Name:..... Class:.....

GRAPHS 1

Domain: 4.18
with guidance, presents information to an audience to achieve a particular outcome

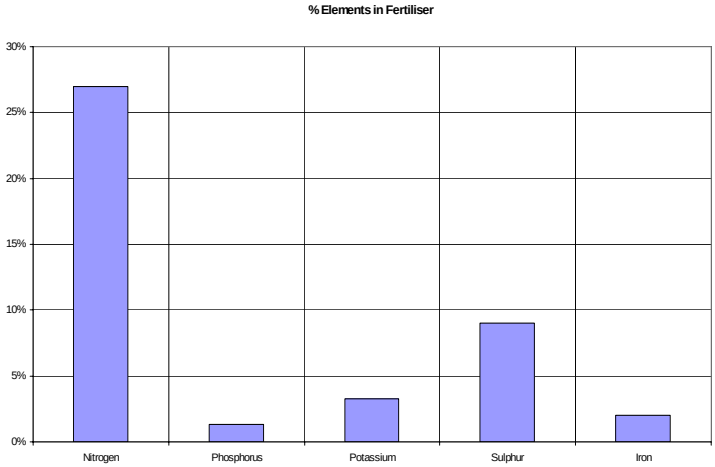
What Are Graphs?

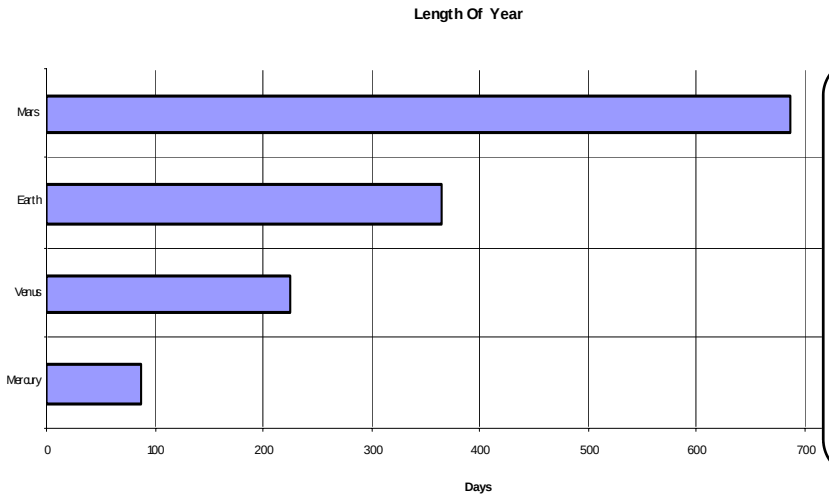
A graph is a ***visual method of communicating scientific information***. It represents a relationship between quantities. We use graphs in science to communicate the ***results of an experiment*** and to help ***analyse the results***. ***Variables*** are quantities that change value. Variables can change in a ***continuous manner*** or they can change ***abruptly***. Variables can be ***numerical***, e.g. temperature values, ***or non-numerical***, e.g. names.

There are many different ways in which a graph can be drawn. The most common types are:

Column Graphs-

This type is used when we plot a variable that does not vary continuously and can be grouped into separate categories. The column graph on the right shows the elements present in a fertiliser and the percentage present.





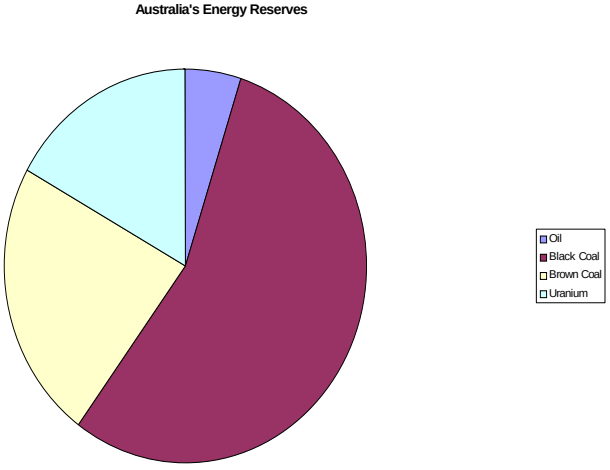
Bar Graphs-

A bar graph is a column graph that has been rotated through 90^{o}. The bar graph on the left compares the length of a year for the first four planets from the Sun. A divided bar graph consists of a single rectangle (bar) divided up in proportion to the quantities represented.

