

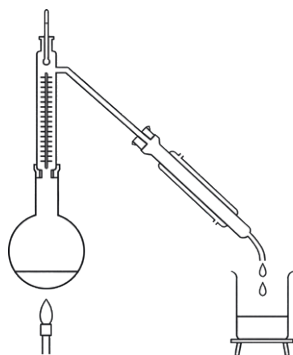
Separation Techniques Exam-Style Questions 1

Answers

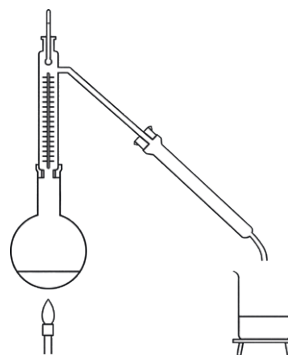
1.

Distillation is a method that can be used to obtain distilled water from a sample of saltwater.

Two different examples of distillation equipment are shown below.



A



B

- a) Which set of equipment will produce distilled water the quickest? **A** or **B**?

A

Give a reason for your answer.

The condenser is surrounded by cool water which causes the water vapour to condense back into a liquid more quickly.

- b) Use the following key words to describe how distillation separates distilled water from saltwater.

Key Words

condenser	evaporates	heated	water vapour
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As the saltwater is heated and water evaporates from the flask, it flows upwards and into the condenser. The condenser is surrounded by cool water which causes the water vapour to condense back into a liquid, this flows down the tube and into the beaker. The water collected in the beaker is distilled water.

- c) Suggest another mixture which could be separated by distillation.

Allow any sensible suggestion, such as ink and water.

2. Explain how to separate salt from a mixture of rock salt.

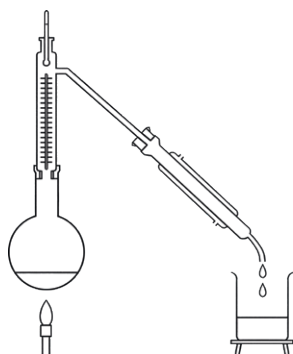
- **Crush the rock salt using a pestle and mortar.**
- **Mix the rock salt with water.**
- **Dissolve the rock salt to make a sand and salt (water) solution.**
- **The salt will dissolve but the sand will not.**
- **Filter the solution through a filter funnel.**
- **The residue is the sand that remains in the filter paper.**
- **Collect the salt (water) solution in a beaker, the filtrate.**
- **Heat the salt (water) solution in an evaporating dish using a Bunsen burner or water bath.**
- **Allow the (saturated) solution to cool and crystals to form in the evaporating dish.**

Separation Techniques Exam-Style Questions 1

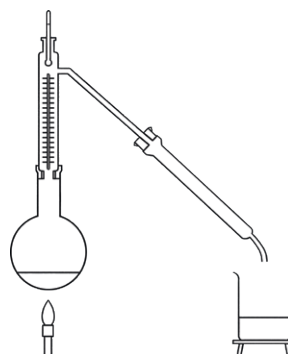
1.

Distillation is a method that can be used to obtain distilled water from a sample of saltwater.

Two different examples of distillation equipment are shown below.



A



B

a) Which set of equipment will produce distilled water the quickest? **A** or **B**? _____

Give a reason for your answer.

b) Use the following key words to describe how distillation separates distilled water from saltwater.

Key Words

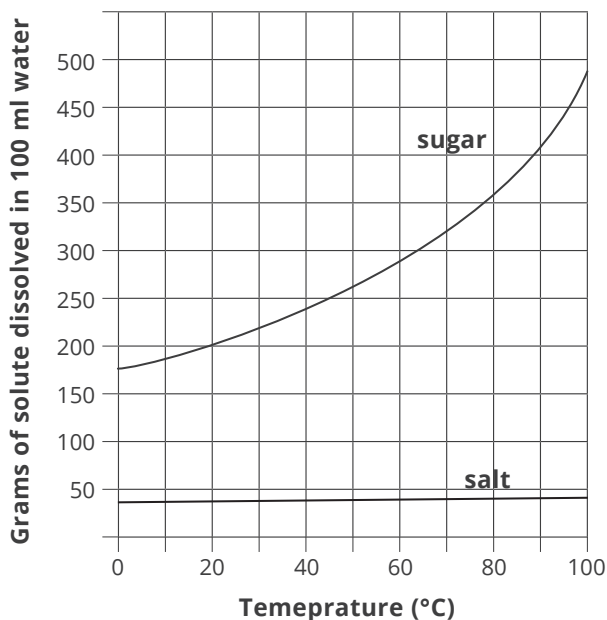
condenser	evaporates	heated	water vapour
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c) Suggest another mixture which could be separated by distillation.

