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How To Make A Big Fog Effect

Time
5 min per demo

WHAT YOU'LL NEED

(Provided in Primary Science Pack)

- Blue Gloves
- Ice Scoop
- Plastic Bucket/red lid
- Dry Ice

Always replace lid on dry ice box immediately after use.

You will also need:

- Hot Water, kettle (optional)
- Funnel (optional)

BACKGROUND

This demonstration can be conveniently performed immediately after the one for floating bubbles. This provides a really spectacular fog effect with a fog blanket falling onto the floor and creeping around the room!

What To Do

1. We recommend that the children sit in their seats for this demo.
2. If you have a kettle then fill to the maximum and switch on to boil, please ensure that the kettle sits for 3 – 5 minutes after boiling before using.
3. Meanwhile place a towel/ paper on a prominent desk at the front of the class. (the towel will soak up any moisture that might be created.)
4. Open the classroom door and we also recommend opening the window to provide plenty of fresh air.
5. Place the plastic bucket with red lid securely on the towel.
6. Pour two full scoop of ice into the bucket through the holes in the red lid and then add the contents of the kettle through the same hole.
7. The fog formed will hide your hand, but you need to empty entire kettle, consider using a funnel
8. Immediately a large quantity of fog will erupt from the bucket, you will need to keep your nerve as you may not be able to see your hand! When the fog has subsided you will be left with a bucket containing warm water, which is safe to pour down the sink.
9. If the children look carefully they will see that the fog is creeping over the floor!

Picture courtesy Farnborough Hill School, Farnborough

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How To Make A Big Fog Effect

Time
5 min per demo

What's Happening?

When dry ice and hot water mix the result is 'fog', lots of tiny drops of water in a cloud. The fog you have created is the same as the fog seen in nature. (It is also the same fog effects that your class may have seen on TV shows!)

Make this an experiment

To turn this demonstration into a true experiment ask the junior scientists to answer these questions:

- **How does the temperature of the water effect the fog?**
- **Why is the fog white?**
- **How can we make a bigger fog effect?**
- **What colour is carbon dioxide gas?**

Picture courtesy St Hilary's School, Godalming

Picture courtesy Greyhouse School, Hartley Witney

TEACHER'S NOTES

Using the equipment supplied and following these instructions means that the demonstration is very safe – as always please read the safety information on dry ice provided with these downloads and available from www.chillistick.com The most hazardous item here is using the hot water from the kettle. We recommend that the water rests so that the temperature falls a little before use, ideally to the temperature of a cup of tea.

Hot water encourages the formation of fog, colder water produces far less fog. You can show this by adding very chilled water to some dry ice in the scoop and compare this to adding some hot water.

Why is the fog white? This is a tough question to answer simply but it likely to be asked! The fog is made up of tiny drops of water and these droplets are so small they scatter light. The result is that the fog looks white in the same way that clouds and fog from weather systems looks white.

Floating Bubbles

Time

10 min set up

1-2 min per demo

WHAT YOU'LL NEED

(Provided in Primary Science Pack)

- Black Bucket
- Bubble Solution
- Plastic Scoop/cup
- Dry Ice

Always replace lid on dry ice box immediately after

BACKGROUND

This simple experiment is a great demonstration and shows that science can be magical (well almost!).

What To Do

1. Collect some dry ice in the plastic scoop provided in the Primary Science Pack, don't forget to put the lid back on the dry ice box.
2. Half fill the scoop to give you about 200 grams of dry ice.
3. Scatter this ice into the base of the large plastic bucket and place the lid over the bucket loosely so that air can get in and out of the bucket - leave it for about 5 minutes. Don't leave it too long — if you put the ice in too early it will all turn to gas and may escape before you are ready!
4. When ready slowly remove the lid and invite students to blow some soap bubbles into the bucket. (The Primary Science Pack comes with bubble mixture.) Watch as the bubbles bob and float in the bucket.

What's Happening?

The dry ice is solid carbon dioxide (the stuff that makes drinks fizzy). At room temperature it wants to turn to a gas and this gas slowly fills the bucket pushing out air.