Pie Graphs-

This type is often used when we plot proportions or percentages. The pie graph on the right shows the percentage of known energy reserves in Australia. To draw a pie graph you need to use a protractor to measure the angle of each segment. The angle is calculated by multiplying the percentage by 360 and dividing by 100. For example, the angle for 25% would be:

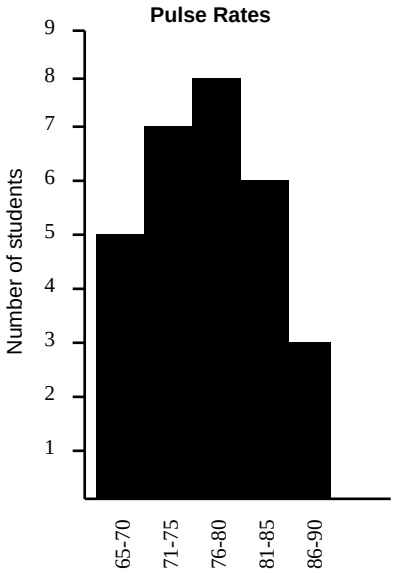
$$\frac{25}{100} \times 360 = 90^{o}$$

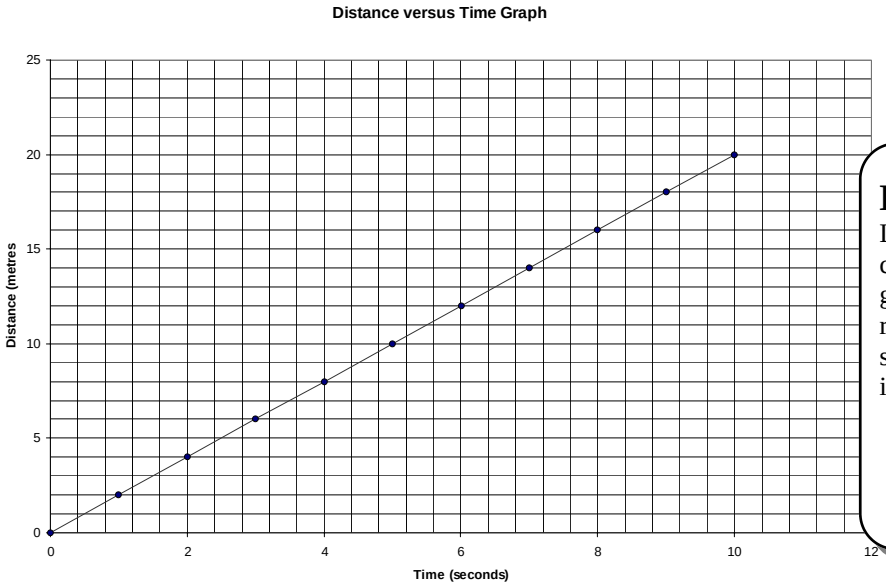


GRAPHS 1

Histograms-

Histograms are like column graphs but each rectangle touches. They are used to represent frequency distributions, i.e. how often a particular value or range of values occurs. The histogram on the right shows the resting pulse rates of students in a science class.





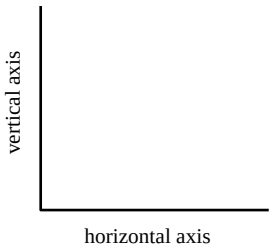
Line Graphs-

Line graphs are used when both variables can change continuously. In science, we use these graphs quite often. The line graph on the left represents the distance an object moves from a starting point measured at regular time intervals.

Some important rules when constructing a graph:

- *Give the graph a title.*
- *Label each axis (except for a pie graph).*
- *Put units in brackets (if it is a measured quantity).*
- *Include a key when necessary.*

More work will be done on graphs in the next worksheet.



