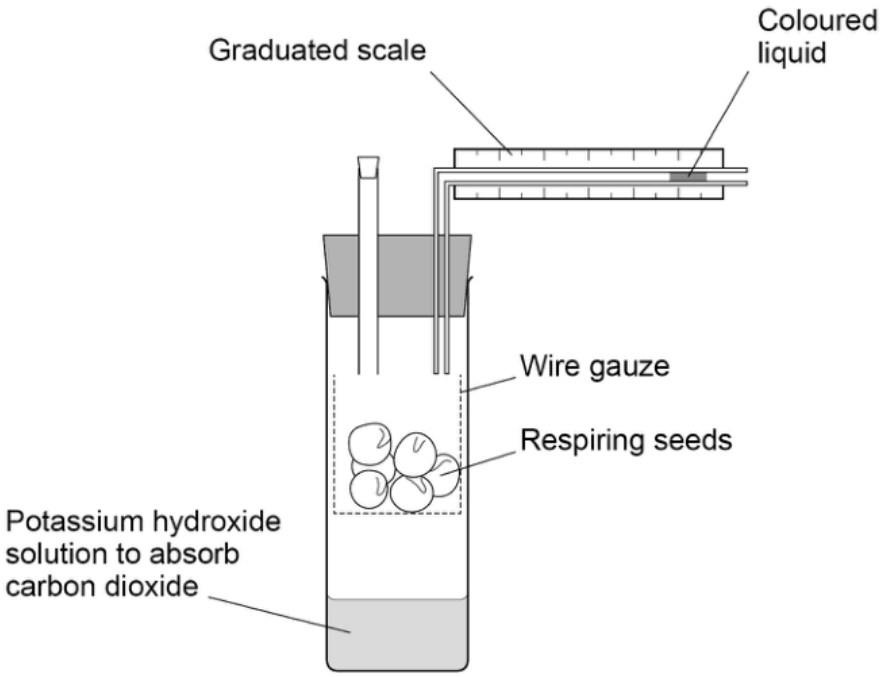
Required Practical 9, Respiration Rate: AQA A Level Biology Exam Quest

11 questions · 20 marks · about 26 minutes. Answer in the spaces, then check the mark schemes at the end.

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A student used the apparatus shown in **Figure 1** to measure the rate of aerobic respiration of seeds for 48 hours.

Figure 1



0 4 . 2 During the 48 hours, the coloured liquid moved to the left.

Explain why.

[3 marks]

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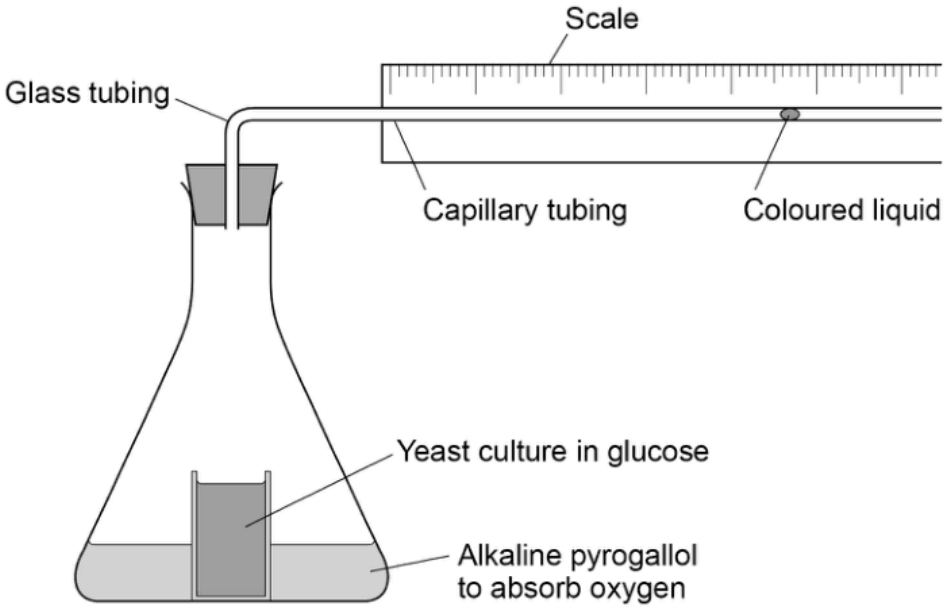
Question 2 · information from earlier in the question

0 3 Yeast cells can respire aerobically or anaerobically. A student used the apparatus shown in **Figure 3** to measure the rate of respiration in yeast.

