GCSE Chemistry: Required practical handbook

Paper 1: required practical

Making salts - Combined and Separates

Neutralisation - Separates only

Electrolysis - Combined and Separates

Temperature changes - Combined and Separates

Paper 2: required practical

Rates of reaction - Combined and Separates

Chromatography - Combined and Separates

Water purification - Combined and Separates

Identifying ions – Separates only

GCSE Chemistry required practical activity: Making salts

Student sheet

Preparation of pure dry copper sulfate crystals

You will react an acid and an insoluble base to prepare an aqueous solution of a salt. The unreacted base from the reaction will need to be filtered. You will evaporate the filtrate to leave a concentrated solution of the salt, which will crystallise as it cools and evaporates further. When dry the crystals will have a high purity.

Risk assessment

- Safety goggles must be worn throughout.

Method

You are provided with the following:

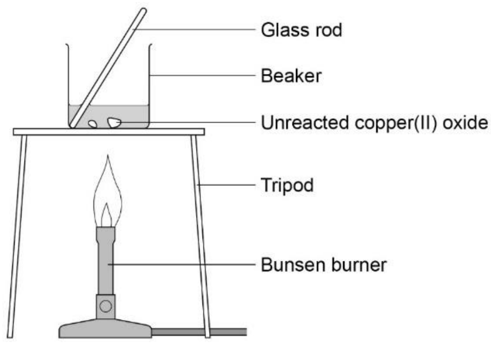
- 40 cm^3 1.0 M dilute sulfuric acid
- copper (II) oxide powder
- spatula
- glass rod
- 100 cm^3 beaker
- Bunsen burner
- tripod
- gauze
- heatproof mat
- filter funnel and paper
- clamp stand
- conical flask
- 250 cm^3 beaker
- evaporating basin
- crystallising dish

Read these instructions carefully before you start work.

1. Measure 40 cm^3 sulfuric acid into the 100 cm^3 beaker.

   The volume does not need to be very accurate, so you can use the graduations on the beaker.

2. Set up the tripod, gauze and heatproof mat. Heat the acid **gently** using the Bunsen burner until it is almost boiling. Turn off the Bunsen burner.



3. Use the spatula to add **small** amounts of copper (II) oxide powder. Stir with the glass rod.

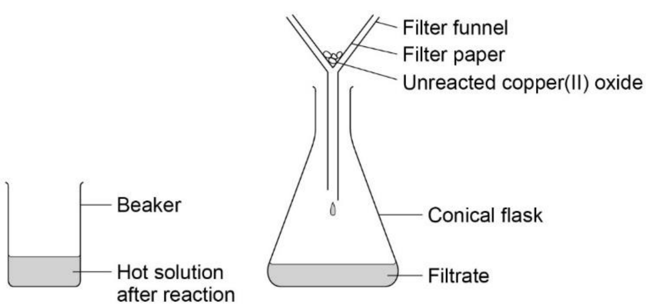
   Continue to add copper (II) oxide if it keeps disappearing when stirred. When the copper (II) oxide disappears the solution is clear blue.

4. Stop adding the copper (II) oxide when some of it remains after stirring.

   Allow apparatus to cool completely.

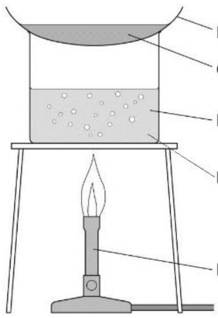
5. Set up the filter funnel and paper over the conical flask. Use the clamp stand to hold the funnel.

   Filter the contents of the beaker from step **3**.



6. When filtration is complete, pour the contents of the conical flask into the evaporating basin.

   Evaporate this gently using a water bath (250 cm^3 beaker with boiling water) on the tripod and gauze (see diagram). Stop heating once crystals start to form.



7. Transfer the remaining solution to the crystallising dish. Leave this in a cool place for **at least 24 hours**.

8. Remove the crystals from the concentrated solution with a spatula. **Gently** pat the crystals dry between two pieces of filter paper.

   These are pure dry crystals of copper (II) sulfate.

