

Skill building pack: Data handling

Drawing line graphs

A **line graph** shows the relationship between two variables. Data points, each representing a set of data for two variables, are marked on graph paper. By joining the data points, a clearer trend can be shown. One or more than one set of data can be plotted on the same graph. The skills involved will be discussed below. Remember that we should always draw line graphs on graph paper.

A Skills in drawing a line graph with one curve

When drawing a line graph, we should note the following:

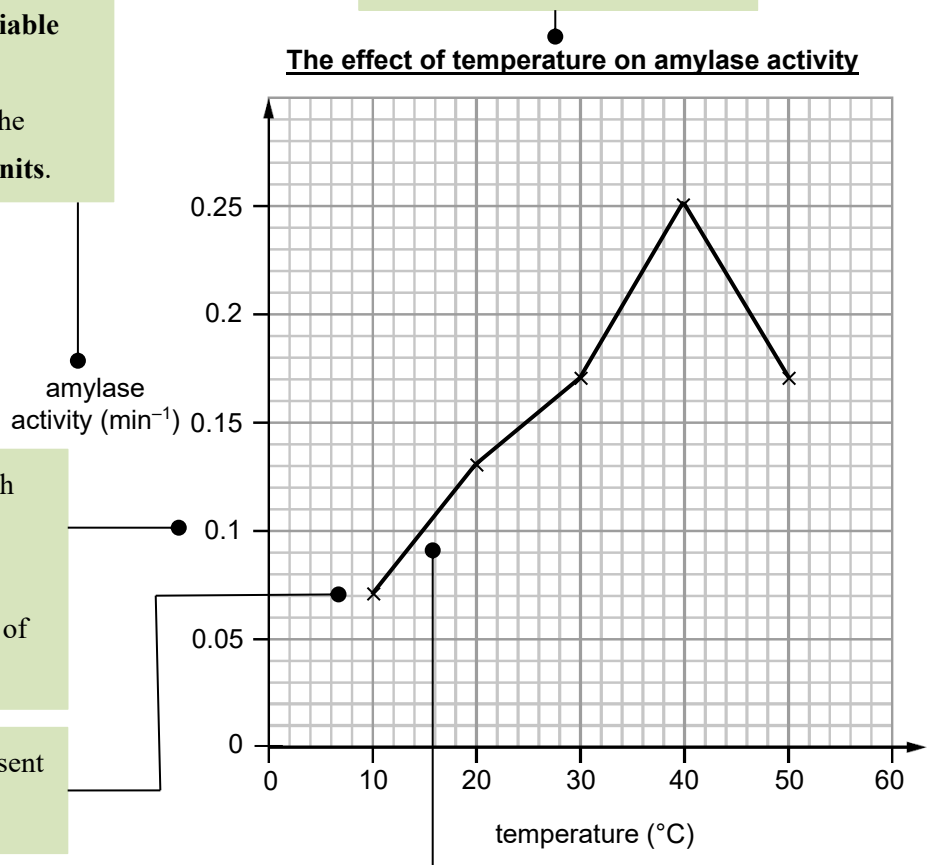
- Put the **independent variable** on the **x-axis**, and the **dependent variable** on the **y-axis**. Write down the **units**.

- Use **uniform** scales which cover the entire range of measurements. The plots should cover at least half of the graph paper.

- Draw a cross (×) to represent each data point.

- Join the points with **short straight lines** when you are uncertain about the values between the points. Use a **smooth curve** only when you predict a gradual change. Draw a **line of best fit** instead if you expect that the variables have a linear relation. Do not join the origin if you do not have data for that point.

- Give a **title** to the graph.