She:

- positioned the flask in a water bath so that the yeast culture reached a constant temperature
- then left the apparatus for one hour before starting her investigation.

Figure 3



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Question 2 · A level Paper 2 · June 2018 · Q03.2 · 2 marks

0 3 . 2 During her investigation, the coloured liquid moved to the right.

Explain why it moved to the right.

[2 marks]

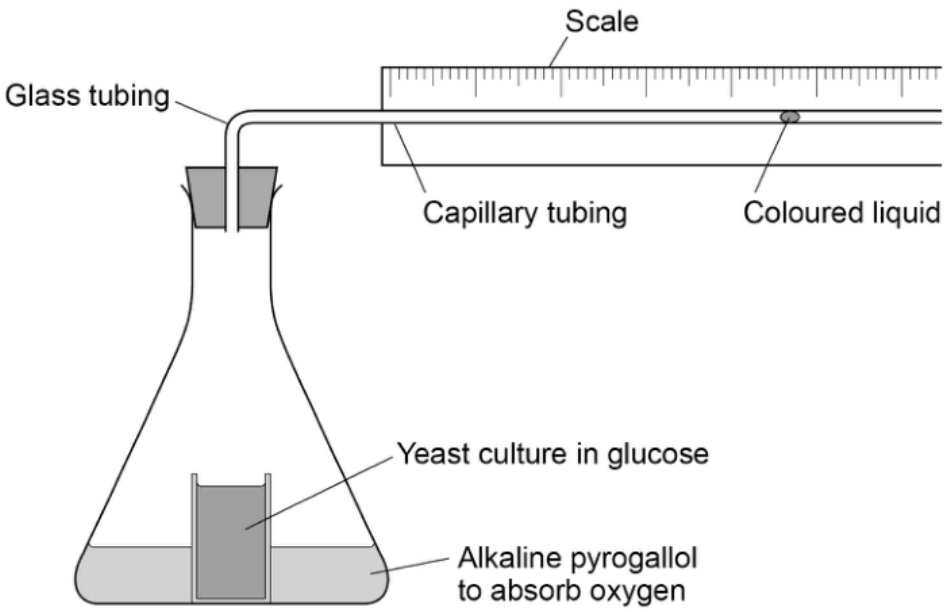
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0 3 Yeast cells can respire aerobically or anaerobically. A student used the apparatus shown in **Figure 3** to measure the rate of respiration in yeast.

She:

- positioned the flask in a water bath so that the yeast culture reached a constant temperature
- then left the apparatus for one hour before starting her investigation.

Figure 3



0 3 . 1 Suggest **one** reason why it was important that the student left the apparatus for one hour after the yeast culture reached a constant temperature.

[1 mark]