Separation Techniques Exam-Style Questions 2

Answers

1. Two students carried out an experiment to investigate the effect of temperature on the solubility of salt and sugar. The results are presented in the graph below.



- a) At 20°C, how many grams of sugar dissolved in 100ml of water?

200g

- b) How does temperature affect the solubility of sugar? Explain your answer using data from the graph.

As the temperature increases, the amount of sugar dissolved also increases. For example, at 20°C, 200g of sugar dissolved whereas at 80°C, 352g of sugar dissolved.

- c) State the main differences between the solubility of sugar and salt as there is an increase in temperature.

The amount of sugar that dissolves varies considerably whereas the amount of salt changes slightly. From 20°C to 80°C, the mass of sugar changed from 200g to 352g. This means an increase in 152g of sugar. However, the increase in the mass of salt was barely noticeable, less than 10g.

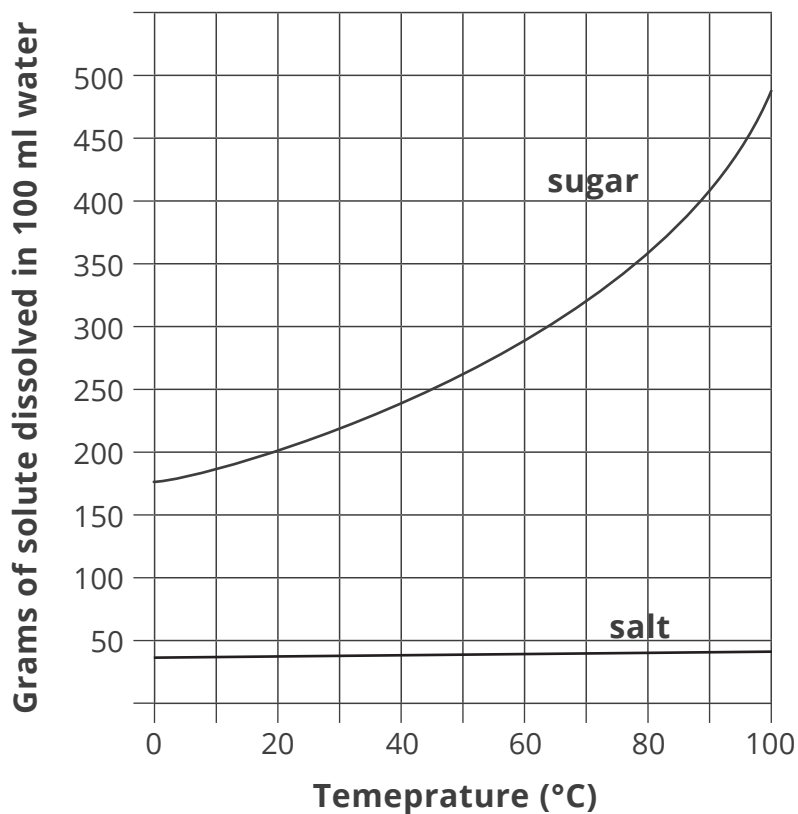
- d) Identify the following in the experiment:

- independent variable **temperature**
- independent variable **grams of solute dissolved in 100ml of water**
- control variables **volume of water, whether the solution is stirred or not, size of the salt and sugar grains**

Separation Techniques Exam-Style Questions 2

1.

