PEARSON EDEXCEL A-LEVEL BIOLOGY B · 9BI0

# BIOLOGY



## EXAM QUESTION PACK

TOPIC 4: EXCHANGE AND TRANSPORT

CORE PRACTICALS 5 AND 6

| SCORE | PERCENTAGE |
| --- | --- |
| /53 | % |

STEMUP

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Q1.

(a) A student investigated the effect of ethanol on plant cell membranes.

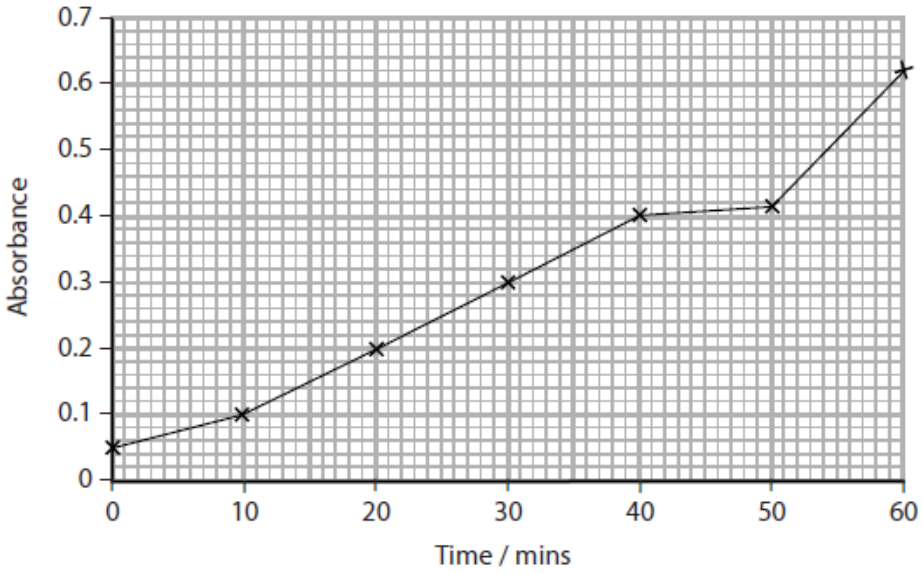
**Step 1:** The student cut leaf discs from leaves, using a cork borer.

**Step 2:** These leaf discs were then added to a boiling tube containing 10 $cm^3$ of 40% ethanol solution. The pigments in the leaf discs dissolved in the ethanol, producing a green solution.

**Step 3:** The boiling tube was shaken and the amount of red light absorbed by this solution (absorbance) was measured at the start.

**Step 4:** The absorbance was measured every 10 minutes, for an hour.

The graph shows the results of this investigation.




(i) Explain why red light was used in this investigation.

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(ii) Explain the absorbance value at 0 minutes.

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(iii) Explain the effect of ethanol on plant cell membranes.

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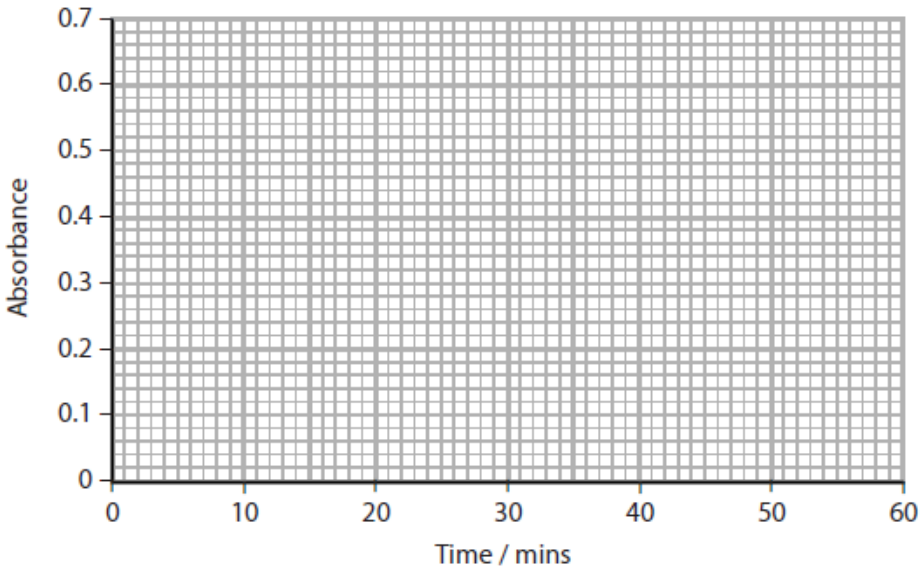
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(b) The student also carried out a control, using water instead of 40% ethanol.

