chillistick

The Horrible Hand

(A Change In State Of Matter Experiment)

Time
10-20 minutes

WHAT YOU'LL NEED

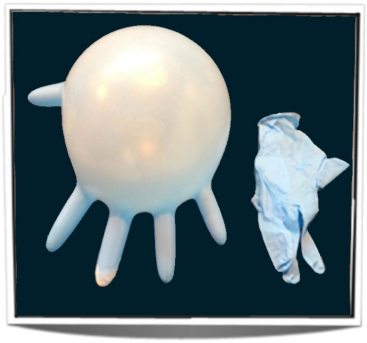
(Provided in Primary Science Pack)

- 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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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!