DUNMAN HIGH SCHOOL

H2 BIOLOGY

Practical Skill Revision Worksheet 3

Suggested Answers

1 Fig 1.1 shows a microscopic image of a stained cross section through a stem of a terrestrial plant.

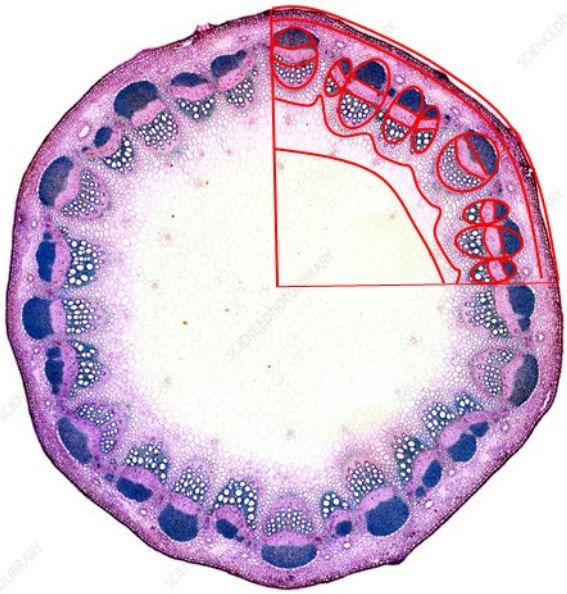


Fig 1.1

You are not expected to be familiar with this specimen.

Observe the different tissues in the region of Fig. 1.1 shown by the shaded area in Fig. 1.2 below.

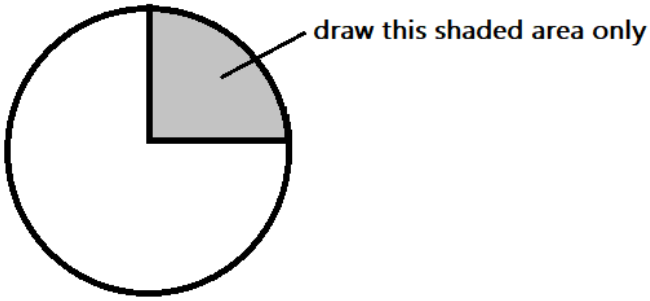
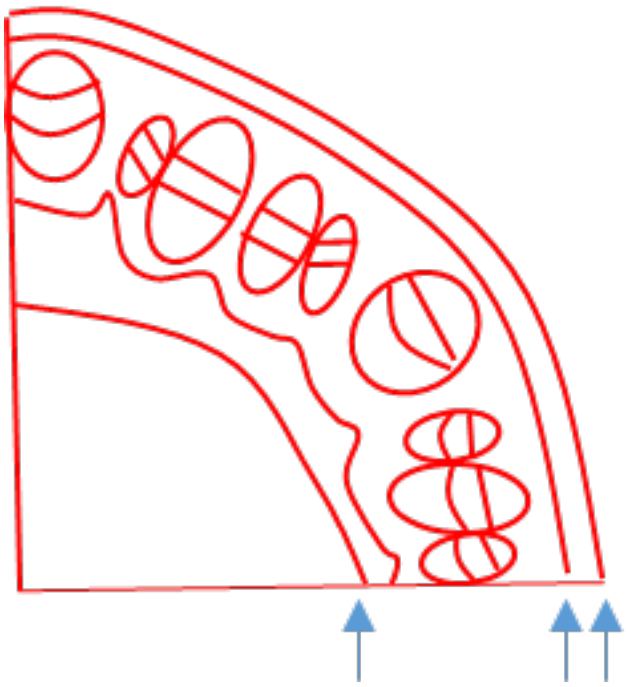


Fig. 1.2

Use the space provided to draw a large plan diagram of the part of the stem shown by the shaded area in Fig 1.2.

A plan diagram shows the arrangement of different tissues, including their correct shapes and proportions. No cells should be drawn.

