GradeMax

Please check the examination details below before entering your candidate information

Candidate surname	Other names

Pearson Edexcel
International Advanced Level

Centre Number | Candidate Number

Wednesday 15 January 2020

Morning (Time: 1 hour 20 minutes) | Paper Reference **WBI13/01**

Biology

International Advanced Subsidiary / Advanced Level
Unit 3: Practical Skills in Biology I

You must have:
Scientific calculator, ruler, HB pencil

Total Marks

Instructions

- Use **black** ink or **black** ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*
- **Show all your working in calculations and include units where appropriate.**

Information

- The total mark for this paper is 50.
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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Answer ALL questions.

Write your answers in the spaces provided.

1 Dietary vitamin C is an antioxidant that may be linked to the risk of cardiovascular disease (CVD).

(a) Explain what is meant by this statement.

(2)

(b) The vitamin C content of food and drink can be measured using DCPIP.

The concentration of vitamin C in a solution can be determined by finding the volume of the solution that causes DCPIP to change colour.

The higher the concentration of vitamin C in the solution, the smaller the volume needed to cause the colour change.

(i) Explain what happens to DCPIP in the presence of vitamin C.

(2)

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(ii) In an investigation, a student compared the vitamin C concentration of freshly squeezed fruit juice and fruit juice stored in a carton.

The table shows the results of this investigation.

Fruit juice	Mean volume of fruit juice needed to decolourise 1 cm^3 of 1% DCPIP solution / cm^3	Mean concentration of vitamin C in fruit juice / mg cm^{-3}	Standard deviation
fresh orange	2.2	6.8	1.0
fresh lemon	2.1	7.1	1.2
fresh lime	1.6	9.4	1.4
carton orange	12.0	1.3	0.2
carton lemon	26.1		0.2
carton lime	42.0	0.4	0.1

The standard solution contained 10 mg of vitamin C per cm^3.

1.5 cm^3 of this standard solution decolourised 1 cm^3 of 1% DCPIP.

Calculate the concentration of vitamin C in carton lemon juice.

(2)

Answer ..... mg cm^{-3}

(iii) Calculate the concentration of vitamin C in lime juice from a carton as a percentage of fresh lime juice.

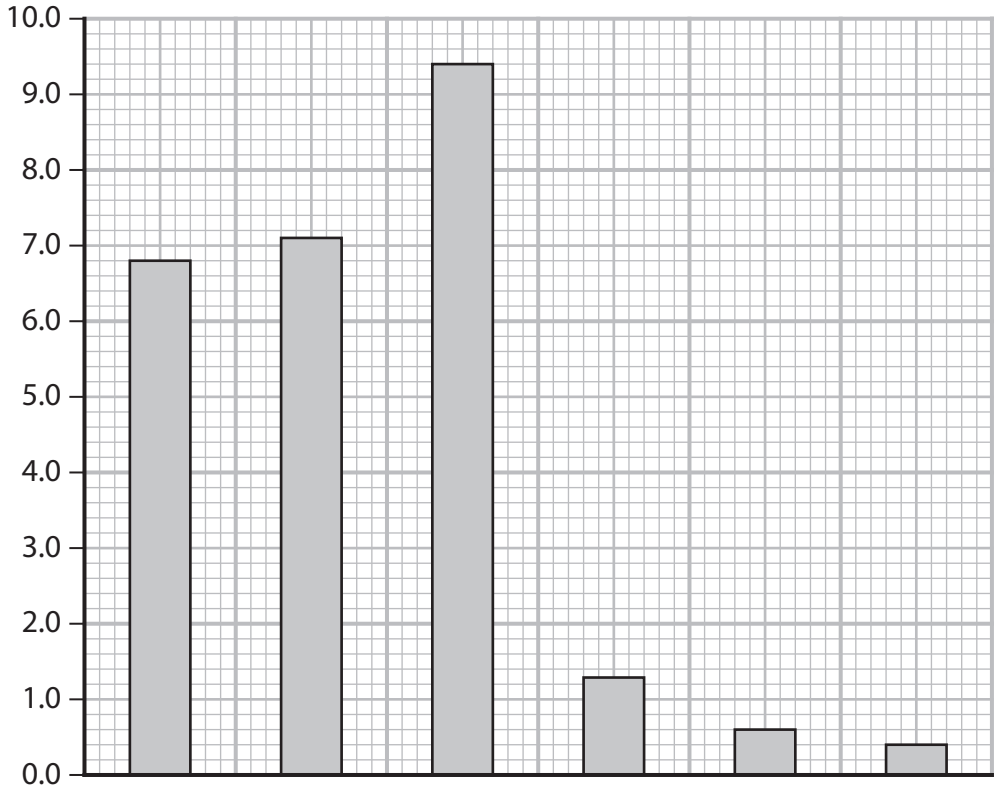
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Answer ..... %

(iv) The results in the table were plotted as a bar chart.