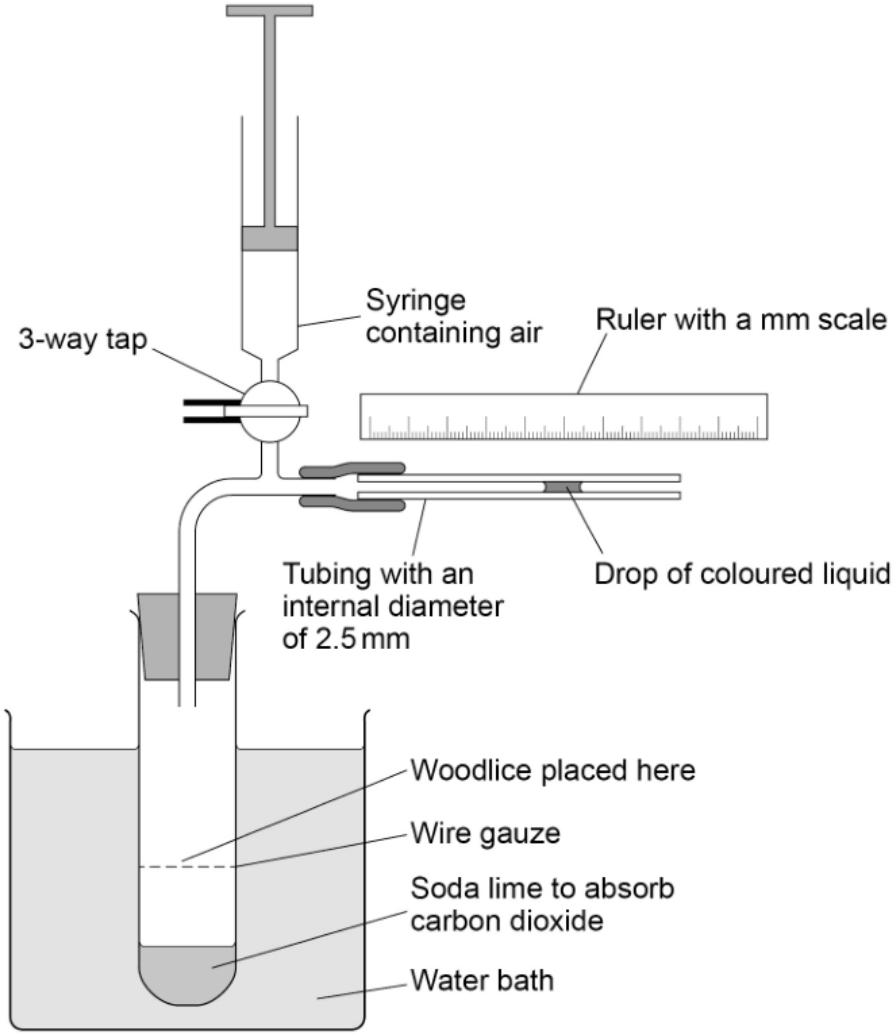
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Question 4 · information from earlier in the question

0 2 A student investigated the effect of temperature on the rate of aerobic respiration in woodlice.

Figure 1 shows the apparatus they used.

Figure 1



The student altered the temperature of the water bath and measured how far the drop of coloured liquid moved every minute for 5 minutes.

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Question 4 · A level Paper 3 · June 2024 · Q02.2 · 2 marks

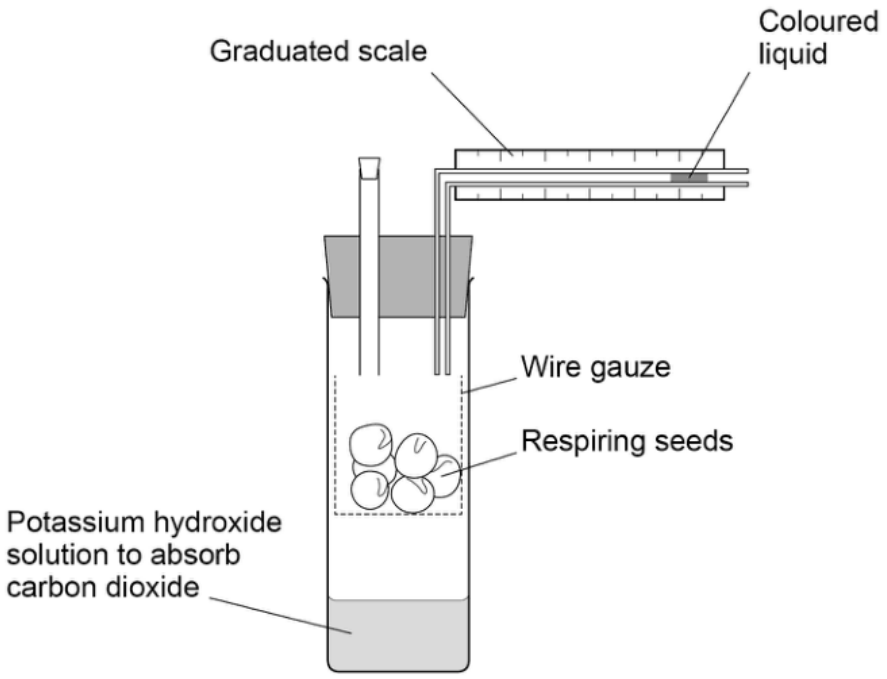
0 2 . 2 Describe how the student used the apparatus in **Figure 1** to reset the drop of coloured liquid back to the **right-hand** end of the tubing.