Draw a line on the graph to show the results for this control.

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(c) The student then investigated the effect of ethanol concentration on leaves from different plant species.

Justify the modifications to the procedure in part (a) that will be required to obtain valid data.

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**(Total for question = 13 marks)**

Q2.

Last year, eight million Christmas trees were bought in the UK.

There are many Christmas tree farms that supply these trees.

The photograph shows young Christmas trees growing on a farm.



Christmas tree farmers remove the other plants (weeds) in order to increase tree growth.

A farmer investigated two methods of removing weeds:

- removing weeds by hand
- spraying herbicides that inhibit weed growth.

The table shows the mean height of Christmas trees using each method, over a five-year period.

| Year | Mean height of trees / cm | |
|---|---|---|
| | Removing by hand | Using herbicide |
| 0 | 20 | 20 |
| 1 | 50 | 60 |
| 2 | 70 | 100 |
| 3 | 90 | 130 |
| 4 | 110 | 160 |
| 5 | 130 | 200 |

A student read that some herbicides work by inhibiting electron transport in photosynthesis.

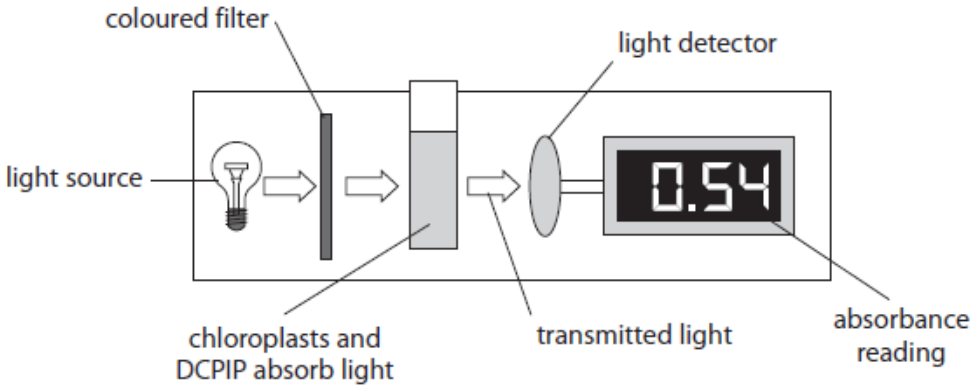
The student investigated this using the indicator DCPIP.

This indicator changes from blue to colourless when it is reduced.

The student used the following method:

- chloroplasts were suspended in two tubes, each containing a solution of DCPIP
- herbicide was added to one of the tubes and no herbicide was added to the other tube
- both tubes were exposed to light
- a colorimeter was used to measure the absorbance in each tube at five minute intervals for 20 minutes.

The diagram shows details of the workings of the colorimeter used by the student.




As DCPIP changes from blue to colourless, the absorbance of light decreases.

(i) Explain how the student used this method to collect valid data.

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The table shows the results.

| Time / min | Absorbance / a.u. | |
|---|---|---|
| | With herbicide | Without herbicide |
| 0 | 0.53 | 0.54 |
| 5 | 0.54 | 0.31 |
| 10 | 0.54 | 0.24 |
| 15 | 0.54 | 0.20 |
| 20 | 0.53 | 0.16 |

(ii) Analyse the data to explain the effect of this herbicide on the growth of weeds.