Two students carried out an experiment to investigate the effect of temperature on the solubility of salt and sugar. The results are presented in the graph below.



a) At 20°C, how many grams of sugar dissolved in 100ml of water?

b) How does temperature affect the solubility of sugar? Explain your answer using data from the graph.

c) State the main differences between the solubility of sugar and salt as there is an increase in temperature.

d) Identify the following in the experiment:

independent variable _____

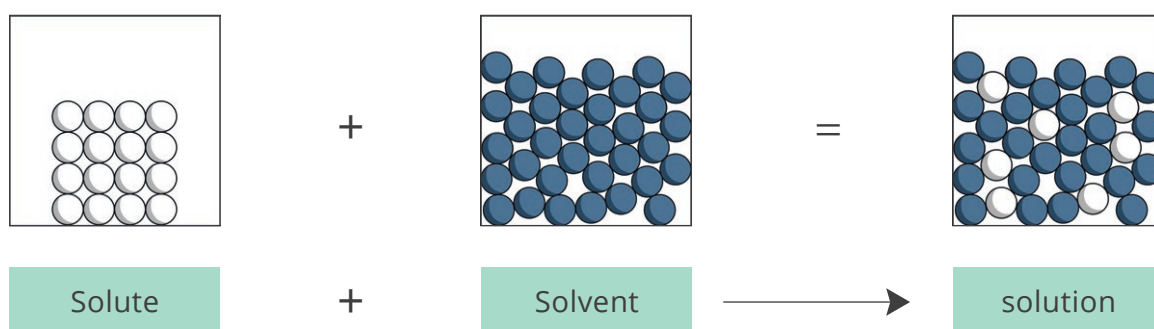
independent variable _____

control variables _____

Separation Techniques **Key Revision Facts**

Key Word	Definition
compound	A substance made up of two or more different elements chemically bonded together. For example, carbon dioxide (CO ₂) and water (H ₂ O).
dissolve	To mix a solute with a solvent to form a solution.
element	A substance made of only one type of atom. For example, carbon (C) and oxygen (O ₂).
insoluble	A substance that does not dissolve in a given solvent.
mixture	A substance consisting of two or more substances not chemically combined together. For example, saltwater and ink.
pure substance	A single element or compound, not mixed with any other substance.
saturated solution	A solution in which no more solute can dissolve at a given temperature.
soluble	A substance that will dissolve in a given solvent.
solute	The substance that dissolves in a solvent to make a solution.
solution	A mixture of two or more substances, formed when a solute dissolves in a solvent. A liquid containing a dissolved solid or another liquid.
solvent	The substance in which a solute dissolves.

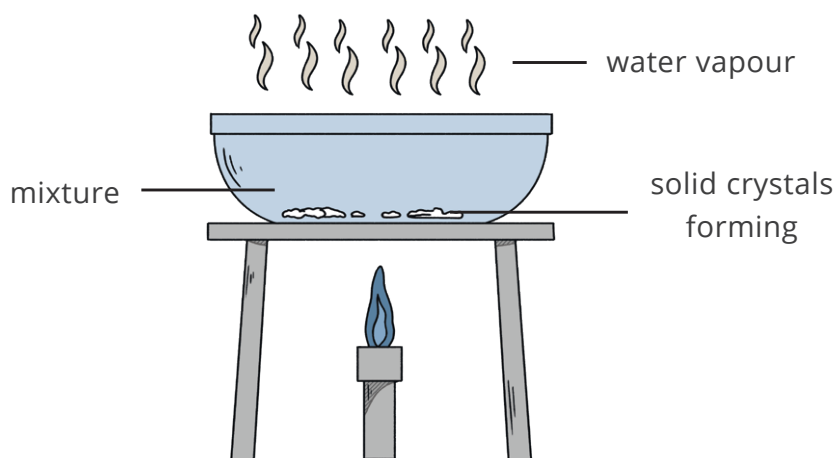
- Dissolving is the process of mixing a soluble solute into a solvent to create a solution.