Carbon dioxide gas is heavier than air and so it tends to stay in the bucket even though it can be pushed out by a draught from a window or air conditioning unit. This is why we suggest placing the lid loosely over the top of the bucket. After a while, particularly if you have enthusiastic bubble makers, the carbon dioxide gas may have escaped from the bucket and then the bubbles will not float. At this point you can either wait a few minutes before resuming, or you can pour a cup of hot tap water into the bucket which will produce some fog and will encourage the formation of the carbon dioxide gas.

Picture courtesy Greyhouse School, Hartley Witney

Floating Bubbles

Time
10 min set up
1-2 min per demo

Make this an experiment

To turn this demonstration into a true experiment ask the junior scientists to answer these questions:

- **Why do bubbles float in the bucket but not in the classroom?**
- **Why do the bubbles stop floating?**
- **Why do helium balloons float?**

TEACHER'S NOTES

Using the equipment supplied and following these instructions means that the demonstration is very safe – as always please read the safety Information on dry ice provided with these downloads and available from www.chillistick.com

Picture courtesy Greyhouse School, Hartley Witney

KS2—Key Stage 2—Year 4—States Of Matter

The Bubble Monster

(A Change In State Of Matter Experiment)

Time

5 min per demo

Plus 5 mins clean-up

WHAT YOU'LL NEED

(Provided in Primary Science Pack)

- Black Bucket
- Bubble Solution
- Plastic Scoop/cup
- Dry Ice

Always replace lid on dry ice box immediately after use.

You will also need:

- Hot Tap Water
- Paper Towels or similar

BACKGROUND

This experiment covers part of the statutory requirement for children to observe that some materials change state when they are heated.

This demonstration is great fun and really messy. For this reason it should be done on a surface that is easy to wipe clean. It follows on from the Big Fog Effect demonstration. The difference is that in this case you add bubble solution as soon as the fog effect starts which creates foam and joy.

What To Do

Unlike the Big Fog Effect you will be using hot tap water, and the bubbles will contain the fog and so you may decide to allow the class to get nearer to the action.

1. Start by placing a towel/ paper on a prominent desk at the front of the class. (the towel will soak up bubble mixture that will pour over the side of the bucket!)
2. Open the classroom door and we also recommend opening the window to provide plenty of fresh air.
3. Place the plastic bucket on the towel and remove the red lid.
4. Pour two full scoops of ice into the bucket and then add a full kettle containing hot (not warm) tap water. Immediately pour a good squirt of bubble mixture into the bucket.

What's Happening?

As before the hot water and dry ice is creating lots of fog. This gas/water mixture inflates the bubble mixture creating a foamy bubble structure.

The dry ice is changing from solid to gas

Make this an experiment

To turn this demonstration into a true experiment ask the junior scientists to answer these questions:

- **How are the bubbles formed?**
- **Where has the ice gone as it warmed up?** (change in state)
- **What are the bubbles made of?** (Gas from the ice, the change in state and large increase in volume)

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Fruit Clouds & Foggy Drinks

Time
5 mins per demo

WHAT YOU'LL NEED

(Provided in Primary Science Pack)

- Ice Cage & Loader
- Drinks Pitcher
- Dry Ice

Always replace lid on dry ice box immediately after

You will also need:

- Cups for the children
- Fruit Cordial concentrate
- Drinking Water

BACKGROUND

This demonstration is also a reward as the class can have a small foggy drink so you may want to do this at the end of the class having completed other demonstrations first.

TEACHER'S NOTES

Using the equipment supplied and following these instructions means that the demonstration is very safe – as always please read the safety Information on dry ice provided with these downloads and available from www.chillistick.com

This jug is only used for drinks and food-grade dry ice and so is not contaminated. Please follow your procedures for food utensils, this may mean storing the pitcher in the kitchen and not the lab, or using your jugs from the kitchen.

The fog is slightly heavier than air and so when you pour the drink from the pitcher the fog pours out much like the liquid - hopefully each cup will hold a little fog along with the drink. The fog consists of carbon dioxide gas (the gas that makes soda drinks fizzy), air, and tiny droplets of the drink, it is safe to breathe and enjoy when used in this way.