[2 marks]

Question 5 · information from earlier in the question

A student used the apparatus shown in **Figure 1** to measure the rate of aerobic respiration of seeds for 48 hours.

Figure 1



Questions, mark schemes and examiners' report extracts © AQA.

Question 5 · A level Paper 2 · June 2022 · Q04.4 · 3 marks

0 4 . 4 The student used the same apparatus to determine the volume of carbon dioxide the seeds produced during 48 hours.

Give the change the student would need to make to the contents of the apparatus **and** describe how he could calculate the volume of carbon dioxide produced.

[3 marks]

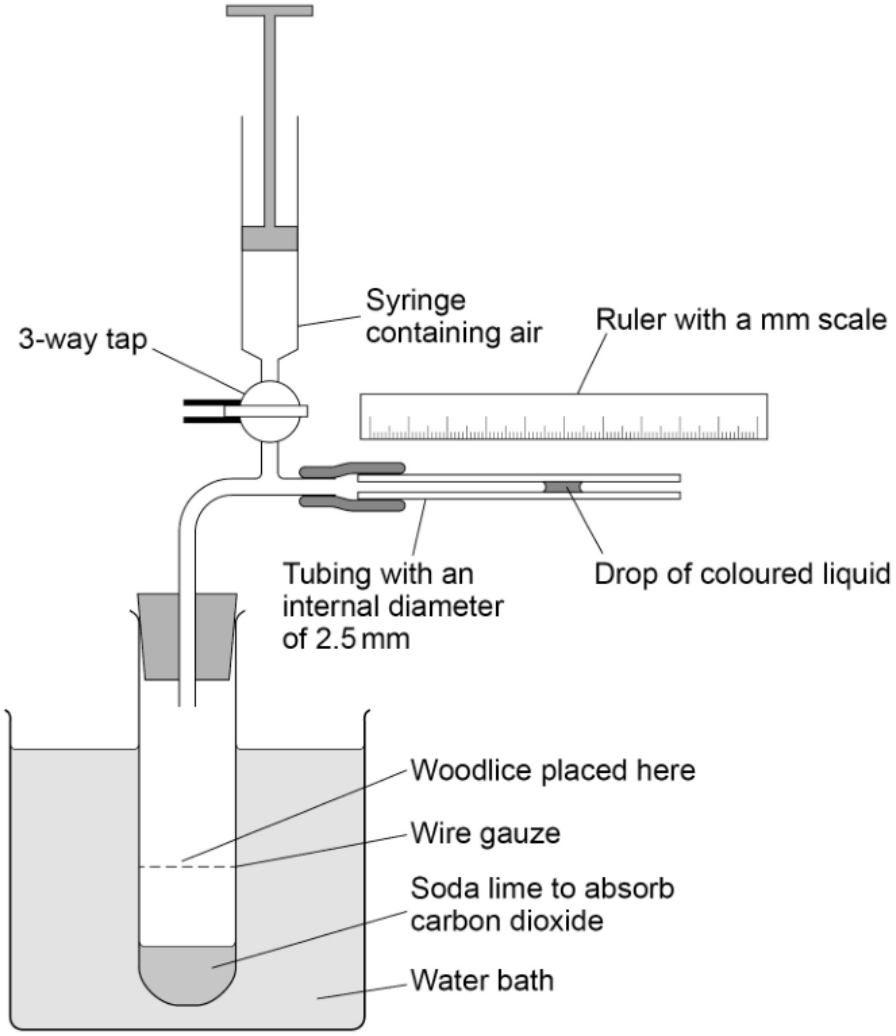
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Question 6 · information from earlier in the question

0 2 A student investigated the effect of temperature on the rate of aerobic respiration in woodlice.