SEPARATES ONLY - GCSE Chemistry required practical activity: Neutralisation

Student sheet – <u>Foundation Tier</u>

Investigation to find the volume of dilute sulfuric acid needed to neutralise a known volume of sodium hydroxide solution

You will find the volume of dilute sulfuric acid needed to neutralise 25 cm^3 of sodium hydroxide solution. Observing the colour change in an acid-base indicator is used to do this.

Risk assessment

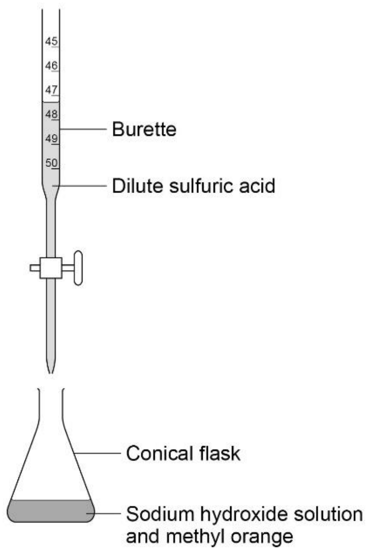
- Safety goggles must be worn throughout.

Method

You are provided with the following:

- 25cm^3 volumetric pipette and pipette filler
- Burette, small funnel and clamp stand
- 250cm^3 conical flask
- White tile
- Dilute sulfuric acid
- Sodium hydroxide solution
- Methyl orange indicator.

Read these instructions carefully before you start work.



1. Use the pipette and pipette filler to put exactly 25 cm^3 sodium hydroxide solution into the conical flask. Your teacher will show you how to do this.

   Stand the flask on a white tile.

2. Clamp the burette vertically in the clamp stand about halfway up its length.

   There should be just enough room underneath for the conical flask and tile.

3. Close the burette tap.

   Use the small funnel to carefully fill the burette with dilute sulfuric acid to the 0 cm^3 line.

You should do this at a low level so that you are not pouring acid from above head height. For example, put the clamp stand temporarily on a lab stool or the floor.

4. Put 5–10 drops of methyl orange indicator into the conical flask. Swirl to mix and place under the burette with the tile.

5. Carefully open the tap so that sulfuric acid flows into the flask at a drop by drop rate.

   Constantly swirl the flask when adding the acid. Look for a colour change from yellow to red in the indicator.

6. There will be signs that the colour change is close to being permanent. When this happens use the tap to slow the drops down.

   You need to be able to shut the tap immediately after a single drop of acid causes the colour to become permanently red.

7. Read the burette scale carefully and record the volume of acid you added. You can use a table such as the one below.

Volume of dilute sulfuric acid needed to neutralise 25cm^3 sodium hydroxide solution (cm^3)			
Trial 1	**Trial 2**	**Trial 3**	**Mean**
23.50	23.45	23.40	

8. Repeat steps **1–7** twice more and record the results in the table.

9. Calculate the mean value for the volume of acid needed to neutralise 25 cm^3 of the sodium hydroxide solution. Record this value in the final space in the table.

SEPARATES ONLY - GCSE Chemistry required practical activity: Neutralisation

Student sheet – <u>Higher Tier</u>

Investigation to find the concentration of a dilute sulfuric acid solution using a sodium hydroxide solution of known concentration

You will find the volume of dilute sulfuric acid needed to neutralise 25 cm^3 of 0.5 mol/dm^3 sodium hydroxide solution. Observing the colour change in an acid-base indicator is used to do this.

The sulfuric acid has an unknown concentration. You also calculate the concentration of the sulfuric acid used in mol/dm^3 and g/dm^3.

Risk assessment

- Safety goggles should be worn throughout.

Method

You are provided with the following:

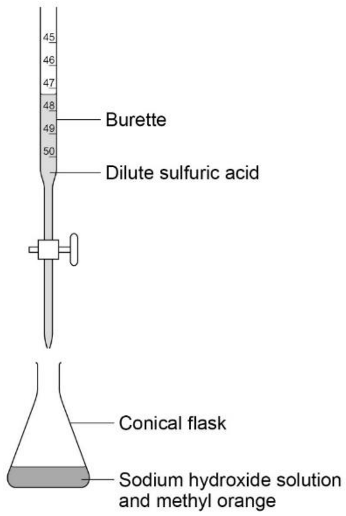
- 25 cm^3 volumetric pipette and pipette filler
- burette
- small funnel
- clamp stand
- 250 cm^3 conical flask
- white tile
- dilute sulfuric acid of unknown concentration
- 0.1 mol/dm^3 sodium hydroxide solution
- methyl orange indicator.