Labels are **not** required. [5]



1. Large drawing;
2. smooth and continuous lines;
3. accurate drawing of the different tissue layers (minimally the 3 lines indicated with ↑);
4. 3 layers in the vascular bundle;
5. accurate proportions of the layers;

2 Fig 2 shows a microscopic image of a stained cross section through a root of a terrestrial plant.

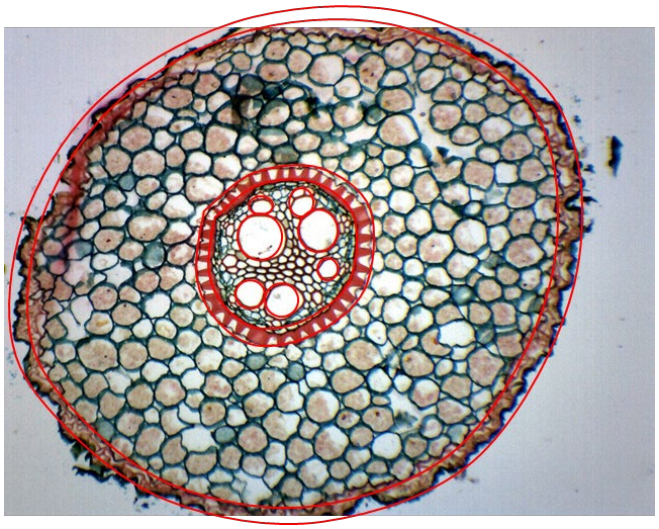


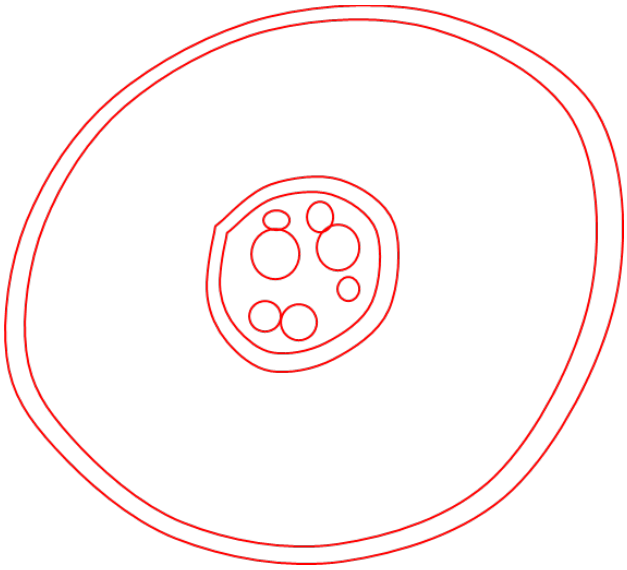
Fig 2

You are not expected to be familiar with this specimen.

Observe the different tissues in Fig 2 and use the space provided to draw a large plan diagram of Fig 2.

A plan diagram shows the arrangement of different tissues, including their correct shapes and proportions. No cells should be drawn.

Labels are **not** required. [5]



1. Large drawing;
2. smooth and continuous lines;
3. accurate drawing of the different tissue layers;
4. large air spaces in the middle;
5. accurate proportions of the layers;

