Teaching structure and bonding companion sheet

This sheet accompanies the online structure and bonding video PD course for teachers. It contains links to key resources and some questions we will be considering on the course as well as providing a place to note down your personal reflections as you work through the course.

You can either work through the video in order or use the content page to find the bits you are most interested.

Towards the end of the sheet you will find an action planning template, so that you can plan the steps you propose to take next to both implement new learning from this course and to continue your professional development.

Learning Objectives

Participants will learn about

- The strengths and limitations of models used to teach structure and bonding
- Diagnostic tools that can be used to identify common misconceptions held by students
- engaging resources and practical activities, some suitable for home learning

Contents

Registered charity number 207890

Introduction

Structure and bonding classroom resources used on our in-person structure and bonding course are found here. As we will only be looking at a few of these resources on this course, you may find it a useful page to visit.

You may wish to note down different teaching contexts here

Common misconceptions & challenges

Suggested further reading:

Beyond Appearances: Students' misconceptions about basic chemical ideas by Vanessa Kind, University of Durham, 2004

Chapter 2 Students' ideas about the particulate nature of matter (pages 9-14)

Chapter 3 Students ideas about change of state (pages 15-20)

Chapter 10 Students' ideas about chemical bonding (page 55-62)

Chemical misconceptions – prevention, diagnosis and cure. Volume1: theoretical background by Keith Taber

Chapter 7 Chemical structure (page 109 -122)

Chapter 8 Chemical bonding (page 125-138)

Further true/false questions on ionic bonding

Reflection time: What misconceptions and challenges do your students face with structure and bonding?

Learning and Teaching (1)

Reflection time: How does your teaching sequences for structure and bonding compare with the progression sequence in the thread of ideas?

Particles in motion Animations and video clips on a range of topics including states of matter and changes of state.

The Stuff and substance multimedia package provides a series of interactive pages that can be used by teachers or students in the classroom, including supporting commentary and questions, animations, videos, images, and teachers' notes.

Reflection time: How could you use these simulations / models with your students?

How do they compare with the models you regularly use with your students?

Practical activities (1)

Follow the links provided to access the resources for the practical activities discussed on the course

Chocolate and structure experiment. This link includes the practical procedure, teaching notes and background information.

Heating sulfur. This link includes several practical activities and teacher's notes. It is just the liquid sulfur experiment that we are focussing on here; although you may be interested to explore the different crystalline structure of sulfur.

Reflection time: How does practical work enhance the teaching and learning of structure and bonding? How could you use the ideas presented on this course with your students?

Literacy: Confusing language

Reflection time: Identify the key words in this topic that students could find confusing or misinterpret due to the everyday meaning being different to the one used in this context.t

What can you do to minimise the chances of your students getting confused?

Learning and Teaching (2)

Model of the atom & the octet rule

Link to the Build an atom simulation Here you can build an atom from scratch, using protons, neutrons, and electrons. Test different combinations to produce ions and unstable elements. There is also a how to use the simulation video.

An analogy for the atom, the Chemical stability and hydrogen fluoride diagnostic probes can be used to explore your students understanding of the atom and octet rule.

Video clip of the reaction between hydrogen and fluorine

Reflection time: What are the pros and cons of using the octet rule in teaching?

Practical activities (2)

Exploring electrostatic

Balloons and static electricity and a link to the balloons and static electricity simulation. Lots of really quick and simple practical activities from the IoP to support the learning of electrostatic charges and magnetism.

Jets of liquid – practical procedure and teaching notes

Heating group 1 metals in air and chlorine

Reflection time: Consider how you can build on ideas learnt early on in physics into teaching about structure and bonding.

Learning and Teaching (3)

Taking an electrostatic approach to chemical bonding.

Using the metallic bonding model of explain the physical properties of metals activity.

Video showing the reaction between sodium and chlorine (starting at 10 mins 13 seconds)

Johnstone's triangle worksheet template. .For further details read the whole article 'Develop deeper understanding with models' by Rachael Hofgartner

Ionic versus covalent bonding an interactive simulation

Reflection time: Reflect up the pros and cons of the more traditional approach to teaching chemical bonding versus the electrostatics approach

Links to other online courses & useful articles

To access these pages on the online course, you will first need to register for each one.

Topic	Course	Section
Using models to explain observations	Developing and using models	The particle model of matter & Applying the particle model to changes of state from a solid to a gas– exploring understanding https://www.rsc.org/cpd/resource/RES00001453/using-models-to-explain-observations/RES00001448#!cmpid=CMP00003455
From macroscopic to sub-microscopic	Developing and using models	Metallic bonding Macroscopic: observable properties & sub-microscopic – core idea https://www.rsc.org/cpd/resource/RES00001450/from-macroscopic-to-sub-microscopic/RES00001448#!cmpid=CMP00003419

Develop and use models in your teaching: Evaluate the particle model of matter by Dorothy Warren & John Walker

Using models in the classroom by Dorothy Warren

How to teach states of matter and the particle theory by David Paterson

Johnston's triangle worksheet template. .For further details read the whole article 'Develop deeper understanding with models' by Rachael Hofgartner

Structure and Bonding Action Planning

As a result of attending this course, what will you do next?

How will you know if you have achieved it?

Short Term Plan		Evidence of impact
Note down, any actions you will take straight away.eg try out a practical activity with Y9		
Medium Term Plan		Evidence of impact
Note down, any actions you intend to take over the next half term e.g feedback to the rest of the department at a meeting		
Long Term Plan		Evidence of impact
Note down, any actions you intend to take		

over the next half term e.g embed new activities and strategies into our schemes of work		