Read these instructions carefully before you start work.

1. Use the pipette and pipette filler to put exactly 25 cm^3 sodium hydroxide solution into the conical flask. Your teacher will show you how to do this.

   Stand the flask on a white tile.

2. Clamp the burette vertically in the clamp stand about halfway up its length.



There should be just enough room underneath for the conical flask and tile.

3. Close the burette tap.

   Use the small funnel to carefully fill the burette with dilute sulfuric acid to the 0 cm^3 line.

   You should do this at a low level so that you are not pouring acid from above head height. For example put the clamp stand temporarily on a lab stool or the floor.

4. Put 5–10 drops of methyl orange indicator into the conical flask. Swirl to mix and place under the burette with the tile.

5. Carefully open the tap so that sulfuric acid flows into the flask at a drop by drop rate.

   Constantly swirl the flask when adding the acid. Look for a colour change from yellow to red in the indicator.

6. There will be signs that the colour change is close to being permanent. When this happens use the tap to slow the drops down.

   You need be able to shut the tap immediately after a single drop of acid causes the colour to become permanently red.

7. Read the burette scale carefully and record the volume of acid you added. You can use a table such as the one below.

Volume of dilute sulfuric acid needed to neutralise 25cm^3 sodium hydroxide solution (cm^3)			
Trial 1	**Trial 2**	**Trial 3**	**Mean**
23.50	23.45	23.40	

8. Repeat steps **1–7** twice more and record the results in the table.

9. Calculate the mean value for the volume of acid needed to neutralise 25 cm^3 of the sodium hydroxide solution. Record this value in the final space in the table.

   Use your mean result to calculate the concentration of the acid in mol/dm^3 and g/dm^3 using the following calculation steps.

Calculations

Step 1

Concentration (mol/dm^3) = number of moles ÷ volume of solution (dm^3)

Moles of sodium hydroxide in 25 cm^3 = concentration × volume = 0.1 mol/dm^3 × (25 ÷ 1000) dm^3

= ______________ moles

Step 2

Equation: $2NaOH + H_2SO_4 \rightarrow Na_2SO_4 + 2H_2O$

This shows that **two** moles of sodium hydroxide neutralise **one** mole of sulfuric acid.

So moles of sulfuric acid used = (answer from step **1**) ÷ 2

= ______________ moles

Step 3

Concentration of sulfuric acid (mol/dm^3) = moles ÷ mean volume of acid

= (answer from step **2**) ÷ (mean volume from table ÷ 1000)

= ______________ mol/dm^3

Step 4

Number of moles = mass of substance (g) ÷ M_r of substance

A_r (H) = 1; A_r (O) = 16; A_r (S) = 3

M_r (H_2SO_4) = ______________

Concentration of sulfuric acid (g/dm^3) = (answer from step **3**) x M_r (H_2SO_4)

= ______________ g/dm^3

GCSE Chemistry required practical activity: Electrolysis

Student sheet

Investigating the elements formed at each electrode when different salt solutions are electrolysed

You will use a low voltage power supply and carbon rod electrodes to pass a current through four different salt solutions. You will identify the element formed at the positive and negative electrode in each case.

Risk assessment

- Safety goggles should be worn throughout.

Method

You are provided with the following:

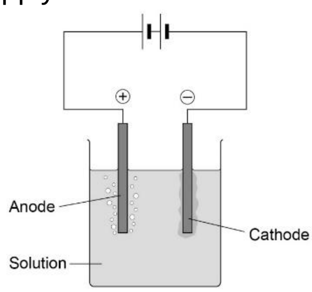
- copper (II) chloride solution
- copper (II) sulfate solution
- sodium chloride solution
- sodium sulfate solution
- 100 cm^3 beaker
- petri dish lid
- two carbon rod electrodes
- two crocodile/4 mm plug leads
- low voltage power supply
- blue litmus paper
- tweezers.

