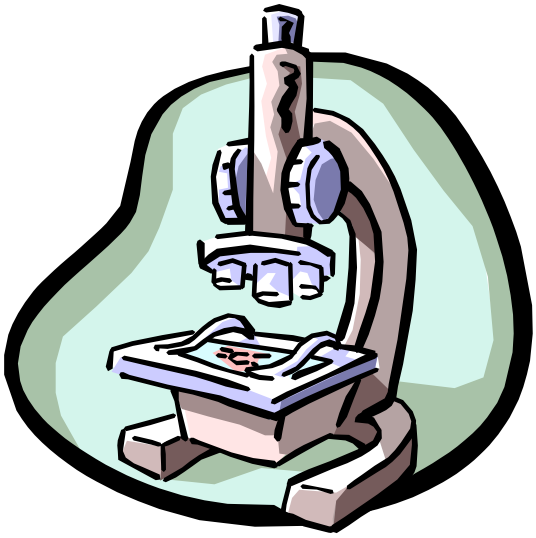
Melbourne High School Science

Year 9 Semester 1 2008



Practical Booklet

Name: ……..

Class: ……..

Teacher: ……

All course information can be obtained from the Science web site:

http://resources.mhs.vic.edu.au/science/

Printed: 13 December 2007

Contents

Safety in the Science Rooms (Laboratory rules)

1. You must not enter the laboratory unless a teacher is present, and you must not enter any preparation room, store room or the roof top nursery except under the direct instruction of a science teacher.
2. Chemicals must not be removed from the laboratory. Theft will be dealt with severely.
3. Never attempt unauthorised experiments. You must follow instructions exactly.
4. If you see another student using an incorrect procedure, point out the error.
5. All apparatus should be examined carefully before use; it should be clean and in working order. Any damaged or dangerous apparatus must be reported immediately. Check all apparatus before putting it away. It should be undamaged and clean. Keep your work area clean and tidy.
6. Avoid waste. Use only small quantities of chemicals and make sure all gas and water taps are turned off before leaving the laboratory.
7. Most waste liquids can be poured down the sink, flush with water if this is the instructed method of disposal. Most waste solids can be disposed of in the bin. Alternative instructions will be given if required. All clean waste paper must be placed flat in the Visy recycle box.
8. If there is an accident, inform your teacher immediately.
9. Whenever you are not sure of how to handle a situation consult with your teacher.
10. Do not handle hot objects, allow sufficient time for the apparatus to cool.
11. Use matches to light a Bunsen burner, not pieces of flaming paper.
12. Be very careful with flammable liquids. Do not open or pour flammable liquids near a flame.
13. Handle glass with respect. Broken glass should be swept up immediately, wrapped and placed in the bin. All accidents must be reported to your teacher.
14. Treat ALL chemicals as poisonous. NEVER taste chemicals. Smell with care and only after being instructed to do so. Avoid skin contact or inhaling any chemicals.
15. Wash your hands thoroughly after using chemicals.
16. Do not eat or drink in the science laboratory.
17. Handle electrical equipment with great care.
18. Always leave the Science rooms looking better than you found them.

What to do in case of accidents or injuries:

1. Inform your teacher immediately.
2. Treat splashes in the eye by irrigating the eye with water continuously for several minutes.
3. Flood spills on the skin or clothes with large amounts of water. This also applies to benches. Clean up.
4. Shower burning paper and other burning solids with water. Use the liquid carbon dioxide fire extinguisher on electrical fires.
5. If a person is on fire, shower with water or cover with a fire blanket. Do not use a fire extinguisher.

Safety is always our first concern!

- Irresponsible and dangerous behaviour will result in your parents being informed and may result in the withdrawal of hands-on practical work.
- Careless handling of equipment causing damage or deliberate breakage will result in the student(s) responsible paying for damaged or broken equipment.
- Serious accidents can occur especially through irresponsibility, disobedience and inattention.
- Class behaviour is also important. Unruly classes will not do practical work.
- We expect you to work well, safely & enjoy this excellent subject.

