



- (c) Kiwi fruit is a good source of vitamin C. Fresh kiwi fruit has a high water content which can be reduced by drying the fruit.

A student investigated the effect of drying time on the vitamin C concentration of kiwi fruit.

The student dried the fruits in an oven and tested samples for vitamin C at regular intervals.

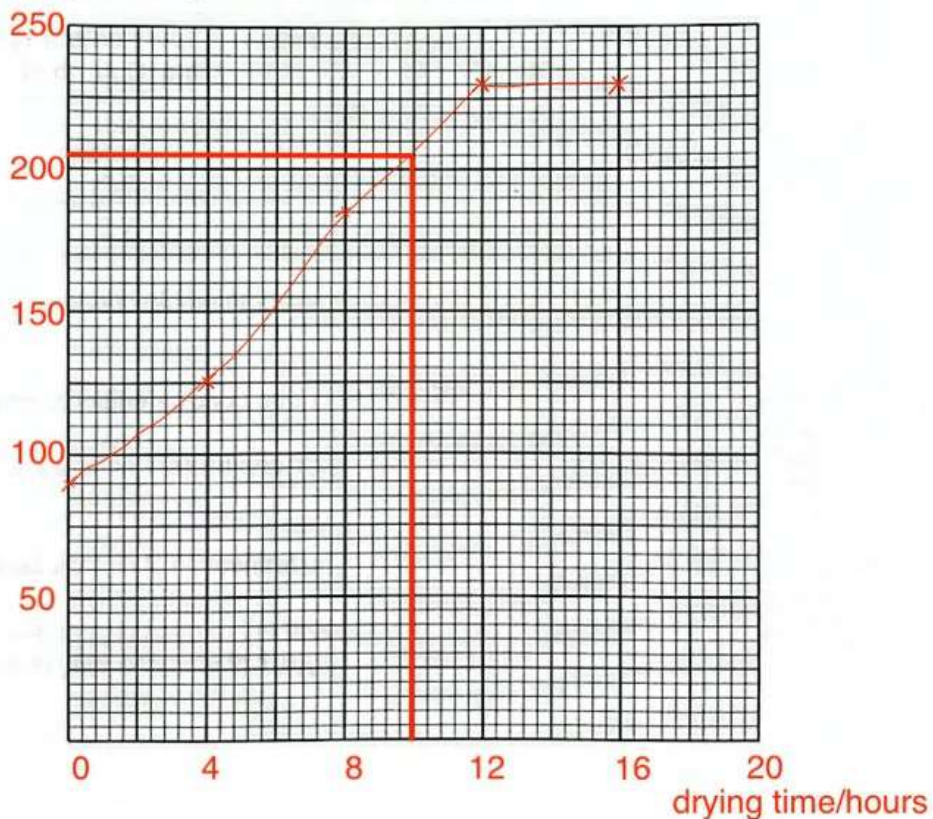
The results are shown in Table 1.3.

Table 1.3

drying time /hours	vitamin C concentration /mg per 100 g of kiwi fruit
0	90
4	125
8	185
12	230
16	230

- (i) Plot a line graph on the grid of the data in Table 1.3.

Vitamin C
concentration/
mg per 100g of
kiwi fruit



[4]





- (ii) Describe and explain the change in the vitamin C concentration in the kiwi fruit in Table 1.3.

The longer the drying time, the higher concentration of vitamin C.

This is because more water is evaporated and lost from the kiwi fruit.

The less water, the higher the concentration of vitamin C.

[2]

- (iii) Use your graph to estimate the vitamin C concentration in kiwi fruit that has been dried for 10 hours.

Indicate on your graph how you obtained your answer.

205 mg per 100g of kiwi fruit [2]

[Total: 23]



- 1 A student estimated the concentration of vitamin C in a drink by comparing it to solutions with known vitamin C concentrations.

The concentration of vitamin C in a sample can be estimated by testing it with iodine solution. The test is done by adding drops of iodine solution to the sample until the colour remains blue-black. The greater the volume of iodine solution added, the higher the concentration of vitamin C in the sample.

dependent variable

(a) The student used this method:

step 1 Label three beakers **V1**, **V2** and **V3**.

step 2 Use the volumes of 0.6% vitamin C solution **V** and distilled water **W** shown in Table 1.1 to make up the different concentrations of vitamin C solution.

- (i) Complete Table 1.1 by writing in the final percentage concentration of vitamin C solution in test-tube **V3**.

Table 1.1

beaker	volume of 0.6% vitamin C solution V/cm ³	volume of distilled water W/cm ³	final percentage concentration of vitamin C solution
V1	12	0	0.6
V2	8	4	0.4
V3	4	8	0.2

[1]

step 3 Label three test-tubes **V1**, **V2** and **V3**.

step 4 Use a 1 cm³ syringe to put 1 cm³ of starch suspension into each test-tube.

step 5 Add 1 cm³ of the vitamin C solution from beaker **V1** to test-tube **V1**.

control variable

step 6 Add 1 cm³ of the vitamin C solution from beaker **V2** to test-tube **V2**.

step 7 Add 1 cm³ of the vitamin C solution from beaker **V3** to test-tube **V3**.

step 8 Fill a clean 5 cm³ syringe with 5 cm³ of iodine solution.

step 9 Use the syringe to add a drop of iodine solution to test-tube **V1** and shake gently to mix.

step 10 Continue adding drops of iodine solution and shaking until the mixture remains a blue-black colour.

step 11 Record the volume of iodine solution remaining in the syringe.

step 12 Repeat step 8 to step 11 using test-tube **V2** and test-tube **V3**.