3 Fig 3 shows the cross section of two apples, one before (Fig 3A) and one after (Fig 3B) iodine staining.

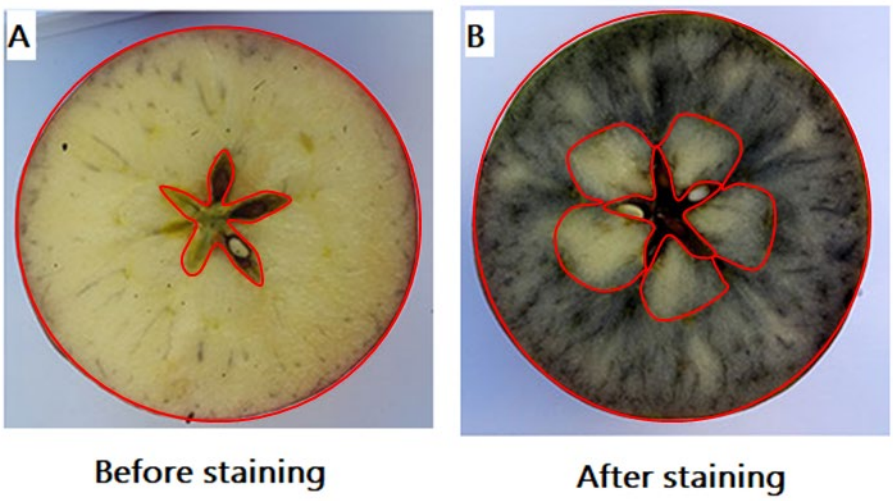


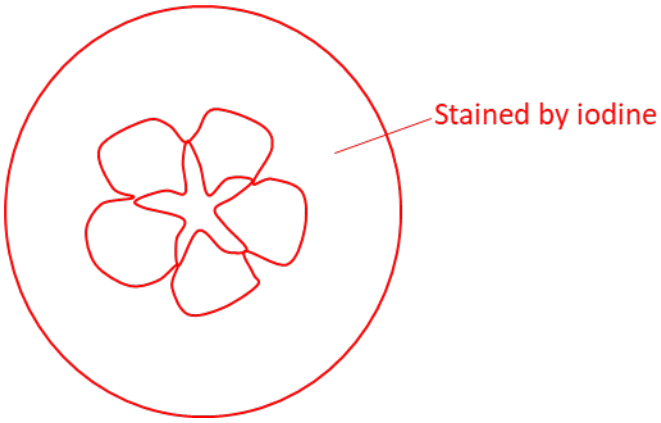
Fig. 3

You are not expected to be familiar with these specimens.

Observe the different tissues in Fig 3 and use the space provided to draw a large plan diagram of a cross section of an apple.

A plan diagram shows the arrangement of different tissues, including their correct shapes and proportions.

Label the region stained by iodine. [5]



1. Large drawing;
2. smooth and continuous lines;
3. accurate drawing of the different tissue layers;
4. accurate proportions of the layers;
5. label iodine-stained region;

4 Fig 4.1 and 4.2 shows microscopic image of a stained transverse section through a leaf of a terrestrial plant.

You are not expected to be familiar with this specimen.