Questions:

1. (a) What is a graph? (b) What are graphs used for in Science?
2. What are the five main types of graphs?
3. Which type of graph is used to:
   (a) Plot proportions or percentages?
   (b) Plot a variable that does not vary continuously and can be grouped into separate categories?
   (c) Plot both variables that are changing continuously?
   (d) Plot frequency distributions?
4. What are four important rules to follow when constructing graphs?

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GRAPHS 2

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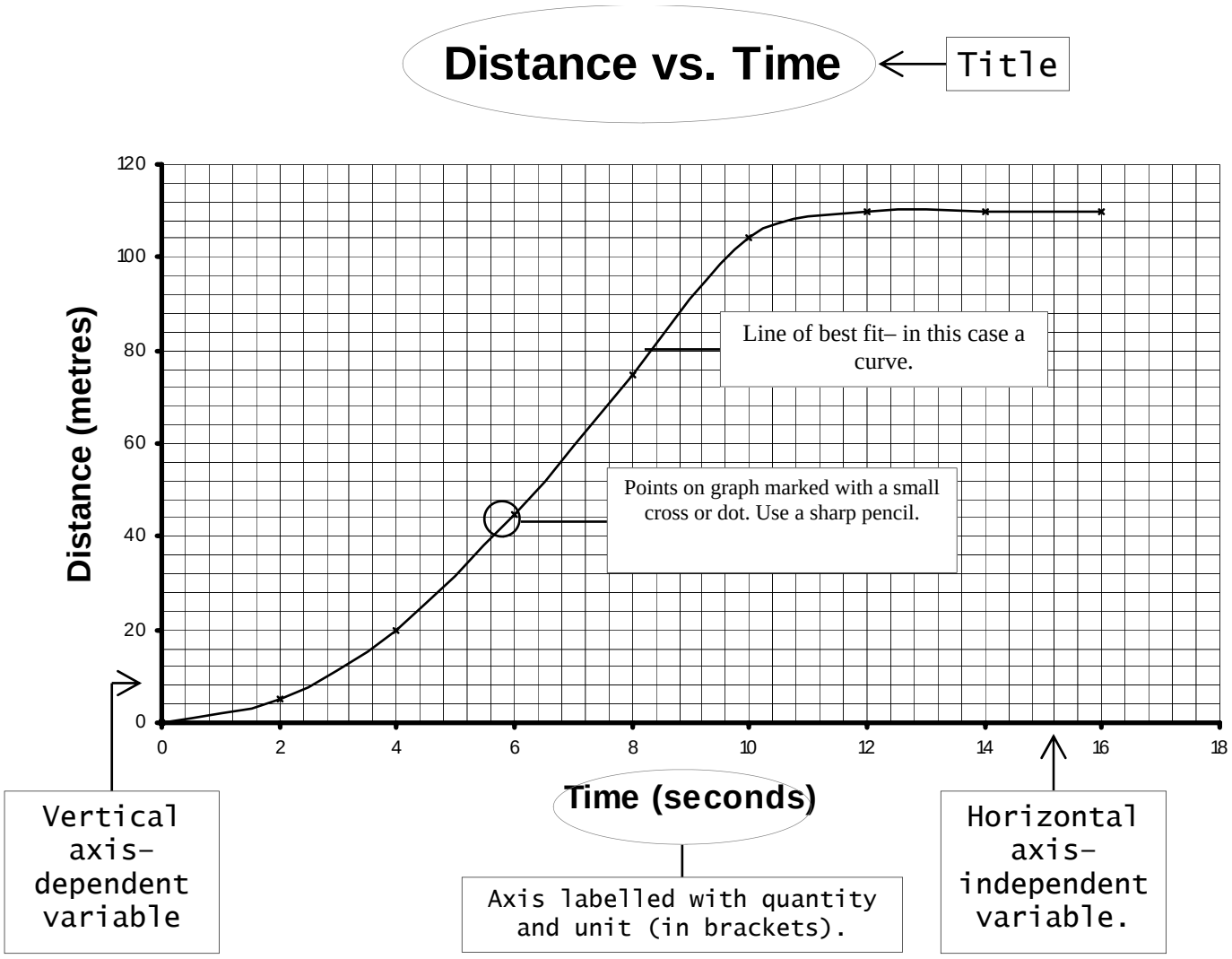
More on Line Graphs