Prac reports – A guide

Your report should include the following information under the correct headings. Not all of these areas will necessarily be needed for every report. Your teacher will inform you if a shorter format is required for a particular piece of work.

INTRODUCTION: An introduction includes some general background to the topic being investigated. Some indication of background reading should be evident.

AIM: This should clearly state what is being investigated and why it is being investigated. This section should also include your hypothesis.

MATERIALS: A list or description of the equipment you used. Drawings may be applicable.

METHOD: This section should be presented in a way which allows the experimental sequence to be easily followed, point form presentation is preferred. Your method should always be presented logically.

RESULTS AND OBSERVATIONS: The presentation of data/results should be in the form of tables, graphs, diagrams. Units must be given for any quantity that requires them. Units are usually measured in S. I. form, eg. metre, kilogram etc. All information should be clearly labelled.

DISCUSSION: Your discussion should include an analysis of your results, an analysis of the design of the experiment, and an error analysis. Try to answer the following questions: What do the results show? How should the results be interpreted? Do they support or disprove the hypothesis? Were there any trends in the data collected? Were any problems encountered? What were they? How did you deal with them? Do you have any suggestions for improvement in the experimental design? How were random errors eliminated? Were there any variables not accounted for?

CONCLUSION: This section should be short and to the point. The conclusion should relate directly to the aim. Has the hypothesis been supported or disproved?

BIBLIOGRAPHY: If you used any books or other written sources, eg. journals, encyclopedias, internet etc. to obtain information, it should be referenced. A list of these sources, if used, must be included in a bibliography.

ACKNOWLEDGMENTS: Any other assistance obtained from people should be acknowledged here.

Practical reports should always be neatly presented and handed in on the due date.

Conservation of mass in a chemical reaction

The following series of steps for testing **Lavoisier's Law of Conservation of Mass** have been jumbled. Number each of the steps in a logical order to ensure that the experiment can be completed effectively. You will need to **define key words** first in order to understand the steps.

	Carefully pour the contents of the first 250 mL beaker into the filter paper - do not allow the suspension to reach the top of the filter paper. Add more as required until all the suspension has been filtered.
	Weigh the filter paper and record its mass.
	Add 20 mL of distilled or deionised water to each beaker and stir under the crystals have dissolved. Rinse the stirring rod under the tap between stirring the two solutions.
	Describe the residue remaining after evaporation is complete.
	Describe the appearance of the filtrate.
	In the **next class**, weigh the dried precipitate and filter paper and record the mass. Dispose of the precipitate as directed. Complete the calculations.
	After cooling, weigh the evaporating basin and residue and record the mass. Rinse the apparatus and put it away as directed. Wipe down the bench.
	Fold the filter paper as directed - your name must be on the inside, place it in the funnel and stand the funnel in the conical flask.
	Use a small amount of water from a wash bottle to rinse the inside of the beaker that contained the insoluble product - ensure that the washings are directed into the filter paper.
	Carefully pour the filtrate into the evaporating basin and evaporate the water, ensuring that the solution does not spit out when being boiled.
	Weigh out approximately 1.0 g of each of potassium iodide crystals and lead nitrate crystals into separate beakers. Record the actual masses and appearances.
	Pour the solutions into a 250 mL beaker so that both compounds are able to react. Record your observations.
	Carefully remove the filter paper and the precipitate from the funnel, open it out and put it the designated place for drying overnight.
	Weigh an evaporating basin and record its mass.
	Obtain a piece of filter paper. Write your name around the edge of the filter paper using insoluble ink or pencil - do not use water soluble ink!

Name: _____

Form: _____

Partner(s): _____

Conservation of mass in a chemical reaction

LEAD COMPOUNDS ARE TOXIC.
Handle with care and dispose of the products as directed. Gloves should be worn and hands must be thoroughly washed before leaving.

