Name:…… Date:……

Nanochemistry

Tiny atoms and molecules react in chemical reactions. Normally, chemists put the reactants together, perhaps heat them, or add a catalyst and then wait for the product(s) to be made. In nanoscience, tiny tools are sometimes used to move particles. The scientist controls exactly where they go. This area of chemistry really is a small world.

It’s a small world: introducing atoms

Atoms are very small – this makes it hard for us to realise they exist. Our eyes can't see atoms directly, so we find it hard to imagine that everything is made from these tiny particles. Think about the small size of atoms during this activity.

What you do

1. Find out how small an atom is. Draw a line about 1 cm long and guess the number of hydrogen atoms which could be placed side by side along it.

   If your worksheet includes two pages, you can find the answer at the end of the questions below. Otherwise, your teacher will reveal the answer.

   Is the answer bigger or smaller than your guess?

   What does this tell you about atoms?

2. Compare atoms with other small things.
   - Draw a table with three columns like the one below. Put 'Name' at the top of the first, 'Picture' at the top of the next and ‘Size’ on the third. Leave enough space for the pictures.

   - Complete the table with 5–6 things which you can see, but which you think are very small. Try to arrange these in size order, with the largest at the top and smallest at the bottom. Put the name of the item in the first column, a picture of it if you can find one (you may have to draw one) in the second and the size in the third.

   - Make a second table of 5–6 things which are too small to see with our eyes. Use the same three column headings as for the first table. Also place these things in size order, with the largest at the top and smallest at the bottom.

Name	Picture	Size

continued on next page

Nanochemistry

continued from previous page

Questions

1. What is the smallest thing your eyes can see? What size is this?

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2. Why can't our eyes see the things in the second table?

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3. What are all these small things made from?

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4. What does this tell you about the sizes of atoms?

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*About 1.35 x 10^6 (that is over 1 million) hydrogen atoms would be alongside each other in 1 cm.

Note: This worksheet can be downloaded as part of several resources, including:

- A collection of activities for 11–16 year olds exploring atoms and nanochemistry (https://rsc.li/37302Bh)
- A lesson plan on matter, elements and atoms for 11–14 year olds (https://rsc.li/32yJ6Qu)
- A lesson plan on atoms and nanoscience for 14–16 year olds (https://rsc.li/2ZsG12K)