Here are some more important points about drawing line graphs:



Some important rules when constructing a line graph:

- *Use graph paper when available.*
- *Give the graph a title.*
- *Label each axis . The vertical axis is the dependent variable and the horizontal axis is the independent variable (quite often it is* Time*).*
- *Spread the scale out (don't make it too small!).*
- *Put units in brackets (if it is a measured quantity).*
- *Use a small cross or dot for each plotted point.*
- *Include a key if you're are plotting more than one line on the graph.*
- *Draw a line of best fit through the points. You may have to join the points with straight lines in some line graphs.*

Questions: (answer sheet supplied)

1. Draw a column graph which displays the following results (the boiling points of a number of liquids):

Liquid	water	bromine	methanol	pentane	ethanol	propanone
Boiling Point (°C)	100	58	65	36	78	56

2. Draw a pie graph which displays the following results (the number of road users fatally injured in multiple vehicle 4WD crashes in 1998). You will need to identify which sector represents each type of crash and select suitable colours for each sector. You will then need to complete the key.

Car Driver	Car Passenger	4WD Driver	4WD Passenger	Bicycle Rider	Motorbike Rider	Light Truck Occupants
41%	23%	11%	7%	4%	11%	3%

3. Draw a line graph which displays the following results (the stopping distance for a car when travelling at various speeds):

Speed (km/h)	25	50	75	100
Stopping Distance (m)	3	10	22	40

4. Draw a line graph which displays the following results (the temperature of a reaction mixture measured at one minute intervals after the two reactants were mixed together):

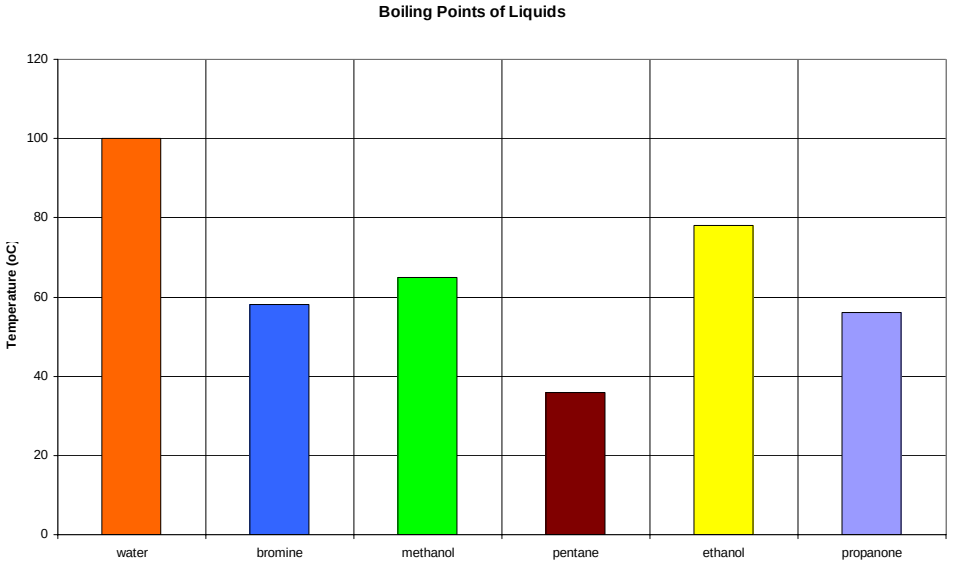
Time after reactants were mixed (minutes)	1	2	3	4	5	6	7	8	9	10
Temperature (°C)	28	29	32	36	40	45	50	59	69	82

5. Draw a line graph which displays the following results (the temperature changes when a substance was heated):

Time (minutes)	0	1	2	3	4	5	6	7	8	9	10
Temperature (°C)	5	10	10	10	15	20	30	30	30	40	50

GRAPHS 2 (answers)

1.