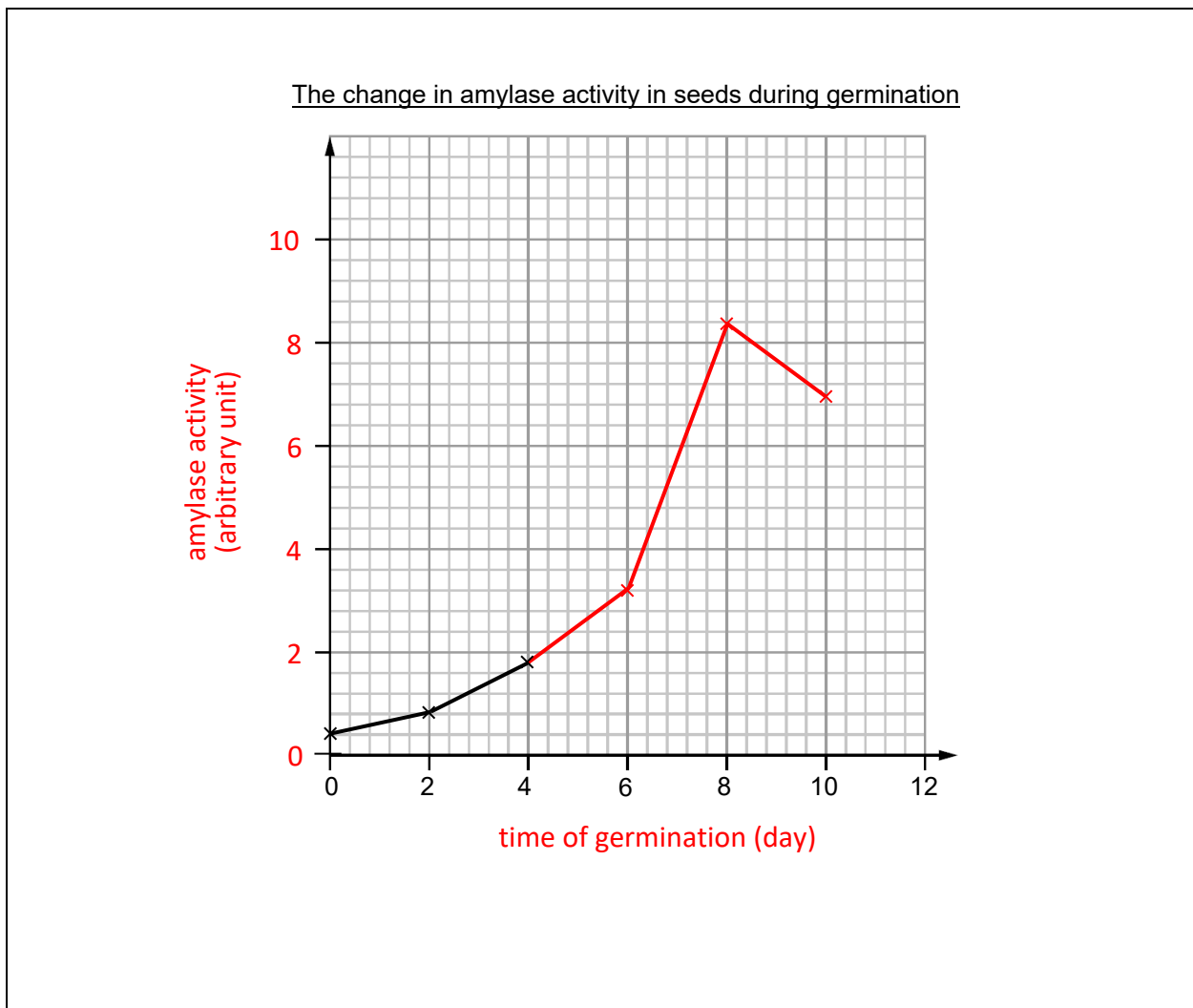


Practice 1

A student carried out an experiment to investigate the change in amylase activity in seeds during germination. The table below shows the results.

Time of germination (day)	Amylase activity (arbitrary unit)
0	0.4
2	0.8
4	1.8
6	3.2
8	8.4
10	7.0

Plot a graph to show the change in amylase activity in seeds during germination. Some parts of the graph have been done for you.