What To Do

1. The Chillistick Primary Pack comes with a jug and Ice Cage. The Ice Cage is designed to hold a small amount of dry ice so the user can have the benefits without coming in direct contact with dry ice.
2. Please ensure the Jug and Ice cage are freshly washed.
3. Place the funnel into the safety valve of the ice cage and scoop dry ice into the cage using the funnel until half full.

4. Remove the funnel from the ice cage.

5. Make a jug of your chosen drink and drop the ice cage into the jug.
6. A decent fog will be generated which will carry the aroma of the drink – ask the children to smell. You can then pour from the jug into your cups whilst the fog is still being made.

What's Happening?

The dry ice contained in the Ice Cage and drink mixture create a fog of tiny droplets of the drink. This is why the aroma of the drink is easy to detect – you have created a fruit-flavoured cloud! The dry ice converts from a solid directly to a gas and this is the only way it can leave the Ice Cage.

Make this an experiment

To turn this demonstration into a true experiment ask the junior scientists to answer these questions:

- **Will the drink turn fizzy?**
- **Why can we smell the drink?**
- **When the drink is poured the fog pours downwards – why?**

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The Safe Explosion

(A Change In State Of Matter Experiment)

Time
5 min per demo

WHAT YOU'LL NEED

(Provided in Primary Science Pack)

- Ice Scoop
- Red Plug
- Blue Gloves
- Dry Ice

Always replace lid on dry ice box immediately after

You will also need:

- Safety Glasses for the demonstrator

BACKGROUND

This experiment covers part of the statutory requirement for children to observe that some materials change state when they are heated.

Don't be put off by the title! This is very safe and will get a round of applause.......

Here we are going to blow the red plug out of the ice scoop. The red cap will fly up a metre or so in the air with a nice popping sound. This demonstration can be performed indoors.

What To Do

1. Place the ice scoop on a table at the front of the class.
2. Place 3-4 pellets of dry ice into the ice scoop/cup. The easiest way to do t his is to scoop the ice directly from the ice box. If you want to place the pieces in by hand please wear the lightweight blue gloves supplied in the pack.
3. Push on the red plug firmly. After about 20 seconds the red cap will pop off.


Picture courtesy St Hilary's School, Godalming

What's Happening?

The warm air in the room is causing the dry ice to turn to a gas. Gases needs more room than solids and liquids and so the pressure increases in the scoop eventually this will push the cap off.

The dry ice is changing from solid to gas

Make this an experiment

To turn this demonstration into a true experiment ask the junior scientists to answer these questions:

- **How would you speed up the bang?**
- **How could you get a bigger bang?**
- **How else could you get**


Picture courtesy Greyhouse School, Hartley Witney

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The Safe Explosion

(A Change In State Of Matter Experiment)

Time
5 min per demo

TEACHER'S NOTES

Using the equipment supplied and following these instructions means that the demonstration is very safe – as always please read the safety Information on dry ice provided with these downloads and available from www.chillistick.com.

The red plug is easy to push on and is easy to pop out – this is all low pressure stuff and is therefore safe. The red plug is deliberately quite large and won't travel very far. Once the red plug is on you can secure it fully by turning the assembly over and pressing down on a flat surface before turning it back so that the red cap is pointing upwards. Time is of the essence as it will probably pop in 10 – 20 seconds and so once in place move away.

Reducing the time needed to pop off the red cap is achieved by making carbon dioxide gas more quickly. The students may consider this and conclude that adding more dry ice will achieve this goal, (the surface area to produce the gas is increased). Alternatively a small amount of warm water could be added to the dry ice, this will also speed up carbon dioxide gas formation. Please bear in mind that the red cap will pop off in seconds so if you are going to attempt this be aware!

If you wanted to try an alternative; sandwich bags with a zip lock seal work well (and also will fail at low pressure), this makes a bigger noise as you can see from the reaction in the photo below!

