Enhanced Learning
Educational Services
"the study skills specialist"

# SCIENCE SKILLS

**Developing your skills for Science will help you learn the subject more effectively and enjoy the process!**

- **You should read each point and highlight the key phrases in that point.**
- **Discuss with a friend or parent as you read through the handout.**
- **You may like to work through this over a number of sessions.**

 

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**Enhanced Learning Educational Services Profile**

Our Organisation:
Enhanced Learning Educational Services (ELES) is the leading provider of study skills resources in Australia. Since 2001 over 500,000 students across Australia have benefited from our study skills worksheets and workbooks. An Australian business based in Sydney, our clients extend throughout Australia and to international schools overseas. We are committed to helping all students improve their ability to learn and study by providing study skills seminars and resources on the topics students need.

Our Mission:
To provide a worthwhile and effective service to teachers, students and parents, enhancing students' learning skills and abilities through dynamic programs, resources and strategies to unlock the power of the mind and enable greater success at school and in life.

Our Commitment:
As part of ELES' commitment to education, 5% of all gross income is donated to charities that help and assist children.

**For further information about ELES or our products or contact details:**

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# 1. SCIENCE IN THE SCHOOL LABORATORY

- **BE PREPARED FOR CLASS:** come to class with your workbook, textbook, pens, pencils, ruler, calculator and science apron or lab coat.
- **SIT AWAY FROM DISTRACTIONS:** including friends or the window if you tend to gaze out and daydream.
- **BE PREPARED TO LEARN:** this means going over your notes from the previous lesson and writing down any clarification you need before learning new material. You also may like to read ahead.
- **ASK QUESTIONS:** don't be shy about asking a question, someone else probably has the exact same query.
- **LOOK FOR REAL LIFE APPLICATIONS:** where possible, try to apply the theory you are learning in practice – making an everyday or laboratory connection to what you are learning will help to consolidate the info you are learning.
- **BECOME A SELF-DIRECTED LEARNER:** active learners will seek out information themselves. This means you have a desire to learn more about a topic and are self-motivated to do it in your own time outside of the school setting.

*Safety in the laboratory:*

- **LAB LAYOUT:** Knowing the layout of your school laboratory will help you become even more prepared.
- **EQUIPMENT:** If you are not sure how to assemble some of the equipment, simply ask the teacher to demonstrate how to put it together and write yourself a note so you remember for next time.
- **FIRST AID:** make sure you always know where the first aid kit is, the location of the shower and eye wash station and the broken glass disposal unit.
- **RISKS:** before commencing any practical investigation you should be aware of any risk involved, how to minimise that risk and what to do in the case of an accident.
- **REPORT ISSUES:** never be afraid to tell your teacher about an incident, your safety comes first.
- **RISK ASSESSMENTS:** a risk assessment is written before commencing any practical. You can also be asked to write a risk assessment in an exam, so it is important to learn about risk and safety in the laboratory.

*Lab reports:*

 

We use lab reports to document our ideas, method and findings in science. There are some rules to follow:

- Always write in the 3rd person – never say 'I think' or 'we did this' or 'you should'.
- Always use pencil to draw up tables and graphs.
- Include all the following headings in order (if your school has a specific template to follow then use the headings your school provides): Aim, Hypothesis, Risk Assessment, Materials, Method, Results, Discussion, Conclusion.

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|   | *a. Are you sensible in the school laboratory? Do you follow all of the principles outlined above?* |

# 2. KEY TERMINOLOGY

*Scientific Method*

The scientific method is the basis of all science, research and experiments.

- **STEPS:** The steps to follow are: Make observations, ask questions and try and understand the observations, carry out research, form a hypothesis to explain the observations, make predictions based on the hypothesis, design a fair test (controlled experiment) to test the hypothesis, carry out the test, make a conclusion about the hypothesis.

- **HYPOTHESIS:** A Hypothesis is your proposed explanation of why something happens. You must be able to test your hypothesis to see if your idea is correct or not. It is not just a guess about what might happen, it is an "educated guess" based on the information you have and the observations you have made.

*Observations*

- **QUALITATIVE** observations involve using your senses to observe the results (sight, smell, touch, sound and taste). For example: The leaf is dark green in colour and smells like mint.

- **QUANTITATIVE** observations are made with equipment like rulers, cylinders, balances, stop watches and thermometers and give us a numerical value (measurement). Always remember to include units when making a quantitative observation. For example: The leaf was 15cm long.

- **INFERENCE:** An inference is an explanation you try to make based on your observations.

- **PREDICTION:** Often you may try to work out what will happen, before it actually does. This is called a prediction.

