All questions are for both separate science and combined science students

Q1.

This question is about paper chromatography.

A student investigated substance **Y** using paper chromatography.

This is the method used.

1. Draw a start line in ink on a piece of chromatography paper.
2. Put spots of four different dyes, **A**, **B**, **C** and **D**, and a spot of substance **Y** on the start line.
3. Dip the paper into water so that the water level is below the start line.
4. Wait until the water has risen to near the top of the paper.

(a) The students method contains a mistake in **Step 1**.

What is the mistake in **Step 1**?

Give **one** reason for your answer.

Mistake _____

_____

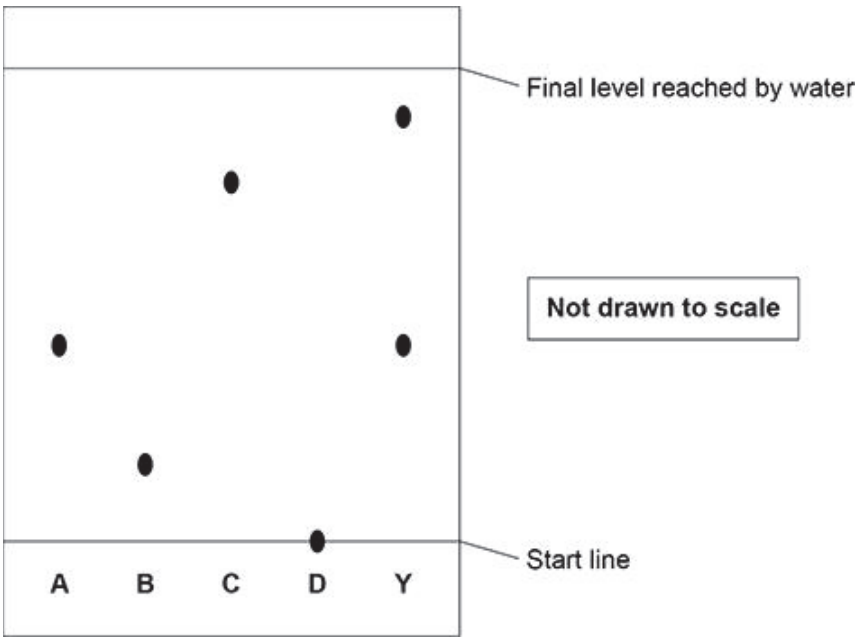
Reason _____

_____

(2)

A different student used a method which gave valid results.

The figure below shows the results.



(b) How many different dyes are in substance **Y**?

Use the figure above.

_____

(1)

(c) Which of the four dyes, **A**, **B**, **C** and **D**, could be in substance **Y**?

Give **one** reason for your answer.

Use the figure above.

Dye _____

Reason _____

_____

(2)

(d) Suggest why dye **D** remained on the start line at the end of the investigation.

Use the figure above.

_____

_____

(1)

(e) The student determined that:

- the distance moved by the water was 6.0 cm
- the distance moved by dye **A** was 2.4 cm.

Calculate the Rf value of dye **A**.

Use the equation:

$$R_f = \frac{\text{distance moved by dye A}}{\text{distance moved by water}}$$

_____

_____

_____

R_f = _____

(2)

(f) Complete the sentence.

Choose the answer from the box.

solute	**solution**	**solvent**

The water in **step 3** is used as a _____ .

(1)

(Total 9 marks)