Read these instructions carefully before you start work.

1. Pour copper (II) chloride solution into the beaker to about 50 cm^3.

2. Add the lid and insert carbon rods through the holes. **The rods must not touch each other**.

   Attach crocodile leads to the rods. Connect the rods to the **dc (red and black)** terminals of a low voltage power supply.



3. Select 4 V on the power supply and switch on.

4. Look at both electrodes. Is there bubbling at neither, one or both electrodes?

5. Use tweezers to hold a piece of blue litmus paper in the solution next to the positive electrode (the one connected to the red terminal). You will need to lift the lid temporarily to do this.

   Write your observations in the first blank row of the table below. What is this element?

Solution	Positive electrode (anode)		Negative electrode (cathode)	
	Observations	**Element formed**	**Observations**	**Element formed**
Copper (II) chloride	**Bubbles produced Turns litmus paper white (bleaches)**		**Solution loses its blue colour A thin metallic cover formed on the electrode**	
Copper (II) sulfate	**Bubbles produced Litmus paper stays blue**		**Solution loses its blue colour A thin metallic cover formed on the electrode**	
Sodium chloride	**Bubbles produced Turns litmus paper white (bleaches)**		**Bubbles produced**	
Sodium sulfate	**Bubbles produced Litmus paper stays blue**		**Bubbles produced**	

6. After no more than five minutes, switch off the power supply. Examine the negative electrode (the one connected to the black terminal). Is there evidence of a metal coating on it? What could it be? Record your results in the table.

7. Clean the equipment carefully. Repeat steps **1–6** using solutions of:
   - copper (II) sulfate
   - sodium chloride
   - sodium sulfate.

Additional information

Gas produced at the positive electrode which does **not** bleach blue litmus paper, is oxygen. The amounts produced are usually too small to identify by testing.

If a gas is produced at the negative electrode, it is hydrogen. The amounts produced are usually too small to identify by testing.

GCSE Chemistry required practical activity: Temperature changes

Student sheet

Investigation of the temperature changes which take place when an acid is neutralised by an alkali

You will monitor the temperature rise as small volumes of sodium hydroxide solution are added to dilute hydrochloric acid. The acid will be contained in an insulated cup.

Plot a graph of your results. Determine how much sodium hydroxide was needed to fully react with the acid.

Risk assessment

- Safety goggles should be worn throughout.

Method

You are provided with the following:

- 2 M dilute hydrochloric acid
- 2 M sodium hydroxide solution
- expanded polystyrene cup and lid
- 250 cm^3 beaker
- 10 cm^3 measuring cylinder
- 50 cm^3 measuring cylinder
- thermometer.

Read these instructions carefully before you start work.

1. Use the 50 cm^3 measuring cylinder to put 30 cm^3 dilute hydrochloric acid into the polystyrene cup.

2. Stand the cup inside the beaker. This will make it more stable.

3. Use the thermometer to measure the temperature of the acid. Record it in the first blank column of the table such as the one below.

4. Put 5 cm^3 sodium hydroxide solution into the 10 cm^3 measuring cylinder.

5. Pour the sodium hydroxide into the cup. Fit the lid and gently stir the solution with the thermometer through the hole.

   When the reading on the thermometer **stops changing**, write the temperature in the next space in the table.

6. Repeat steps **4** and **5** to add further 5 cm^3 amounts of sodium hydroxide to the cup. A total of 40 cm^3 needs to be added.

   The last few additions should produce a temperature fall rather than a rise.

7. Repeat steps **1–6** and record the results in the second blank column of the table.

8. Calculate the **mean** maximum temperature reached for each of the sodium hydroxide volumes. Record these means in the third blank column.

Total volume of sodium hydroxide added in cm^3	**Maximum temperature in ^{o}C**		
	First trial	**Second trial**	**Mean**
0	23.0	25.0	
5	25.0	27.0	
10	27.0	29.0	
15	29.0	31.0	
20	31.0	33.0	
25	33.0	35.0	
30	34.0	36.0	
35	32.0	34.0	
40	30.0	32.0	

9. Plot a graph with:

   - ‘Mean maximum temperature in ^{o}C’ on the y-axis
   - ‘Total volume of sodium hydroxide added in cm^3’ on the x-axis.