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**(Total for question = 8 marks)**

Q3.

Anthocyanin is a purple pigment found in a range of vegetable plants.

The photograph shows some carrots from a variety called Purple Haze.



Describe how you would investigate the effect of temperature on the permeability of the membranes in the root cells of these purple carrots.

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**(Total for question = 5 marks)**

Q4.

Anthocyanin is a purple pigment found in a range of vegetable plants.

The photograph shows some carrots from a variety called Purple Haze.



The anthocyanins in purple carrots are used as antioxidants in the food industry.

Purple Haze carrots with a mass of 750g contain 1265.25 mg of anthocyanin.

Calculate the percentage of anthocyanin in these carrots.

Give your answer to two decimal places.

**(2)**

Answer .....

**(Total for question = 2 marks)**

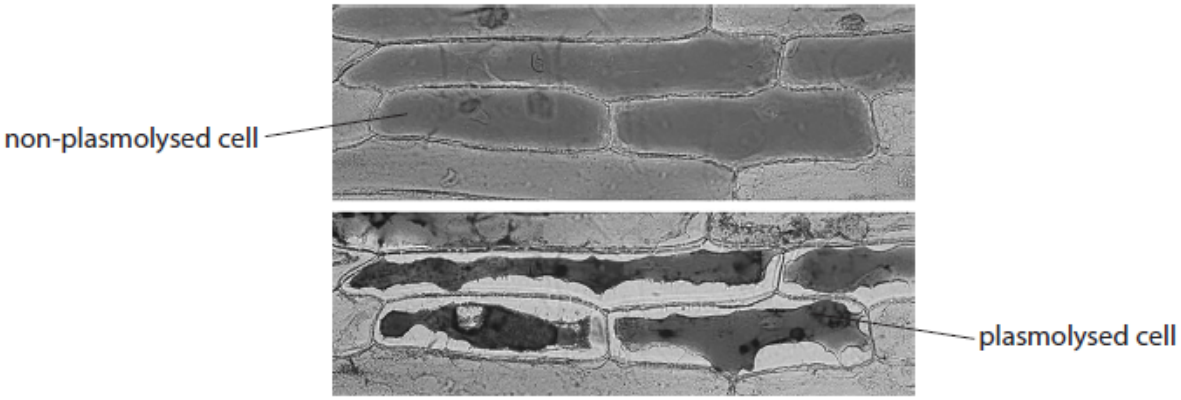
Q1.

The cells of all living organisms contain over 60% water.

A student investigated the effect of salt solution on plant cells.

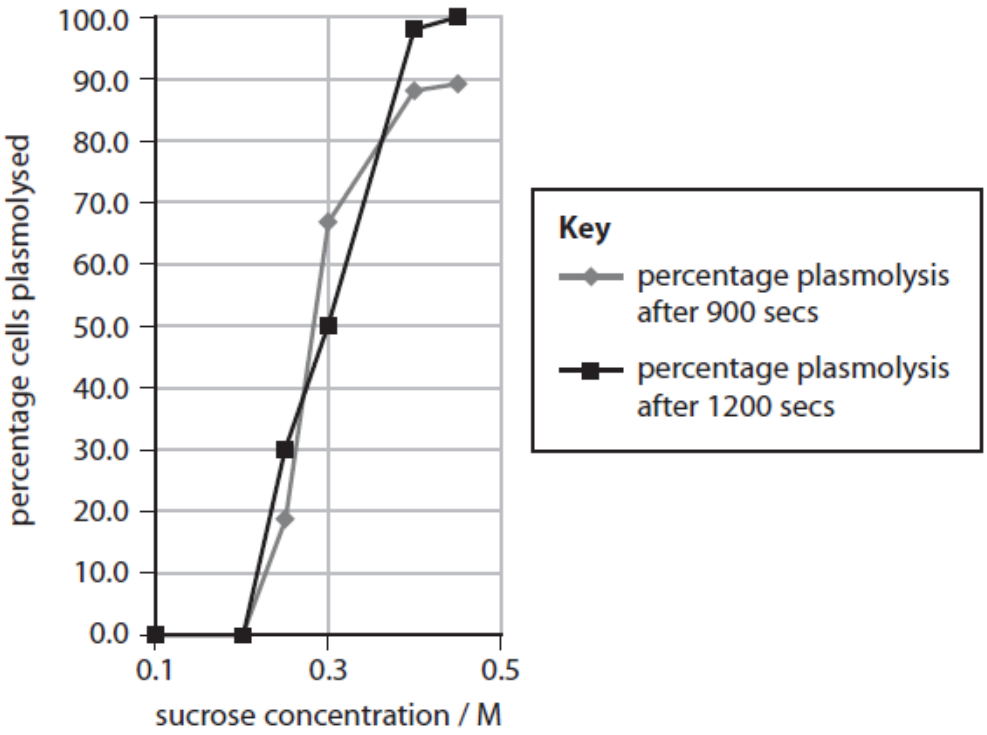
The photomicrograph shows some red onion cells that were placed in a strong salt solution in her investigation.

