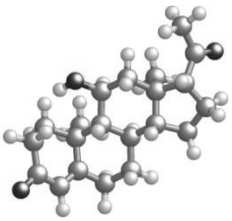

Chem!stry

Name: …… **( )**

Class: ……

Date: …… **/** …… **/** ……

General Guidelines for Designing / Planning an Experiment

1. Describe briefly the general strategy or approach that you would want to use for your experiment.

- Read the information through several times. Make sure that you are clear about the objective of the experiment.
- Think very carefully about how you will perform the experiment. If there is more than one way, then consider which is the best method, the one for which you can write straight forward instructions that you are familiar with.
- Write a brief outline of the experiment. This should focus on the essential steps, measurements and quantities. For example, "*Acids react with carbonates to produce carbon dioxide gas. Excess hydrochloric acid was added to a known mass of indigestion tablet* **X** *and the volume of carbon dioxide gas produced was recorded against time until the reaction was complete. The experiment was then repeated using the same mass of indigestion tablet* **Y**".
- Briefly explain how the results of the experiment will be used to answer the question. For example, "*A graph of volume of carbon dioxide gas against time will be plotted for both indigestion tablets. The tablet with the steepest initial gradient is the one with the largest surface area (to volume ratio)*".
- Avoid using the term "amount" when you can be more specific and use terms such as "mass" and "volume" instead. The term "amount" is normally used to describe the number of moles of a substance, for example, "*The amount of water in 36.0 g of the liquid is 2.00 mol*".
- Avoid the use of abbreviations such as "ppt." for precipitate and "vol." for volume. You should write all words out in full.

2. Identify some key variables that you need to keep constant and those to be changed in the experiment.

- Include three or four essential variables. Do not write a long list of variables, as you may be penalised if any of them are incorrect.
- Be clear about the independent variable (what you will change) and the dependent variable (what you will measure).
- Give one or two examples of important variables that you will need to keep constant. For example, if you are investigating the effect of surface area on the rate of a chemical reaction, then temperature would need to be kept constant (because temperature can also affect the rate of a chemical reaction).
- State the variable that you will change between experiments (independent variable or input variable).
- State the variable that you will measure in order to draw a conclusion (dependent variable or output variable).

3. Write a list of apparatus / materials that you need for your experiment.

- Write a comprehensive list of apparatus and chemicals that you need in order to complete the experiment.
- Be specific. State that you need a 250 cm^3 conical flask rather than just saying that you need to use a conical flask.
- When you draw the diagram, and write the step-by-step instructions, go back to the list of apparatus and add any items that you have forgotten.
- You can normally include *common* laboratory apparatus and reagents in your list, even if they are not given by the exam board. But be careful, the exam board will sometimes state "Use only the apparatus / reagents given".

4. Draw labelled diagram(s) of the experimental set-up.

- Diagrams MUST be labelled.
- Diagrams should be two-dimensional scientific diagrams of the apparatus, not artistic three-dimensional sketches.
- Diagrams can be drawn in pencil, but should be labelled in pen.
- Gas syringes should be drawn so that they appear air-tight.
- The bulb of the thermometer should be drawn in the appropriate location.

5. Write your suggested procedure as a series of step-by-step instructions.

- Before writing the step-by-step method, go back and read your general strategy (Step **1**) and your list of variables (Step **2**). These should be reflected in your step-by-step method.
- Place steps in the correct chronological order. For example, if a strip of metal needs cleaning (strip of magnesium before it reacts with an acid or copper strip before it is used in electrolysis) then this should be done *before* weighing it.
- Some parts of the experiment may need to be done at the same time, *e.g.* adding two reagents together and stating a stopwatch. In the procedure, this can be emphasised by using the word *immediately*, e.g. "The calcium carbonate was added to the beaker of dilute hydrochloric acid and the stopwatch started *immediately*".
- Clearly state the appropriate apparatus to be used at each stage of the experiment.
- Remember to take any important initial readings, for example, initial mass, initial temperature, initial volume.
- Describe how you will take the important readings, *i.e.* the important variables.
- Describe how you will keep other important variables constant.
- Use the correct language, for example, "The *maximum* temperature was recorded" NOT "The *final* temperature was recorded".

6. Describe how the data collected should be processed to fulfil the purpose of the investigation.

- This can be calculations, analysing of data using tables, graphs or diagrams to make meaningful information or locate any trends or patterns that allow inference or conclusion to be made.
- If you plot a graph to illustrate the results, consider whether or not it should pass through the origin (0,0).
- You are not actually required to make-up any data / results.