Figure 1 shows the apparatus they used.

Figure 1



The student altered the temperature of the water bath and measured how far the drop of coloured liquid moved every minute for 5 minutes.

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Question 6 · A level Paper 3 · June 2024 · Q02.3 · 2 marks

0 2 . 3 The student also set up a control experiment.

Suggest a suitable control experiment **and** explain why it was necessary.

[2 marks]

Control experiment _____

_____

_____

Explanation _____

_____

_____

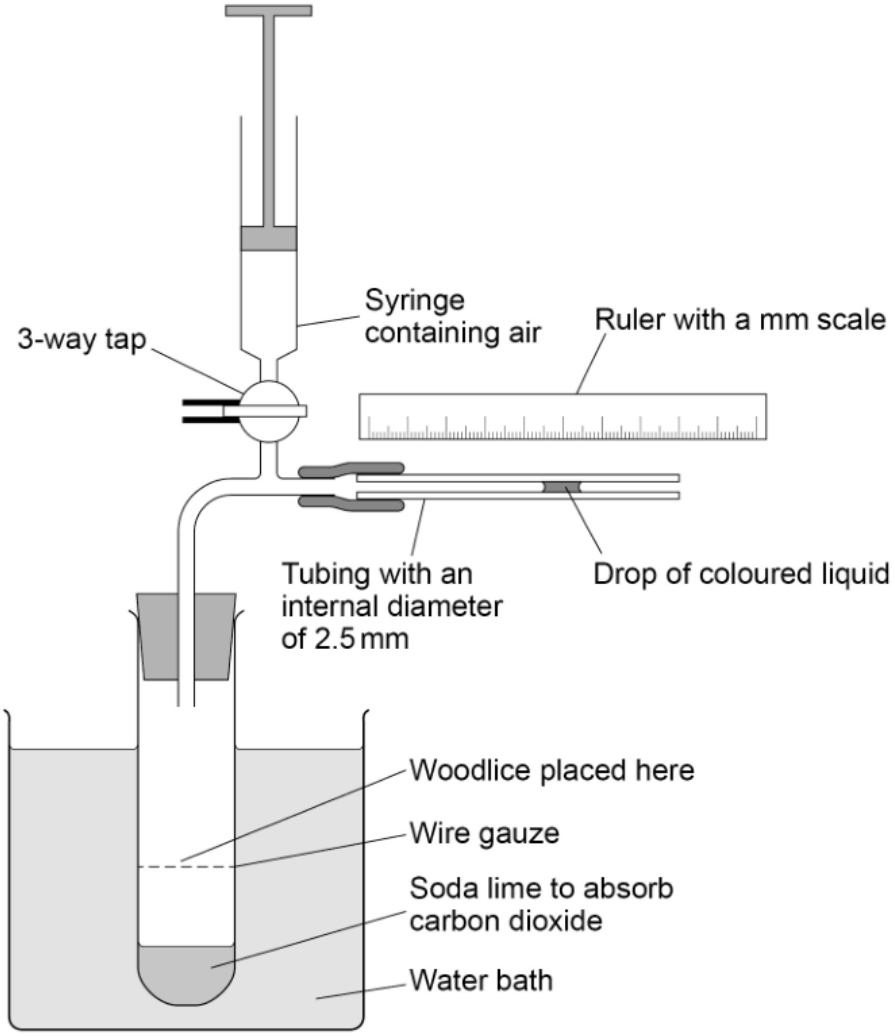
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0 2 A student investigated the effect of temperature on the rate of aerobic respiration in woodlice.

Figure 1 shows the apparatus they used.

Figure 1



The student altered the temperature of the water bath and measured how far the drop of coloured liquid moved every minute for 5 minutes.

