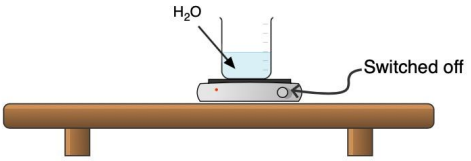
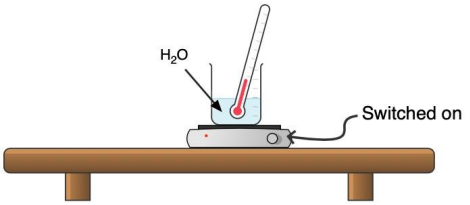
Worksheet 1.4 **What is the Sun made of?**

Please refer to the Teacher Resource document for information on how to use the worksheet for the activity.

Q1. a) Model the Sun and **record your observations** below.





Method:

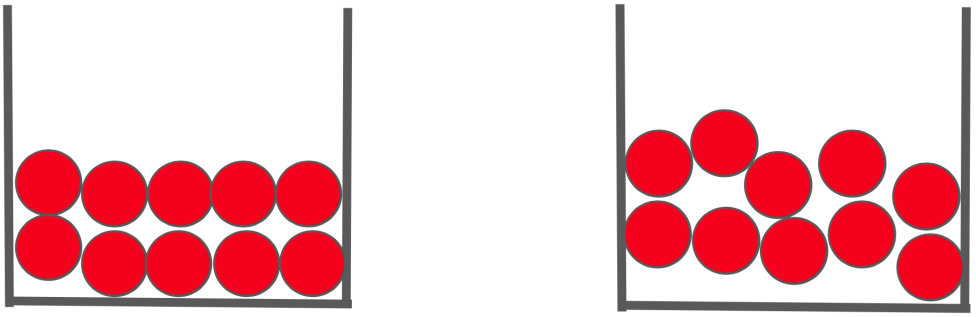
1. Set up a hot plate
2. Fill a large glass pyrex beaker (or a pot) with cold water and place it on the hot plate
3. Turn the hot plate on and bring to boil
4. Observe the change that takes place

My Observations:

Expected responses

At the start the water in the beaker was still, it wasn't moving. As the temperature of the hot plate increased, I noticed that the water started to bubble and then continued to become more and more bubbly and it was not still anymore. When the water was boiling there were lots of bubbles and some steam. This means some of the water changed from a liquid to a gas.

Q1. b) Draw the particle diagram of water at **room temperature** and at the **temperature of the hot plate** when the water is boiling:



Q1. c) As a class, **act out** these **two** particle diagrams of water.

Q1. d) Consider:

i) Which model had more **movement** and caused the most **collisions**?

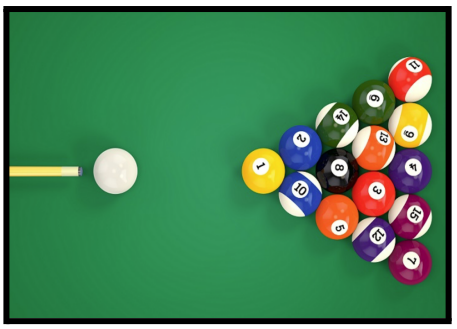
ii) What does this experiment tell you about the **behaviour of particles in the Sun?**

Expected Responses

i) The second one where we modelled the particle diagram of water at the temperature of the hot plate. It was easy to bump into my friends when we tried to act out the movement of the boiling water.

ii) This experiment tells me that the particles in the Sun must be moving around a lot, because I learned in worksheet 1.3 that the Sun is very hot (from 6700°C up to 5,000,000°C). So the particles in the Sun must be bumping into each other more because the temperature is so high. They must be using a lot of energy too to move around.

Q2. a) Examine the following images and **describe the pattern** you observe.