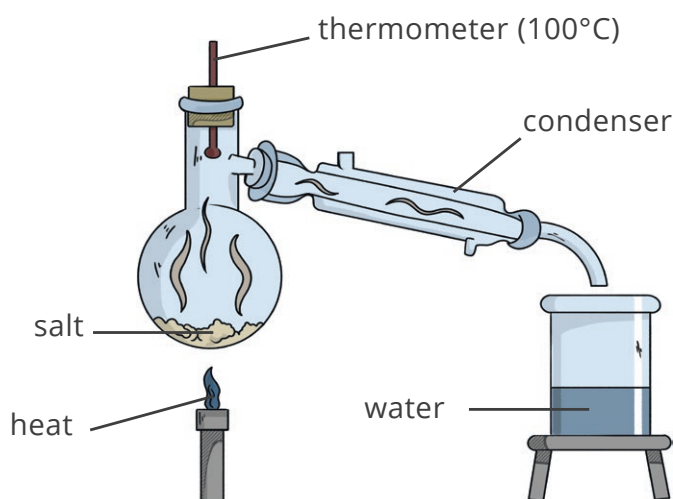
- Solutions dissolve faster with increased temperature, greater surface area and stirring.
- Solubility is the mass of a solute that will dissolve in 100g of water.

Filtration

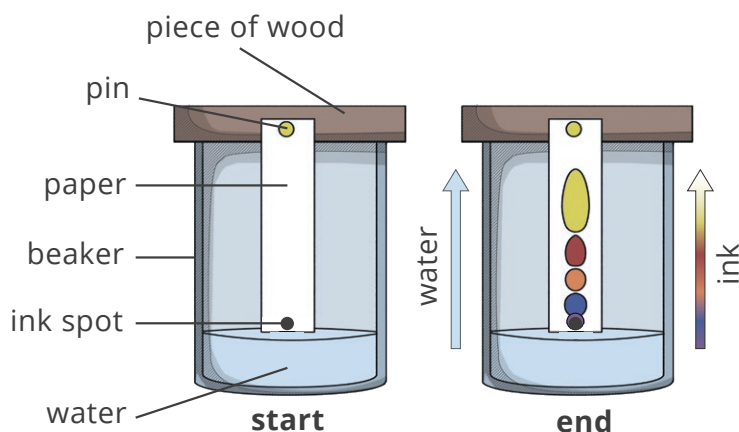
- Filtration is used to separate an insoluble solid from a liquid.
- The solution is passed through a filter paper and a funnel.
- The residue remains in the filter paper, and the part which passes through the filter is called the filtrate.
- A mixture of sand and water can be separated by filtration.

Evaporation

- Evaporation is used to separate a soluble solid from a solvent.
- The solution is heated, the liquid evaporates and the solid crystallises.
- A solution of saltwater can be separated using evaporation.

Distillation

- Distillation is used to separate a solvent from a solution. It can separate the same type of solution as in evaporation but retrieving the other component of the mixture.
- As the saltwater is heated, the water evaporates from the flask, it flows upwards and into the condenser.
- The condenser is surrounded by cool water which causes the water vapour to condense back into a liquid. This flows down the tube and into the beaker. The water collected in the beaker is distilled water.
- The salt crystals remain in the flask.

Chromatography

- Chromatography is used to separate, for example, different dyes in ink.
- The colours are separated because they have varying solubilities.
- The separate inks are carried different distances up the filter paper by the solvent.
- Examples of the solvent which can be used include water and ethanol.

Separation Techniques Progress Sheet

To show how confident you are with each statement, either colour the square red, amber or green or add a tick in the correct box.

I can...	Red	Amber	Green
describe the particle arrangements in a mixture.			
explain how to identify a pure substance.			
explain the difference between solute, solvent and solution.			
draw a diagram to illustrate what happens to particles when dissolving occurs.			
explain solubility.			
explain what is meant by a saturated solution.			
state some examples of substances that can be separated by filtration.			
draw and label the equipment used in filtration.			
explain how evaporation can be used to separate a mixture.			
label a distillation diagram.			
explain how distillation can be used to obtain distilled water from saltwater.			
explain how chromatography can be used to separate food colourings or dyes.			

Separation Techniques Progress Sheet

Place a tick to show you have completed the following:

I can...	I have studied	I have revised	I have attempted exam-style questions
describe the particle arrangements in a mixture.			
explain how to identify a pure substance.			
explain the difference between solute, solvent and solution.			
draw a diagram to illustrate what happens to particles when dissolving occurs.			
explain solubility.			
explain what is meant by a saturated solution.			
state some examples of substances that can be separated by filtration.			
draw and label the equipment used in filtration.			
explain how evaporation can be used to separate a mixture.			
label a distillation diagram.			
explain how distillation can be used to obtain distilled water from saltwater.			
explain how chromatography can be used to separate food colourings or dyes.			