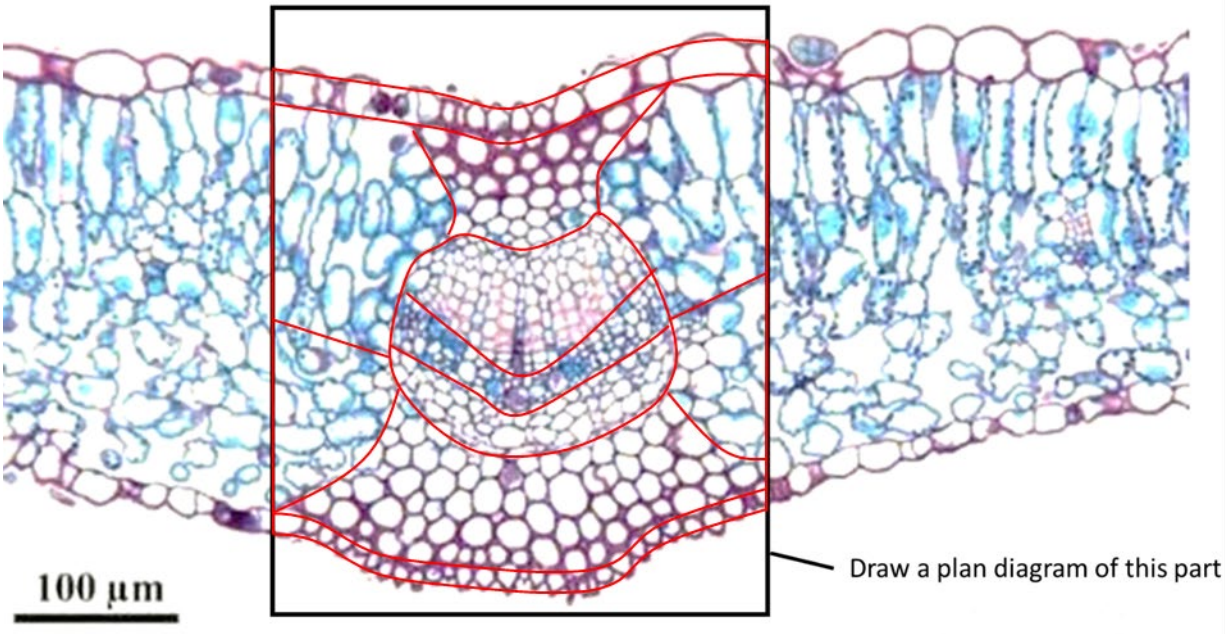


Fig 4.1

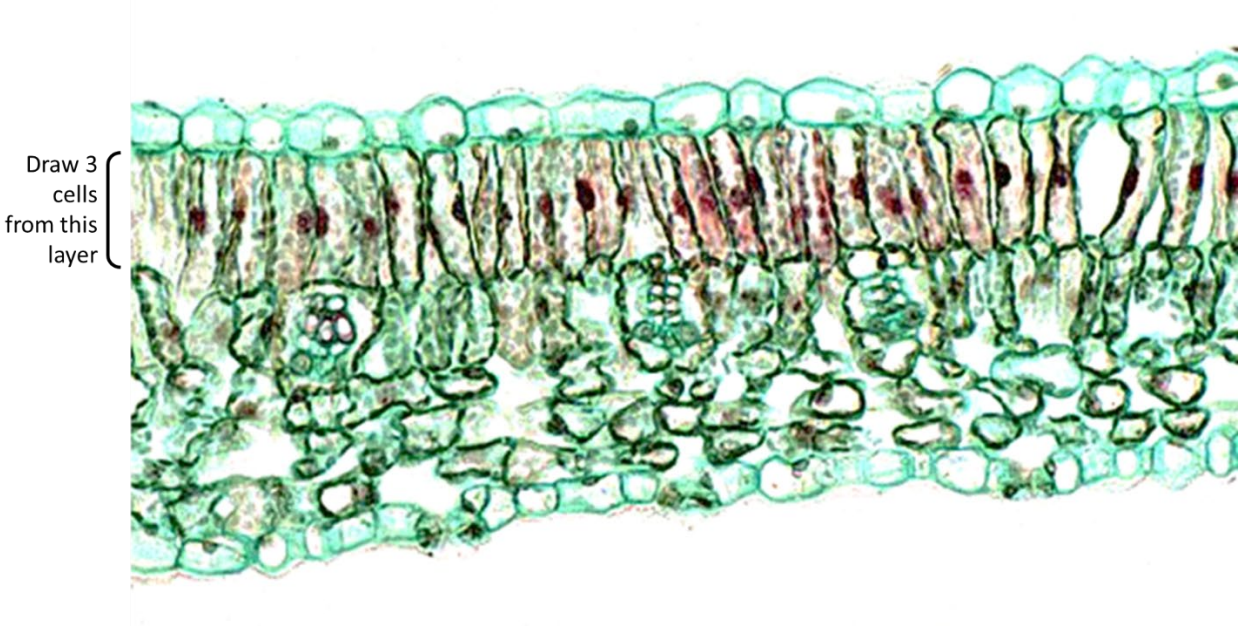


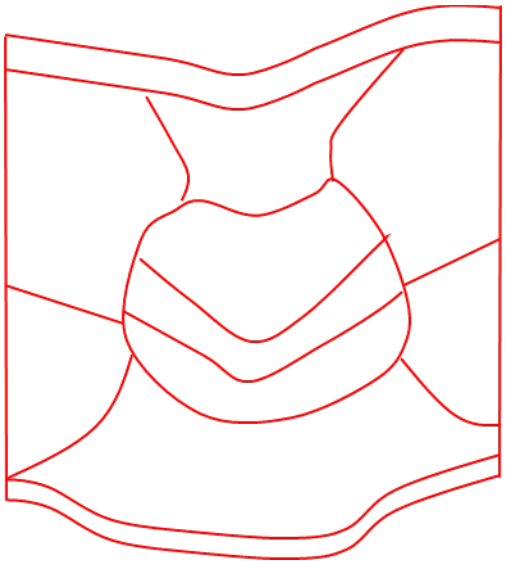
Fig 4.2

(a) Observe the different tissues in the region boxed out in Fig. 4.1**.**

Use the space provided to draw a large plan diagram of the part of the leaf boxed out in Fig. 4.1.

A plan diagram shows the arrangement of different tissues, including their correct shapes and proportions. No cells should be drawn.

Labels are **not** required. [5]

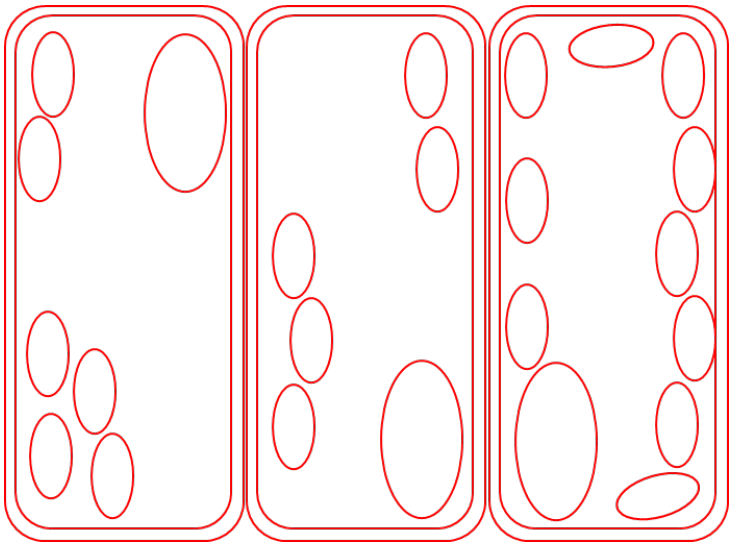


1. Large drawing;
2. smooth and continuous lines;
3. accurate drawing of the different tissue layers;
4. 3 layers in the vascular bundle;
5. accurate proportions of the layers;

(b) Observe the cells in the layer labelled in Fig. 4.2.

Make a large drawing of 3 cells in this layer labelled in Fig.4.2.

Labels are **not** required. [4]



1. Large drawing;
2. smooth and continuous lines;
3. accurate drawing of 3 cells with cell wall, nucleus and chloroplasts;
4. accurate proportions of the organelles;

5 Yeast undergoes alcoholic fermentation in the absence of oxygen. The accumulation of alcohol is known to kill yeast. You are tasked to determine the lowest concentration of alcohol that kills yeast.

Yeast are normally able to oxidise glucose. Yeast killed by ethanol will no longer be able to oxidise glucose.

Some preliminary investigations showed that:

- yeast can completely digest glucose within 180 seconds in 30-35°C
- the optimal ratio for volume of yeast to glucose solution is 3:1
- it takes 1 to 2 minutes for alcohol to kill yeast in 40-45°C
- the optimal ratio for volume of yeast to alcohol is 10:1

You are provided with:

- 10 cm^3 70% ethanol, **E1**
- Sufficient Distilled water
- 20 cm^3 10% glucose solution, **G**
- Sufficient Benedict's solution
- 50 cm^3 of yeast mixture, **Y**
- Syringes
- Hot water
- Tap water
- Stopwatch
- Thermometer
- Normal laboratory glassware e.g. test-tubes, beakers, measuring cylinders, graduated pipettes, glass rods etc. ; as well as syringes.