   Draw two straight lines of best fit:

   - one through the points which are increasing
   - one through the points which are decreasing.

   Ensure the two lines are extended so they cross each other.

10. Use the graph to estimate how much sodium hydroxide solution was needed to neutralise 25 cm^3 dilute hydrochloric acid.

GCSE Chemistry required practical activity: Rates of reaction

Student sheet

Investigation into how the concentration of a solution affects the rate of a chemical reaction

There are two parts to this practical which investigate how the rate of reaction can be measured.

Activity 1: Observing colour change

You will react sodium thiosulfate with hydrochloric acid. You will then find out how the rate of reaction changes as the thiosulfate solution becomes more dilute.

Activity 2: Measuring the volume of gas produced

You will react magnesium ribbon and hydrochloric acid. You will then find out how the rate of reaction is affected by the concentration of the acid.

Risk assessment

- Safety goggles should be worn throughout.

Method

Activity 1: Observing colour change

You are provided with the following:

- 40 g/dm^3 sodium thiosulfate solution
- 2.0 M dilute hydrochloric acid
- 10 cm^3 measuring cylinder
- 100 cm^3 measuring cylinder
- 100 cm^3 conical flask
- printed black paper cross
- stopclock.

Read these instructions carefully before you start work.

1. Use a measuring cylinder to put 10 cm^3 sodium thiosulfate solution into the conical flask.

   Use the measuring cylinder to then add 40 cm^3 water. This dilutes the sodium thiosulfate solution to a concentration of 8 g/dm^3.

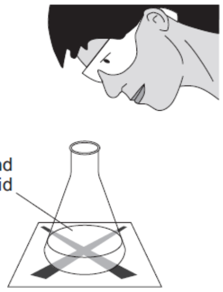
   Put the conical flask on the black cross.

2. Put 10 cm^3 of dilute hydrochloric acid into the 10 cm^3 measuring cylinder.

3. Put this acid into the flask. At the same time swirl the flask gently and start the stopclock.

4. Look down through the top of the flask. Stop the clock when you can no longer see the cross.

   Take care to avoid breathing in any sulfur dioxide fumes.



5. Write the time it takes for the cross to disappear in the first blank column of the table such as the one below. Record the time **in seconds**.

   You will need to multiply any minutes by 60 and then add the extra seconds.

Concentration of sodium thiosulfate in g/dm^3	**Time taken for cross to disappear in seconds**			
	First trial	**Second trial**	**Third trial**	**Mean**
8	197	200	205	
16	108	100	98	
24	50	46	51	
32	19	21	20	
40	9	8	11	

6. Repeat steps **1–5** four times, **but in step 1 use:**
   - 20 cm^3 sodium thiosulfate + 30 cm^3 water (concentration 16 g/dm^3)
   - 30 cm^3 sodium thiosulfate + 20 cm^3 water (concentration 24 g/dm^3)
   - 40 cm^3 sodium thiosulfate + 10 cm^3 water (concentration 32 g/dm^3)
   - 50 cm^3 sodium thiosulfate + no water (concentration 40 g/dm^3)

7. Then repeat the **whole investigation** (steps **1–5**) twice more.

   Record the results in the second and third blank columns of the table.

8. Calculate the **mean** time for each of the sodium thiosulfate concentrations. Leave out anomalous values from your calculations.

   Record the means in the fourth blank column.

9. Plot a graph with:
   - 'mean time taken for cross to disappear in seconds' on the y-axis
   - 'Sodium thiosulfate concentration in g/dm^3' on the x-axis

   Draw a smooth curved line of best fit.

   What can you say about the effect of the independent variable (concentration) on the dependent variable (time taken for the cross to disappear)? What were your control variables?

