

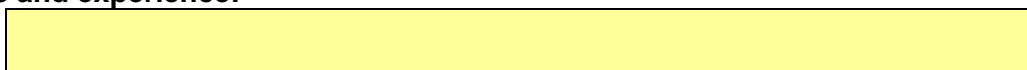
# Topic: Physical Changes and Chemical Reactions

## Issues tackled:

1. **Misconceptions – Problems with the meanings of melting and dissolving.**
2. **Models and analogies – Role play and other models to show chemical and physical changes.**
3. **Practical work – Demonstrating distillation and using a datalogger to show melting or boiling point.**

## Issue 1: Misconceptions – Problems with the meanings of melting and dissolving

### Prior knowledge and experience:



### Possible tasks:

#### Preparation for tutorial:

1. Identify a common misconception in a coming lesson e.g. melting/burning/dissolving etc. - suggest ways that you could overcome this within your lesson using different teaching styles.
  2. Modify an existing worksheet for use with pupils to assess their understanding of physical and chemical changes. (see Taber K (2000). Chemical Misconceptions.)
- Prepare questions/activities that you would use in a starter activity to elicit pupils' specific misconceptions.

#### Possible activities during tutorial:

1. Discuss the misconceptions and teaching strategies they have identified.
2. Present the modified worksheet and look at other existing materials.
3. Present starter activities and try out other possibilities.

### AST Input:

- Draw and discuss particle diagrams to show the differences between melting and dissolving.
- Discuss definitions to use with Key Stage 3 pupils for chemical and physical changes. (Could use pages 25 – 26 of Taber K (2000) Chemical Misconceptions article.)

### Reading:

#### Subject knowledge and understanding

#### Subject pedagogy

Taber, K. (2000), **Chemical misconceptions – prevention, diagnosis and cure** Volume 1, Royal Society of Chemistry, London, pages 22 – 29. Find worksheets online at [www.rsc.org.uk](http://www.rsc.org.uk) <http://www.rsc.org> and follow A-Z contents; Schools and Colleges Service; Teacher Fellow Publications; Chemical Misconceptions.

Hesse, Joseph J., III; Anderson, Charles W., (1992), "Students' Conceptions of Chemical Change", *Journal of Research in Science Teaching*, 29, 3 pages 277-99.

This presents results of intensive clinical interviews with 11 high school chemistry students representing a broad range of achievement levels as selected from 180 students who

completed a written test upon completion of an instructional unit on chemical change. Results indicate that students commonly experience difficulties in chemical knowledge, conservation reasoning, and explanatory competence.

DfES. (2002) Misconceptions in Key Stage 3 science; resource pack for tutors. LEA consultants have this pack which also contains a video on 'Drawing out pupils' thinking and misconceptions in science'.

Video; 'Drawing out pupils' thinking and misconceptions in science'. In DfES (2002) Misconceptions in Key Stage 3 science; resource pack for tutors.

#### **Useful websites and applications:**

QCA web site section on assessment for learning: [www.qca.org.uk](http://www.qca.org.uk). Follow links to age 3-14 and assessment for learning – gives guidance on questioning strategies.

ReviseWise is aimed at supporting 10-11 year olds as they prepare for their Key Stage 2 National Curriculum Tests in English, Maths and Science. The website is supported by TV programmes and videos, and a range of study and practice books. It contains science material on Solids, liquids and gases.

[www.bbc.co.uk/schools/revise/wise/science/materials](http://www.bbc.co.uk/schools/revise/wise/science/materials)

#### **Resources:**

##### **Tasks 1, 2 and 3**

Taber, K. (2000) **Chemical misconceptions – prevention, diagnosis and cure Volume 2**, Royal Society of Chemistry, London, pages 21 – 24. See links on RSC site at <http://www.rsc.org> and follow A-Z contents; Schools and Colleges Service; Teacher Fellow Publications; Chemical Misconceptions.

## Issue 2: Models and analogies – Role play and other models to show chemical and physical changes

### Prior knowledge and experience:

### Possible tasks:

#### Preparation for tutorial:

1. Devise a role play using your class to show simple chemical changes, for example forming water, carbon dioxide, magnesium oxide, sodium chloride.
2. Produce a model to explain dissolving.

#### Possible activities during tutorial:

1. Discuss role play ideas.
2. Present model to explain dissolving.

### AST Input:

- Discuss use of models to extend understanding.

### Reading:

#### Subject knowledge and understanding

#### Subject pedagogy

Taber, K (2000) Chemical misconceptions – prevention, diagnosis and cure, Vol 2 London RSC pages 19 – 20 or online at [www.rsc.org.uk](http://www.rsc.org.uk) and follow A-Z contents; Schools and Colleges Service; Teacher Fellow Publications; Chemical Misconceptions.

#### Useful websites and applications:

### Resources:

#### Tasks 1 and 2

Basic laboratory equipment as necessary.

### Issue 3: Practical work – Demonstrating distillation and using a datalogger to show melting or boiling point

#### Prior knowledge and experience:

#### Possible tasks:

##### Preparation for tutorial:

1. Set up demonstration of Liebig condenser for the distillation of ink. Talk through the demonstration as you would to pupils. Include SEP iButton Datalogger into task and be prepared to discuss the problems arising.
2. Devise an experiment using SEP iButton Datalogger Starter kit to investigate the melting point of pure water and a water + salt mixture.

##### Possible activities during tutorial:

- 1 and 2. Present and discuss the experiments prepared.

#### AST Input:

- Ensure trainees have ordered equipment via technician.
- Look for demonstration technique – e.g. positioning as needed in front of class and health and safety.
- Discuss demonstration and problems using datalogger.
- Mentor could then demonstrate fractional distillation and discuss to further trainee knowledge/understanding.
- Look at drawing scientific diagrams.

#### Reading:

##### Subject knowledge and understanding

Some interesting ideas can be found in Cleminson, A. (2003) **Brunel University Chemistry Materials** under [Classifying Materials](#).

##### Subject pedagogy

##### Useful websites and applications:

Useful material relevant to KS2 can be found on the BBC web site:  
[www.bbc.co.uk/schools/revisewise/science/materials](http://www.bbc.co.uk/schools/revisewise/science/materials)

Information on using the iButton datalogger can be found at [www.sep.org.uk](http://www.sep.org.uk) follow links to resources, equipment and iButton datalogger.

#### Resources:

##### Tasks 1 and 2

iButton datalogger from SEP or any other datalogging equipment used by the school.  
Distillation of ink apparatus and fractional distillation demonstration.  
Laptop and software to display / manipulate data.