Picture courtesy St Hilary's School, Godalming

The Volcano

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Time
2 mins per eruption

WHAT YOU'LL NEED

(Provided in Primary Science Pack)

- Ice Scoop
- Dry Ice

Always replace lid on dry ice box immediately after use.

You will also need:

- Volcano Structure

BACKGROUND

In preparation for the lesson make a volcano out of paper mache or plaster as a class craft project. You can also use clay or if there is no time make one out of mud using soil and water! Ensure that there is room in the middle of the model volcano to fit the entire scoop supplied by Chillistick. The scoop needs to be sitting open-end up in the middle of the volcano but ideally should not be visible and you need to be able to get it out after each volcano demo!

What To Do

1. Place the scoop in the volcano.
2. Pour about 5 – 10 pieces of dry ice into the scoop using a coffee mug.
3. Get some hot water, about the temperature of a cup of tea, (hot tap water should be fine).
4. Gather the class around the volcano and then pour half a coffee mug (no more than 150ml of hot water) into the scoop.

You will see a spectacular release of fog which will erupt from the top of the volcano and then flow down around the volcano. This is well worth repeating and showing other classes.

What's Happening?

When dry ice and hot water mix the result is 'fog', lots of tiny drops of water in a cloud. The fog you have created is the same as the fog seen in nature. (It is also the same fog effects that your class may have seen on TV shows!)

Make this an experiment

To turn this demonstration into a true experiment ask the junior scientists to answer these questions:

- **How does the temperature of the water effect the fog?**
- **Why is the fog white?**
- **How can we make a bigger fog effect?**
- **What colour is Carbon Dioxide gas?**

TEACHER'S NOTES

Using the equipment supplied and following these instructions means that the demonstration is very safe – as always please read the safety Information on dry ice provided with these downloads and available from www.chillistick.com.

Hot water encourages the formation of fog, colder water produces far less fog. You can show this by adding very chilled water to some dry ice in the scoop and compare this to adding hot water.

Why is the fog white? This is a tough question to answer simply but it likely to be asked! The fog is made up of tiny drops of water and these droplets are so small they scatter light. The result is that the fog looks white in the same way that clouds and fog from weather systems looks white.

CO2 gas is colourless (we know this because our breath is usually invisible!).

To make a bigger fog effect you need more ice and more hot water, this is best shown with 'how to make the perfect fog effect' experiment available to download at www.chillistick.com

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Fruit Smoothie

(A Change In State Of Matter Experiment)

Time

20 minutes

(including eating and clean up)

WHAT YOU'LL NEED

(Provided in Primary Science Pack)

- Dry Ice (250g)

Always replace lid on dry ice box immediately after use.

You will also need:

- 750 ml smoothie
- 100g Sugar
- Food Processor with blade
- Plastic/Ceramic Bowl
- Disposable spoons & bowls

BACKGROUND

This experiment explores the effect of temperature on a fruit smoothie changing it to a sorbet.

The most delicious demonstration we have! This works well as an end-of-term treat or perhaps for an open day/sports day crowd-pleaser. Hopefully most of the class can enjoy this non-dairy treat, but please check for fruit/food allergies.

Some of the carbon dioxide evolved from the dry ice will absorb into the mixture and will provide a very small amount of fizz – be prepared for applause!

Picture courtesy St Hilary's School, Godalming

What To Do

1. Place 250g dry ice in a food processor. Blitz for approx10 seconds until the ice turns to powder
2. Pour the powder into a bowl. Examine the powder to satisfy yourself there are no large lumps of dry ice remaining. If you do see residual pellets you will need to blitz again.
3. Pour smoothie mixture into the food processor and add the sugar. Pulse a few times to help the sugar dissolve.
4. Add about half the dry ice and as soon as possible switch processor on. You will see a column of white fog leaving the machine and you should pick up the aroma of the smoothie.
5. When the fogging has died down remove the bowl and add small amounts of additional powdered dry ice, continually stir with a wooden spoon or whisk. You will start to see that the smoothie is becoming a thick liquid and that the dry ice causing it to foam and bubble in the bowl. Keep adding small amounts of dry ice until the smoothie mix has set like an ice cream.
6. Wait a few minutes before serving to ensure the dry ice has sublimed. The fruit sorbet mixture should not be too hard - if you can cut it easily with a spoon the dry ice has gone and it is ready to eat. (If dry ice were still present it would freeze adjacent smoothie mixture rock hard.) This is another reason for breaking the dry ice into a powder in your processor.