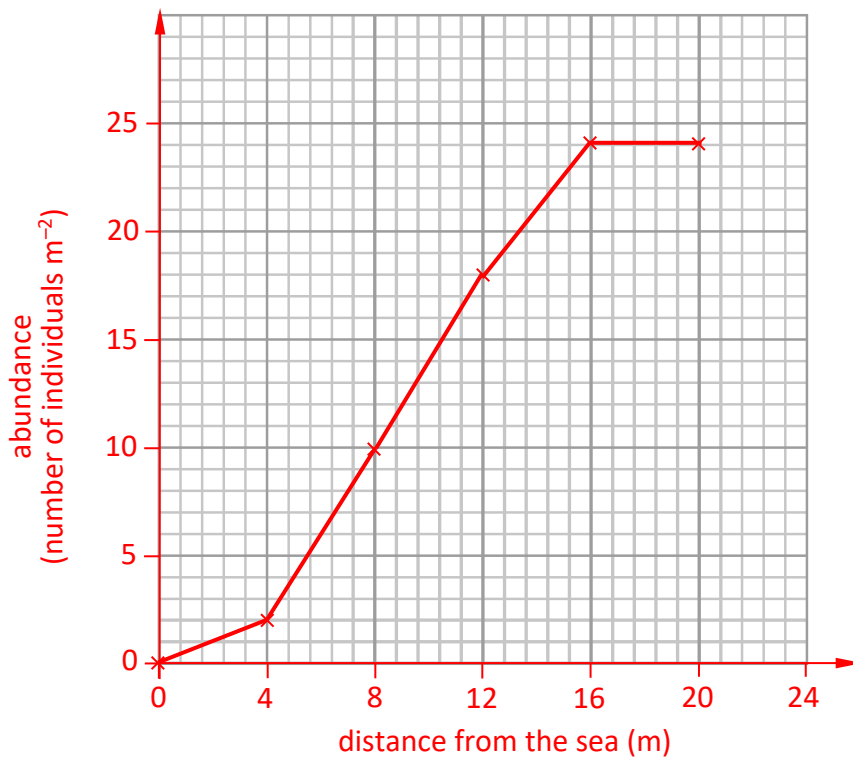
Practice 2

A student carried out a study to investigate the abundance of animal species X at different distances from the sea. The table below shows the results.

Distance from the sea (m)	Abundance (number of individuals m^{-2})
0	0
4	2
8	10
12	18
16	24
20	24

Plot a graph to show the abundance of animal species X at different distances from the sea.

The abundance of animal species X at different distances from the sea

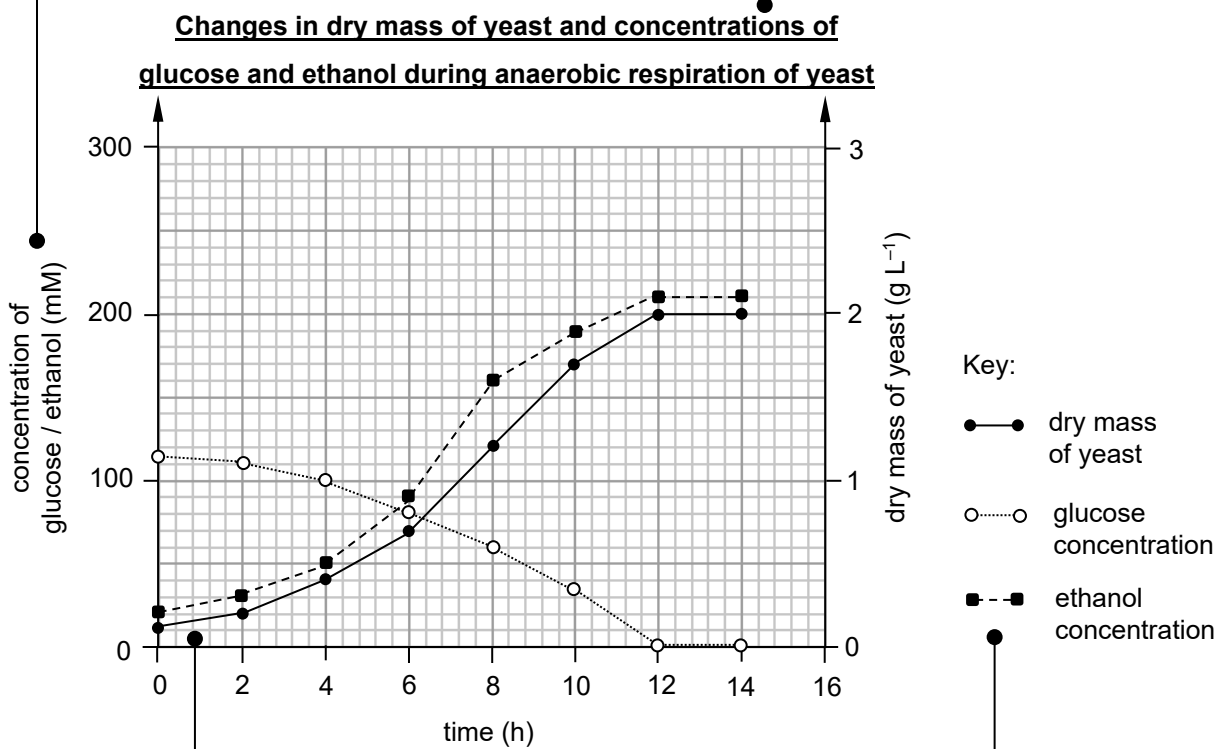


B Skills in drawing a line graph with two or more curves

When drawing a line graph with two or more curves to show changes in different variables, we should note the following:

- 2 Correct labelling of **axes** with units. In case the **scales** and the **units** of the axes are different for the curves, they should be shown clearly.

