Chem Factsheet

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Laboratory Chemistry - Continuous Practical Assessment

After working through this Factsheet you will:

- **have met in more detail the skills that you will be assessed for in practical work;**
- **have been given some examples of the experiments from A2 level that are helpful in preparing for assessments;**
- **have been offered specific advice on improving your performance in assessments.**

Each Examination Board (or Awarding Body) for AS/A2 level Chemistry publishes a specification, and this contains the precise details of the Continuous Practical Assessment. Since there are slight variations between the Boards, you must use the advice in this Factsheet in conjunction with your specification and ensure you know the requirements of your Examination Board.

Assessing Practical Skills at A2 level

Chemistry is a practically-based subject, and laboratory work is integral to both an understanding of the subject as well as developing your practical skills.

In continuous assessment, the school or college identifies various practicals throughout the year of the course to be assessed (often these are recommended by the Board, which also provides instruction sheets and mark schemes.) The practicals are marked by your teacher/lecturer and the various marks kept on your individual Record Sheet.

The skills to be assessed

There are four skills assessed in continuous practical assessment.

Planning

This is how to perform a practical and covers the following areas:

- method
- quantities of substances to be used
- apparatus needed
- use information to make choices of reagents, etc
- safety issues
- control of variables

N.B. Often you will be asked to perform the practical according to the plan you have designed, then you are asked to comment on what changes you would make to the plan in the light of your experience.

Manipulation

You are marked on the **use of apparatus** and the **accuracy of your results**. It covers the following:

- handling apparatus and chemicals (including safety aspects)
- taking measurements and readings
- performing common procedures without instructions being given eg. filtering
- following a sequence of instructions
- specifically – preparing, purifying, qualitative

N.B. Mark schemes for this skill reflect your level of accuracy i.e. the closer you get to the correct answer the more marks are allocated.

Observing and recording

You gain marks by your ability to:

- record observations accurately of physical changes e.g. colour, gas formation, solubility, etc
- record accurately data readings
- record observations/readings in an appropriate manner and use correct terminology

N.B. You need to be **specific** in your descriptions and use appropriate levels of **accuracy** for data readings.

Interpretation and evaluation of results

This skill covers:

- use correct equations for calculations
- use correct calculation methods
- use graphs
- collate information to reach a correct conclusion e.g. identify a substance
- use and manipulate data, identify trends
- identify anomalous results and experimental error and suggest improvements
- assess reliability of data
- recognise the limitations of the procedure
- estimates of errors

N.B. The ability to handle equations and data to 'draw conclusions' is essential.

Put very basically, the skills are:

1. Can you describe in detail how to perform a particular experiment so that anyone else could use your instructions to get a successful result? (**planning**).

2. Can you perform an experiment by following the instructions, using apparatus correctly and so obtaining accurate results? (**manipulation**).

3. Can you write down in a correct format e.g. a table, etc. all the correct observations and accurate readings generated by an experiment? (**observing and recording**).

4. Can you use the results you obtain in an experiment to draw conclusions about what the experiment shows you and if there are problems with any of the data? (**interpretation and evaluation of results**).

Over the year of the A2 course you will perform a number of assessments and each one will cover one or at most two of the four skills. You may have several opportunities to score well on each skill before submitting the final overall mark .

What are the practicals used?

It is impossible to say which of the hundreds of available practicals you will cover in your Continuous Assessment but here is a piece of advice:

Exam Hint *- When you are told you are about to do a Practical Assessment you will be told what skill it is to cover. Use your specification to remind yourself of the experimental work you need to know.*

Summary
All of the following can be used for Practical Assessments:

1. **Titrations** - acid/base, redox and 'one off' analysis examples.
2. **Tests and compounds** - if you do this to it and this happens what can you tell about the compound?'
3. **Preparations and purification of an organic compound**
   - a liquid
   - a solid
4. **Kinetics/Equilibria** - rates of reactions and 'one off' equilibria experiments.

