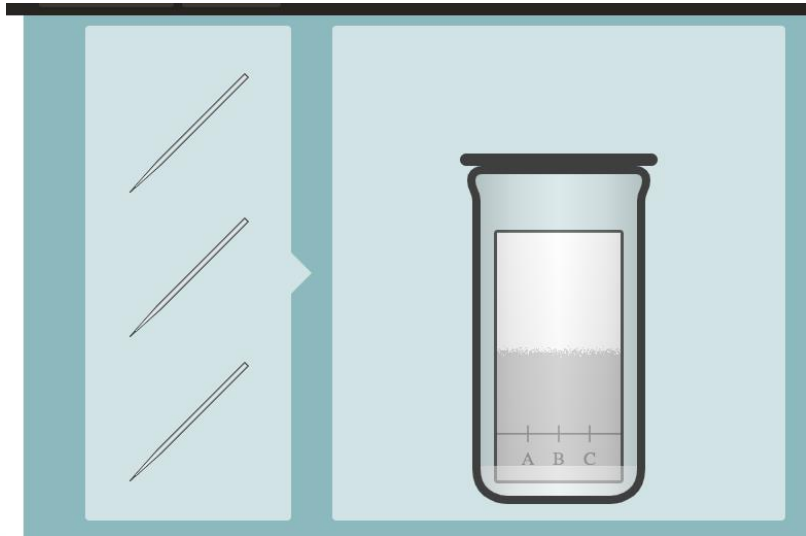
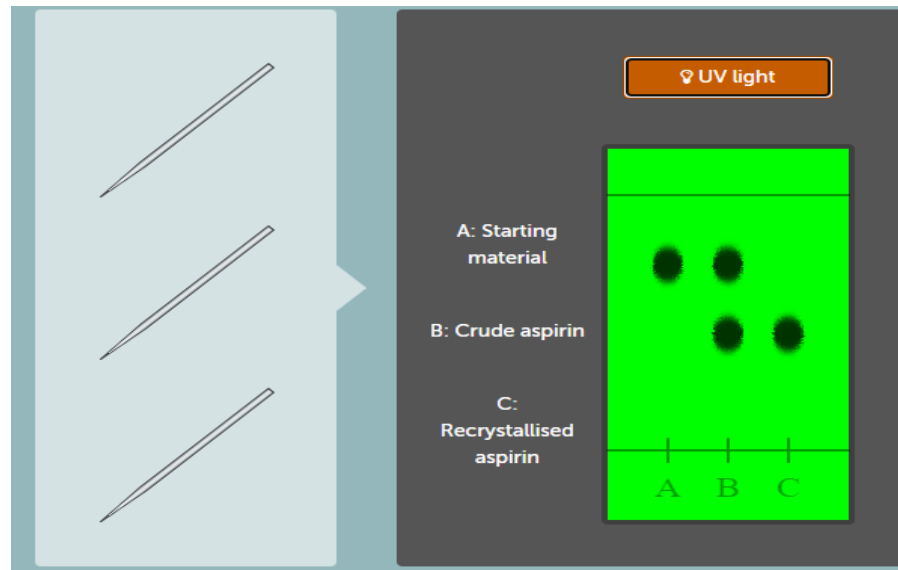
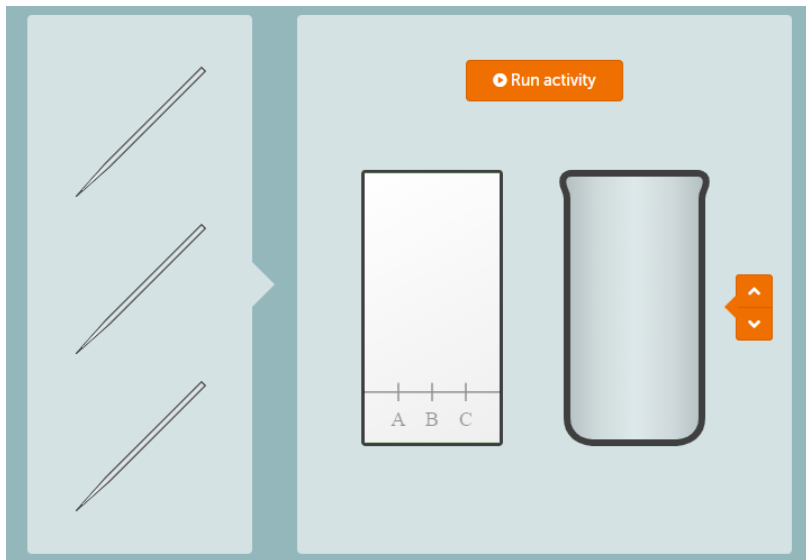
# Aspirin On Screen Experiment



Vacuum filtration  
to collect  
purified aspirin



# Aspirin On Screen Experiment



# Additional Notes

- [Titration Teacher Notes](#)
- [Aspirin Teacher Notes](#)
- <https://edu.rsc.org/resources/collections/screen-experiments> (Overview)
- User number: 1639748365