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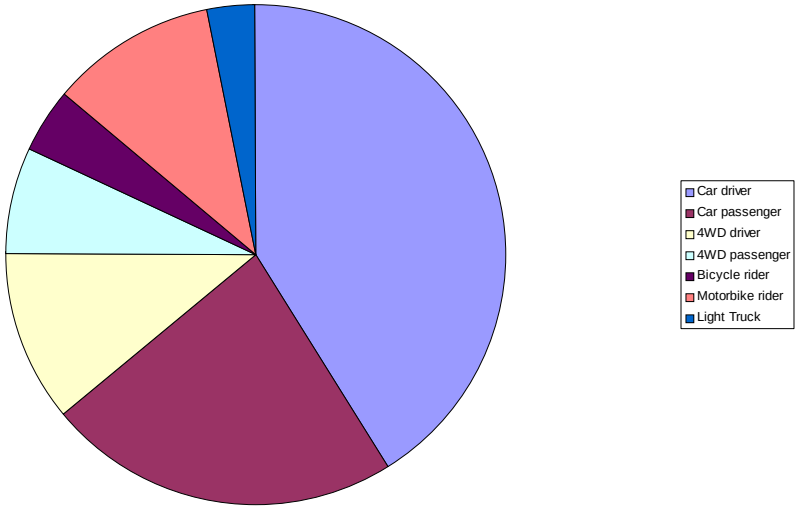

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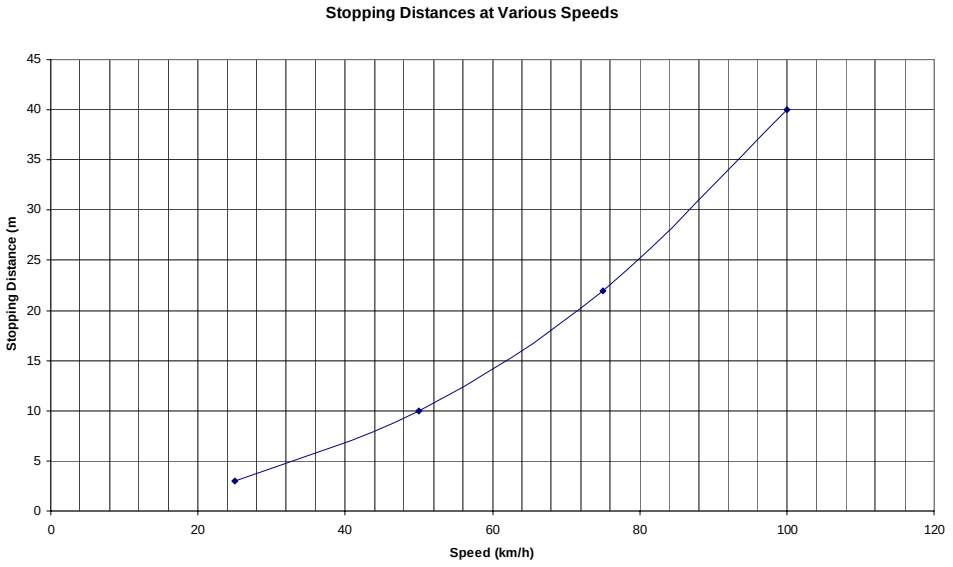