   Activity 2: Measuring the volume of gas produced

You are provided with the following:

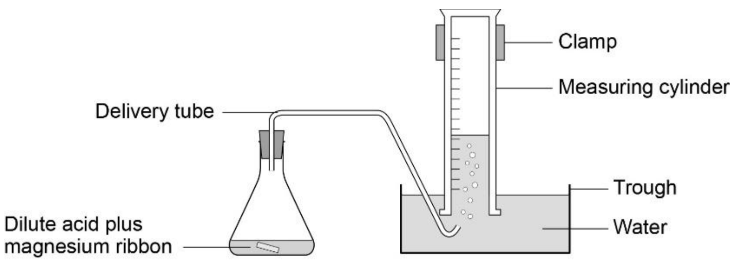
- safety goggles
- conical flask (100 cm^3)
- single-holed rubber bung and delivery tube to fit conical flask
- trough or plastic washing-up bowl
- two measuring cylinders (100 cm^3)
- clamp stand, boss and clamp
- stop clock
- graph paper
- magnesium ribbon cut into 3 cm lengths
- dilute hydrochloric acid, (2.0 M, and 1.0 M).

Read these instructions carefully before you start work.

1. Measure 50 cm^3 of 2.0 M hydrochloric acid using one of the measuring cylinders. Pour the acid into the 100 cm^3 conical flask.

2. Set up the apparatus as shown in the diagram.

   Half fill the trough or bowl with water.



3. Fill the other measuring cylinder with water. Make sure it stays filled with water when you turn it upside down.
4. When you are ready, add a 3 cm strip of magnesium ribbon to the flask, put the bung back into the flask as quickly as you can, and start the stopclock.
5. Record the volume of hydrogen gas given off at suitable intervals (eg 10 seconds) in a table such as the one below.

   Continue timing until no more gas appears to be given off.

Time in seconds	Volume of gas produced for 2.0 M hydrochloric acid in cm^3
10	30.0
20	40.0
30	50.0
40	55.0
50	57.0
60	58.0
70	58.0
80	58.0
90	58.0
100	58.0

6. Repeat steps **1-5** using 1.0 M hydrochloric acid.
7. Plot a graph with:
   - 'Volume of gas produced in cm^3 (for 2.0 M hydrochloric acid)' on the y-axis
   - 'Time in seconds' on the x-axis

   Draw a smooth curved line of best fit

8. Plot a curve for 1.0 M hydrochloric acid on the same graph.
9. Use this graph to compare the rates of reaction of 1.0 M and 2.0 M hydrochloric acid with magnesium
10. Compare your results with the data collected in **Activity 1.**
11. Use kinetic theory to explain your findings.

GCSE Chemistry required practical activity: Chromatography

Student sheet

Investigation into the use of paper chromatography to separate and identify a mixture of food colourings

You will use paper chromatography to separate the different colours present in an unknown mixture of food colourings. You will then measure the distance travelled by each colour and the solvents to calculate R_f values.

Risk assessment

- Safety goggles should be worn throughout.

Method

You are provided with the following:

- 250 cm^3 beaker
- glass rod
- a rectangle of chromatography paper
- four known food colourings labelled **A**-**D**
- an **unknown mixture** of food colourings labelled **U**
- glass capillary tubes.

Read these instructions carefully before you start work.

1. Use a ruler to draw a horizontal pencil line 2 cm from a short edge of the chromatography paper.

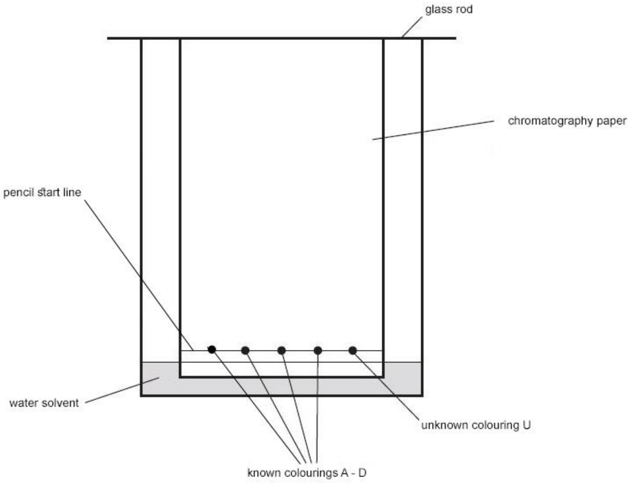
   Mark five pencil spots at equal intervals across the line. Keep at least 1 cm away from each end.
2. Use a glass capillary tube to put a small spot of each of the known colourings on four of the pencil spots. Then use the glass capillary tube to put a small spot of the unknown mixture on the 5th pencil spot.