Separation Techniques Test Yourself 1 **Answers**

Word Search

o e j c a s u e l z g e p s h
i f t v q e a x g l d i e o a
h i d u q k q t r c b n q l j
b s w o l a i t u y a j g u k
t n e v l o s d t r i u t t l
l j g h e u s i o h a t h i l
o k i n s o l u b l e t k o g
r p r j l i f v p u m m e n f
k n y u b l d e y d k o g d y
b x b u q s e k w e n j e r x
v l l z e e c n t w t i c w z
e o j h q t u y e v t o w m s
s z x w q j p i s e l f f o v
s t v n h n m b u a z n m y m
q u h y y p s l l q i u e g j

Rock Salt

Rock salt is a mixture of rock and salt. Number the sentences **1** to **6** to describe how the salt can be separated from the pieces of roc.

The salt will dissolve.	3
Pour the salt solution into an evaporating dish and heat gently.	5
Add warm water to the rock salt and stir.	2
Crush the rock salt using a pestle and mortar.	1
The water will evaporate and the salt crystals will appear in the evaporating dish.	6
Filter the mixture, the salt solution will collect in the beaker and the pieces of rock will collect in the filter paper.	4

Filtration Missing Vowels

residue	filtrate	insoluble	soluble	liquid
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Separation Techniques **Test Yourself 1**

Word Search

o e j c a s u e l z g e p s h
i f t v q e a x g l d i e o a
h i d u q k q t r c b n q l j
b s w o l a i t u y a j g u k
t n e v l o s d t r i u t t l
l j g h e u s i o h a t h i l
o k i n s o l u b l e t k o g
r p r j l i f v p u m m e n f
k n y u b l d e y d k o g d y
b x b u q s e k w e n j e r x
v l l z e e c n t w t i c w z
e o j h q t u y e v t o w m s
s z x w q j p i s e l f f o v
s t v n h n m b u a z n m y m
q u h y y p s l l q i u e g j

insoluble

saturated

solubility

soluble

solute

solution

solvent

Rock Salt

Rock salt is a mixture of rock and salt. Number the sentences **1** to **6** to describe how the salt can be separated from the pieces of roc.

The salt will dissolve.	
Pour the salt solution into an evaporating dish and heat gently.	
Add warm water to the rock salt and stir.	
Crush the rock salt using a pestle and mortar.	
The water will evaporate and the salt crystals will appear in the evaporating dish.	
Filter the mixture, the salt solution will collect in the beaker and the pieces of rock will collect in the filter paper.	