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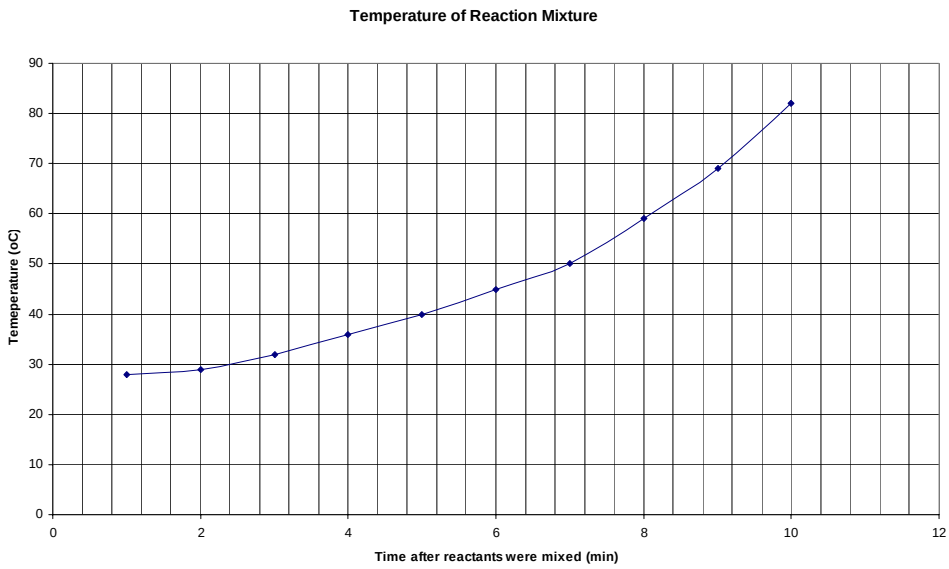
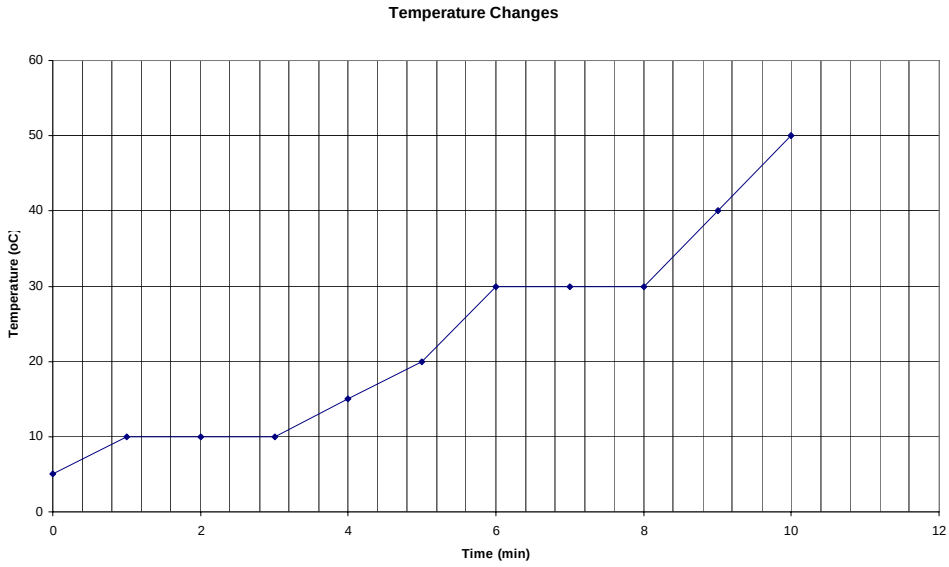

Temperature of Reaction Mixture
Temeperature (oC)
Time after reactants were mixed (min)
0
10
20
30
40
50
60
70
80
90
0
2
4
6
8
10
12