Aim: To test Lavoisier's Law of Conservation of Mass.

Terminology:
chemical reaction, chemical equation, reactant, product, precipitate, suspension, filtrate, residue, evaporating basin

Materials:

Glassware	Other apparatus	Chemicals
250 mL beaker	balance	potassium iodide crystals
100 mL beaker	evaporating basin	lead nitrate crystals
100 mL measuring cylinder	filter paper	distilled or deionised water
300 mL conical flask	wash bottle	
filter funnel	bunsen burner	
stirring rod	bench mat	
	tripod and gauze	
	matches	

Method: Your teacher will provide you with a document listing the steps for performing this experiment.

Results and observations

mass of potassium iodide crystals = _____ g

mass of lead nitrate crystals = _____ g

mass of filter paper = _____ g

mass of filter paper plus dried precipitate = _____ g

∴ mass of precipitate (lead iodide) = _____ g

mass of evaporating basin = _____ g

mass of evaporating basin plus solid residue = _____ g

∴ mass of residue (potassium nitrate) = _____ g

total mass of reactants = _____ g

total mass of products = _____ g

appearance of potassium iodide crystals	
appearance of lead nitrate crystals	
appearance after the solutions are mixed	
appearance of the filtrate	
appearance of potassium nitrate residue after evaporation	
appearance of lead iodide after drying	

Discussion

1. How do you know that a chemical reaction has occurred? State at least two.

2. Write a word chemical equation for the reaction that occurred in this prac - include symbols of state.

3. Do your results support the Law of Conservation of Mass? If not, suggest a reason why they do not support it, remembering that the total number of atoms before the reaction must be the same as the total number of atoms after reaction.

4. Why was distilled or deionised water used in preference to tap water when dissolving the reactants in this exercise?

5. Why is it necessary to rinse the stirring rod when preparing the solutions of the reactants?

6. What is the reason for carrying out step 8 of the Method?

7. Why must the filter paper be named around the edge rather than in the middle?

8. Why is water soluble ink inappropriate for use when naming the filter paper?

9. Why is it essential to allow the evaporating basin to cool before reweighing it?

10. Solid potassium nitrate is pure white but it is unlikely that your potassium nitrate was white. Suggest a reason why your potassium nitrate was not white.

11. What skills and knowledge have you gained from completing this experiment?

12. If you had to explain the Law of Conservation of Mass to someone in Grade 6, what would you say?

Name: _____

Form: _____

Partner(s): _____

The rate of photosynthesis

Aim:
To set up a basic experiment to show how the rate photosynthesis can be measured.

Materials:

- Three large test-tubes with stoppers
- Bromothymol blue indicator
- A drinking straw
- Aquatic plant such as Hydrilla, Eloda or Myriophyllum* (parrots feather)
- Black plastic

Note: Myriophyllum is an introduced pest and must be disposed of carefully. Elodea is banned in some states.

Method:

1. Place 1mL of bromothymol blue into each of three test-tubes, and then three-quarter fill them with water.
2. Bubble your exhaled breath through the solution with the straw. The carbon dioxide in your breath will turn the indicator pale yellow. Stop as soon as the solution turns yellow. Completely fill the test-tubes with water.
3. Place a segment of aquatic plant into two of the test-tubes, and stopper in each.
4. Wrap one of the test-tubes containing a plant in black plastic. See figure 1.
5. Place all tubes in front of a lamp or bright light.
6. Check the tubes the next day and record any colour changes.