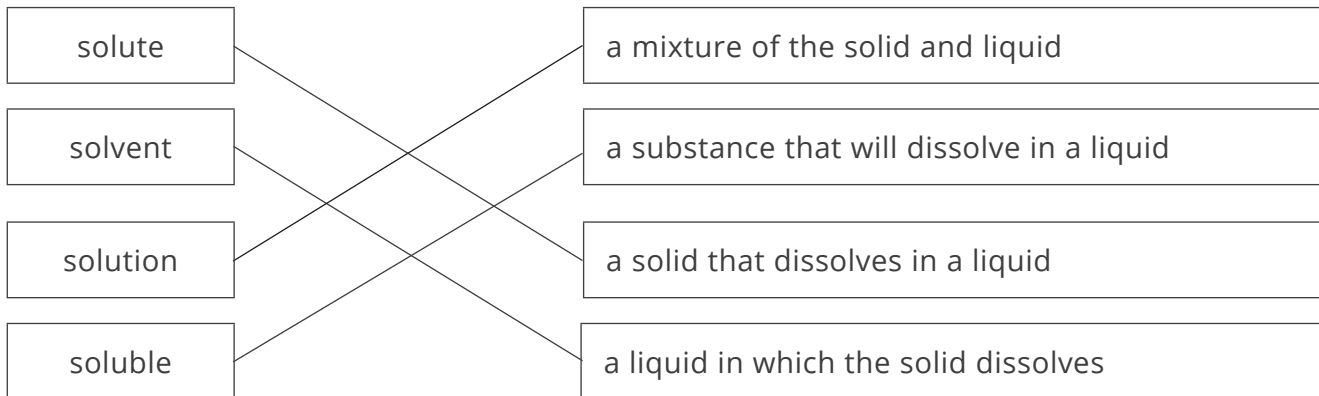
Filtration Missing Vowels

r _ s _ d _ _	f _ l t r _ t _	_ n s _ l _ b l _	s _ l _ b l _	l _ q _ _ d
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Separation Techniques Test Yourself 2 **Answers**

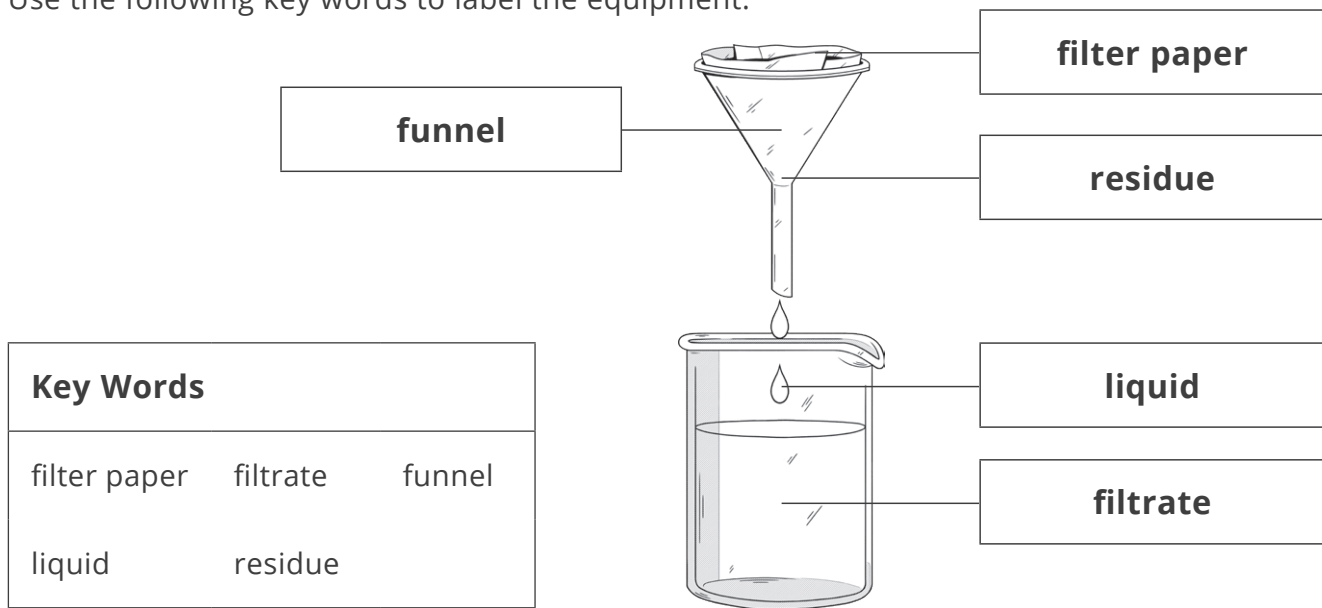
Match and Draw

Draw **one** line from each key word to the correct definition.