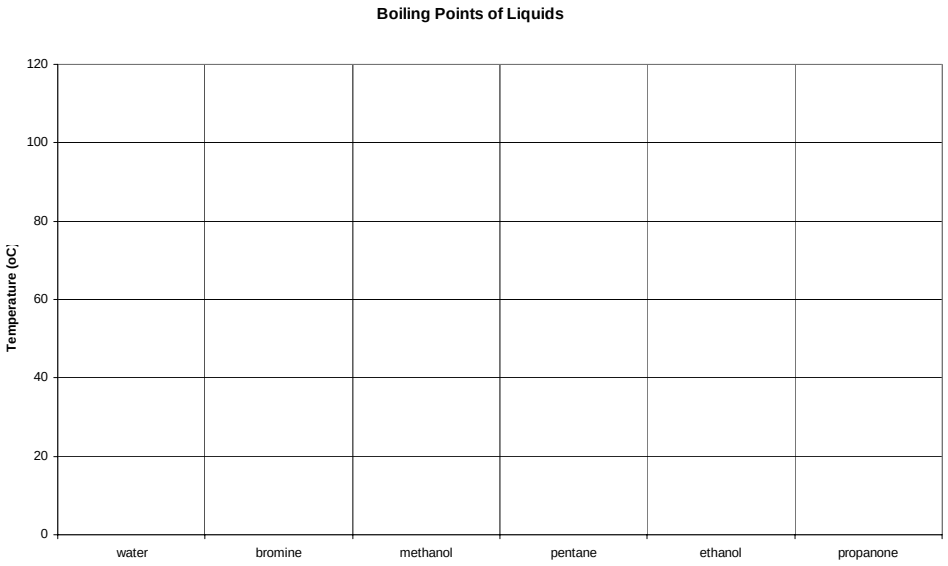
5.


Temperature Changes
Temperature (oC)
Time (min)
0
10
20
30
40
50
60
0
2
4
6
8
10
12

Name:…… Class:……

GRAPHS 2 (Student Answer Sheet)

1.



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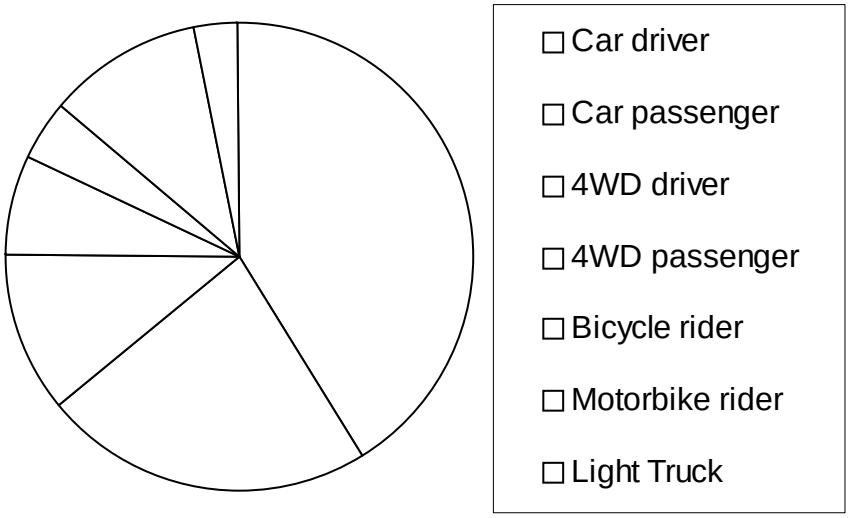
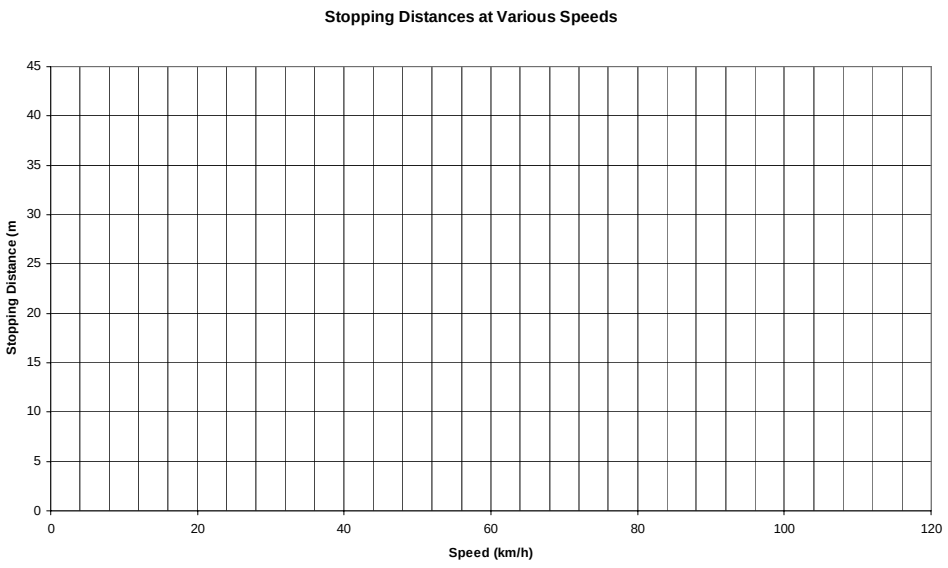


3.