Picture courtesy St Hilary's School, Godalming

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Fruit Smoothie

(A Change In State Of Matter Experiment)

What's Happening?

When the sorbet mixture is chilled water ice crystals start to form and this continues through the chilling process. When an ice crystal is formed it attracts surrounding moisture to it and therefore grows in size. The objective is to create lots of small ice crystals so that the resultant ice cream feels smooth and creamy in your mouth, rather than fewer larger water ice crystals which will feel gritty and sharp in the mouth. For this reason it is necessary to chill down the contents as quickly and evenly as possible.

Food grade dry ice for chilling down is a good choice as it is very cold and can be mixed into the bulk of the ice cream mixture. Dry ice works best with fruit flavoured ices and sorbets, this is because any residual CO2 absorbed into the smoothie from the dry ice causes a slight tartness on the tongue due to formation of carbonic acid with water which complements fruity flavours.

TEACHER'S NOTES

Using the equipment supplied and following these instructions means that the demonstration is very safe – as always please read the safety Information on dry ice provided with these downloads and available from www.chillistick.com

Make sure all the dry ice used to freeze the sorbet mix has sublimed before serving.

Picture courtesy The Greyhouse School, Hartley Witney

The Rocket

(A Statutory Forces Experiment)

Time

Allow 15 minutes as this must be done outside.

After that each launch takes 2-3 mins

WHAT YOU'LL NEED

(Provided in Primary Science Pack)

- Plastic Water Bottle Rocket
- Bottle Plug
- Jug Launcher
- Black Funnel Loader
- Dry Ice

Always replace lid on dry ice box immediately after

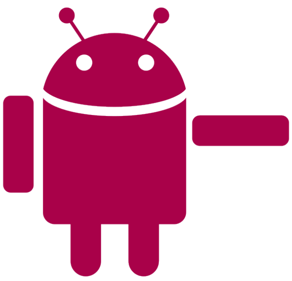
You will also need:

- Water
- Safety Glasses
- Deserted Playground/field
- Long Tape Measure (optional)
- Paper Towels or similar

This experiment can be used as part of the statutory requirement to teach Forces. It covers both air resistance and the force of gravity.

BACKGROUND

We said the fruit ice cream was the best demo. Well it's not, this is. The rocket is an empty drinks container which will travel 10 metres vertically and so this experiment **must be** done outside.



What To Do

1. Optional: several days prior to the demonstration ask the class to decorate a number of empty 1 – 2 litre capacity plastic drinks bottles. Perhaps this can be done in teams so that you have say 4-5 launches in total. Explain that the plan is to see which rocket will travel the furthest.
2. Ensure that you have a playing field or similar to yourselves. Ask the children to line up 3 – 4 metres behind you. On a flat surface fill the bottle with xx ml of cold water (about 1/5th full).
3. Wearing safety glasses and using the funnel put 5 good pieces of dry ice in the top of the bottle. You will see some fog starting to form.
4. Place the plastic bottle plug so that it rests on the top of the bottle and then place the jug over the bottle. As you push down on the jug you will push the plug into the bottle. Do this as firmly as you can.
5. Grasping the neck of the bottle turn the jug and bottle over whilst holding the jug by the handle. Do this so that the rocket is never pointing at anyone.
6. Holding the launcher jug by the handle aim the rocket at an angle of about 45 degrees into the field (and away from the children).
7. The rocket will fly off after about 20 - 60 seconds. The plug will be trapped in the launcher jug and can be re-used. Most of the water will be caught by the jug even though it is quite possible that the demonstrator may get a bit wet.
8. Measure how far the rocket went to determine who wins.
9. Consider experiments to investigate air resistance, e.g. would a nose cone make the rocket go further? Perhaps taping the red lid supplied in the Primary Science Kit.