Complete the bar chart by labelling the axes and showing the standard deviation for fresh orange juice and for orange juice from a carton.

(2)



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(v) Comment on the vitamin C content of fresh juice compared with juice from a carton.

(3)

(Total for Question 1 = 13 marks)

2 In an investigation, the tensile strength of fibres from five plant species was determined.

The breaking force was measured by finding the mass in grams that would break the fibre.

(a) Describe a valid method that could be used to compare the breaking force of these fibres.

(4)

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(b) To calculate the tensile strength of the fibre, the cross-sectional area has to be determined.

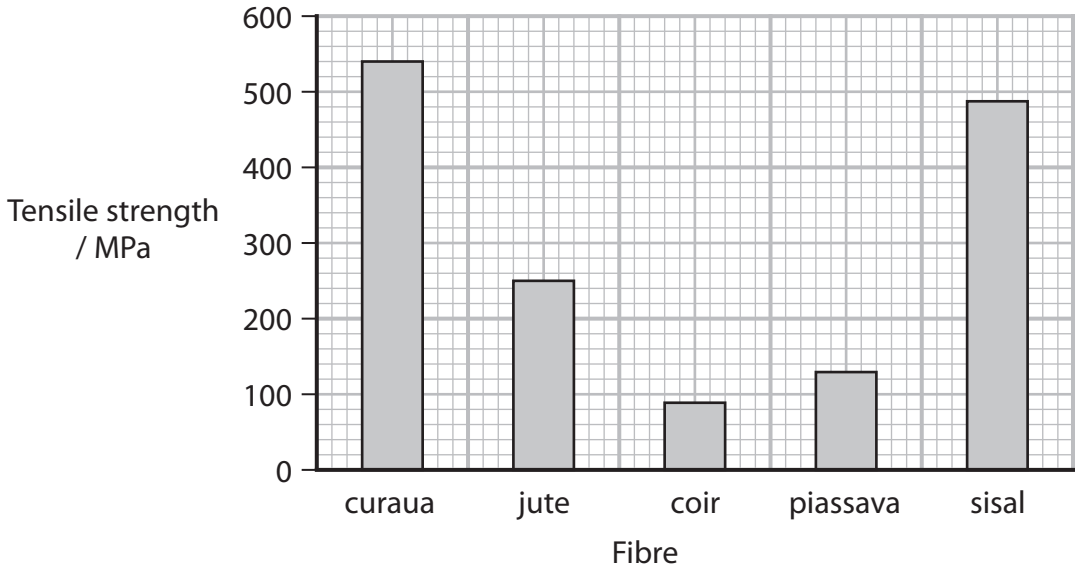
(i) Devise a method to determine the cross-sectional area of a fibre, using the following equipment:

- a sharp blade
- a microscope
- a microscope slide and coverslip
- an eyepiece graticule
- a stage micrometer.

(5)

(ii) The breaking force and the cross-sectional area were used to determine the tensile strength of fibres from five species of plant.

The graph shows the results of this investigation.



Draw a suitable table to show these results.

(3)

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(iii) The breaking force of a jute fibre is 1.08 newtons.

Calculate the cross-sectional area of a jute fibre, using the information in the graph and the following formula

$$\text{Tensile strength} = \frac{\text{breaking force in newtons}}{\text{cross-sectional area in mm}^2}$$

(3)

Answer ..... mm^2

(Total for Question 2 = 15 marks)

3 Beetroot cells contain a red pigment called betalain. This pigment does not leak out of the cells, unless their membranes are damaged.

A student investigated the effect of detergent on beetroot cell membranes.

Discs of tissue were cut from a beetroot. Any betalain on the outside of the discs was removed.

One disc was placed into each of five test tubes, containing 0.2% detergent solution.

The five tubes were left for 30 minutes at 20 °C.

The discs were then removed carefully.

Betalain had leaked from the discs and formed a red solution in each test tube.