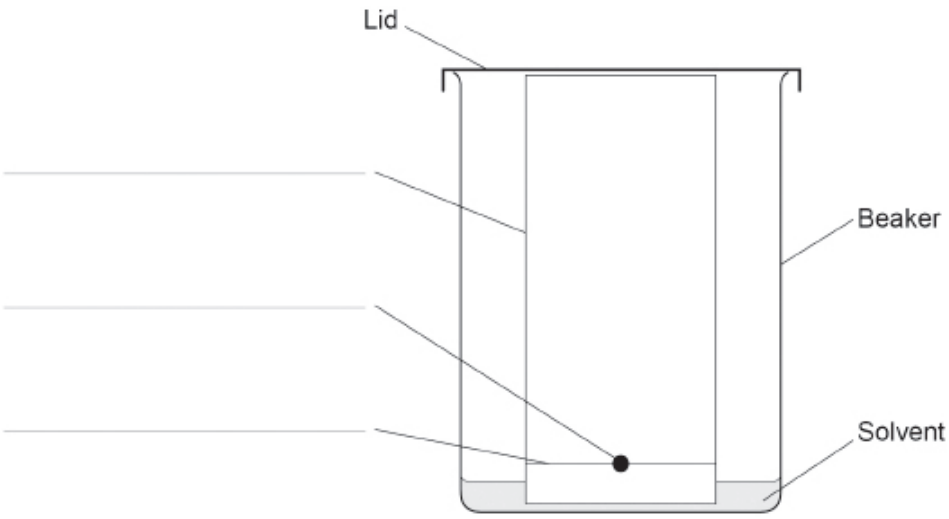
Q2.

This question is about chromatography.

A student investigated an orange dye using paper chromatography.

(a) **Figure 1** shows the apparatus at the start of the investigation.

Figure 1

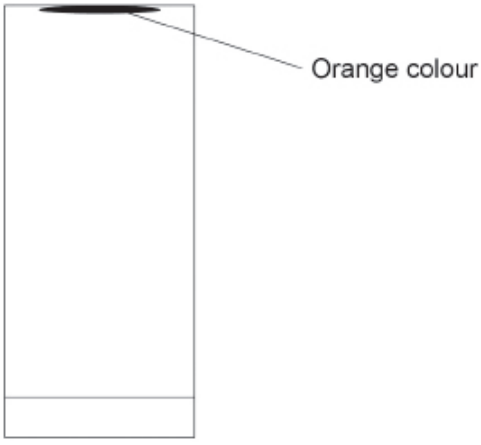


Complete the labels on **Figure 1**.

(3)

(b) **Figure 2** shows the results at the end of the investigation.

Figure 2



The student made a mistake in the investigation.

What mistake did the student make to produce the results shown in **Figure 2**?

Tick (✓) **one** box.

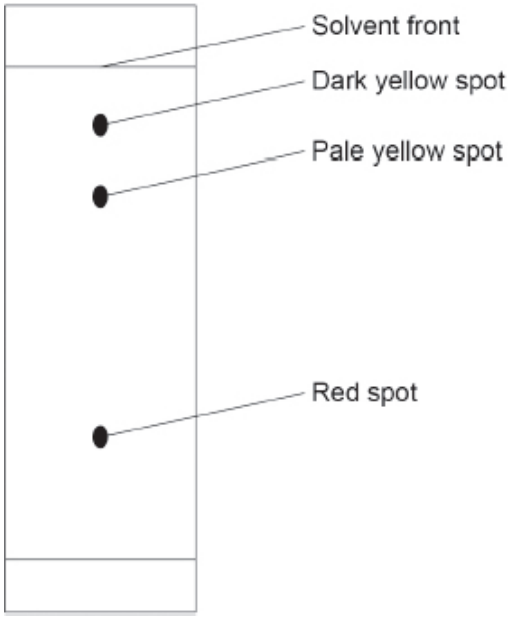
Left the investigation for too long	☐
Used a lid on the beaker	☐
Used a solvent which did not dissolve the dye	☐

(1)

A different student did the investigation correctly.

Figure 3 shows the results.

Figure 3



(c) How do the results in **Figure 3** show that the orange dye is **not** a pure substance?

_____

_____

(1)

(d) Determine the Rf value for the red spot.

You should measure:

- the distance moved by the red spot
- the distance moved by the solvent.

Use **Figure 3** and the equation:

$$R_f = \frac{\text{distance moved by red spot}}{\text{distance moved by solvent}}$$

Distance moved by red spot _____ cm

Distance moved by solvent _____ cm

_____

_____

R_f = _____

(4)

(e) Which spot had the greatest R_f value?

Use **Figure 3**.

Tick (✓) **one** box.

Dark yellow spot	☐
Pale yellow spot	☐
Red spot	☐

(1)

(Total 10 marks)