0 2 . 1 Other than those stated, suggest **two** variables the student should have kept constant in this investigation.

[1 mark]

1 _____

_____

2 _____

_____

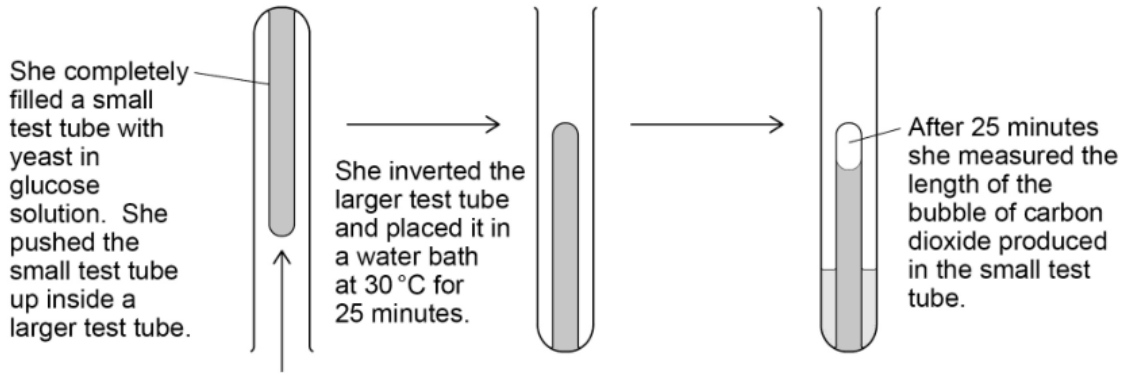
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Question 8 · A level Paper 3 · June 2023 · Q02.1 · 1 mark

0 2 A student investigated the effect of different sugars on the rate of respiration in yeast. Yeast normally respires glucose.

Figure 2 shows the method she used for her first experiment.

Figure 2



0 2 . 1 Other than those stated, suggest **two** variables the student needed to keep constant in her investigation.

[1 mark]

1 _____

2 _____

Question 9 · A level Paper 3 · June 2023 · Q02.4 · 2 marks

0 2 . 4 A second student used a different method to investigate the effect of different sugars on the rate of respiration in yeast.

He set up a tube with yeast in glucose solution and added bromothymol blue. Bromothymol blue changes from blue to yellow when carbon dioxide is produced.

To determine the rate of respiration, he timed how long it took for the solution to change from blue to yellow.

Suggest:

- why the method the second student used would be less accurate than the method the first student used
- how the accuracy of the method the second student used could be improved.

[2 marks]

This method would be less accurate because

_____

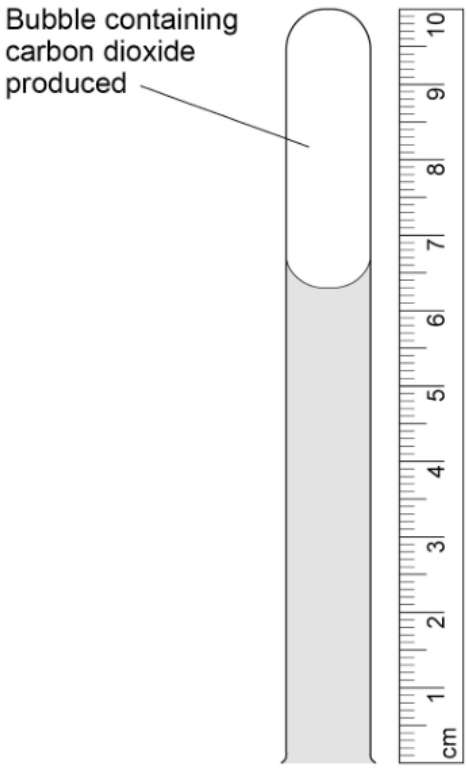
_____

_____

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Figure 3 shows the result she obtained for yeast in glucose solution.

Figure 3



0 2 . 2 Use **Figure 2** and **Figure 3** to calculate the rate of carbon dioxide production in mm s^{-1} for yeast in glucose solution.

