Topic: Quantitative Chemistry

Prepared by: **Khatma Bibi** and **Karen Hurst**

Issues tackled:

1. **Key ideas, use of language and terminology - Using the correct terms associated with calculations.**
2. **Models and analogies – Using a simple model to explain balancing equations, chemical formulae and moles.**
3. **Ideas and evidence – An appreciation of the ideas and contribution of past scientists.**
4. **Applications, relevance and cross-curricular issues- Application of numeracy across the curriculum.**

Issue 1: Key ideas, use of language and terminology - Using the correct terms associated with calculations.

Prior knowledge and experience:

Possible tasks:

Preparation for tutorial:

1. Look up and familiarise yourself with the following key skills/facts.
    a. Writing formulae, balancing equations.
    b. Mathematical skills of ratios, percentages and adding positive and negative numbers.
    c. The common positive and negative ions.
    d. Some common covalent molecules.
2. Design an activity to introduce the pupils to the correct terminology associated with writing formulae and balancing equations (e.g. reactants, products, symbols, equations, mole, formula mass).
3. Plan an activity about how to write the formulae of ionic substances.
4. Find a past exam question about reacting masses and plan to use it to teach calculation.

Possible activities during tutorial:

1. Use the skills and facts learnt to work together on one of the other preparation tasks suggested.
2. Present the activity; consider the accuracy of the terms and how it helps pupils to learn them.
3. Show the activity as if to a class.
4. Teach the calculation question as if to a class, the mentor will take the role of the pupils.

AST Input:

- Ask trainee to complete an activity designed for pupils to check their accuracy and look at difficulties which pupils may incur.
- Discussion of problems arising e.g. why the formula for sodium chloride is NaCl, possible problems with mathematics and strategies to overcome it etc..
- Look at exam questions and discuss the typical style of question.

Reading:

Subject knowledge and understanding

Ramsden, E. (1992), **Chemistry for GCSE,** Prentice Hall & IBD, US
Ryan, L. (2005), **Chemistry for You**, Nelson Thornes, Cheltenham
Other GCSE texts.

Subject pedagogy

Numeracy across the curriculum

http://www.standards.dfes.gov.uk/keystage3/respub/numxc

Useful websites and applications

Numeracy across the curriculum http://www.standards.dfes.gov.uk/keystage3/respub/numxc

National Numeracy Strategy:www.standards.dfes.gov.uk/numeracy/

Resources: **Task 4** and **Tutorial**

Past examination papers with questions involving quantitative chemistry.

Tutorial

Pupil worksheet or questions on quantitative chemistry (formulae of ionic compounds, balanced equations, calculating formula mass etc.).

Issue 2: Models and analogies – Using a simple model to describe balancing equations, chemical formulae and moles.

Prior knowledge and experience:

Possible tasks:

Preparation for tutorial:

1. Find and look at some models that could be used to support the learning of balanced equations, chemical formulae and moles. The readings below contain some ideas.
2. Look at interactive ICT resources, which allow pupils to test and extend their skills with balanced equations, formulae or moles.

Possible activities during tutorial:

1. Discuss the advantages/disadvantages of each model and its application in teaching of this topic.
2. Demonstrate the ICT resources and discuss the limitations.

AST Input:

- Discuss a selection of models which could be used in this topic and consider the problems associated with each model. Place the emphasis on the correlation between the model and scientific knowledge.
- Show any available ICT resources which could be used to support this topic.

Reading:

Subject knowledge and understanding

Barker, V., (2002), **Building Success in GCSE Science; Chemistry**, Folens, Bedfordshire. (This is a folder of resources.)

Ryan, L. (2005) **Chemistry for You**, Nelson Thornes, Cheltenham.

Subject pedagogy

Multimedia Science School, New Media. This is a set of interactive computer activities. Details can be found at www.new-media.co.uk

Useful websites and applications

For an example of an ICT activity, www.bgfl.org go to **science, chemistry, Key Stage 4-Chemical Equation**s.

Resources:

Issue 3: Ideas and evidence – An appreciation of the ideas and contributions of past scientists.

Prior knowledge and experience:

Possible tasks:

Preparation for tutorial:

1. Research the contributions made by the following scientists with regards to particles etc: Robert Boyle, Greeks, George Stahl, Antoine Lavoisier, Joseph Priestley. Be aware of the phlogiston theory.
2. Prepare a storyboard activity or role play to introduce pupils to the contributions of one or more of the scientists listed in 1.
3. Prepare a debate/role play about the phlogiston theory.

Possible activities during tutorial:

1. Discuss how the work of these scientists can be worked into a lesson, perhaps by planning a storyboard activity or role play as described above.
2. and 3. Present the activity. Discuss its use in meeting the objectives of Sc1 – ideas and evidence.

AST Input:

- Discuss the use of interactive activities and how they can be used to maximum effect.

Reading:

Subject knowledge and understanding

Ryan, Johnson, Adamson and Williams, (2004) **Spotlight Science Pupil's Book 9,** Nelson Thornes, Cheltenham. Pages 30-31.

Subject pedagogy

DfES (1999) **Science: The National Curriculum for England**, London, HMSO – Ideas and evidence section.

Useful websites and applications

The Kar2ouche (www.kar2ouche.com) software package offers some useful role play activities.
The People in Science series, produced in association with Pearson Education, is designed to deliver the Ideas and Evidence strand of the Science Curriculum. See website and follow links to **science** and **11-18** for more information.

The interactive presentations for the **Heinemann Eureka** series are also useful. See http://www.heinemann.co.uk/ and follow links to **secondary, science, 11-14, Eureka.**

Resources:

Tasks 1, 2 and 3.
Access to ICT suite; Eureka and Kar2ouche needs to be available on the network.

Issue 4: Applications, relevance and cross-curricular issues - Application of numeracy across the curriculum.

Prior knowledge and experience:

Possible tasks:

Preparation for tutorial:

1. Research techniques used by the Maths department, in order to avoid confusing pupils. Relevant topics include percentages, ratio, use of a calculator, significant figures or decimal places and mental estimates.
2. Look at some relevant sections of the Numeracy Strategy.

Possible activities during tutorial:

1. and 2. Look at some calculation questions about formula mass and other relevant topics. Work through the calculations thinking about the mathematical skills required and the best techniques to use.

AST Input:

- Discuss problems that could arise during the teaching of mathematical calculations.
- Demonstrate the practical of burning magnesium in a crucible.
- Discuss the problems associated with this practical and work through calculation.

Reading:

Subject knowledge and understanding

GCSE Maths textbooks and revision guides.

Ryan, L. (2002), **Chemistry for You**, Nelson Thornes, Cheltenham.

Subject pedagogy

Useful websites and applications

To view the numeracy strategy go to www.standards.dfes.gov.uk/keystage3/ follow link to **mathematics** and look at the framework for teaching maths in year 7, 8 and 9.

Resources:

Task 2

The National Numeracy strategy (KS3) or framework for teaching mathematics, years 7, 8 and 9.

Tutorial

Calculation questions to work through (formula mass etc.).
Equipment for practical demonstration – accurate digital balance, crucible with well fitting lid, magnesium ribbon, tongs.
Calculators.