   Try to make sure each spot is no more than 5 mm in diameter. Label each spot **in pencil**.
3. Pour water into the beaker to a depth of **no more than 1 cm**.
4. Tape the edge of the chromatography paper to the glass rod. The paper needs to be taped at the end furthest from the spots.

   Rest the rod on the top edge of the beaker. The bottom edge of the paper should dip into the water.

   Ensure that the:

   - **pencil line is above the water surface**
   - **sides of the paper do not touch the beaker wall.**



5. Wait for the water solvent to travel at least three quarters of the way up the paper. Do **not** disturb the beaker during this time.

   Carefully remove the paper. Draw another pencil line on the dry part of the paper as close to the wet edge as possible.

6. Hang the paper up to dry thoroughly.
7. Measure the distance in mm between the two pencil lines. This is the distance travelled by the water solvent.

   Measure and record the same distance for each food colouring in the table below.

Food colouring	Distance travelled in mm		Rf value
	Solvent	Spot	
A	80	45	
B	80	57	
C	80	25	
D	80	10	

7. For each of the four known colours, measure the distance in mm from the bottom line to the centre of each spot. Write each measurement in the table.

8. Use the following equation to calculate the R_f value for each of the known colours.

$$R_f = \frac{\text{distance moved by substance}}{\text{distance moved by solvent}}$$

Write the calculated values in the table.

GCSE Chemistry required practical activity: Water purification

Student sheet

Analysis and Distillation of water from different sources

In this investigation you will test three water samples from different sources for pH and the presence of dissolved solids. After distillation of the sea water, you will test the water again to check that dissolved solids have been removed, making the water fit to drink.

Method

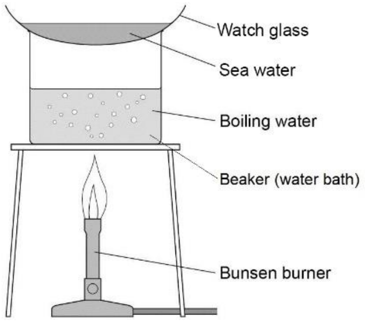
You are provided with the following:

- water samples
- universal indicator
- test tubes and rack
- Bunsen burner
- 10 cm^3 measuring cylinder
- tripod
- gauze
- heatproof mat
- 250 cm^3 beaker
- watch glass
- tongs
- clamp stand
- 250 cm^3 conical flask
- delivery tube with bung
- ice

You should read these instructions carefully before you start work.

1. Pour around 1 cm depth of the sea water into a test tube in the rack. Add a few drops of universal indicator solution. Using a pH colour chart, match the colour and record the pH of the water in the results table. Repeat this test for spring water and rain water and record the results.

2. Weigh a dry watch glass. Record its mass in the table. Pour 4 cm^3 sea water (less if your watch glass is small) into it and place it above a beaker acting as a water bath as shown in the diagram.

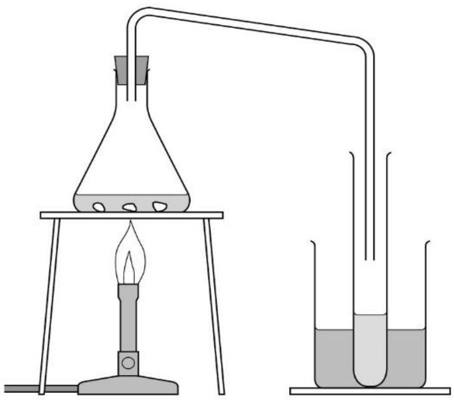


3. Allow all the water to evaporate from the watch glass. Do not let the water bath boil dry.

4. You should see dissolved solids on the glass. Remove the watch glass with tongs and allow to cool. Dry the bottom of the watch glass with a cloth and reweigh it. Record the new mass in the table. Subtract the mass of the watch glass alone and record the mass of the dissolved solids. Wash the watch glass and dry it.

5. Repeat steps 2 – 4 for the other water samples. You do not need to weigh the empty watch glass again as long as you use the same one each time.