My Observations:

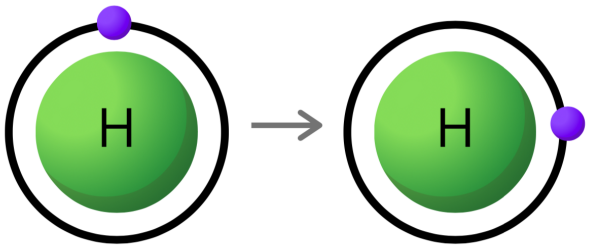
Expected Responses

- In image 1 a bowling ball is knocking over bowling pins.
- In image 2 someone is taking a Jenga block out of the tower and it's about to fall over. As the blocks fall they might hit off each other or knock one out of the way of another one as they fall.
- In image 3 a billiard ball is about to be pushed into the other balls and move them out of the way so they will probably all spread out.
- In each image something is being pushed or knocked over. Something moves to change something else.
- In each image something is colliding with something else.
- The arrangement of things before the collision is different to how they will look

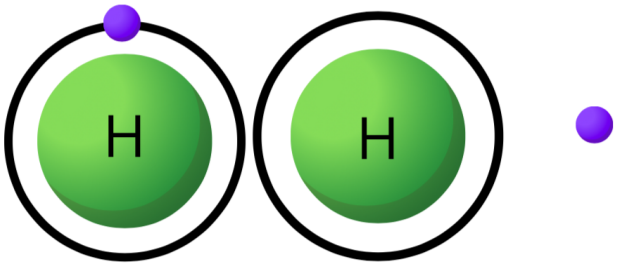
after the collision. (e.g the bowling pins will be toppled over on the ground, not standing up and the bowling ball will be behind the pins, not in front of them)
- All of the images have something happening that involves motion and a transfer of energy.

Q2. b) The diagram shows two Hydrogen atoms. One atom moves very fast towards the other and they collide.

Before:



After:



Using the diagram, describe what happens when the atoms **collide**.

Expected Responses

- In the "before" part the atoms are separate. One atom is moving towards the other one. Each atom has 1 electron.
- In the "after" part the atoms are touching. The first one has collided with the second one. Only one atom has an electron, the atom that got hit has lost its electron. So the first atom must have been moving so fast that it knocked the electron off the second atom when they collided.
- The collision between the atoms reminds me of the collisions in the images in Q2 part a).

Q3. Here is information about the chemical element Sodium from the periodic table. Using this information fill table A.

Table A.

	Number of Protons present	Number of Neutrons present	Number of Electrons present
Sodium	11	12	11

Table B gives the charges of each subatomic particle.

Table B.

	Proton	Neutron	Electron
Charge	+1	0	-1

Using Table A and Table B describe **what would happen to the charge of an atom** of Sodium if it lost 1 electron. What is the **name** given to this type of atom?

Expected responses

- If an atom of Sodium loses 1 electron then it loses one negative charge. So instead of having 11 negative charges it only has 10 negative charges. But it still has 11 positive charges because it doesn't lose any protons. So it actually has more positive charge left rather than negative charge.
- If an atom loses a charge it's called an Ion. If it loses a negative charge (electron) it is called a Positive Ion (because there is more positive charge left behind) and if it loses a positive charge (proton) then it is called a Negative Ion (because there is more negative charge left behind).

Q4. An astrophysicist called **Cecilia Payne-Gaposchkin** discovered that the Sun is made of mostly Hydrogen and Helium gaseous atoms (they are gas).
In Q1 you modelled the behaviour of atoms in the Sun so you have learned that the atoms are moving very fast as the temperature increases.
In Q2. you investigated what happens to atoms that collide and how the charge of an atom changes if it loses electrons.

Putting all of this together, describe **what you think happens to Hydrogen and Helium gaseous atoms in the Sun when they collide**. How does this tell us more about what the Sun is made of?

Expected Responses

- I expect that if two Hydrogen atoms are moving really fast inside the Sun they could collide and then one of the atoms would lose its electron. That means one atom would now be a positive ion.
- There must be lots of atoms of Hydrogen and Helium in the Sun because it's so big and it's so hot so there must be lots of collisions and that means there must be lots of ions in the Sun.
- The same thing would happen with Helium atoms - more ions would be formed after collisions with Hydrogen or Helium atoms.
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