Give your answer in standard form **and** to **2** significant figures.

Show your working.

[2 marks]

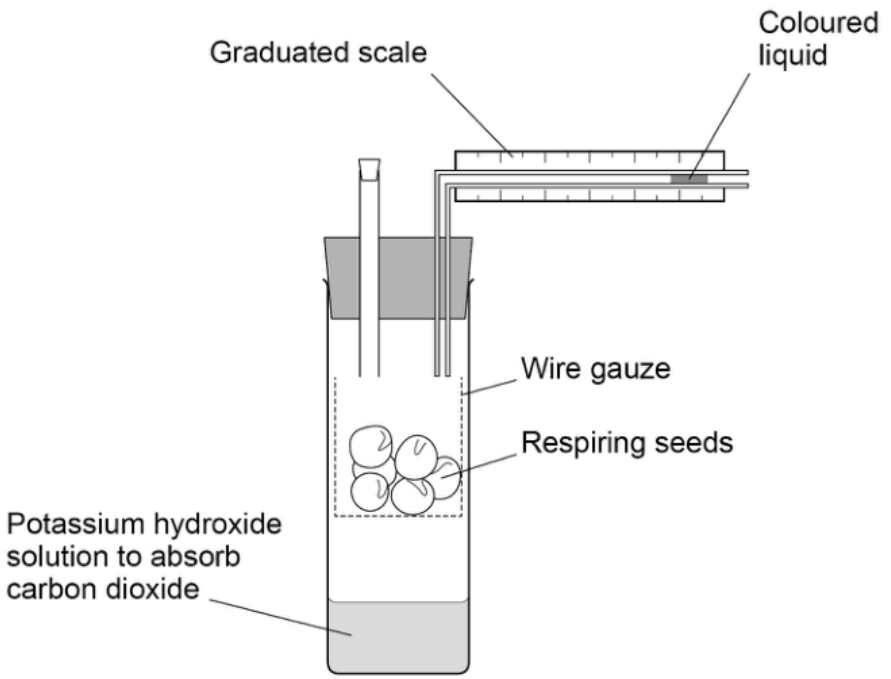
Answer _____ mm s^{-1}

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Question 11 · information from earlier in the question

A student used the apparatus shown in **Figure 1** to measure the rate of aerobic respiration of seeds for 48 hours.

Figure 1



Question 11 · A level Paper 2 · June 2022 · Q04.5 · 1 mark

0 4 . 5 The student calculated that during the 48 hours, 6.2×10^{-4} cm^3 of oxygen was absorbed by 40 g of seeds.

Calculate the oxygen uptake in $cm^3\,g^{-1}\,hour^{-1}$

[1 mark]

Answer _____ $cm^3\,g^{-1}\,hour^{-1}$

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Mark schemes

Question 1 · A level Paper 2 · June 2022 · Q04.2 · 3 marks

04.2	1. Oxygen/O_2 taken up/used (by seeds); 2. Carbon dioxide/CO_2 (given out) is absorbed by solution/potassium hydroxide/KOH; 3. Decrease in pressure/volume (of air inside);	3 (3 x AO2)

3. Ignore 'negative pressure' but reject reference to vacuum. 3. Accept 'air pressure higher than inside'.

Question 2 · A level Paper 2 · June 2018 · Q03.2 · 2 marks

03.2	1. Anaerobic respiration produces carbon dioxide; 2. Increase in pressure/volume (of gas);

2	2. Reference to either volume or pressure required for the mark

Question 3 · A level Paper 2 · June 2018 · Q03.1 · 1 mark

03.1	1. (So the) oxygen is used/absorbed/respired;	1

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02.2	1. Open the (3-way) tap; 2. Push/press the syringe (down);	2 (2 x AO3)

1. Accept descriptions of opening the tap, eg push/move/turn
2. Accept descriptions of the pushing the syringe down, eg apply pressure to the syringe

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Question 5 · A level Paper 2 · June 2022 · Q04.4 · 3 marks

04.4	1. Remove potassium hydroxide/KOH **OR** Remove solution which removes carbon dioxide. **OR** Replace potassium hydroxide/KOH with water; 2. Record distance liquid moves (without potassium hydroxide); 3. Use difference in distance liquid moves (with potassium hydroxide and without potassium hydroxide) **OR** Use difference in (calculated) volumes (with potassium hydroxide and without potassium hydroxide);	3 (3 x AO3)

Answers which add/use a syringe, reject mp2 **and** mp3.