 

*Fair Testing and Variables*

- **INDEPENDENT VARIABLE:** is what you are going to be testing or CHANGING in your experiment. You may only have one independent variable to test, eg the effect of temperature on the rate of reaction. The temperature in this case is the independent variable, because it is what you are physically manipulating or changing in the experiment.

- **DEPENDENT VARIABLE:** is what you are MEASURING, basically your result. This could be time, temperature, length, mass or anything you can take a quantitative measure of. In the above mentioned example, the dependent variable would be the rate of the reaction, measured in time (seconds).

- **VARIABLE HELD CONSTANT:** is what needs to be kept the same in the experiment, for example using the same type of measuring equipment in each test performed. In the above mentioned example, some variables held constant would include using the same thermometer, stopwatch, volumes and masses of the reacting compounds.

- **CONTROL:** A control in an experiment is a scientific set-up that does not include the independent variable. This is used to provide baseline data which all results are compared against. In the above mentioned example the control would be a seedling without any liquid fertiliser added.

- **RELIABILITY:** To check the reliability of an experiment, you repeat it a number of times. If you get results that are very similar, then it is a reliable experiment. If the results keep being different, it isn't reliable. This means there must be some part of the experiment that is not controlled properly.

- **VALIDITY:** An experiment is valid if it allows you to collect results that answer the aim. An experiment is valid if you: use the most appropriate equipment available to you to make your measurements, make sure all variables are held constant, conduct the experiment across a range of measurements (if possible), have a control (if possible).

- **ACCURACY:** Accuracy refers to how close your results are to the actual or expected value.

- **FOR GRAPHS:** The independent variable lies on the x-axis and the dependent variable lies on the y-axis.

- **FOR TABLES:** The independent variable is always written in the first left hand column (going down), while the dependent variable is written across the top right hand column.

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| DISCUSS | *b. Tick which of the above terminology you were familiar with. Do you understand now the ones you weren't sure of?* |



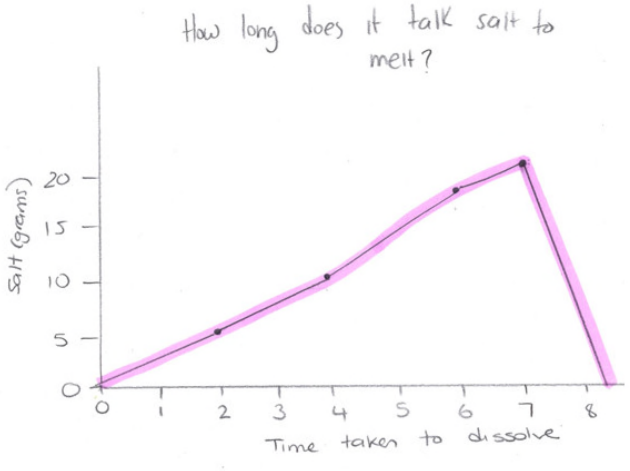
# 3. SCIENTIFIC DIAGRAMS, GRAPHS & TABLES

*Diagrams*

- Diagrams are a great way to learn and summarise information in science. They are also often a part of exams in the skills section where you may be asked to draw apparatus or biological diagrams.
- Draw your diagrams in your notes how you would in an exam to give you practice with this technique.
- All diagrams should be drawn in pencil, no colouring or shading and should be two-dimensional.
- Diagrams should be approximately a third of the page with neat and clear lines.
- Labels should be drawn with a ruler and they should not cross over each other.
- Labels can be written in either pen or pencil but should be horizontally aligned with the label line drawn.
- Always include a title at the top and if a magnification or scale is required include it at the bottom right hand corner.

*Graphs/Tables*

- In Science when you conduct an experiment you will need to write your results up in a table. Tables should always be drawn in pencil and with a ruler and given an appropriate descriptive heading. Put units for mass, time or temperature in the heading column.
- Graphs allow us to summarise and interpret a large amount of data into a clear and simple format.




- Always use a pencil and ruler.
- Label the x and y axis (independent variable = x axis and dependent variable = y axis) and include units.
- Draw an appropriate scale on the x and y axis (go up by 5, 10, 20 etc.).
- Plot the data accurately.
- If plotting multiple sets of data, include a key – using different shapes for each set of data e.g. dots, squares.
- Even if you get completely stuck in an exam or do not have time to complete the whole graph, you will still be given marks if you put in the title, labels and scale, this could potentially give you up to half the marks for the graph.

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| DISCUSS | *c. How well do you draw and interpret graphs, tables and diagrams in Science? Is this a strength or weakness of yours?* |