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Have you logged in this week?

Thursday, 11 June 2020

The Scientific Method: Dissolving Salt

Lesson Outcomes:

List the steps of the scientific method

Demonstrate that you can do each of the steps

1 2 3 4 5 6

Write up an investigation

Keywords: Salt, water, solution, dissolving

Starter task:

What do you think makes a good science experiment?

This Experiment requires the use of hot water so MUST be completed in the presence of an adult

The Scientific Method: Dissolving Salt

This Power Point will show you all of the steps required to follow the scientific method and show you how to accomplish each step.

This will take some time so please feel free to spread this out over a longer period.

Please also feel free to complete some, but not all of the lesson if this is all you have time for

Good luck!

The Scientific Method

The scientific method is a way to **ask** and to **answer** scientific questions

The method has 6 parts. This video will show you what they are.

In your margin write the numbers 1 to 6 and fill out the steps as the video plays

The Scientific Method

1) Ask a question
2) Make observations / do some research
3) Form a hypothesis
4) Design an experiment and test your hypothesis
5) Analyse your data
6) Draw a conclusion

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Progress Check

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Checkpoint:
Without looking, try to tell somebody all of the steps of the scientific method

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The Scientific Method

During this task you will be using the scientific method.

For this experiment you will be given help, set by step, to follow the scientific method.

You can then do other experiments if you would like to practice doing this on your own

Dissolving salt

Step 1 – Ask a question

Does the temperature of water affect how quickly salt dissolves?

Salt can be changed for any substance that dissolves. One alternative might be sugar if you have some

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Checkpoint:

What scientific questions would you ask if you had the chance to find the answers them?

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Dissolving salt

Step 2 – Make observations

Before you start thinking of an experiment you can do you need to have an idea of what to look for and what you might expect to find.

Here are some videos to help you think. Make notes as the videos play

Dissolve Song

Video 1

Video 2

Dissolving salt

What notes did you make?

Find somebody and share your notes

Do your notes make sense to them?

Do they agree with you?

All scientists share their results so you should start now!

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Checkpoint:

What scientific questions did you say you would like to ask?

What would you expect to see if you did an experiment?

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Dissolving salt

Step 3 – Form a hypothesis

A hypothesis is a statement that you can test. Here are two hypotheses

1) Salt will dissolve more slowly in hotter water
2) Salt will dissolve more quickly in hotter water

Which do you think we should test? Why?

Dissolving salt

Step 3 – Form a hypothesis

<u>It really doesn't matter</u> which you choose as your experiment will either prove you hypothesis to be correct or incorrect.

But for arguments sake, we will choose hypothesis 2 so that we all have the same starting point

<u>Salt will dissolve more quickly in hotter water</u>

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List the steps of the scientific method ✓

Demonstrate that you can do each of the steps

1 ✓ 2 ✓ 3 ✓ 4 5 6

Write up an investigation

Checkpoint:

Watch this video.

Have a go at turning your question into a hypothesis.

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Dissolving salt

Step 4 – Design an experiment and test the hypothesis

Designing an experiment can be quite tricky as there are lots of things to think about

You have already seen some videos, though, so you should have an idea of what to do.

One thing we **must** think about is variables. What are variables? What types of variables do you know?

Variables

There are three types of variables

1) Control
2) Dependent
3) Independent

Watch the video and explain what each of the three variables are.

Watch the whole video first, discuss with your group what you think each type of variable is then write down what you have agreed on.

Now watch the video again and check to see if you were right.

Variables

There are three types of variables

1) Control – this is **everything** you try to keep the same. There are more than one of these in an experiment
2) Dependent - this is the thing that we measure. In our experiment it will be how quickly the salt dissolves
3) Independent– this is the one factor you change on purpose. In our experiment this will be the temperature of the water. It is the only thing we want to change to see how it affects our independent variable

Safety

One of the other things we have to consider is our own safety and the safety of everybody else.

Can you think of any safety rules we might have in the science labs at school?

Why might we have these rules?

Think about how you can do this experiment safely at home. You should always ask an adult for help if you're not sure. This is true at home and in school

Writing a method

Writing a method is a key concept in science and will earn you marks in your exams.

Methods should be clear and precise and allow somebody to do exactly what you are doing.

Let's think about applying this to something we all know… Making a cup of tea

Writing a method

Making a cup of tea couldn't be more simple!

You put a teabag in some boiling water, leave it, add milk and sugar if you like, then voila! You have a cup of tea!

But if you gave that set of instructions to someone who has never made one before, would they make a decent cuppa?

Probably not!

Writing a method

So how do you make the method better?

We add detail

We make an equipment list

We think about timings

Writing a method

What equipment would you need to make a cup of tea?