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The Rocket

(A Statutory Forces Experiment)

Time

Allow 15 minutes as this must be done outside.

After that each launch takes 2-3 mins

What's Happening?

The water is heating up the dry ice and in so doing causes the formation of carbon dioxide gas which needs much more room than the solid form. This causes the pressure in the bottle to rise until the plastic bung is pushed out. The pressure of the carbon dioxide gas also expels all the water and any residual dry ice pellets. This gives the plastic bottle thrust and this is why it flies off, just like a real rocket. (Except in our case we don't have an pesky electronics or astronauts on board.)

Make this an experiment

To turn this demonstration into a true experiment ask the junior scientists to answer these questions:

- **How to make the rocket go further—would a bigger bottle help?** Try it out
- **Would the shape of the rocket make any difference? -** A nose cone would reduce air resistance, perhaps get one made out of cardboard and see what happens.
- **What about changing the angle the launcher is held? -** Definitely!

What would happen if warm water was used (rather than cold) The rocket will go off more quickly, so best avoided! **Please stick to cold water.**

- **More dry ice?** You need the minimum ice necessary to generate enough pressure to push the bung. Any dry ice that is pushed out will help the rocket go further. However after that any ice that remains stuck in the rocket will just weigh it down in flight. Extra payload as we rocket scientists call it!
- **More water?** (see comments for extra dry ice). We suggest 300ml but try different amounts. Perhaps ask students to plot water amounts versus rocket distance.

Class discussion—principles of the rocket demonstration (the experiment must be outside!)
Picture courtesy of The Greyhouse School, Hartley Witney

TEACHER'S NOTES

Using the equipment supplied and following these instructions means that the demonstration is very safe – as always please read the safety Information on dry ice provided with these downloads and available from www.chillistick.com

Our suggestion is to optimise the distance travelled (our record is 30 metres!). Tell us how you get on

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The Horrible Hand

(A Change In State Of Matter Experiment)

Time

10-20 minutes

WHAT YOU'LL NEED

(Provided in Primary Science Pack)

- Blue Gloves
- Dry Ice

Always replace lid on dry ice box immediately after use.

BACKGROUND

In the previous demonstrations we learn that dry ice sublimes from a solid to a gas. This experiment proves this and shows that gases take up more space than solids.

What To Do

1. Place around 2 - 3 pellets of dry ice inside one of the blue gloves supplied with the hardware pack and tie a knot in the end. If you use 2 -3 pieces of dry ice there is no danger of the hand balloon bursting – please be careful not to add more than this!

2. Over the next 5 - 10 minutes the glove will inflate into a rather horrible looking swollen hand! As the dry ice sublimes the glove gets larger, eventually all the dry ice will have disappeared, the students can judge this by shaking the glove — the dry ice will rattle inside the glove.

3. After about 10 minutes the glove will be full of CO_2 gas and the dry ice will have disappeared. Meanwhile the ice left on the bench top will have become smaller and will eventually disappear.

What's Happening?

The dry ice disappears in the space of about 10 minutes. **Where did it go?** Matter cannot be made or destroyed (this The Law of Conservation of Mass), so it must have been converted into something we cannot see. Ask the students to consider what this might be. The dry ice converts to CO_2 gas without going through a liquid phase. Normal water ice melts to a liquid. Dry ice misses out the liquid state and turns into a gas at atmospheric pressure. This is called **SUBLIMATION**. When a solid changes to a gas without passing through the liquid phase it **SUBLIMATES.** There is no liquid phase, and this is why it is called 'dry' ice.

Picture courtesy The Greyhouse School, Hartley Witney

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The Horrible Hand

(A Change In State Of Matter Experiment)

Time
10-20 minutes

Make this an experiment

To turn this demonstration into a true experiment ask the junior scientists to answer these questions:

- **Why does the balloon get bigger?**
- **How can the inflation of the balloon be increased?**
- **Is the weight of the CO_2 gas in the glove different from the weight of the dry ice?**

The class are world experts on the subject of balloons. Ask them to drop the hand on the ground.