Light was shone through this solution. The percentage of the light transmitted through the solution was recorded.

The same procedure was repeated using detergent concentrations of 0.0%, 0.5%, 1.0% and 2.0%.

(a) (i) State the independent variable in this investigation.

(1)

.....

.....

(ii) State **two** abiotic (environmental) variables that should be controlled in this investigation.

(2)

1 .....

2 .....

(iii) Choose **one** of the variables you named in (a)(ii) and state how it could be controlled.

(1)

Variable .....

How it could be controlled .....

.....

.....

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(iv) Explain why the discs were removed carefully.

(2)

(v) Explain why five discs were used for each concentration of detergent.

(2)

(b) The table shows the results of this investigation.

Concentration of detergent solution (%)	Mean percentage of light transmitted through the solution (%)
0.0	97
0.2	90
0.5	75
1.0	65
2.0	50

(i) Suggest why this investigation included a 0.0% detergent solution.

Use the information in the table to support your answer.

(1)

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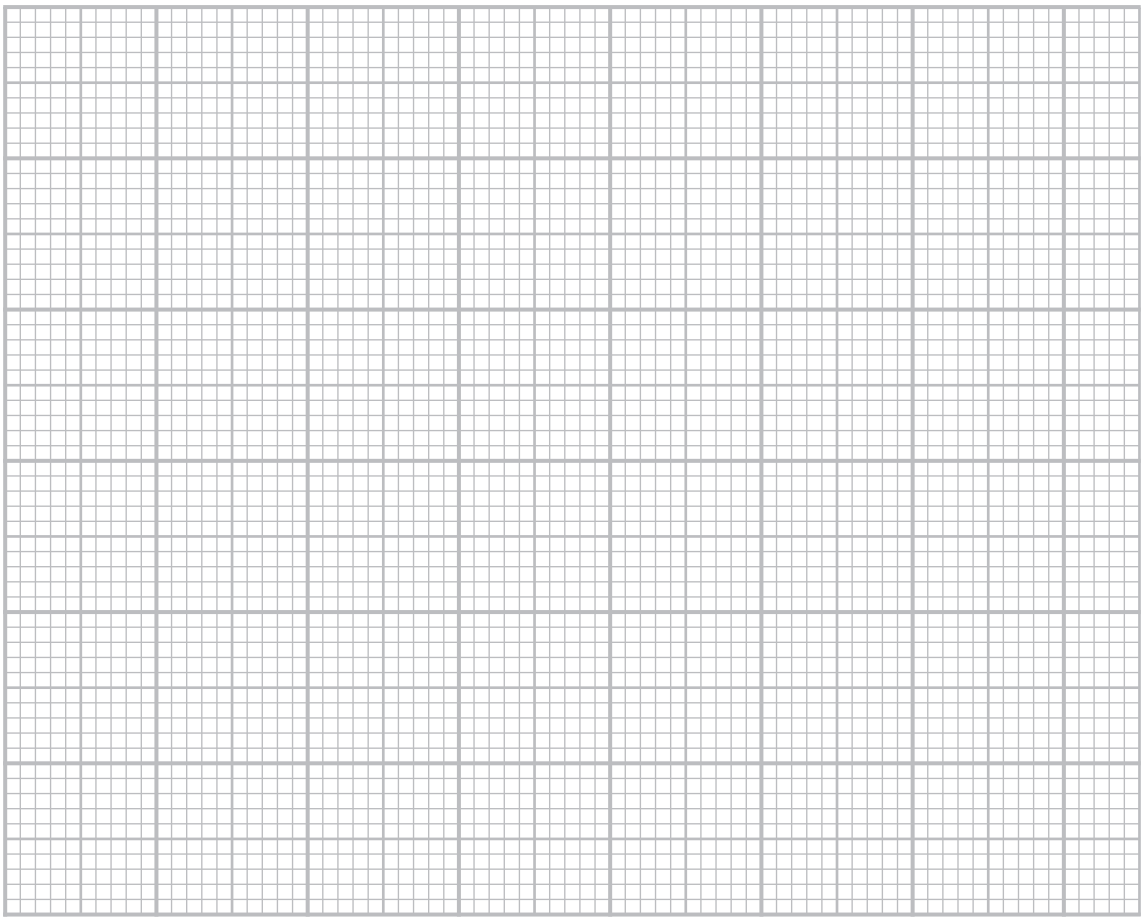
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(ii) Plot a line graph to show the relationship between detergent concentration and percentage of light transmitted.

