### M3.3 – Understanding that *y = mx +c* represents a linear relationship

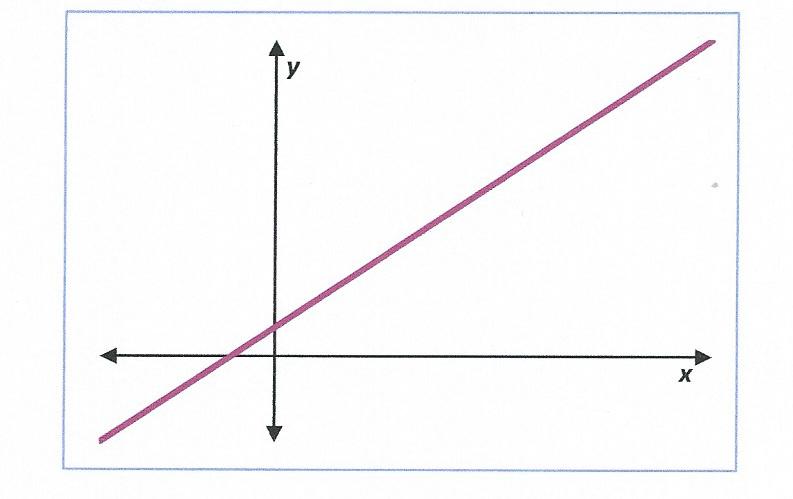
### Tutorials

Learners may be tested on their ability to:

* predict/sketch the shape of a graph with a linear relationship, e.g. the effect of substrate concentration on the rate of an enzyme-controlled reaction with excess enzyme.

**Linear relationships represented by *y = mx + c***

As we discussed in section M3.1, you should be able to identify a linear relationship when given a graph that looks like this. You also must be able to sketch a graph when given a linear relationship.



A sloping straight line shows that the dependent variable on the y axis is proportional to the independent variable on the x axis. To demonstrate something is proportional to something else we use the symbol α.

Dependent variable (y axis)

Independent variable (x axis)

y α x

Mathematically this is represented by the equation *y = mx + c*. The letter “m” is the gradient of the line – we explain how to calculate this in section M3.5, and “c” is the value of the intercept on the y axis, which we explain in section M3.4.

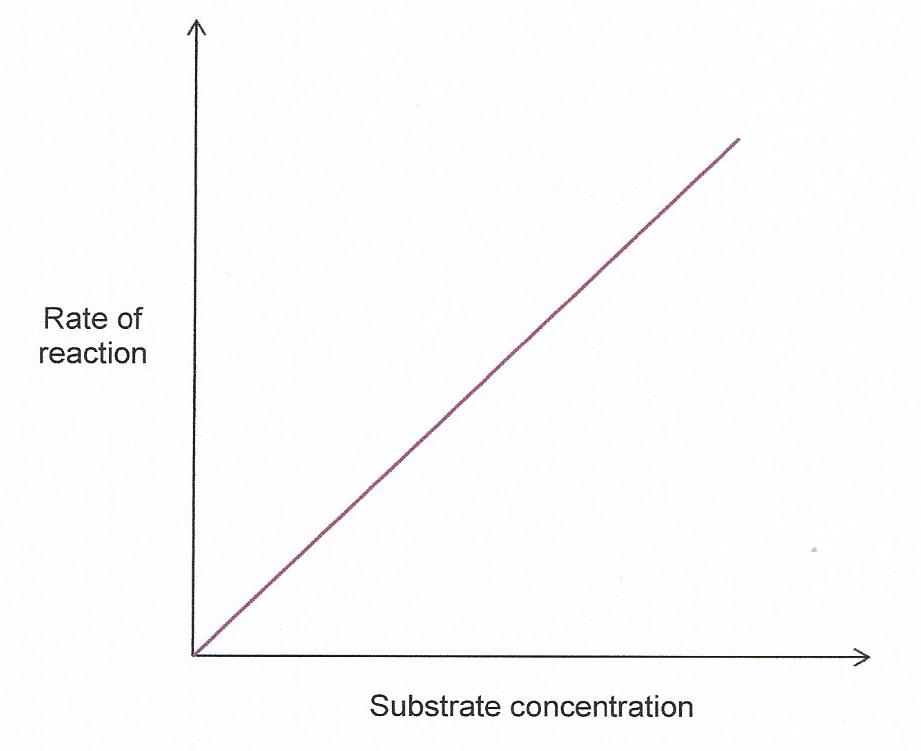
m 🡪 Gradient of the line

c 🡪 Y intercept

You need to be able to determine whether the linear relationship is positive or negative. If the line slopes up from left to right this shows a positive relationship, and the gradient “m” will be a positive number. If the line slopes down from left to right, it’s a negative relationship and the gradient “m” is a negative number.

Positive relationship – positive gradient (m)

Negative relationship – negative gradient (m)



For example, this graph of rate of an enzyme reaction against substrate concentration shows a positive relationship.

In this example the intercept on the y axis (represented by “c” in the equation) is zero. Therefore in this case the equation becomes y = mx + 0, or y = mx.

y = mx + 0

y = mx

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