- 1 Give an appropriate **title**. The title must describe the **purposes** of **all the curves**.



- 3 Correct plotting and joining of **points**. Use **different symbols** to mark the **points** of different curves, e.g. dots, small crosses, small circles, small squares, etc. The **lines** for the two curves should be different, e.g. continuous line vs dotted line, lines of different colours, etc.

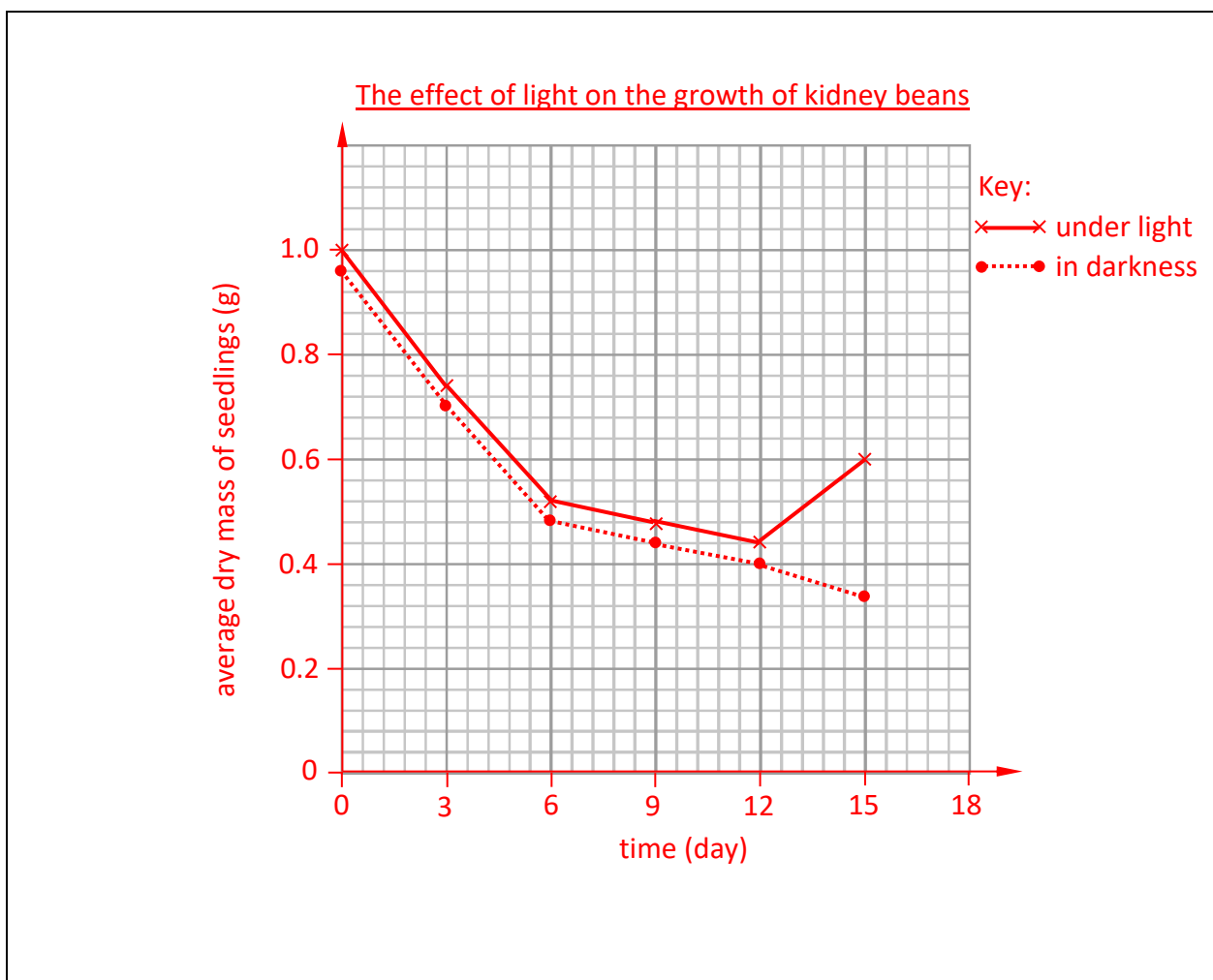
- 4 Provide a **key** for each curve. An alternative way is to label each curve correctly.