Specific Advice about skills

1. Planning

This is the most difficult of the skills! When you are given notice of the Assessment you will probably be pointed towards other similar practicals that you have already done. It is very important that you do revisit these practicals.

In a planning exercise you must have the following:

(a) A clear sequence of events written as a set of instructions for another student to follow e.g.
   (i) Collect a 50 cm^3 pear-shaped flask, a connector and a condenser.
   (ii) Set the glassware up as shown in the diagram.
   (iii) Using a 10 cm^3 measuring cylinder measure out 7.5 cm^3 of ethanol and pour into the pear-shaped flask etc.

(b) Use labelled diagrams for any apparatus or procedures.

(c) Be specific about apparatus e.g. 25.0 cm^3 pipette, 50 cm^3 burette, 10 cm^3 measuring cylinder, etc.

(d) Be specific about reagents e.g. dilute HCl, H_2SO_4, aqueous potassium manganate (VII), solid Na_2CO_3, etc.

(e) The calculation of amounts is vital!
Use this method:
   (i) write the equation
   (ii) from the equation work out moles and masses of compounds
   (iii) convert masses to volumes for liquids (Density = mass ÷ volume)
   (iv) work backwards from the amount of product you are supposed to make (including 'percentage conversion') to calculate starting amounts.

(f) Cover safety issues in your instructions i.e.
corrosive liquids/solids - (plastic gloves, safety goggles)
gases/fumes evolved - (fume cupboard)

(g) If you are asked to perform the experiment you must retrospectively say what you would do to improve on your original plan

2. Manipulation

It is important to recognise that when a practical covers two skills it will normally be **manipulation + observing/recording**.

The reason for this is that if you perform an experiment (manipulation) and obtain results/data, these will be written down (observing/recording).

When you hand in your work for marking the accuracy of your results/ observations will reflect how well you have performed the procedures.

This is why the markscheme will give 3/2/1 marks for results in **manipulation** – accuracy of titrations are a classic example of this!

***Remember** - your marks will come from two sources:*
1. *Observations by your teacher/lecturer as you do the practical (usually recorded on a checklist sheet),*
2. *The level of accuracy of your results.*

3. Observing and recording

N.B. Remember - this goes with **manipulation** in many Assessments.

Key Issues:

(a) **Physical changes** - colours (be specific – is it dark blue/sky blue/red /crimson/yellow/orange/etc) – see the textbooks 'effervescence' ('fizzy') i.e. production of bubbles/gas 'colourless' vs. 'clear' (they are not the same)

Remember - you must describe:
(a) (i) what the two substances looked like before you mixed them together
(ii) what they looked like after mixing them.

(WAIT! – chemicals mixed together need at least 3-4 minutes to react before writing down your observation)

***(b) NO** - 'No Reaction'*
***YES** - 'No Apparent Change'/'No Observable Change'*

(b) **Readings from apparatus**
- Electronic - 2 or 3 decimal places
- Thermometers - 1 decimal place
- Electronic meters - whatever the display shows e.g. pH = 3.5 or 3.54
- Burettes - 20.15 or 20.10 i.e. nearest 0.05

4. Interpretation and evaluation of results

As stated already, this is a skill that covers a wide range of practical experiences, which makes offering specific advice difficult.

However, this checklist will help you to obtain good scores for the skill. You must be able to:

(a) use your calculator to handle all the 'powers' and functions needed to process results

(b) plot results of experiments as graphs including connecting plotted points as 'smooth curves' or 'straight lines'.

(c) comment on trends in numerical data or displayed in the form of a graph.

(d) identify from graph plots those results that do not fit the 'curve' or the 'straight line' (anomalous results) and give a reason why they do not fit the pattern

(e) be able to substitute values into equations and rearrange the equation to obtain the unknown value

(f) remember specific tests and results for
   (i) cations/anions
   (ii) functional groups in organic compounds and be able to use these to identify the compound

(g) understand that readings of 1 or 2 decimal places of data cannot produce answers of 3-4 decimal places. This is called 'level of accuracy'.

(h) be able to recognise where errors arise in practical work, BUT you cannot use 'human error'!

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