(a) Complete the table below to obtain a serial dilution of **E1**, to reduce the concentration of ethanol by a **factor of ten** between each of four successive dilutions, **E2**, **E3**, **E4** and **E5**.

You will need to make up 10.0 cm^3 of each solution. Some of this will be used to make the next solution. [2]

	E1	**E2**	**E3**	**E4**	**E5**
Percentage concentration of ethanol	70	7	0.7	0.07	0.007
Label of solution to be diluted		**E1**	**E2**	**E3**	**E4**
Volume of solution to be diluted / cm^3		1.0	1.0	1.0	1.0
Volume of distilled water to make the dilution / cm^3		9.0	9.0	9.0	9.0

(b) Complete Table 5.1 to explain how the benedict's test can be used to indicate if yeast had been killed. [2]

Table 5.1

Indication	Results of benedict's test	Explanation
Yeast killed	Benedict's solution changes colour from blue to brick-red	Glucose not oxidised by yeast hence reduces Cu^{2+} in Benedict's solution to result in colour change.
Yeast not killed	Benedict's solution remains blue	Yeast will oxidise glucose, hence there will be no reducing sugar present to react with Benedict's solution.

(c) Using only the apparatus provided above, plan an experiment to determine the lowest concentration of alcohol that kills yeast. Do **not** plan to carry out repeats. [6]

Your planned method should:

- have a clear and helpful structure so that the method described could be repeated by anyone reading it
- include details to ensure that results are as accurate and repeatable as possible
- use the correct technical and scientific terms

1. Prepare 2 beakers of water baths – one of 45°C and another of 35°C, using hot water and tap water and monitored with a thermometer. Prepare a 3rd water bath by placing a beaker of water on a tripod stand over a wire gauze and bring the water to boil with a Bunsen burner.
2. Mix 1 cm^3 of **E1**, measured with 1 cm^3 syringe, and 10 cm^3 of **Y**, measured with 10 cm^3 syringe, in a test tube. Stir well with a glass rod.
3. Place the test tube in the beaker of water bath of 45°C.
4. Start the stopwatch and time for 2 minutes before removing the test tube from the water bath.

5. Remove 9 cm^3 of mixture from this test tube using a 10 cm^3 syringe and transfer into another clean test tube. Add 3 cm^3 of **G**, using a 5 cm^3 syringe, into this test tube. Stir well with a glass rod.
6. Place the test tube in the beaker of water bath of 35°C.
7. Start the stopwatch and time for 3 minutes before removing the test tube from the water bath.
8. Remove 2 cm^3 of mixture from this test tube using a 5 cm^3 syringe and transfer into another clean test tube. Add 2 cm^3 of benedicts solution using a 5 cm^3 syringe. Stir well with a glass rod.
9. Place the test tube in the beaker of boiling water bath. Boil the mixture for 3 minutes and record for colour change in benedict's solution.
10. Repeat steps 1-8 with **E2**, **E3**, **E4** and **E5**.

Yeast to ethanol in ratio of 10:1 ;
Yeast-ethanol mixture incubate 1-2min in 40-45deg ;
Yeast to glucose ratio of 3: 1 ;
Yeast-glucose incubate 3min in 30-35deg ;
Correct description of benedict's test ;
Appropriate use of apparatus ;

(d) Suggest a suitable control for this experiment to show that it is the yeast that had digested the glucose. [1]

Mix ethanol with distilled water of equivalent volume to yeast solution (10 cm^3), in place of yeast solution. Use this mixture to incubate with glucose solution and perform benedict's test.

(e) A student performed the experiment and identified that the lowest concentration of ethanol required to kill yeast is **E2**.