Join the points with straight lines.

(4)



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(iii) Detergent permanently damages beetroot cell membranes.

Explain what will happen to the rate of loss of betalain if these discs are then transferred to test tubes of distilled water.

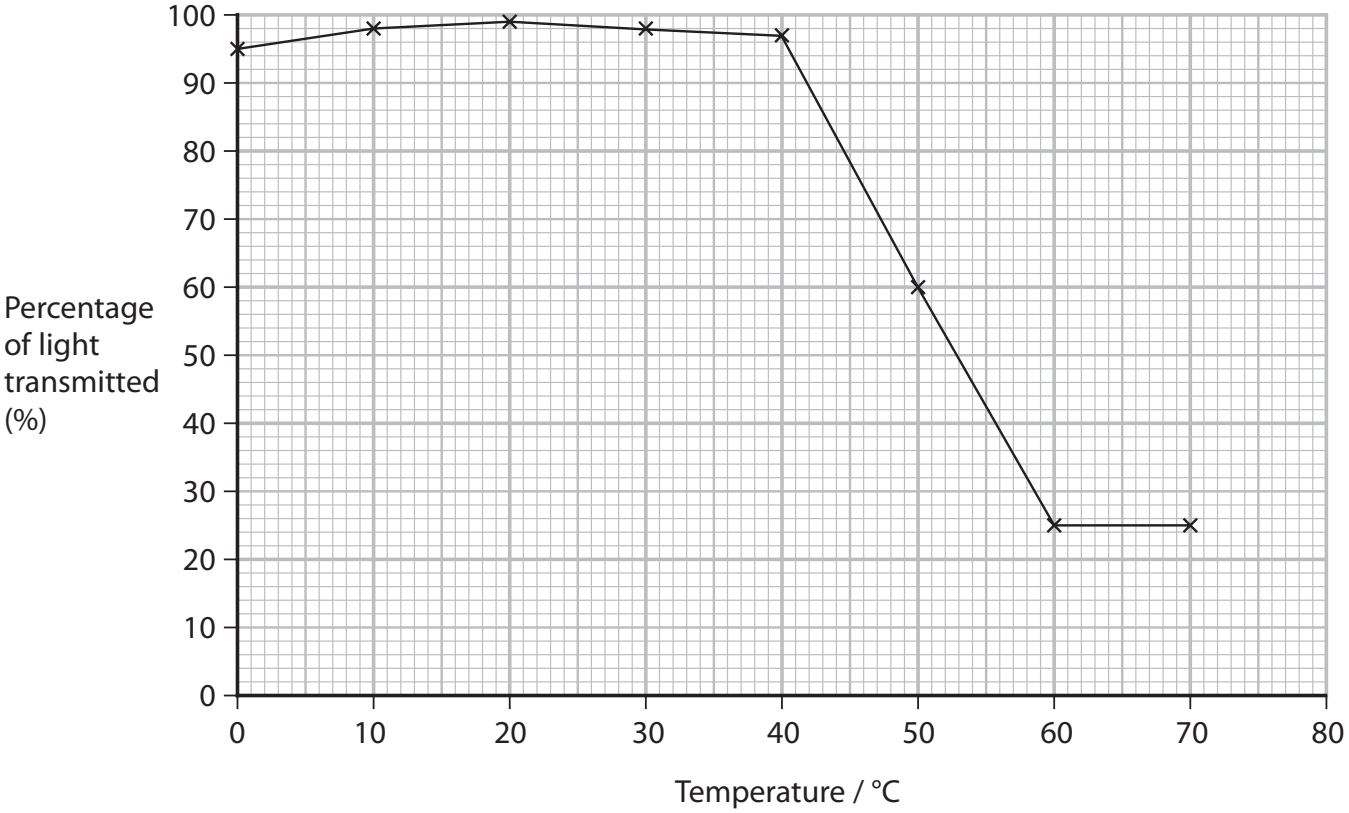
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(iv) In a second investigation, the effect of temperature on beetroot cell membrane permeability was studied.

The graph shows the results of the second investigation.



Compare and contrast the effects of detergent concentration and temperature on the leakage of betalain from beetroot cells.

(3)

(v) Estimate the percentage of light transmitted at 80 °C.

Use the information in the graph and your own knowledge to support your answer.

(3)

(Total for Question 3 = 22 marks)

TOTAL FOR PAPER = 50 MARKS

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