Figure 1.1 shows the volume of iodine solution remaining in the syringes used for test-tubes V1, V2 and V3. The grey shading in the syringes represents the iodine solution.

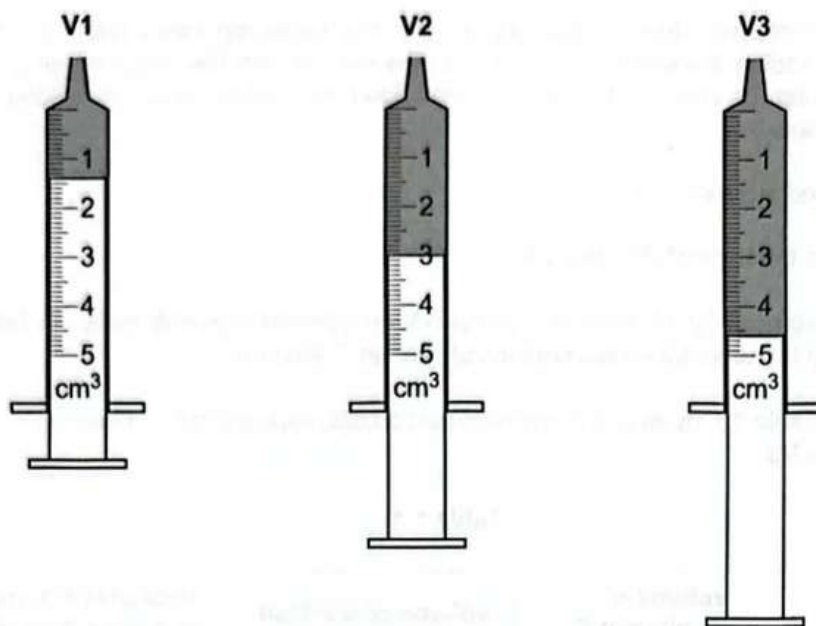


Figure 1.1

(ii) Prepare a table and record the results shown in Figure 1.1.

Include the final percentage concentrations of the vitamin C solutions in your table.

Concentration of vitamin C	Volume of iodine solution remaining/cm ³
0.6	1.4
0.4	3.0
0.2	4.6



- (iii) Calculate the volume of iodine solution added to each test-tube.

Use the formula shown:

volume of iodine solution added = 5.0 – the volume remaining in the syringe

test-tube V1 3.6 cm³

test-tube V2 2.0 cm³

test-tube V3 0.4 cm³
[1]

- (iv) State the dependent variable in this investigation.

volume of iodine solution added [1]

- (v) Explain why a blue-black colour was seen when iodine solution was added to the test-tubes.

This is a positive result due to the presence of starch
.....
..... [1]

- (vi) The student used the same syringe to add the vitamin C solution in step 5, step 6 and step 7.

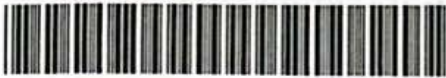
Suggest what effect this would have on the volume of iodine solution required for the mixture in test-tube V3 to remain blue-black.

The volume will increase
.....
..... [1]

- (vii) Another student repeated the investigation but counted the number of drops of iodine solution added instead of measuring the volume.

Suggest why measuring volume is more accurate than counting drops.

The size of drops are different
.....
..... [1]



(b) The student estimated the vitamin C concentration in drink D.

The student used this method:

step 13 Label a test-tube D.

step 14 Put 1 cm^3 of starch suspension into the test-tube.

step 15 Add 1 cm^3 of drink D to the test-tube.

step 16 Fill a clean syringe with 5 cm^3 of iodine solution.

step 17 Use the syringe to add a drop of iodine solution to test-tube D and shake gently to mix.

step 18 Continue adding drops of iodine solution and shaking until the mixture remains a blue-black colour. Record the volume of iodine solution added.

step 19 Repeat step 13 to step 18 two more times.

(i) Table 1.2 shows the volumes of iodine solution the student recorded in step 18 and step 19.

Table 1.2

volume of iodine solution added to drink D/ cm^3
2.8
2.9
2.7

Calculate the mean volume of iodine solution added to drink D.

mean volume of iodine solution added to drink D **2.8** cm^3 [1]

(ii) Use your answers in 1(a)(iii) and 1(b)(i) to estimate the vitamin C concentration in drink D.

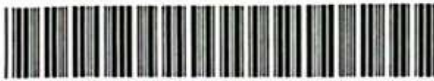
estimated vitamin C concentration in drink D **0.5** % [1]

(iii) Describe one modification to the procedure in 1(a) that would allow you to have more confidence in your estimate in 1(b)(ii).

Add more different concentrations of vitamin C solution between 0.4% to 0.6%

OR repeat experiment more than three times [1]





- (iv) The manufacturer of a drink claims that it does **not** contain reducing sugars.

Describe a test that would confirm the presence of reducing sugars.

Add Benedict's solution. Heat. Positive result: blue turns red

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.....

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.....

.....

[2]

- (v) State **one** other test that could be used to determine the presence of vitamin C.

DCPIP

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[1]