Some of these cells are plasmolysed because the cytoplasm has lost water, shrunk and pulled away from the cell wall.




As part of her research, the student found some data on the effect of sucrose concentration on plasmolysis in the epidermal cells of another plant species.

The graph shows the data that she found.




* The student concluded that the osmotic potential of these cells was equivalent to 0.3 M of sucrose.

Analyse the data to explain why the osmotic potential of these cells is not necessarily equivalent

to 0.3 M sucrose.

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Q2.

A student investigated the water potential of potato cells.

The student used this method.

- six potato cubes of the same shape and size were cut from the same potato

- each cube was weighed
- each cube was then placed into a different concentration of sucrose solution
- each cube was removed from the sucrose solution after one hour
- each cube was then reweighed and the percentage change in mass was calculated

The table below shows the results of the investigation.

| Concentration of sucrose solution / mol $dm^{-3}$ | Percentage change in mass (%) |
|---|---|
| 0.0 | +18.0 |
| 0.2 | +5.0 |
| 0.4 | −8.0 |
| 0.6 | −16.0 |
| 0.8 | −23.5 |
| 1.0 | −24.0 |

The student was given a 1.0 mol $dm^{-3}$ sucrose solution.

State how the student used this solution to make a 0.8 mol $dm^{-3}$ sucrose solution.

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**(Total for question = 1 mark)**

Q3.

Devise an experiment, which uses changes in mass, to compare the water potential of carrot tissue with the water potential of potato tissue.

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**(Total for question = 5 marks)**

Q4.

A student investigated the water potential of potato cells.

The student used this method.

- six potato cubes of the same shape and size were cut from the same potato
- each cube was weighed
- each cube was then placed into a different concentration of sucrose solution
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The table below shows the results of the investigation.

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| 0.4 | −8.0 |
| 0.6 | −16.0 |
| 0.8 | −23.5 |
| 1.0 | −24.0 |

The method used by the student could be improved to obtain a more accurate value for the water potential of these potato cells.

Justify **three** improvements that could be made.

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**(Total for question = 3 marks)**

Q5.

Biodiversity is monitored by conservationists.

The photograph shows a hedge.