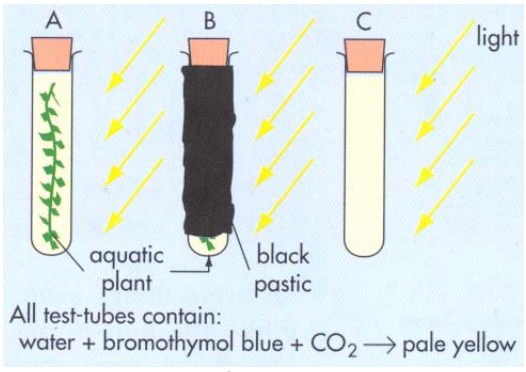


Figure 1

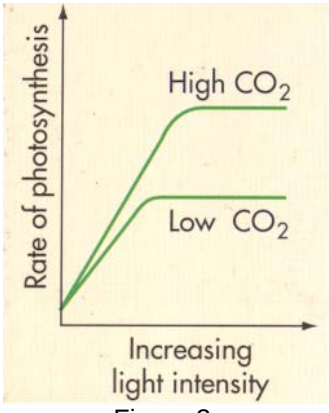


Figure 2

Results:

Test tube A	Test tube B	Test tube C
Conditions experienced	**Conditions experienced**	**Conditions experienced**
Observations	**Observations**	**Observations**

Results and Discussion:

1. What would the black plastic do to the rate of photosynthesis in that tube? Explain why.

2. What gas exchange would have occurred between leaf and solution in the lit tube?

3. Why can plants only use a certain amount of light and carbon dioxide at any one time?

4. Look at Figure 2. What are the better conditions for photosynthesis as shown by the graph? Explain.

Conclusion: (The conclusion is usually a brief statement that summarises the experimental results; support or contradict the stated hypothesis and prediction; and answers the aim)

Name: _____

Form: _____

Partner(s): _____

The pendulum

The Problem: What variables control the period of swing of a pendulum?

Requirements: Fishing line or thread, a selection of masses (for the bobs of the pendulum), metal stand, ruler, stopwatch.

What to do: This investigation is to be planned by you, as an exercise in working scientifically. A broad outline of steps is given below.

Look at "The Problem" stated above. You need to form a hypothesis from this question.

Write a list of the variables that could influence the period (time of swing) of a pendulum.

Variables:

1) _____

2) _____

3) _____

Devise an aim for testing. This should examine the effect of one variable only.

Aim: _____

_____

Devise a hypothesis for testing. This should be for the selected variable chosen.

Hypothesis: _____

_____

- *Design an experiment to test your hypothesis.* Remember to allow for these things in your design:
- Control all variables except the dependent and independent variables mentioned in the hypothesis. (In this case don't use a control; simply make sure these things don't change during the experiment)
- You must replicate the experiment. Time several (say ten) swings of the pendulum, not just one. Repeat this a few times for each value of the dependant variable.

Discuss your design with your teacher.

Method: (write these as a series of steps)

1)

2)

Perform your experiment and *record the data.*

Results:

Variable 1 (my results)

Trial number	Weight/Angle/Length	Time taken
1		
2		
3		
4		
5		
6		
7		
8		

Observations for my experiments:

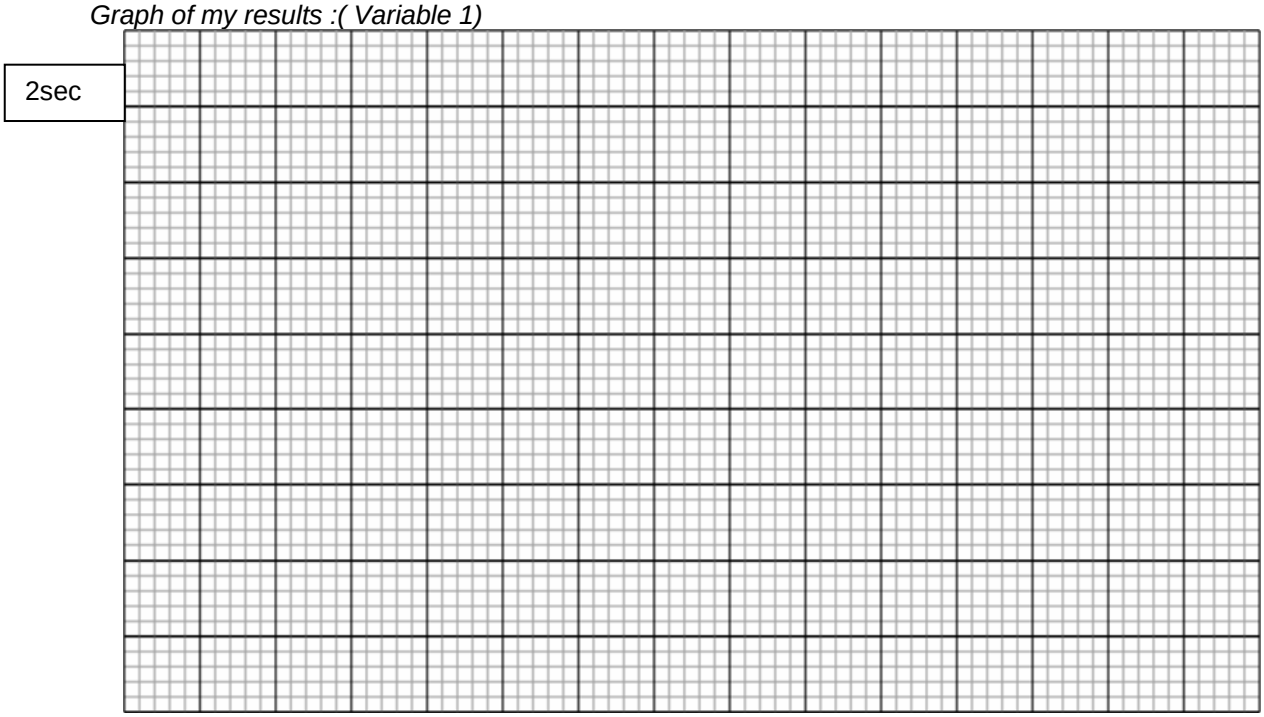
Variable 2 (class results)

Trial number	Weight/Angle/Length	Time taken
1		
2		
3		
4		
5		
6		
7		
8		

Variable 3 (class results)

Trial number	Weight/Angle/Length	Time taken
1		
2		
3		
4		
5		
6		
7		
8		

Graph of my results :(Variable 1)



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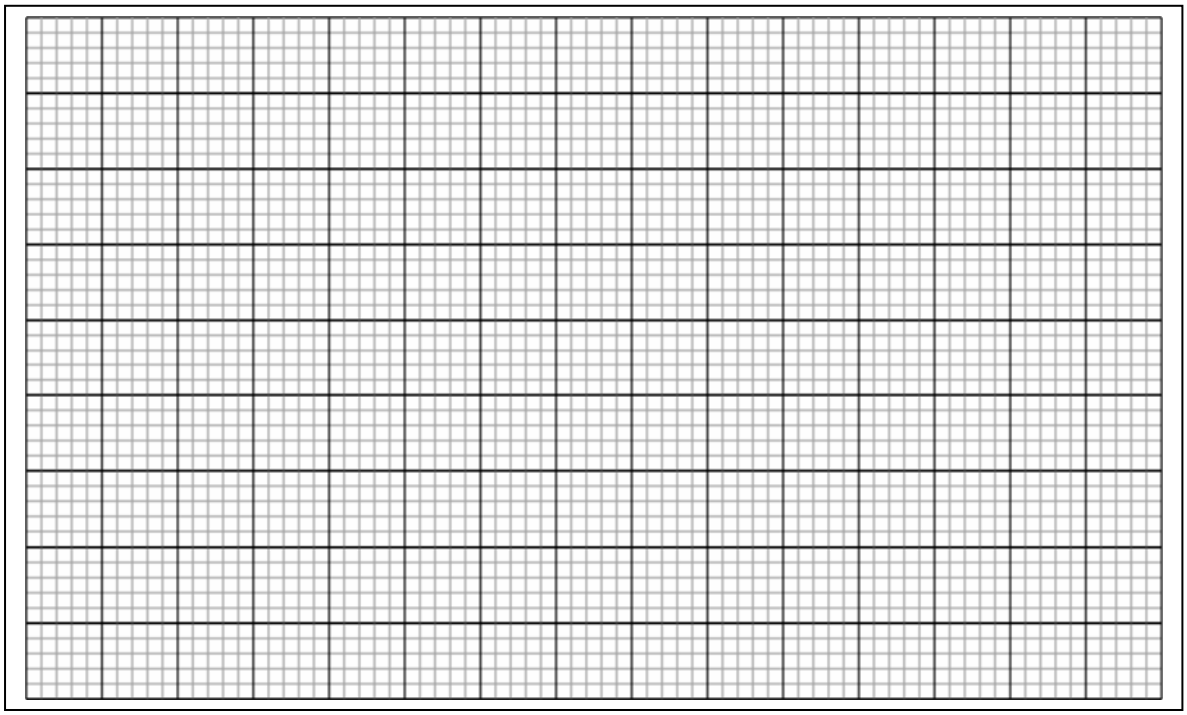