- **does it seem different from an air-filled balloon?**

Picture courtesy The Greyhouse School, Hartley Witney

TEACHER'S NOTES

Using the equipment supplied and following these instructions means that the demonstration is very safe – as always please read the safety information on dry ice provided with these downloads and available from www.chillistick.com

The energy from the warm air in the room is making the dry ice sublime, and the volume difference between solid dry ice and CO_2 gas is about x 840 fold, so the balloon gets bigger.

Dry ice will sublimate quite quickly at room temperature, where the difference in temperature is about 100°c (from -79°c to +20°c). If the temperature difference increases, for example by placing into a cup of hot water, then the dry ice sublimates at a faster rate. Even just breathing on a piece of dry ice will accelerate the process. To increase the speed of inflation place the balloon in a hot water bath or under a hot tap.

The conservation of mass is a basic law of science - the weight of the balloon plus the ice should be exactly the same as the weight of the balloon inflated with CO_2 gas. If you have very accurate scales it might be a quick experiment to carry out. If there is a difference in weight it is likely to be because the balloon material is gas-permeable!

The hand is filled with carbon dioxide gas which is heavier than air and this is why it falls quickly to the floor – the opposite of a helium filled balloon!

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The Hovercraft

(A Change In States Of Matter Experiment)

Time
5—10 min per demo
+ class discussion

WHAT YOU'LL NEED

(Provided in Primary Science Pack)

- Blue Gloves
- Dry Ice

Always replace lid on dry ice box immediately after use.

You will also need:

- Smooth Tabletop
- Paper/fabric towel

This experiment covers part of the statutory requirement for children to observe that some materials change state when they are heated.

BACKGROUND

This demonstration illustrates friction and change of state. Dry ice changes from a solid to a gas - when placed on a table this gas makes a film that allows the dry ice to float across a smooth flat surface like a hovercraft. Students can participate in keeping the piece of dry ice on a table provided they know not to pick the dry ice piece up. Either they wear thin plastic gloves or move the dry ice with a ruler or book, (a bit like table hockey!). If the dry ice falls on the floor instruct the students to let it stay there and not pick it up – it will evaporate to gas in minutes.

What To Do

The demonstrator selects one decent size piece of dry ice from the box using the blue gloves supplied our using the scoop. Put the lid back on the box. Using a paper towel (or similar) to grip the piece of dry ice rub vigorously on a tabletop for about 10 seconds. This will create a flat surface on one side of the dry ice cylinder. Invite the class to gather round the table whilst you gently push the dry ice across the surface. It will travel with minimum effort floating on a tiny cloud of invisible gas. If safety issues are satisfied you can invite some of the class to gently push the ice across the table so that they can judge how easily it glides.

Picture courtesy of St Hilary's School, Godalming

chillistick

The Hovercraft

(A Change In States Of Matter Experiment)

Time

5—10 min per demo
+ class discussion

What's Happening?

Dry ice is changing from a solid to a gas, this process is called 'subliming'. The CO2 gas from the solid provides a small layer of gas between the tabletop and the flat side of the dry ice greatly reducing friction between these two surfaces. It is the heat from the tabletop that is causing the dry ice to sublime. It follows that if the table top is very cold the dry ice piece will not glide as well.

Make this an experiment

To turn this demonstration into a true experiment ask the junior scientists to answer these questions:

- **How could you make the hovercraft work better/ worse?**

Consider devising a method to do this in a bigger way using pellets. We haven't managed this yet, but it would be impressive to show students how to slide a book, for example, across a desk! We will credit any suggestions on our website…

Teachers' notes

Using the equipment supplied and following these instructions means that the demonstration is very safe – as always please read the safety information on dry ice provided with these downloads and available on chillistick.com

Change the temperature of the surface, hotter will mean more sublimation and lower friction. Colder will mean the opposite. You could test this by chilling down part of the surface using some dry ice, and then launching the hovercraft at this patch. The cold section should cause the dry ice piece to slow down or stop, like brake.

Engineers and scientists are constantly working to reduce friction in machinery of all types to save on material and energy costs.

Picture courtesy The Greyhouse School, Hartley Witney