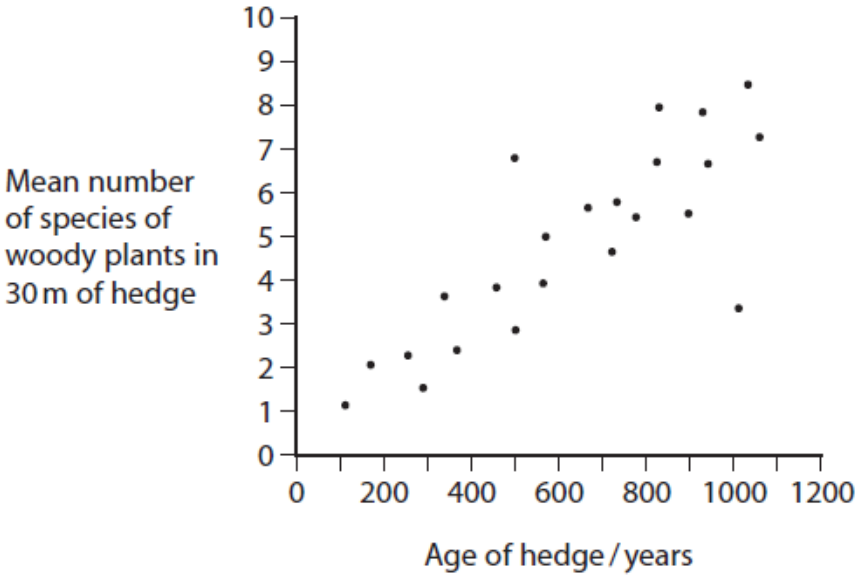
(Source: © 1000 Words/Shutterstock)

Many fields in the UK are separated by hedges.

Conservationists investigated biodiversity in hedges of different ages.

Hedges of different ages were sampled at random and the number of species of woody plants was counted.

The graph shows the results of this investigation.




A student thought that the age of a plant affects the water potential of its tissue.

The student used potatoes of different ages to test this hypothesis.

Justify each step of a method the student could use to compare the water potential of potato tissue of different ages.

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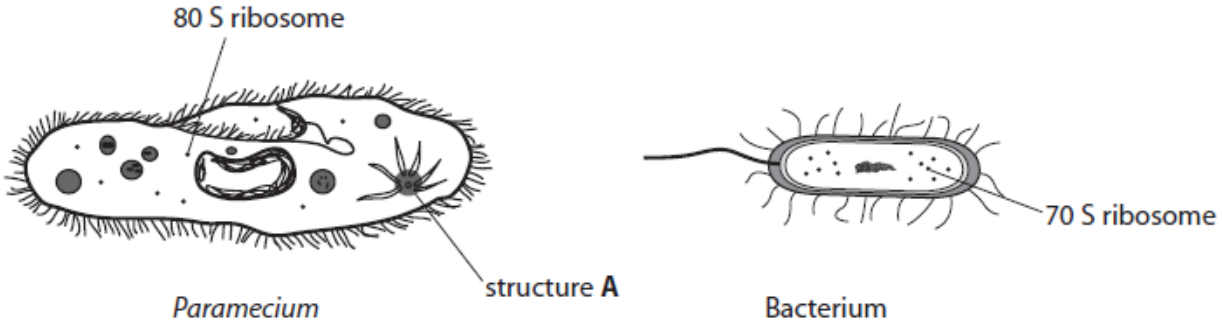
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**(Total for question = 5 marks)**

Q6.

The drawings show two single-celled organisms that live in ponds, *Paramecium* and a bacterium.




*Paramecium*

Magnification ×200

Bacterium

Magnification ×5000

Structure **A** is a contractile vacuole. This removes water from the *Paramecium*.

Explain why the *Paramecium* needs to remove water.

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Q7.

A student investigated the water potential of potato cells.

The student used this method.

- six potato cubes of the same shape and size were cut from the same potato
- each cube was weighed
- each cube was then placed into a different concentration of sucrose solution
- each cube was removed from the sucrose solution after one hour
- each cube was then reweighed and the percentage change in mass was calculated

The table below shows the results of the investigation.

| Concentration of sucrose solution / mol $dm^{-3}$ | Percentage change in mass (%) |
|---|---|
| 0.0 | +18.0 |
| 0.2 | +5.0 |
| 0.4 | −8.0 |
| 0.6 | −16.0 |
| 0.8 | −23.5 |
| 1.0 | −24.0 |

Sketch a graph you could use to identify the water potential of potato cells.

**(2)**

**(Total for question = 2 marks)**