Graph of results :(Variable 2)

Graph of results :(Variable 3)

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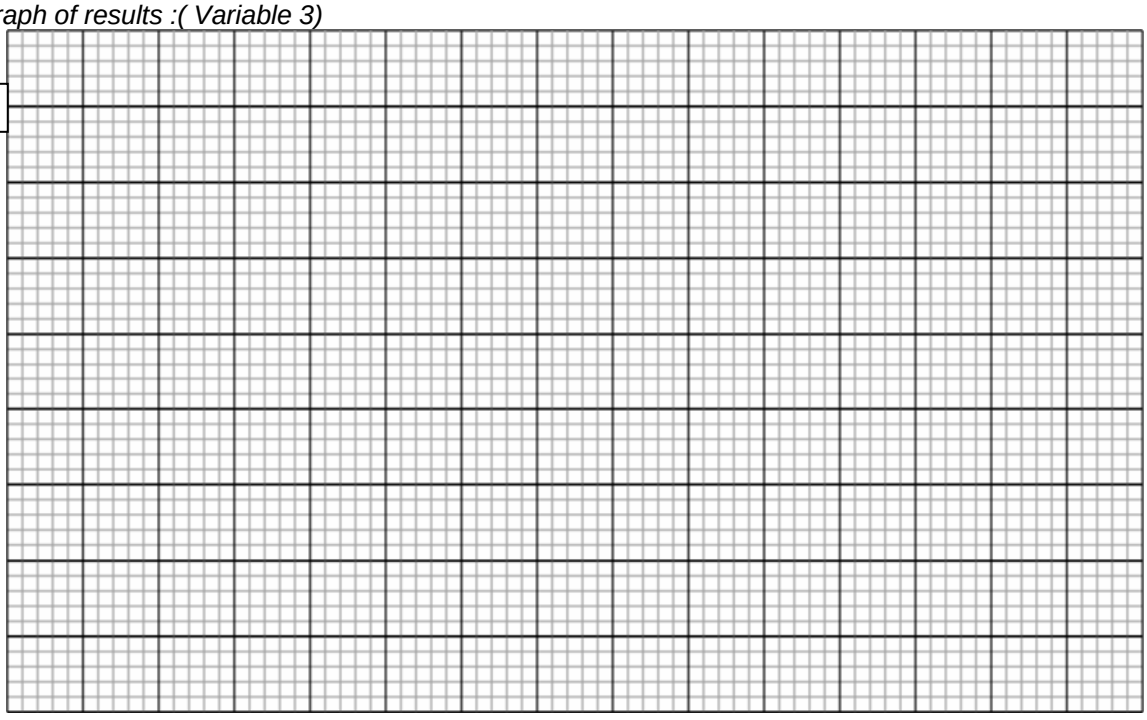


Interpret your results. Look for any irregularities (or errors) amongst the measurements. Rewrite your hypothesis with any modifications and conditions included.