Practice 3

A student carried out an experiment to investigate the effect of light on the growth of kidney beans. The table below shows the results.

Time (day)	Average dry mass of seedlings (g)	
	Under light	In darkness
0	1.0	0.96
3	0.74	0.70
6	0.52	0.48
9	0.48	0.44
12	0.44	0.40
15	0.60	0.34

Plot a graph to show the effect of light on the growth of kidney beans.



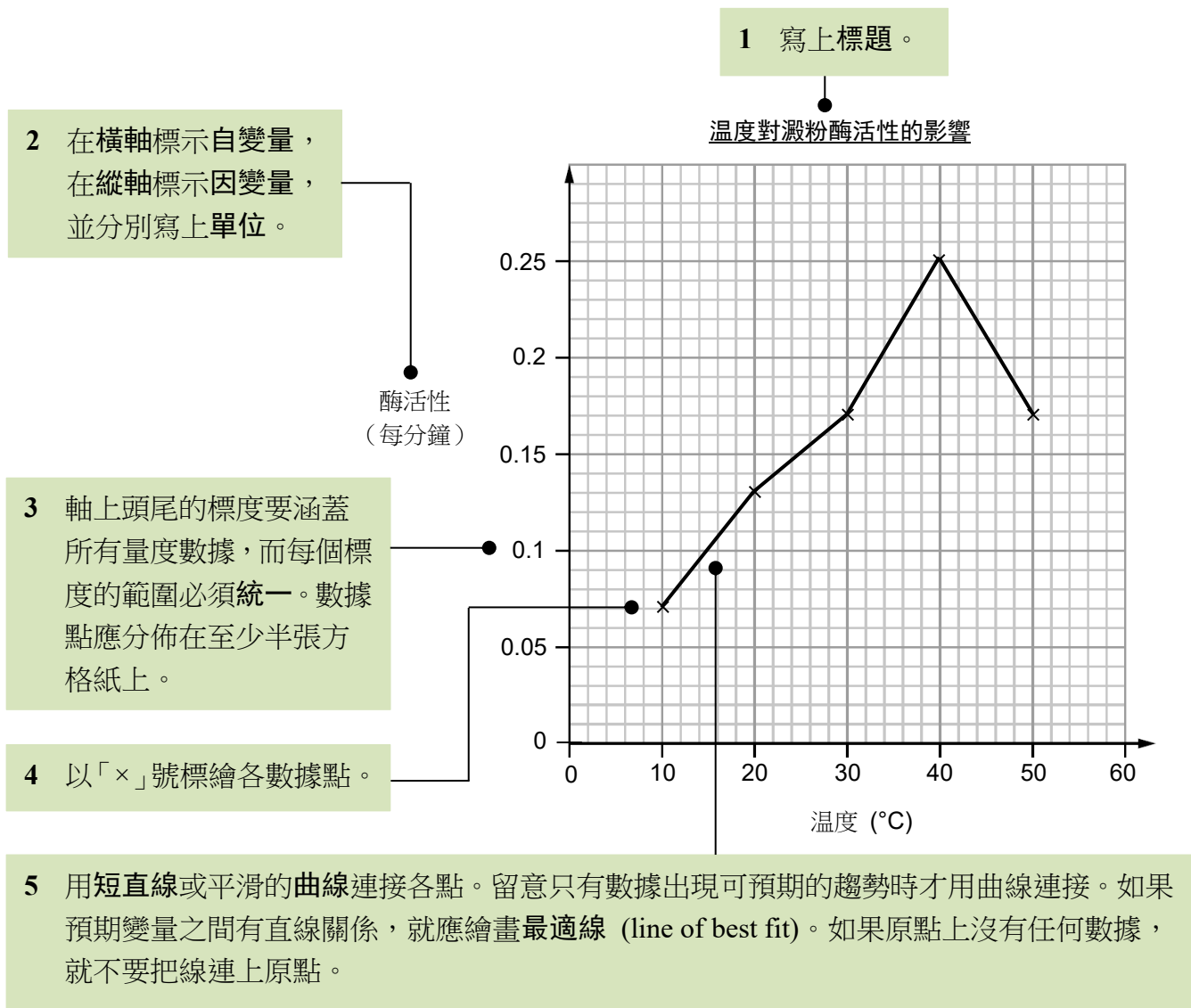
技巧提升教材：數據處理

繪畫線圖

線圖 (line graph) 可用來顯示兩個變量之間的關係。繪畫線圖時，我們會把數據點標示在方格紙上，每個數據點表示兩個變量的數據。用線把各個數據點連起來，就能清楚地展示數據的趨勢。同一個線圖可包含一組、兩組或多組的數據，有關的繪畫技巧會於下文討論。留意線圖應繪畫在方格紙上，而非其他類型紙張。