Replicating or repeating the investigation would increase the confidence in the student's estimate of the lowest concentration of ethanol required**.**

Describe **one** other modification to this method that would increase the confidence in the student's estimate. [1]

Repeat using smaller intervals of concentrations between 0.7% (**E3**) and 7% (**E2**);

In another experiment to determine the lowest concentration of alcohol that kills yeast, the ability of yeast to decompose hydrogen peroxide was measured.

Yeast contains catalase that enables the decomposition of hydrogen peroxide to water and oxygen gas.

The experimental set-up can be seen in Fig 5 below.

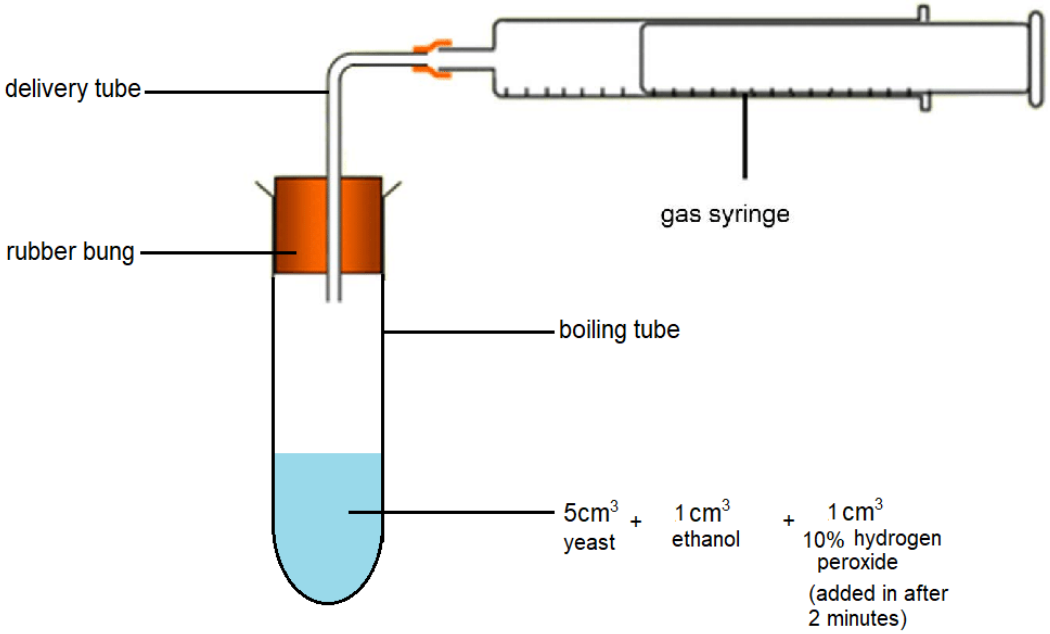


Fig 5

Table 5.2 shows the volume of oxygen released by yeast upon incubation with hydrogen peroxide, with increasing ethanol concentration.