Discussion:

Conclusion: (a brief statement that summarises how the results support of contradicts the stated hypothesis and answers the aim.

Discuss and compare your hypothesis and conclusion with other groups*. What variables control the period of swing of a pendulum?*

Class Demonstration: Sugar and Concentrated Sulphuric Acid

Aim: To observe and describe the reaction between concentrated sulphuric acid and sugar.

Apparatus: 1 beaker, sugar and concentrated sulphuric acid

Method:
Gather around the fume hood when requested to do so.
Observe carefully what occurs when your teacher adds concentrated sulphuric acid to a beaker of sugar.
Complete the following steps:

- ONE. Working as individuals, write down as many observations as you can in 2 minutes.

- TWO. Turning to the person next to you, team up into pairs and compare answers so that you have a complete list of each person's observations. There should also be time to write down anything missed in the frantic first two minutes.

- FOUR. Two pairs stand and now team up at the work bench around the outside of the room. Each group of four should compare observations and add any they have missed.

Answer the following questions:
1. How many observations did you make?
2. How many more observations did you add when you paired up with another student?
3. How many more observations did you add when you were in a group of four?
4. How observant were you in comparison with the list of observations made by the chemist?
5. Classify your observations in terms of the senses - what did you see? smell? feel? hear? - we'll ignore taste. Why?

Name: _____

Form: _____

Partner(s): _____

Dissolving Time

Aim:
1) To form and test a hypothesis about how temperature affects the time it takes an antacid tablet to dissolve in water.
2) To be able to predict time taken for an antacid tablet to dissolve when the temperature is known.

PLANNING THE EXPERIMENT:
Write down your hypothesis→ a smart guess about how you think temperature affects dissolving time and guess the time taken to dissolve one uncrushed tablet at room temperature (25^0C)
Write up a plan of your experiment, making sure you control all variables except temperature.

Apparatus:
- 250ml beaker
- thermometer (-10 to 110 ^{0}C)
- clock or timer
- 3 tablets (e.g. Alka Setza)
- Bunsen burner
- Tripod
- fire proof mat
- gauze mat.

Method:
1) Add ice to a beaker then fill the beaker to the 200ml mark with water from the tap. Wait until the ice has melted. (Some salt may help the process).

2) Record the temperature accurately. Note you can measure to half scale accuracy.

3) Drop in antacid tablet and time how long it takes for the antacid tablet to dissolve (disappears completely).

4) Record this time in a data table.

5) Repeat steps 1→4 but this time, heat the water to the designated temperature.