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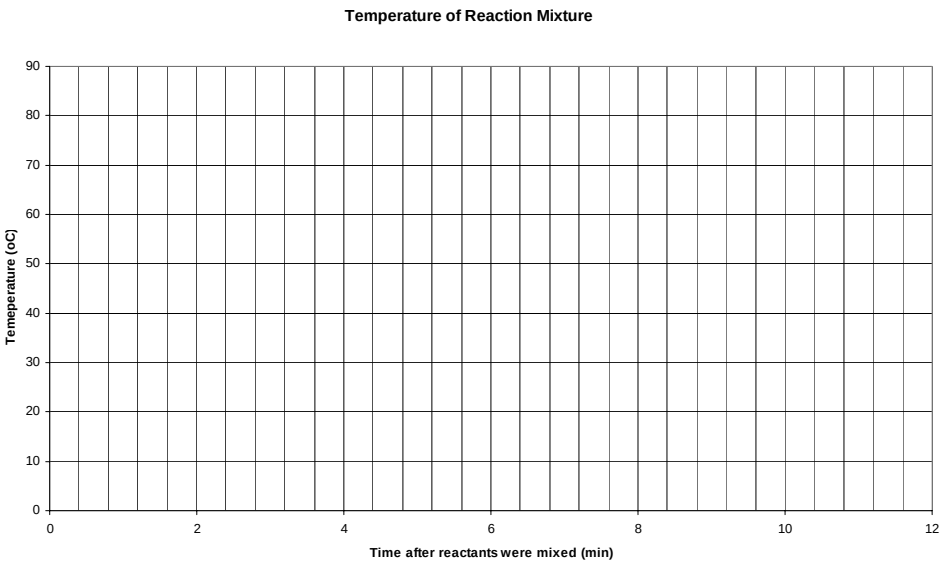
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0
10
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70
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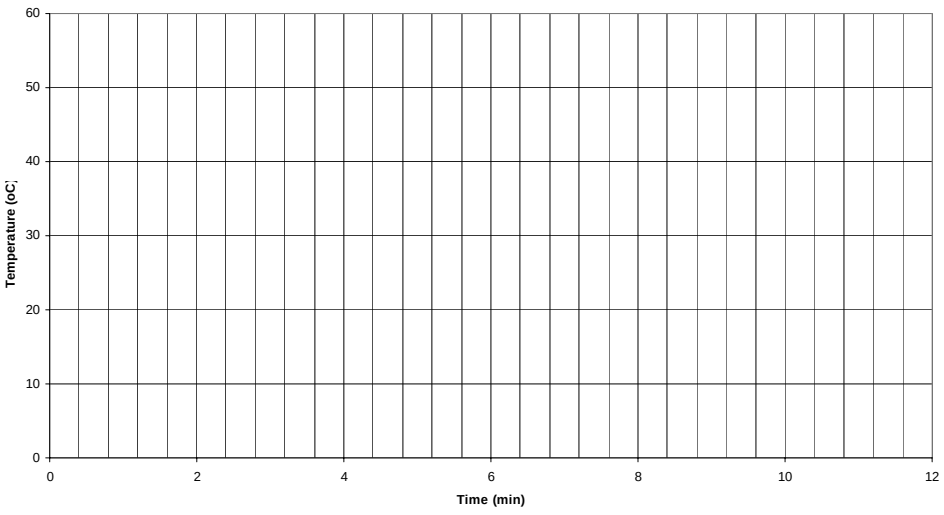
2
4
6
8
10
12
Time after reactants were mixed (min)

5.


Temperature Changes
Temperature (oC)
0
10
20
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60
0
2
4
6
8
10
12
Time (min)