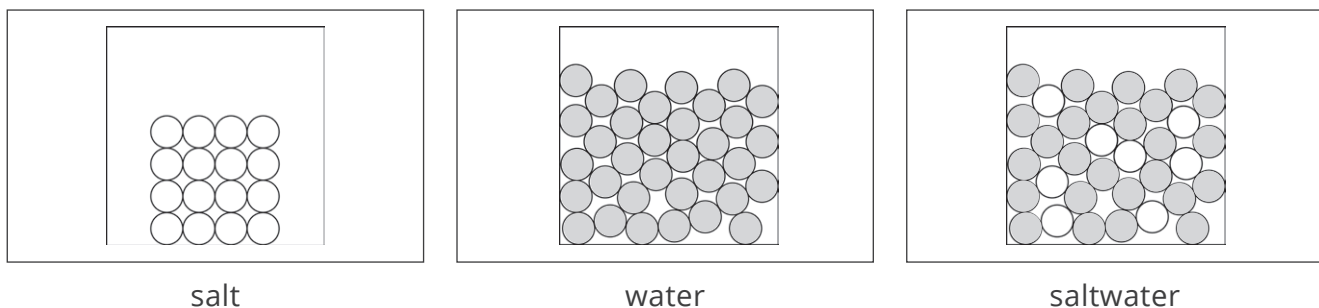
Filtration

Use the following key words to label the equipment.



Dissolving

Complete the boxes below to show the particles in salt, water and saltwater.



Separation Techniques **Test Yourself 2**

Match and Draw

Draw **one** line from each key word to the correct definition.

solute

a mixture of the solid and liquid

solvent

a substance that will dissolve in a liquid

solution

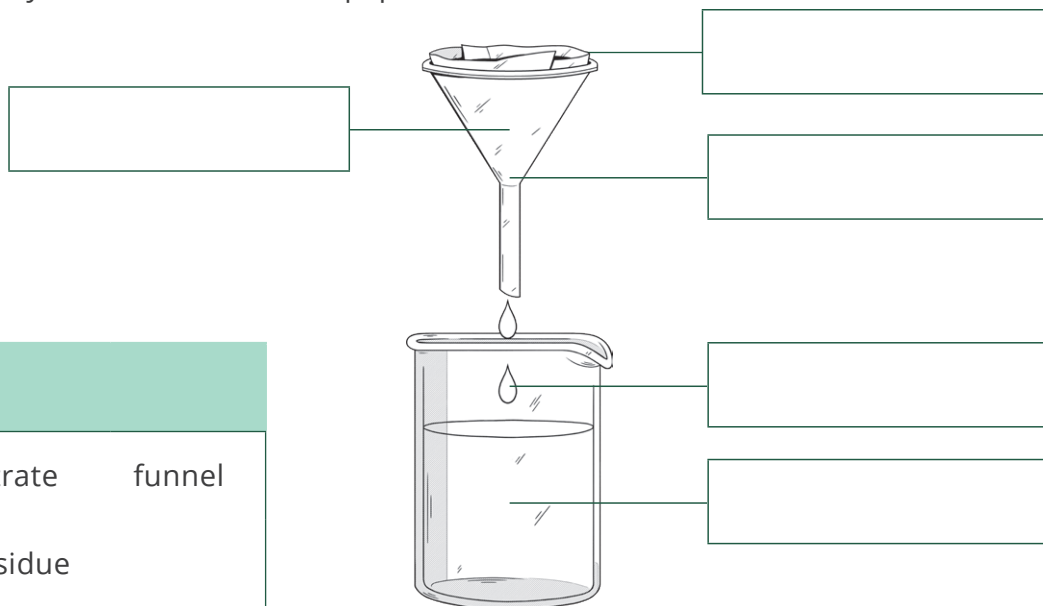
a solid that dissolves in a liquid

soluble

a liquid in which the solid dissolves

Filtration

Use the following key words to label the equipment.

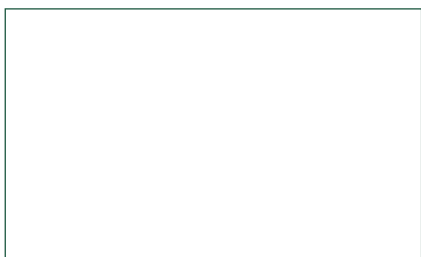


Key Words

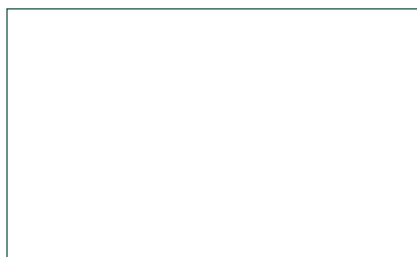
filter paper filtrate funnel
liquid residue