Place the remaining sea water (around 40 cm^3) in the conical flask and set up the apparatus for distillation as shown in the diagram.



.Make sure the conical flask is held on the tripod and gauze using the clamp stand. Place a mixture of ice and water in the beaker surrounding the test tube.

6. Heat the sea water with the Bunsen burner until it starts to boil. Then reduce the heat so that the water boils gently. Distilled water will collect in the cooled test tube. Collect about 5 cm depth of water in this way, then stop heating.

7. Repeat the tests in steps 1 to 4 again using the distilled sea water, again recording your results in the table. How does the distilled water compare with the undistilled sea water?

Water	pH	Mass in grams		
		Watch glass	Watch glass and dissolved solids	Dissolved solids
Sea	8.10	14.75	14.92	
Spring	5.8	14.75	14.82	
Rain	5.6	14.75	14.78	
Distilled sea	6.9	14.75	14.76	

SEPARATES ONLY - GCSE Chemistry required practical activity: Identifying Ions

Student sheet

Identify the ions in a single ionic compound using chemical tests

You will analyse a range of known ionic compounds.

The methods you will use are:

- flame testing
- addition of acids
- addition of barium chloride
- addition of silver nitrate.

You will then apply the knowledge you gain to identify the ions in an unknown compound.

Risk assessment

- Safety goggles should be worn throughout.

Method

You are provided with the following:

- Bunsen burner
- test tubes and test tube rack
- teat pipette
- nichrome wire mounted in handle
- limewater
- 0.4 M dilute hydrochloric acid
- 0.1 M barium chloride solution
- 0.4 M dilute nitric acid
- 0.05 M silver nitrate solution
- known labelled solutions: chlorides of lithium, sodium, potassium, calcium and copper
- known labelled solutions: sodium salts containing carbonate, sulfate, chloride, bromide and iodide
- salt solution labelled 'unknown'.

Read these instructions carefully before you start work.

Flame Tests

1. Pour around 1 cm depth of each of the **labelled chloride solution**s into five test tubes in the rack.
2. Dip the nichrome wire into the first solution. Then hold the tip of the wire in a blue Bunsen burner flame.
3. Record your observation in **Table 1** (at end of this worksheet).
4. Clean the wire carefully.
5. Repeat steps **2–4** for each of the other four solutions.
6. Empty and clean the test tubes.
7.

Carbonate test

1. Pour around 1 cm depth of each of the **labelled sodium solutions** into five test tubes in the rack.
2. Place 2 cm depth of limewater in a sixth test tube.
3. Add 1 cm depth of **dilute hydrochloric acid** to each sodium salt in turn.

   Only if you see bubbles, **quickly** use the teat pipette to transfer the gas produced to the limewater. Your teacher may show you how to do this. You will need to take several pipettes of the gas to get a change in the limewater.
4. Record your results in the first blank row of **Table 2** (at end of this worksheet).
5. Empty and clean the test tubes.

Sulfate test

1. Pour around 1 cm depth of each of the **labelled sodium solutions** into five test tubes in the rack.
2. Add a few drops of **dilute hydrochloric acid** to each solution. Then add 1 cm depth of **barium chloride** solution.
3. Record your observations in the second blank row of **Table 2**.
4. Empty and clean the test tubes.

Halide test

1. Pour around 1 cm depth of each of the **labelled sodium solutions** into five test tubes in the rack.
2. Add a few drops of **dilute nitric acid** to each solution. Then add 1 cm depth of **silver nitrate** solution.
3. Record your observations in the third blank row of **Table 2**.

Unknown

1. Repeat the flame, carbonate, sulfate and halide tests on the unknown salt solution.

2. Use your results from:

   - **Table 1** to identify the positive metal ion in the unknown compound
   - **Table 2** to identify the negative non-metal ion.

Table 1

Possible flame colours are:

- green
- crimson
- lilac
- yellow
- red.

Metal ion	Lithium	Sodium	Potassium	Calcium	Copper
Flame colour					

Table 2

Possible outcomes are:

carbon dioxide release

or

white, cream or yellow precipitates

or

no reaction

Non-metal ion	Carbonate	Sulfate	Chloride	Bromide	Iodide
Carbonate test					
Sulfate test					
Halide test					