1. Reject if seeds removed or another organism used.

2. Reject moves to the right.

2. Accept 'liquid would not move'.

3. Accept 'if liquid does not move (volume of) carbon dioxide produced is the same as (volume of) oxygen used'.

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02.3	1. No woodlice **and** all other conditions/apparatus/equipment the same; 2. To show that (respiring) woodlice are causing the drop to move **OR** To show that (respiring) woodlice are taking up the oxygen **OR** To show that (respiring) woodlice are causing the change in volume/pressure;	2 (2 x AO3)

1. Accept other inert objects instead of woodlice eg glass beads
1. Accept dead woodlice for no woodlice
1. Accept descriptions of 'all other conditions/apparatus/equipment the same' eg same investigation
2. Accept to show that (respiring) woodlice are affecting the results
2. Accept 'no other factor(s)' **OR** no other named factor **OR** 'nothing else' for woodlice

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02.1	Accept any **two** of the following for **1** mark; Volume/mass soda lime Concentration of soda lime Number/mass of woodlice Age of woodlice Same woodlice Species/type of woodlice Time for woodlice to acclimatise to (water bath) temperature (Starting) concentration of oxygen (inside the apparatus) Light intensity	1 (1 x AO3)

Accept weight/volume of woodlice for number/mass of woodlice

Ignore 'amount' for concentration/volume/weight/mass

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Question 8 · A level Paper 3 · June 2023 · Q02.1 · 1 mark

02.1	Accept any **two** of the following for **one** mark: Concentration/mass of yeast Concentration/mass of glucose/sugar (solution/s) Concentration of oxygen (in solution) Volume of yeast Volume of glucose/sugar (solution/s) pH (of glucose/sugar solution/s) Species/type of yeast Size/diameter/volume of test tubes	1 (AO3)	Ignore number of yeast cells Ignore amount for volume or concentration

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02.4	**This method would be less accurate because** 1. Colour/endpoint is subjective; **The accuracy of this method could be improved by** 2. (Have a) colour standard (of the yellow) as a reference for the end point; **OR** (Have a) colorimeter/absorbance/transmission reading (of the yellow) as a reference for the end point;	2 (2 x AO3)

1. Accept descriptions of the word 'subjective'
2. Accept use a colorimeter to time how long it takes to reach a certain value/absorbance/ transmission
2. Ignore any references to coloured filters used in a colorimeter

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Question 10 · A level Paper 3 · June 2023 · Q02.2 · 2 marks

02.2	Correct answer of 2.5×10^{-2} **= 2 marks**;; 4.2×10^{-2} (scale read from the wrong direction) **= 1 mark** **OR** 2.5×10^{-3} (scale read as 3.7 mm not 3.7 cm) **= 1 mark** **OR** 2.4×10^{-2} (scale read as 36.5) **= 1 mark** **OR** Correct answer not in standard form and/or not to 2 significant figures, eg 0.0247/0.025/2.47×10^{-2} **= 1 mark** **OR** Answer in incorrect standard form eg 25×10^{-3} **or** 0.25×10^{-1} **= 1 mark** **OR** Evidence of 37 ÷ 1500 **or** 37 ÷ (25 x 60) **= 1 mark**	2 (2 x AO2)

Question 11 · A level Paper 2 · June 2022 · Q04.5 · 1 mark

04.5	Answer in the range 3×10^{-7} to 3.33×10^{-7};	1 (AO2)	Accept equivalent answers in this range which are not in standard form. Accept 3.0×10^{-7} Ignore any numbers after 3.33.

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