Topic: Rates of Reaction / Reactions involving Enzymes

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Issues tackled:

1. **Investigative skills – Investigating rate of reaction to produce a piece of GCSE coursework.**
2. **ICT – Using data logging to investigate rate of reaction.**
3. **Applications, relevance and cross-curricular issues – Applications of enzymes.**

Issue 1: Investigative skills – Investigating rate of reaction to produce a piece of GCSE coursework.

Prior knowledge and experience:

Possible tasks:

Preparation for tutorial:

1. Research how to investigate the rate of the reaction between hydrochloric acid and calcium carbonate. Order all apparatus and chemicals needed in readiness for the tutorial where you will demonstrate the practical.
2. Produce a set of instructions to enable the pupils to carry out an investigation of the rate of reaction between hydrochloric acid and calcium carbonate as a piece of coursework.

Possible activities during tutorial:

1. and 2. Demonstrate the practical and discuss the verbal and written instructions which should be given.

AST Input:

- Discuss the issues arising from the trainee's demonstration.
- Discuss how this investigation fits the assessment criteria for Sc1.

Reading:

Subject knowledge and understanding

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

Lister, T. and Renshaw, J., (2000), **New Understanding Chemistry for Advanced Level**, Stanley Thornes, Cheltenham.

Subject pedagogy

Hill, G. and Walker, S., (1989), **Chemistry Counts Practical Investigations, Teachers' Handbook**, Hodder and Stoughton, London.

Hyde, P., (2003), Rates of Reaction in McDuell, B. (Ed.), **Teaching Secondary Chemistry**, John Murray, London.

Pruden, V. (1999), **Assessing Sc1 for GCSE**, Heinemann, Oxford.

DfES (2002) Key Stage 3 National Strategy Scientific Enquiry, Resource pack for tutors, London, DfES. Possibly available through science advisor or advisory teachers.

Sang, D. and Wood-Robinson, V., (2002), **Teaching Secondary Scientific Enquiry**, John Murray, London.

Useful websites and applications

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An example pendulum investigation to show pupils how to obtain the highest marks can be found at http://www.8886.co.uk/examples.htm

The assessment criteria and a general investigation checklist can be found at http://www.jcwyatt.34sp.com/sciencelhs/invest.htm

This may be a bit dodgy but real examples of coursework can be found by following the links at http://www.coursework.info

Resources:

Task 1 and **tutorial**
Apparatus for the experiment (to include various strengths of hydrochloric acid, calcium carbonate chips, various sizes of measuring cylinder, flasks, bungs and tubing for gas collection by downward displacement of water, accurate balance, stopclocks, bowls, goggles, gas syringes if available).

Tutorial
Copy of Sc1 assessment criteria, any relevant samples of coursework

Issue 2: ICT – Using data logging to investigate rate of reaction.

Prior knowledge and experience:

Possible tasks:

Preparation for tutorial:

1. Design a practical, comparing the rates of a reaction, using data logging, but excluding the use of a mass balance.
2. Trial the school's data logging equipment and make a list of ideas to use it in experiments about rate of reaction.

Possible activities during tutorial:

1. Demonstrate the experiment designed. Discuss what use to make of the data collected.
2. Demonstrate the data logging equipment and present ideas for experiments. Discuss and develop one idea to use as a class experiment or a demonstration.

AST Input:

- Describe how to make best use of the data produced in this sort of activity.
- Constructively criticise the activity the trainee has developed. Discuss the level of the activity and how it could be used to stretch the more able and support the less able.
- Offer some alternative suggestions and give some examples.

Reading:

Subject knowledge and understanding

Chapman, Lewis, Musker and Nicholson, (1999), **ICT activities for Science, 14-16**, Heinemann, Oxford.

Subject pedagogy

There are several useful books written by Roger Frost and available from the ASE, (www.ase.org.uk)
Frost, R. (2003**) The IT in Science of Datalogging and Control**. IT in Science, Cambridge
Frost, R. (2003) **IT in primary science.** IT in Science, Cambridge
Frost, R. (2003) **Data logging in practice**. IT in Science, Cambridge
Sang, D. and Frost, R (2005), **Teaching Secondary Science Using ICT,** John Murray, London.

Useful websites and applications

There are lots of suggestions for experiments and practical advice at
http://www.rogerfrost.com/index.htm
Click on 'datalogging' and follow links to 'Experiment Gallery'

Resources:

Tasks 1 and 2 and **tutorial**
Datalogging hardware.
Access to computer and datalogging software.
Experimental equipment.

Issue 3: Applications, relevance and cross-curricular issues – Applications of enzymes.

Prior knowledge and experience:

Possible tasks:

Preparation for tutorial:

1. Design a practical activity that shows an application of enzymes which pupils may be familiar with.
2. Research the everyday and industrial uses of enzymes and put together a PowerPoint presentation to use with a class.

Possible activities during tutorial:

1. Demonstrate/explain the activity developed. Discuss how to adapt the activity to suit different audiences and situations e.g. demonstration versus whole class practical.
2. Present the PowerPoint. Discuss how to involve pupils in the presentation.

AST Input:

- Constructively criticise the activity the trainee has developed e.g. highlight where it will be most effective.
- Offer some alternative suggestions.

Reading:

Subject knowledge and understanding

Barbor, M., Boyle, M., Cassidy, M. and Senior, K. (1997), **Collins Advanced Science: Biology**, Collins Educational, Glasgow.

Subject pedagogy

Hyde, P. (2003), Rates of Reaction in McDuell, B (Ed.), **Teaching Secondary Chemistry**, John Murray, London.

Useful websites and applications

A worksheet on biological washing powders can be found at http://www.longman.co.uk/gcsebiology/worksheets.html

More information can be found at www.s-cool.co.uk Type enzymes into the search box.

Resources:

Task 1

Practical equipment for activity as planned by trainee.

Task 2

Computer with PowerPoint software. Projector if possible for the tutorial.

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