Teacher packs in Experimental Science

CHE Pack 4

Magnetic separation of a mixture of iron filings and sand

Pack contents:

A. Teacher's Guide
B. Students Guide
C. Assessment – Student's sheet
D. Extensions to experiments
E. Useful Links
F. Health and Safety
G. Evaluation pack

Curriculum areas covered:

- Physical and chemical changes
- Compounds, mixtures, solute and solvents
- Homogenous and heterogeneous mixtures
- Separation of mixtures

Produced as part of DelPHE-funded collaboration between University of Cape Coast and The Open University, UK

Title: Magnetic separation of a mixture of iron filings and sand

Target group: DBE students

Also suitable for: S H S students

Duration: **30 minutes plus Discussion**

Learning outcomes:

These are the learning outcomes expected after students have gone through this Pack

1. **Knowledge and understanding**

   These are the learning outcomes expected after students have gone through this Pack

   KN1 explain how to separate a mixture of iron filings and sand using a magnet

2. **Key Skills**

   KS1 separate magnetic substances from non-magnetic substances

3. **Practical skills**

   PS1 use a bar magnet to separate other similar mixtures
   PS2 observe and record what happens

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A. Teacher's Guide

Assessment Questions

Discuss with the students how to handle this scenario

'Agnes was sent by his mother to buy a box of sewing pins from the supermarket. On her way back she toppled and fell. All the pins poured into the sand and she started crying.'

Notes:

Separating a mixture of iron filings, sand and saw dust involves two processes

a. add water and stir to float the saw dust and decant
b. apply the use of the magnetic bar to separate the iron filings from the sand

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B. Student Guide

Purpose

The ultimate objective of this experiment is for students to know that magnetic separation of mixtures can be done on mixtures of magnetic and non-magnetic substances.

Background to experiment

Magnetic separation is one of the ways of separating heterogeneous solid mixtures. This is done by the use of a bar magnet. A bar magnet is an object made of certain materials which can attract metals like iron.

The use of a bar magnet is one of the simplest and easiest ways of physical separation of magnetic substances from non-magnetic substances. This is done by passing the magnet over the mixture when it will pick the magnetic substance out of the mixture (see Figure 1).

Magnetic impurities are removed from their ores by the use of magnetic separation. This can also be applied in the laboratory, e.g. to a mixture of iron filings and sulphur.

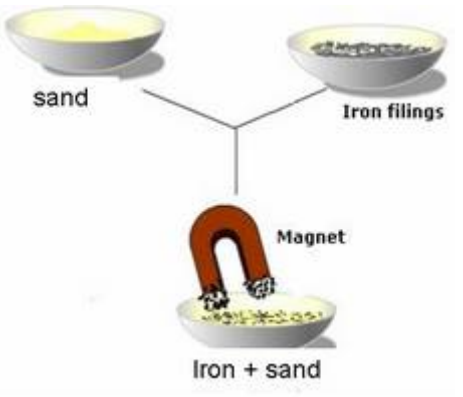

Fig. 1. Separating a mixture of iron filings and sand using a magnetic bar

Equipment/ Materials

Magnetic bar
Iron fillings, iron chippings, or metal scraps
Sand
Petri dish/ plastic plate/bowl
Plastic bag/wrapper

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Other requirements

Working bench/table, Open space, Laboratory coat, Eye goggles, Nose mask, Hand gloves.

Experimental Procedure

Procedure

1. Mix the sand with the iron filings in the plastic plate as shown in Figure 1
2. wrap the plastic bag around the bar magnet
3. suspend the bar magnet over the plate
4. the iron would be collected / attracted to the surface of the magnetic bar
5. carefully remove the plastic bag around the magnetic bar and scrape off the iron filings
6. Repeat the procedure from step 2 until all the iron fillings are removed.
7. This will help separate the iron filings from the sand

Reflection on the experiment

Why was the sand not attracted to the magnet?
Can the same procedure be used to separate carpenter's nails from saw dust? Give a reason(s) for your answer.

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C. Assessment – Student's sheet

On completion of the experiment, you should answer the following questions:

1. Agnes was sent by his mother to buy a box of sewing pins from the supermarket. On her way back she toppled and fell. All the pins poured into the sand and she started crying. How would you help her to recover the pins back?

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D. Extensions to experiment

How will you separate a mixture of iron filings, sand and sawdust?

E. Useful links

⇒ http://www.climatechangematters.net.au/LOTS/Chem/sub/sepironfil/sepironfil.htm
⇒ http://www.tutorvista.com/content/chemistry/chemistry-iii/chemistry-concepts/mixtures.php

F. Health and Safety

Basic safety rules:

1. Do not eat, drink or chew whilst doing the experiment.
2. Avoid breathing in dust particles of the iron fillings.
3. Report any accident, no matter how minor, to the instructor/ health officer.

COMPULSORY SAFETY DRESS FOR THE LABORATORY:

You will not be allowed to do the experiment unless you are wearing the following items:

⇒ Long-sleeved overcoat that is long enough to cover the hips, worn closed at all times.
⇒ Safety glasses. Please note that contact lenses do not provide eye protection and in some cases may complicate an emergency (caustic liquids which splash into the eye can be trapped behind the contact lens). It is recommended that you avoid wearing contact lenses in the laboratory, if possible.
⇒ Closed, flat-heeled shoes (no open sandals).
⇒ Long hair and loose scarves must be tucked away or tied up.

Tidy working

⇒ Keep your working area tidy. A cluttered bench is a common contributory factor to accidents.
⇒ Cleaning after use should be done immediately.

Disposal of chemical waste

⇒ Clean up and dispose of your unknown substances according to your teacher's instructions.

H. Evaluation

a. Was it difficult/easy to have access to the experimental materials listed?
b. Were the experimental procedures easy to follow? Explain.
c. Suggest other methods and materials which can be included in this pack.

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