A 在線圖中繪畫一條曲線的技巧

繪畫線圖時要注意下列各項：

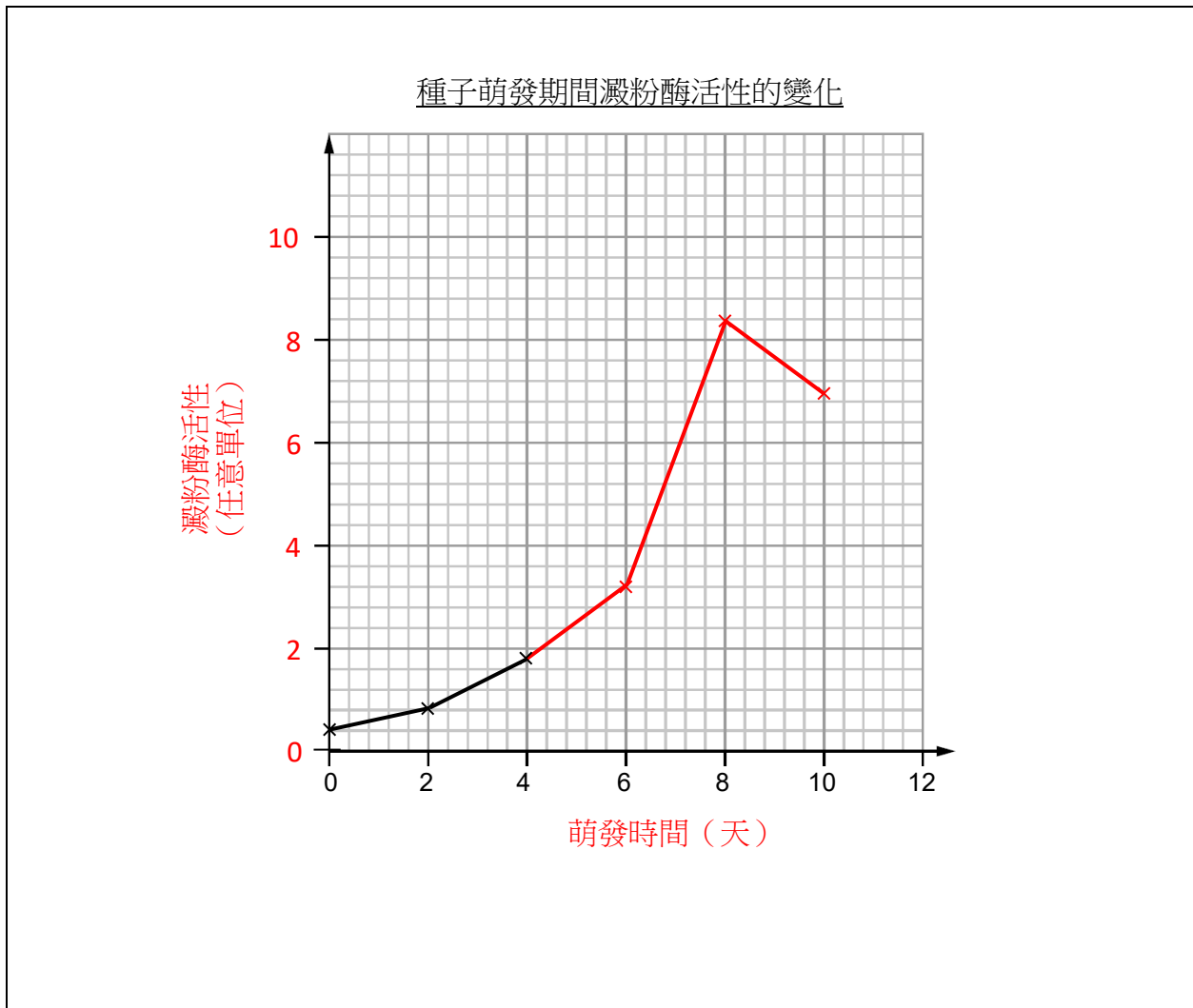


練習 1

一名學生進行實驗，以探究種子萌發期間澱粉酶活性的變化。下表顯示結果。

萌發時間 (天)	澱粉酶活性 (任意單位)
0	0.4
2	0.8
4	1.8
6	3.2
8	8.4
10	7.0

繪畫圖表，顯示種子萌發期間澱粉酶活性的變化。圖表的某些部分已完成。

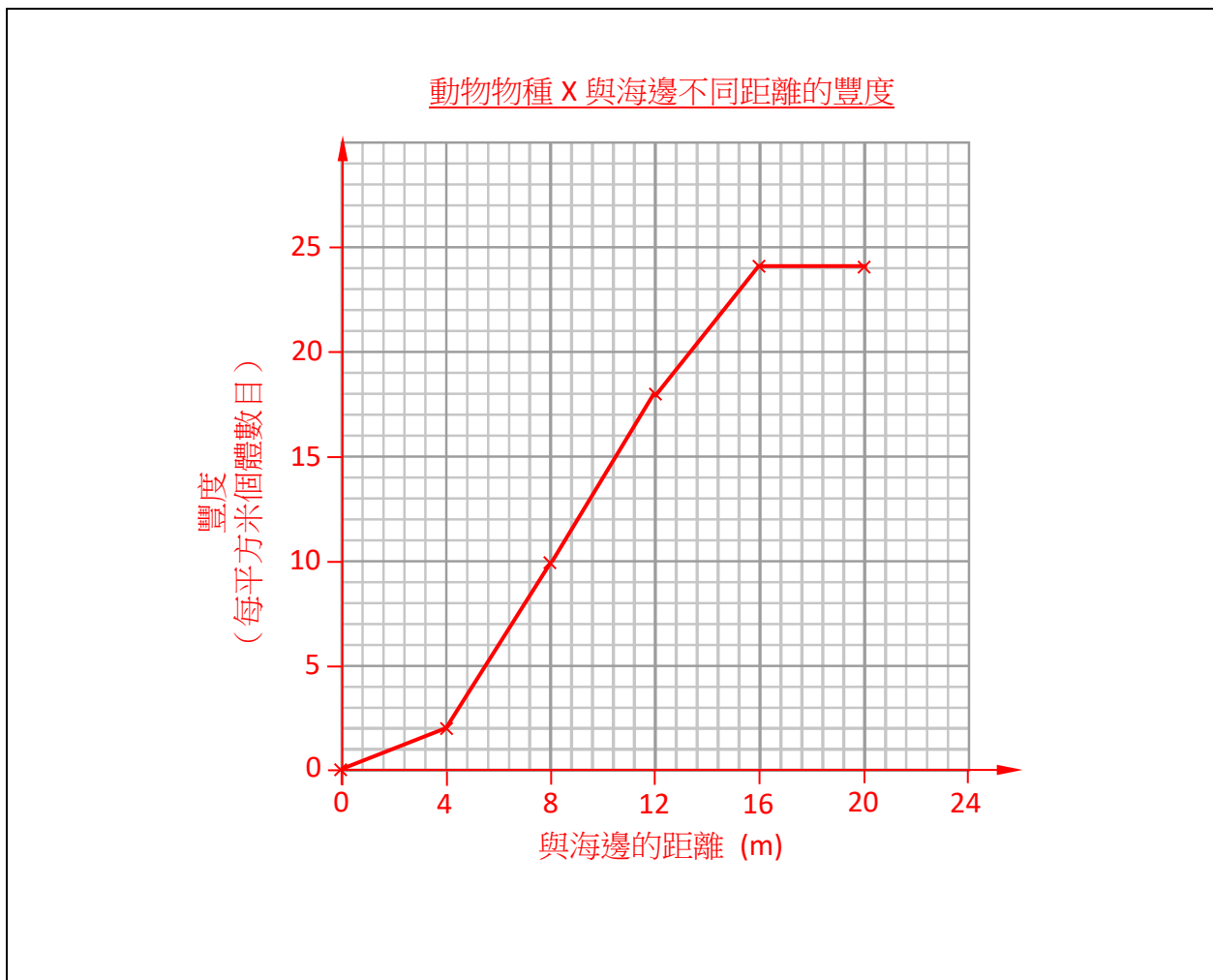


練習 2

