Transport

CO_2 transport activity

Name: _____

You will need

- Electrical or duct tape
- 4 or more metres of garden hose or similar
- Foot pump or hand pump (as used for cars, airbeds, etc.)
- Balloons
- Thick rubber bands

What to do

1. Attach the tube to the pump and seal with lots of electrical or duct tape so you have an airtight seal.
2. Attach the balloon to the other end of the tube, securing with the rubber band.
3. Separate the group into two teams. Team 1 will do the pumping of the gas, while Team 2 will monitor the reservoir (the balloon).
4. Arrange the two teams so you can hear, but can't see each other, i.e. around a corner, or with a divider between you – and no peeking!
5. Team 1: slowly start pumping, sending gas through the tube into the balloon (which you can't see).
6. Team 2: communicate with Team 1, letting them know the gas is getting there, listening for any leaks, and anything else you think is helpful.
7. When you think the balloon reservoir is full, Team 2 should tell Team 1 to stop pumping – don't pop your balloon reservoir!
8. Carefully slide the balloon off the tube making sure no gas escapes and tie it off – **did any gas leak from your balloon reservoir**?

What's happening?

By using a pump, we are able to squash or slightly compress air by increasing the pressure it is under. Gases and liquids always move from areas of high pressure to areas of lower pressure – they always aim to be in a state of balance. That is why the balloon inflates. Basically we squash the air in the pump (high pressure) and it gets pushed along the tube and into the balloon (low pressure).

Experiment originally conceived as part of the Commonwealth Scientific Industry Research Organisation's (CSIRO) CarbonKids program. www.csiro.au/Portals/Education/Teachers/Classroom-activities/CarbonKids

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Applications

In carbon capture and storage (CCS), a similar process is used to move CO_2 from where it is collected at the power station or industrial plant, to where it is stored in an underground reservoir. The big difference to the experiment you have just carried out is the amount of pressure used.

By using massive amounts of pressure – over 73 times more than in the air around us – we can squash CO_2 so much that it turns from a gas into a sort of liquid. At normal pressure, like in our atmosphere, there is lots of room between the CO_2 molecules, but as we squash them more and more, the space between molecules get smaller and smaller until the CO_2 eventually turns from a gas into a kind of liquid.

For CCS, the CO_2 is squashed until it turns into a 'supercritical liquid', which is a substance that is somewhere in-between a gas and a liquid.

Did you know?

When you go deep underground you naturally increase pressure? So when CO_2 is stored deep underground it is kept in this super-critical liquid state!

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