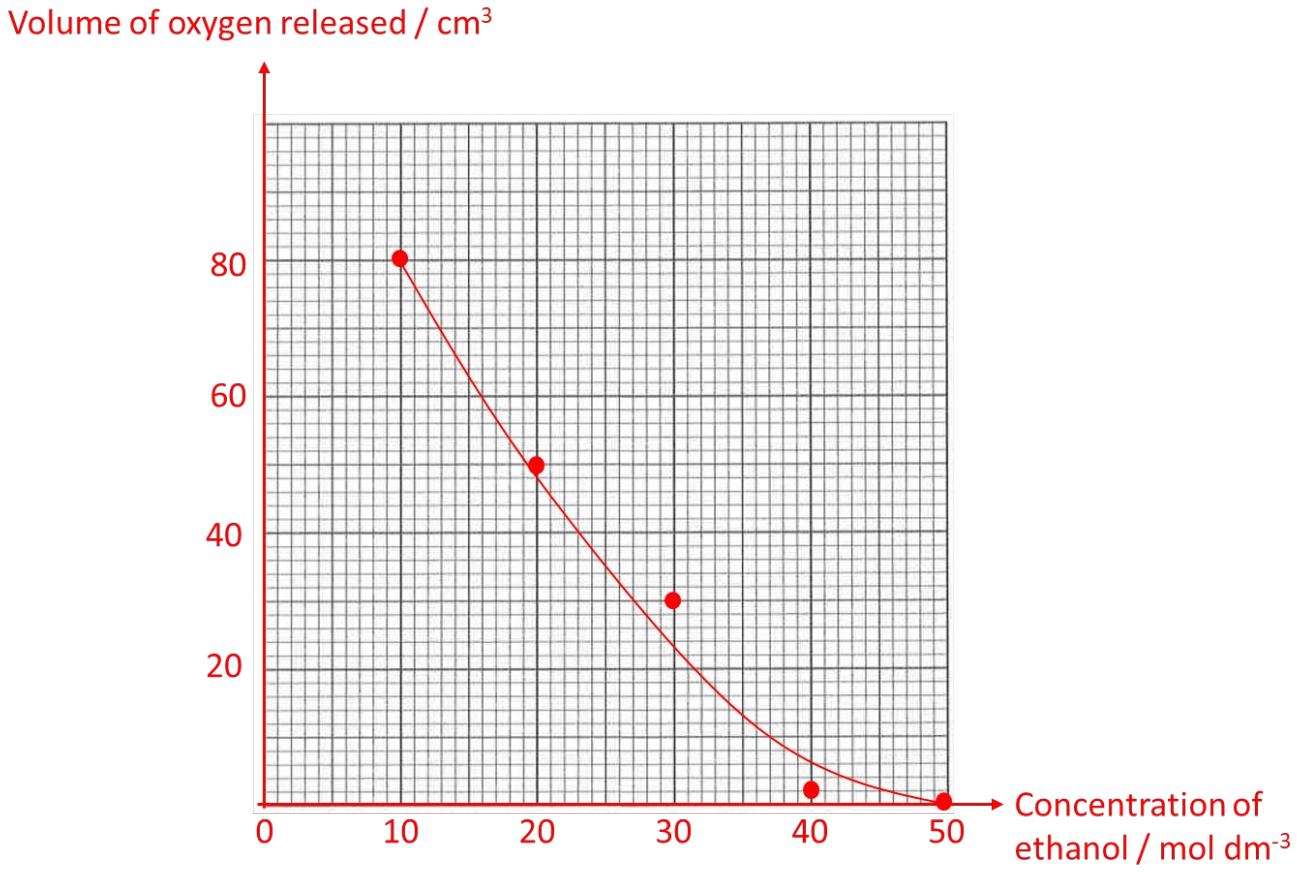
Table 5.2

Concentration of ethanol / mol dm^{-3}	Volume of oxygen released / cm^3
10	80
20	50
30	30
40	2
50	0

(f) (i) In the space below, draw a suitable table to show how the above stated concentration of ethanol can be obtained by simple dilution using a 50 mol dm^{-3} ethanol solution, **A**. Make up 10.0 cm^3 of each solution. [2]

Concentration of ethanol / mol dm^{-3}	Volume of A / cm^3	Volume of distilled water / cm^3	Total Volume / cm^3
10	2.0	8.0	10.0
20	4.0	6.0	10.0
30	6.0	4.0	10.0
40	8.0	2.0	10.0
50	10.0	0.0	10.0

(f) (ii) Use the grid provided to display the results shown in Table 5. [4]



(f) (iii) Some variables that needed to be standardised in this investigation can be seen in Fig 5.

Describe how **three other** variables in this investigation could be standardised. [3]

Mass of yeast used + use an electronic scale to weigh a fixed mass of dried yeast;

Duration of oxygen collection + start the timer after addition of hydrogen peroxide and measure the volume of oxygen collected in the syringe after a fixed duration;

Temperature of set up + place the boiling tube in a thermostatically controlled water bath monitored with a thermometer;