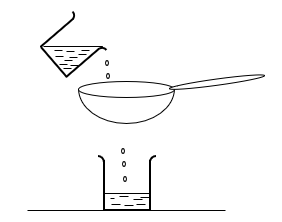
**Sieving and filtering**

1. Sam takes a beaker of water and adds a spoonful of fine sand to it. She stirs it all up together. The water looks orange and cloudy.
   1. She pours half of it through a kitchen sieve. The water which comes through is still orange and cloudy.



What is the best explanation for this?

A The grains of sand are **bigger** than the holes in the sieve.

B The grains of sand are **the same size** as the holes in the sieve.

C The grains of sand are **smaller** than the holes in the sieve.

* 1. Sam then pours the other half of the cloudy orange water into a funnel containing a folded filter paper. The sand collects in the filter paper.

What is the best explanation for this?

A The grains of sand are **bigger** than the gaps between the fibres of the filter paper.

B The grains of sand are **the same size** as the gaps between the fibres of the filter paper.

C The grains of sand are **smaller** than the gaps between the fibres of the filter paper.

D The paper has no gaps in it, so sand particles cannot get through it.

* 1. The water that comes through the filter paper is clear. How does the water get through the filter paper?

Which of these is the best explanation?

A Water is made of tiny particles that are **bigger** than the gaps between the fibres of the filter paper.

B Water is made of tiny particles that are **the same size** as the gaps between the fibres of the filter paper.

C Water is made of tiny particles that are **smaller** than the gaps between the fibres of the filter paper.

D Water is not made of tiny particles. It is a liquid, so it can soak through paper.

*Chemistry > Big idea CPS: Particles and structures > Topic CPS1: Substances and mixtures > Key concept CPS1.2: Particles in solutions*

|  |
| --- |
| **Response question** |
| **Sieving and filtering** |

|  |  |
| --- | --- |
| Learning focus: | Understand how a particle model of matter can be used to describe and explain solutions. |
| Observable learning outcome: | Predict and explain the filtrate and residue when a mixture (suspension or solution) is filtered. |
| Activity type: | simple multiple choice |
| Key words: | filter, filtrate, residue, particle, clear, cloudy, suspension, solution |

This activity can help develop students’ understanding by addressing the misunderstandings revealed by the following diagnostic question:

* Filtering mixtures

**What does the research say?**

Johnstone (1991) explains the difficulties that many students face in understanding science as the degree of ‘multilevel’ thought required. In chemistry students are frequently required to think about very different types of thing all at once.

Johnstone presented this in the form of a triangle:



*(after Johnstone, 1991, p78)*

**Ways to use this activity**

Encourage students to make links between part a and part b by thinking about the holes in the filter paper as being like those in the sieve, but very much smaller.

This activity aims to help students to visualise at the sub-microscopic level by using a sieve as a model which is observable at the macroscopic level.

*Differentiation*

Students could also carry out the experiment.

**Expected answers**

1a C b A c C

**Acknowledgments**

Developed by Helen Harden (UYSEG) adapted from an Evidence-based Practice in Science Education (EPSE) diagnostic item.

Images: York Science

**References**

Johnstone, A.H. (1991). Why is chemistry difficult to learn? Things are seldom what they seem. *Journal of Computer Assisted Learning*, 7, 75-83

Taber, K.S. (2013). Revisiting the chemistry triplet: drawing upon the nature of chemical knowledge and the psychology of learning to inform chemistry education. *Chemistry Education Research and Practice*, 14, 156