WJEC (Eduqas) Chemistry A-level

Practical Assessment Skills

Key Skills and Exam Techniques

Required Practicals

Completing the required practicals allows practical skills to be gained, including the ability to:

- Apply **investigative** approaches and methods to practical work.
- Think **independently** when undertaking practical work.
- Use a wide range of experimental and practical **instruments, equipment and techniques.**
- **Plan methods** appropriate to the knowledge and understanding included in the specification.

WJEC Competencies

1. Follow written procedures.
2. Apply investigative approaches and methods when using instruments and equipment.
3. Safely use a range of practical equipment and materials.
4. Make and record observations.
5. Research, reference and report

Practical Skills

Planning an Experiment

Some tasks will require an experiment to be **planned** out before it can be carried out. In these cases, it is important to consider **appropriate methods** and any **risks** that could occur due to the method or materials used. Details such as concentration ranges and methods to **reduce errors** must also be considered and incorporated into the written method.

When describing arrangements of apparatus for an experiment, it should include a **detailed description** with the aid of a clearly **labelled diagram**. Any procedures that need to be followed should also be **explained thoroughly**.

Data Collection and Analysis

When carrying out an experiment, it is important to:

- Describe how data from the experiment should be used in order to **solve a problem** or reach a **conclusion**.
- **Set up apparatus** correctly without assistance and follow instructions given.
- Undertake and record **trial readings** to determine the suitability of ranges and intervals where appropriate.
- Take **repeat readings** where appropriate to help reduce errors.
- Make and record **accurate measurements**.

Risk Assessment

Sometimes it will be required for a **risk assessment** to be produced for an experiment. Assessing the possible hazards and risks of an experiment is key during the planning process:

- **Hazard** - an object or chemical can be a hazard (eg. $AgNO_3$ solution - corrosive)
- **Risk** - an 'action' in the method that can create a risk (eg. using a bunsen burner has a risk of burning)

Details of the **specific hazards** associated with certain chemicals being used should also be included and any hazards or risks should be countered using an appropriate **control measure**.

Table of Results

It is important that any data collected is **recorded and presented** in a **clear and efficient** way. When using a results table:

- Present numerical data and values in a **single clear table** of results.
- Use **column headings** for both quantity and include the unit (eg. Volume HCl / cm)
- Include enough columns for all **primary data** and any subsequent values calculated using it.
- Record primary data to the same number of decimal places as the **resolution** of the apparatus. (eg. if volume is measured to the nearest 0.05 cm^3 then all volumes in the column should be recorded to the nearest 0.05 cm^3)

Recording Readings and Significant Figures

All primary data should be recorded to the **resolution of the apparatus** used. Any data calculated from the primary data should be given to the **same number of significant figures** (or a maximum of one extra) as the primary data.

The number of significant figures should be the **same for all data within a column** of a graph.

Graphs

When plotting a graph, it is important to:

- Include a **title and axes** which are labelled with **scales and units**.
- Make sure the scales are **convenient** to use, so that readings may easily be taken from the graph.
- Avoid scales which use factors of 3.
- Ensure that the plotted points occupy at least **half of both the vertical and horizontal axis**.
- Consider carefully whether your plotted points suggest a **straight line** or a **curve**, then draw in your best fit line. This should be done with a **ruler** for straight lines and as a **freehand sketch** for curves.
- Determine the **gradient** of a graph, showing clearly the readings you use by drawing a **right angled triangle** (this should be as large as possible so that accuracy is preserved).

Estimating Uncertainties

In practical experiments, uncertainties can affect the outcome. Therefore, it is important to:

- Identify the measurement which involves the **greatest uncertainty** (based on apparatus resolution).
- Express the uncertainty as a **percentage** of the measured value.
- Express the result to a **sensible number of significant figures**.

Conclusions and Evaluations

In order to reach a conclusion or solve a problem, **experimental data** should be used to **support any points** made. Once complete, **evaluate** the experimental methods and suggest **improvements** that could produce a better outcome.