**Science Skills**

**Line Graphs Level 3**

**Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Class: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Line Graphs**

In Science, results of an investigation usually have to be displayed as a graph.   
A graph is a diagram that shows the relationship of one variable to another.

Graphs are used because they present information in a way that is easy to understand.  
Scientists use graphs to avoid the need to write long, detailed descriptions of their results.

A **line graph** is used to display the relationship between two variables. Usually one of the variables is time. The variables in the graph below are **time** and **temperature**.  
The line graph below **tracks** the temperature at various **times**.

**Layout**

A **line graph** looks like this:

The scale on the Y axis **starts at 0** at the bottom and goes up **evenly** (in tens in this graph).

The graph should be big enough to be clear. Make it just a little smaller than the graph paper you are given.

The data you have **found out** in the investigation, (in this graph the **temperature**) goes on the Y axis.

The values are plotted using a small x or a dot, and the dots are joined together with a line.

The graph **must** have a title.

The Y axis **must** have a title with **units**.

**Y** axis

**X** axis

The **thing you know or control in the investigation** always goes along the **X axis**. In this case it is the **time**.

The values (numbers) along the X axis are evenly spaced.

The X axis **must** have a title with **units**.

**How to Draw a Line Graph**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Results of investigation into the temperature of water over a period of time** | | | | | | | | |
| Time in minutes | Start | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Temperature of water in degrees C | 20 | 40 | 60 | 70 | 80 | 85 | 90 | 95 |

1. Decide on a **Title** for the graph by combining the headings in the table.   
The aspect should be mentioned first in the title.  
***“Time Taken for Water to Heat”***

2. Decide what is being compared. In a line graph the **thing you know or control**, in this case the **time**, always goes in the X axis (along the bottom).  
  
There are 8 entries in the table. You will need **eight** lines.  
These have to be evenly spaced. Start at the first heavy line from the left.

Start 1 2 3 4 5 6 7

3. Write in the values (number of the minutes) under the lines.

4. Now look at the numbers in the other set of data, **what you have** **found out** in the investigation. Look at the lowest and the highest numbers to decide on the **scale**.   
Decide what they should “go up in” in the Y axis. At Level 3 this will usually be 2s, 5s, 10s or 20s. Remember, it should always start at 0.  
In the example below it “goes up in” 10s.

20

10

0 Start 1 2 3 4 5 6 7

5. Fill in the rest of the scale on the Y axis. Make sure it goes up evenly spaced.

6. Look back at the data in the table. Draw the dots or Xs to the correct height according to the scale. Join the dots with a line. (Use a ruler)

7. Label the X axis. Remember the units. (***Time in minutes***)

8. Label the Y axis. Remember to put in the units. (***Temperature in ºC***)

1. Two pupils measured the weight of salt which dissolves in 100 ml of water.   
 They measured it at various temperatures of water.  
 Their results are shown below.

|  |  |
| --- | --- |
| *Temperature of Water (ºC)* | *Weight of salt which dissolves (g)* |
| 20 | 40 |
| 40 | 52 |
| 60 | 63 |
| 80 | 78 |

Show these results as a line graph.

* They knew the different **temperatures** they were using, so these go on the X axis (along the bottom).
* The ‘**weight of salt’** results were: lowest – 40; highest - 78. So the scale starts at 0 and goes up in 10s.

Weight of Salt which Dissolves at Various Temperatures



0 20 40 60 80

2. The activity of a radioactive material was measured at different distances from a  
 detector. Readings on the detector were measured in a unit called ‘counts per second’.

The results are shown in the table below.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Distance from Detector in metres | 100 | 150 | 200 | 250 | 300 | 350 |
| Activity in counts per second | 110 | 90 | 45 | 30 | 20 | 15 |

Present this information as a line graph.

* They knew the different **distances** they were using, so these go on the X axis (along the bottom).
* The ‘**activity’** results were: lowest – 15; highest - 110. So the scale starts at 0 at the bottom and goes up in 10s.

Activity of Radioactive Material at Different Distances





0 100 150 200 250 300 350

3. A block of copper was heated in a water bath. The temperature of the copper block was  
 noted every minute for five minutes. The results are shown in the table.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Time (minutes) | 0 | 1 | 2 | 3 | 4 | 5 |
| Temperature (ºC) | 20 | 30 | 38 | 44 | 48 | 52 |

Present this information as a line graph.

* They knew the different **times** they were using, so these go on the X axis (along the bottom).
* The ‘**temperature’** results were: lowest – 20; highest - 52. So the scale starts at 0 at the bottom and goes up in 10s.

Changes in Temperature of Copper over 5 minutes in Water



0 1 2 3 4 5

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Time (hours) | 0 | 1 | 2 | 3 | 4 | 5 |
| Amount of alcohol in blood (units) | 120 | 110 | 95 | 80 | 65 | 50 |

4. After drinking at a party, the amount of alcohol in David’s blood was measured every  
 hour. The results are shown in the table.

Present these results as a line graph.

* He knew the different **times** he was using, so these go on the X axis (along the bottom).
* The ‘**amount of alcohol’** results were: lowest – 50; highest - 120. So the scale starts at 0 at the bottom and goes up in 10s.

Alcohol Content in Blood over 5 Hours





0 1 2 3 4 5

5. To improve your fitness, you should exercise hard enough to reach the target heart   
 rate for your age.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Age in Years | 15 | 25 | 35 | 45 | 55 | 65 |
| Target Heart Rate in beats per minute | 145 | 140 | 135 | 125 | 120 | 110 |

Present this information as a line graph.

* You know the different **ages** you are using, so these go on the X axis (along the bottom).
* The ‘**target heart rate’** results are: lowest – 110; highest - 145. So the scale starts at 0 at the bottom and goes up in 10s.

Target Heart Rate for People of Different Ages



0 15 25 35 45 55 65

6. Paul set up an experiment measuring the number of oxygen bubbles given off by pond   
 weed in one minute. He counted them with the water at various temperatures.  
 His results are in the table below.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Temperature in ºC | 10 | 20 | 30 | 40 | 50 | 60 |
| Number of bubbles per minute | 6 | 10 | 17 | 24 | 15 | 0 |

Present this information in a line graph.

* Paul was in control of the the different **temperatures** he used, so these go on the X axis (along the bottom).
* The ‘**number of bubbles per minute’** results he found out are:   
  lowest – 0; highest - 24.   
  So the scale on the Y axis starts at 0 at the bottom and goes up in 5s.

Number of Oxygen Bubbles Produced per Minute at Various Temperatures



7. Small organisms were fed chicken manure. The volume of biogas produced was  
 measured over a period of five hours.   
  
 The results are shown in the table.

|  |  |
| --- | --- |
| *Time in hours* | *Volume of Biogas in cm³* |
| 0 | 0 |
| 1 | 3 |
| 2 | 6 |
| 3 | 12 |
| 4 | 24 |
| 5 | 48 |

Show this information as a line graph. Remember that line graphs should be big enough to fit most of the graph paper given.

Volume of Biogas Produced by Organisms over 5 Hours