My equipment list:

1 cup or mug	Milk
Sugar	1 teabag
1 spoon	Timer
1 kettle	Water

Now use this equipment list to explain how to make a cup of tea

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Checkpoint:

Write a method to explain how to make a cup of tea

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My method for making tea

Fill a kettle half-way with water

Turn the kettle on to get the water to boiling

Get a mug and place a teabag into it

When the water has boiled, add the water to the mug until it reaches 2cm from the top of the mug

Leave for 1 minute 30 seconds (time this with your timer)

Using a spoon, remove the teabag and safely dispose of it (in the bin)

If milk is desired add milk until the level inside the mug is 1cm away from the top

If sugar is desired add using a spoon

Stir the tea using the spoon

Enjoy the tea! <- this bit isn't *actually* required but I do enjoy tea!

Writing a method

How did your method look compared to that one?

Can you suggest improvements?

Now it's time to write a method for dissolving salt in different temperatures of water.

You're going to see a ***very*** basic method. It is up to you to turn it into a ***good*** method

Writing a method

Put 100cm^3 of water into a beaker. Add some salt and stir. Time how long it takes for ***all*** of the salt to dissolve. Repeat with different temperatures of water e.g. cold, warm, hot and freshly boiled

This is horribly basic. You have 5 minutes to think about and perhaps discuss with someone how you can turn this into a brilliant method.

Try not to spend more than 5 minutes doing this – any longer and people tend to go too far into detail: you want just enough so that someone can copy what you've done

Testing your hypothesis

You're just about ready to start.

Before you do I have some questions…

…How many times should you do each experiment?

…Why?

Testing your hypothesis

Each test at each temperature should be done three times so that we can calculate an average.

We do this so that we can identify if the experiment has valid data – if you do it only once you might have made a mistake and you wouldn't know.

Remember:
This Experiment requires the use of hot water so MUST be completed in the presence of an adult

Testing your hypothesis

Here's a table to help you collect your data as you experiment:

Water Temperature (°C)	Time taken for the salt to dissolve (seconds)			
	Test 1	Test 2	Test 3	Average
30				
40				
50				
60				
70				

These can be changed for whatever water temperatures you have decided to use. Most of us don't have a thermometer at home so you can label these as cold, warm or hot, for example.

Drawing a graph

Step 5 – Analysing your data

The best way to analyse your data is by putting it into a graph.

This allows to quickly and clearly see what your results show you.

In almost every case, you are going to draw a scatter graph or line graph.

Here's how to draw one: Video

Drawing a graph

Key points:

Your independent variable (temperature in this case) is plotted on the x-axis

Your dependent variable (time) is plotted on the y-axis

The scales should be separated equally

Temperature into sections of 10 ^{o}C

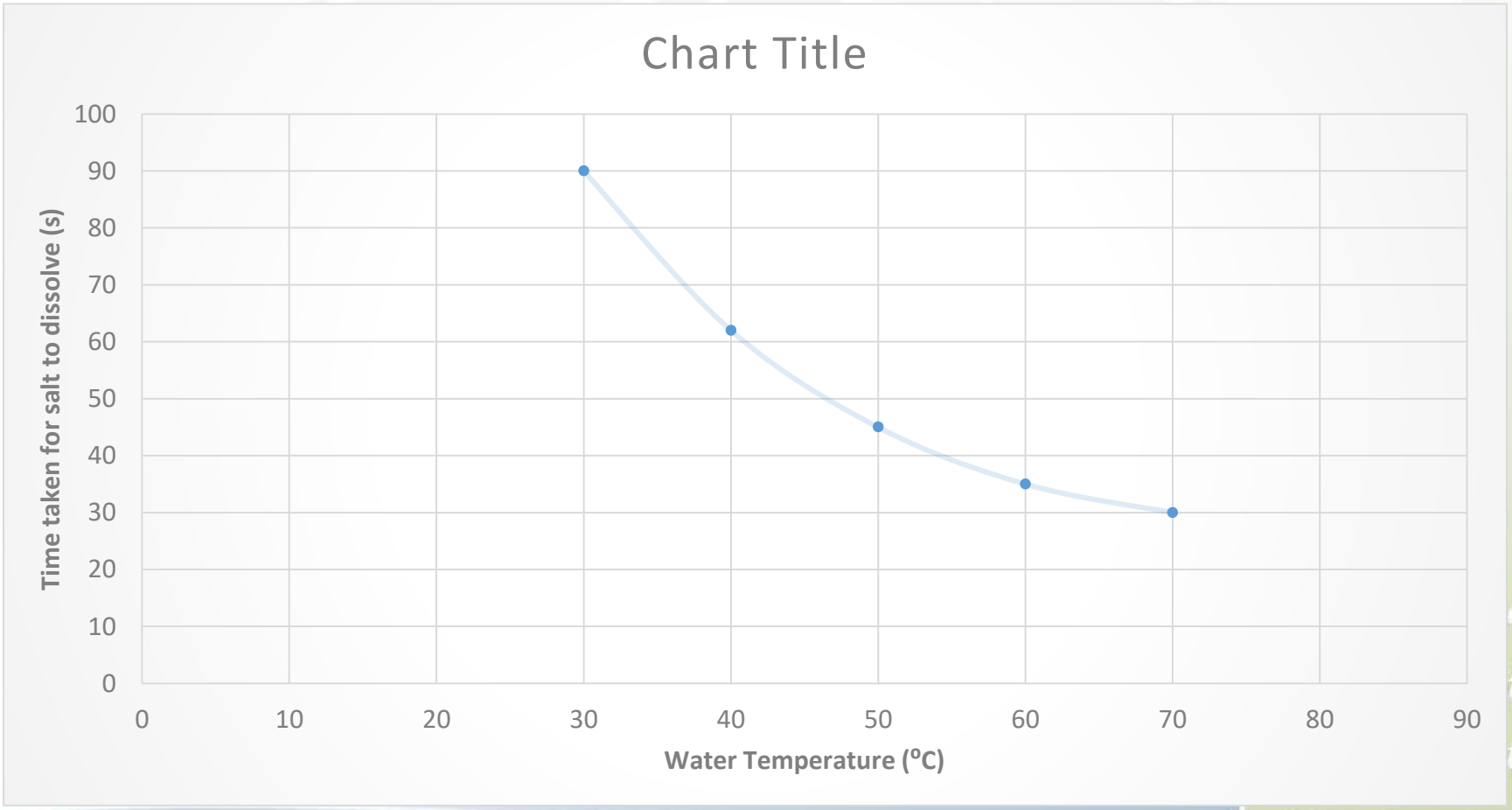
Time into sections of 10 seconds

Again, this can be changed to cold, warm or hot, for example.

Once you have plotted your data they should be joined using a line of best fit

Drawing a graph

Here's what mine looks like



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Checkpoint:

Analyse your graph.

Did you follow all of the Key points?

Your independent variable (temperature in this case) is plotted on the x-axis

Your dependent variable (time) is plotted on the y-axis

The scales should be separated equally

Temperature into sections of 10 ^{o}C

Time into sections of 10 seconds

Once you have plotted your data they should be joined using a line of best fit

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Writing a Conclusion

Step 6 – Drawing a conclusion

By looking quickly at my graph I can see that the hypothesis was correct:

Salt will dissolve more quickly in hotter water

When you write about your hypothesis you should include data relevant to your conclusion.

I might say: At 30^{o}C the salt took 90 seconds to dissolve but at 70^{o}C it took just 30 seconds

Ext: Can you include a reason for your observations?

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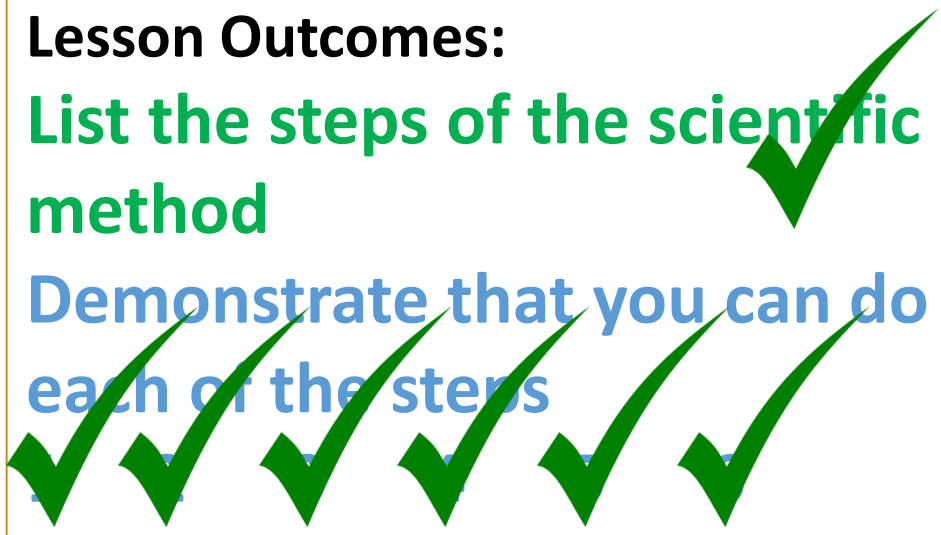

Checkpoint:

Watch this video for a summary on conclusions.

What are the things that a conclusion should include?

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Writing up an Investigation

Writing up an investigation is possibly the most important part of any scientific experiment.

Writing up a neat, clear document that contains all the steps of the scientific method is the best way to share information.

All scientists share information – that's how we can check if the science is correct!

Writing up an Investigation

You are going to write up, as neatly as you can, your investigation.

Write on A4 paper, single sided.

The best investigation write ups will be displayed in the classroom

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List the steps of the scientific method ✓

Demonstrate that you can do each of the steps ✓ ✓ ✓ ✓ ✓ ✓

Write up an investigation ✓

Checkpoint:

Put your experiment write up away safely.

In two days time read through it again.

- Does it still makes sense?
- Do you need to change anything?

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