一名學生進行研究，以探究動物物種 X 與海邊不同距離的豐度。下表顯示結果。

與海邊的距離 (m)	豐度 (每平方米個體數目)
0	0
4	2
8	10
12	18
16	24
20	24

繪畫圖表，顯示動物物種 X 與海邊不同距離的豐度。

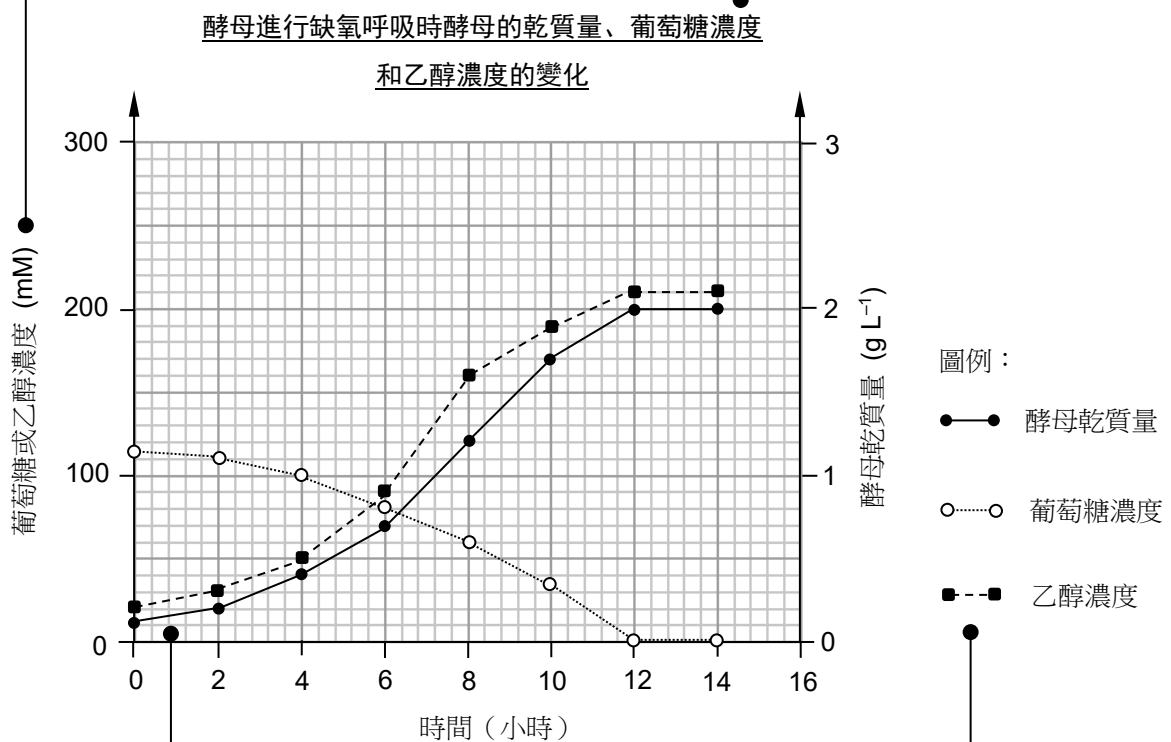


B 在線圖中繪畫兩條或以上曲線的技巧

在線圖上繪畫兩條或以上的曲線來表示不同變量的變化時，要注意下列各項：

2 適當地標註軸，並附有單位。如果不同曲線由不同的軸表示，便需要明確標註軸的刻度和單位。

1 提供合適的標題，標題必需描述所有曲線的目的。



3 數據點位置和連線要正確，利用不同圖案標示不同曲線的數據點，例如圓點、交叉、圓圈、正方形等。不同曲線要用不同樣式的線條表示，例如實線、虛線或不同顏色的線。

4 每條曲線都需要提供圖例，或者在每條曲線旁加上標註辨別。

練習 3

一名學生進行實驗，以探究光對腰豆生長的影響。下表顯示結果。

時間 (天)	幼苗的平均乾質量 (g)	
	光照下	黑暗中
0	1.0	0.96
3	0.74	0.70
6	0.52	0.48
9	0.48	0.44
12	0.44	0.40
15	0.60	0.34

繪畫圖表，以顯示光對腰豆生長的影響。