Dissolving

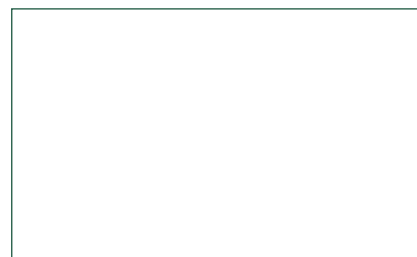
Complete the boxes below to show the particles in salt, water and saltwater.



salt



water

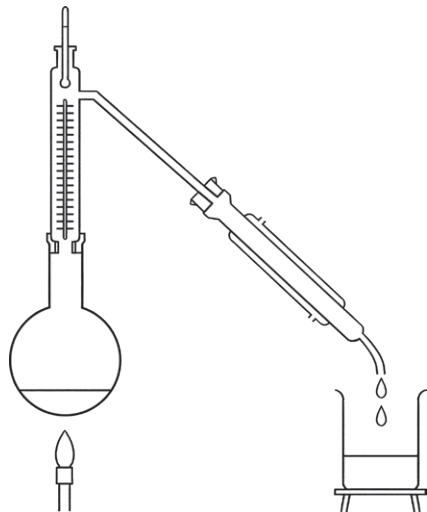


saltwater

Separation Techniques **Test Yourself 3**

Distillation

Number the sentences **1** to **5** to describe how distillation separates distilled water from saltwater.



The water starts to boil and evaporates.	2
As the water vapour travels along the condenser, it cools down and condenses back into a liquid.	4
The distilled water drips into the beaker.	5
The saltwater is heated.	1
The water vapour flows upwards and into the condenser.	3

True or False?

State whether the following statements are true or false.

Statement	True or False
Chromatography can be used by forensic scientists.	true
When a substance dissolves, it is correct to say it disappears.	false
A saturated solution will not allow any more solute to dissolve in it.	true
Filtration will separate an insoluble substance from a soluble substance.	true
Water is the only solvent.	false

Extension Question

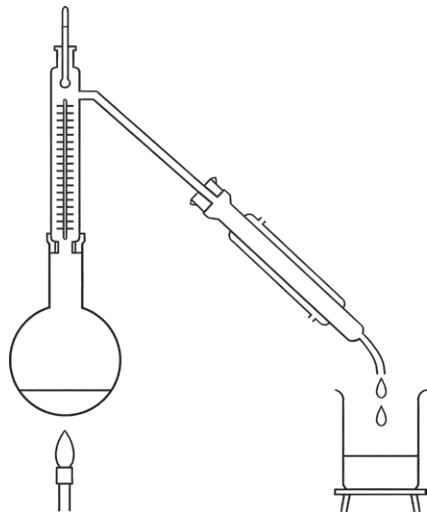
Write a sentence to describe how temperature affects solubility.

As the temperature increases, the solubility of a solute will also increase.

Separation Techniques **Test Yourself 3**

Distillation

Number the sentences **1** to **5** to describe how distillation separates distilled water from saltwater.



The water starts to boil and evaporates.	
As the water vapour travels along the condenser, it cools down and condenses back into a liquid.	
The distilled water drips into the beaker.	
The saltwater is heated.	
The water vapour flows upwards and into the condenser.	

True or False?

State whether the following statements are true or false.

Statement	True or False
Chromatography can be used by forensic scientists.	
When a substance dissolves, it is correct to say it disappears.	
A saturated solution will not allow any more solute to dissolve in it.	
Filtration will separate an insoluble substance from a soluble substance.	
Water is the only solvent.	

Extension Question

Write a sentence to describe how temperature affects solubility.

Separation Techniques Revision Pack

Teacher Notes

This revision pack has been designed to be used in a variety of ways depending on the needs of your students.

Progress Sheets

The progress sheets can be given out at the start of the topic and students complete them as each section has been covered.

or

The progress sheets can be used towards the end of the topic, so students can chart their understanding of the topic and focus their independent revision.

Key Revision Facts

This information sheet ensures students have a copy of the key facts and is particularly useful if students have been absent from lessons.

Test Yourself

These can be used either as homework or in a lesson just before a test to help students assess their understanding of topics.

Exam-Style Questions

These are available to show students typical exam-style questions and can be used as a starter, plenary or homework task.