

## Student's document

### CHEMISTRY FOR FUN: Demonstrating chemistry experiments

Vocational chemistry students can go on to obtain jobs in schools – and different types of school, from primary to university. You work as an assistant to a chemistry teacher. Your job is to prepare experiments for chemistry teachers to use in the chemistry courses they teach.

#### Your brief

You will work in a group.

1. Your group is asked to prepare and perform an experimental part of a lecture, instead of a teacher, together with short explanations of the experiments, to a class of pupils or students. There are four lectures (courses, issues) planned. Each presentation should be about 30 minutes. Experiments and presentations should be interesting and attractive to the students.

2. In addition, your group is invited to perform experiments at other schools. This time, you have to have a budget to cover expenses. You are asked to calculate the budget, including transport expenses to and from other locations.

3. Chemistry course contents include the following areas of general chemistry: acids and bases, buffers, chemical redox reactions and rate of chemical reactions.

4. A presentation at a course is composed of three parts; these are to be shared among your group (use **Student sheets**):

- a) A brief introduction to the issue
- b) A demonstration of experiments
- c) Explanations of the phenomena seen

5. The task is open-ended, which means you can add your own ideas to the activity.

#### Your investigation

##### Overview of tasks

1. Prepare an introduction, the experimental part and the explanation for each of the courses, which have the following titles:

- a. Acids and bases
- b. Buffers
- c. Redox reactions
- d. Chemical rate

Use all four **Student sheets**. Adapt to suit the knowledge-level of the audience and use different text, written by yourself.

2. Make a list of chemicals and accessories for each experiment.

3. Estimate expenses for chemicals, accessories, equipment, transport by car (taking into account the use of a private car, school car or rent-a-car) and the labour cost. Transport is to be taken as price per kilometre from starting point to location and back.

4. Calculate the required budget for the demonstrations for all four courses.
5. Estimate how distance in kilometres influences the proportion of the budget needed for transport.
6. You will need the CAS numbers (CAS = Chemical Abstract Service) and MSDS numbers (MSDS = Material Data Safety Sheets). For additional chemicals, visit: <http://msds.chem.ox.ac.uk/#MSDS>
7. Measure the time needed to conduct an experiment, for all the experiments.
8. A risk assessment must be carried out before starting practical work. Risk assessment is made using MSDS data. It is suggested that you use data from <http://msds.chem.ox.ac.uk/#MSDS>

### **Task 1**

Using **Student sheet:** *Acids and bases*

- Give a short introduction to acids and bases.
- Perform the experiment showing change of colour on adding acid or base to pure water. Use pH indicator.
- Add the opposite, acid or base, to an acidic or basic solution until the colour is changed back.

### **Task 2**

Using **Student sheet:** *Chemical buffers*

- Give a short introduction to acid-base buffer solutions.
- Perform the experiment showing the delayed change of colour after the addition of acid or base, when buffers are present in the solution.
- Add the opposite, acid or base, to an acidic or basic solution until the colour is changed back.
- Explain the observations.

### **Task 3**

Using **Student sheet:** *Oxidation–reduction reactions*

- Give a short introduction to oxidation – reductions.
- Perform experiments with  $\text{H}_2\text{O}_2$  - following the idea in the text.
- Explain the observations.

### **Task 4**

Using **Student sheet:** *Chemical rate*

- Give a short introduction to chemical change.
- Perform the experiment.
- Explain the observations.

### **Task 5**

Budget and resource managing

- Estimate expenses for chemicals, accessories, equipment, transport by car and a labour cost.
- Calculate the required budget for the performance of all four courses.
- Estimate how distance in kilometres influences the proportion of the budget needed for transport.

### **Your findings**

- Write down some tips, based on your experience with the experiments.
- Discuss your experience with your group.
- Evaluate your own performance first and then follow this with a class evaluation.
- Prepare a poster as a group, including some photos.
- Write a short report on the tasks you completed.

### **Student self assessment**

This activity was about using scientific knowledge and understanding to solve problems, working in teams to solve problems and resource and budget management. For each case, write about 50-100 words explaining:

- What scientific skills and knowledge you used and how effectively you used them.
- How you worked as a team, giving examples of how you supported others in your group or were supported by them.
- How useful you think it was to work out the cost of demonstrations.

You may decide to use alternative forms of self assessment.

The use of the file *Evaluating skills.doc* from the **ProBase** website is suggested.

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