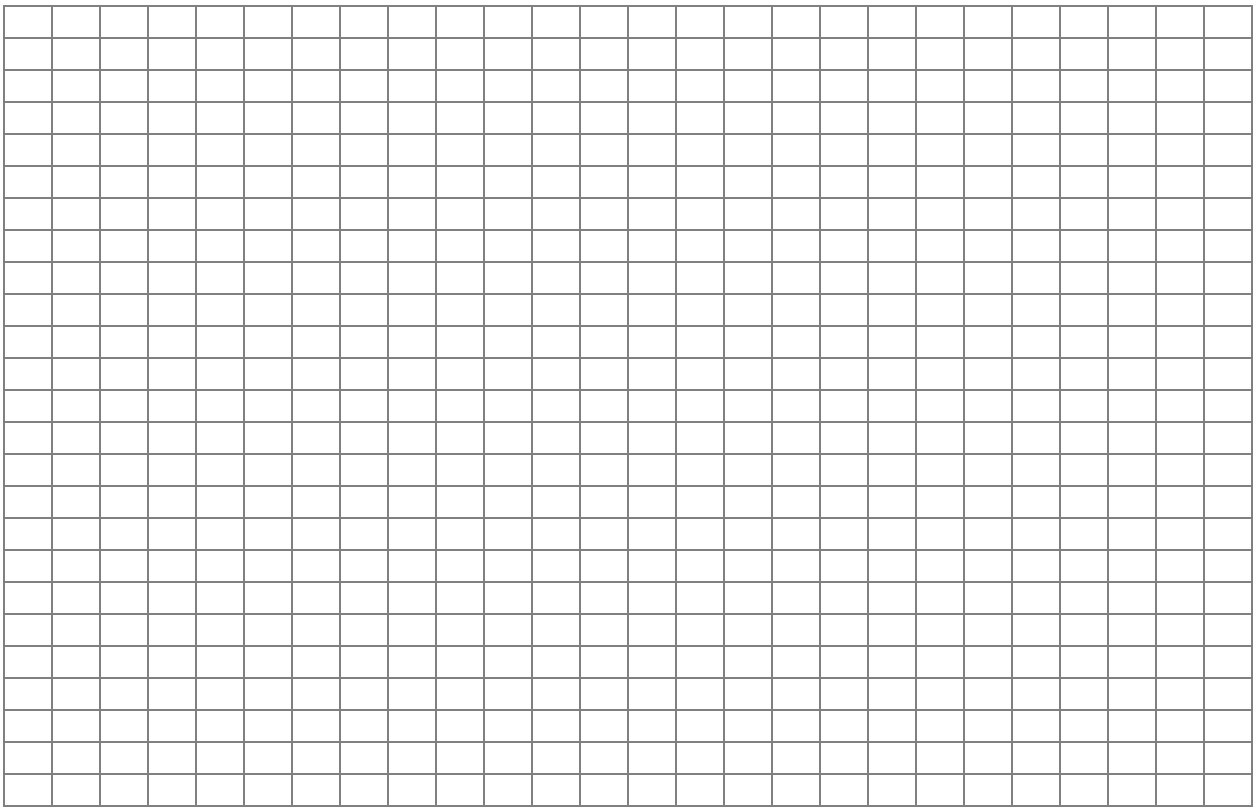
6) Complete the data table using other student results.

7) Draw a graph of temperature (dependent variable) against time (independent variable).
Note the independent variable is always on the horizontal axis.

Results:
Data Table

Time	Temperature	Time	Temperature	Time	Temperature

From your table of results plot your measurements and in pencil draw a “smooth curve of best fit” corresponding to the plotted points on the graph paper. Label your graph fully including a title.



Discussion:

1. What does the graph tell you about the relationship (link) between temperature and dissolving time?

2. Use your graph to predict how long the tablet would take to dissolve at 35^0C?

3. What temperature would the water need to be for the tablet to dissolve in exactly one minute?

4. Did your hypothesis include things you didn't test? For example, did you say that all antacids or all substances dissolve faster in hot water than cold water?

5. Identify one possible error for each of the following possible types:

Systematic (variations due to equipment):

Gross (mistakes by the operator):

Random (small variations in results that cannot be controlled):

6. Design an experiment to test the effect of stirring. Include all the variables and how you would control them.

CONCLUSION: (A brief statement that summarises how the experimental results support or contradict the stated hypothesis and prediction and answers the aim)

Practical report: Mythbusters

Title: ……..

Abstract: (A sketchy summary of the main points of the theory, dealing with the subject before any reference to the practical purpose or intention)

Aim: (A clear brief statement of the purpose of this experiment)

Hypothesis: (A clear brief proposition that attempts to explain certain facts or observations. It is this proposition that will be tested through the experiment.)

Apparatus and Materials: (List all the equipment and/or materials used in this experiment)

Method: (Give a step by step description of how the experiment was carried out. This section should be written in passive voice, in prose form and in past tense)

Results: (Observations or data should be clearly tabulated, with units clearly shown. Use graphs when appropriate.)

Discussion: (Discuss your results and explain if they support the relevant theory. Comment on how the experiment was done and ways you could improve the results.)

Conclusion: (The conclusion is usually a brief statement that summarizes how the experimental results support or contradict the stated hypothesis and prediction.