PEARSON EDEXCEL A-LEVEL BIOLOGY B · 9BI0

BIOLOGY



EXAM QUESTION PACK

TOPIC 2: CELLS, VIRUSES AND REPRODUCTION OF LIVING THINGS

CORE PRACTICAL 2

SCORE	PERCENTAGE
/36	%

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Q1.

The photograph shows a germinating pollen grain as seen through a light microscope.



(Source: © CAROLINA BIOLOGICAL SUPPLY COMPANY/SCIENCE PHOTO LIBRARY)

The actual length of this pollen tube is 136 µm.

Calculate the magnification of this photograph.

(2)

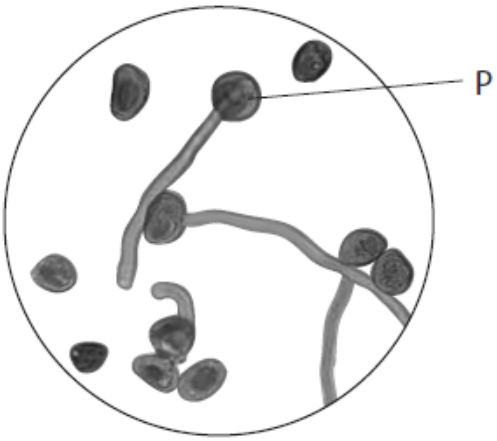
Answer .....

(Total for question = 2 marks)

Q2.

A student used a light microscope to determine the mean percentage germination of pollen grains.

The photograph shows one high power field of view observed by the student.



The student used a paintbrush to obtain pollen grains from a flower.

Describe the steps taken by the student to see these pollen grains using a microscope.

(3)

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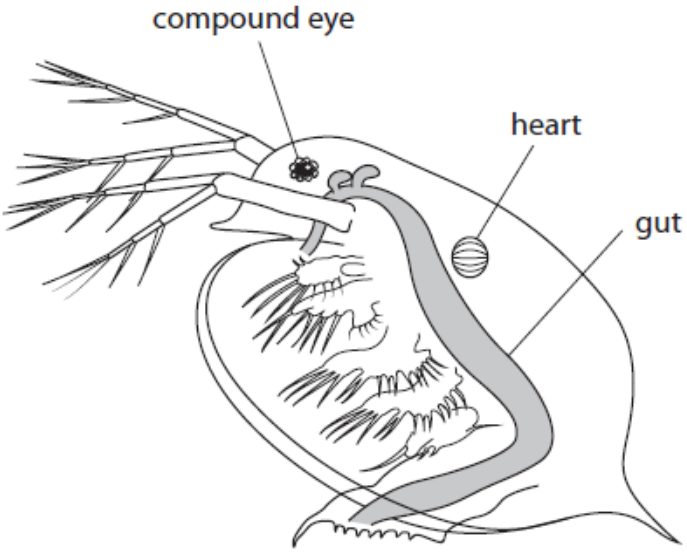
(Total for question = 3 marks)

Q3.

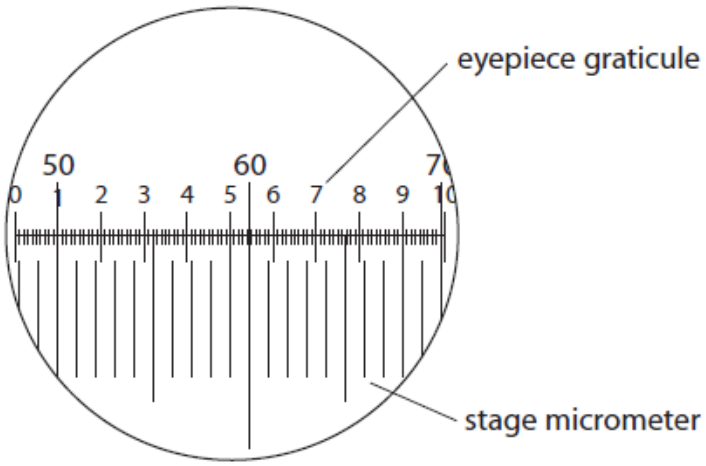
Water fleas are small animals that live in pond water.

A student observed a water flea using a light microscope.

The diagram shows the student's drawing of the water flea.



The diagram shows an eyepiece graticule and a stage micrometer used by the student to measure the diameter of the heart in this water flea.



(Source: http://biology4alevel.blogspot.com/2014/07/2-cell-structure-microscopy.html)

Each small division on the stage micrometer is 0.01 mm.

The diameter of the heart was found to be 0.2 mm.

Determine the number of eyepiece units that equal the diameter of the water flea heart.

(1)

Answer .....

(Total for question = 1 mark)

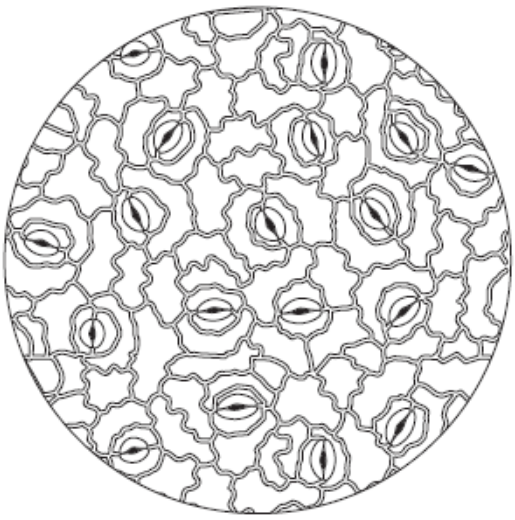
Q4.

A student investigated the effect of light intensity on the development of stomata in coffee plant leaves.

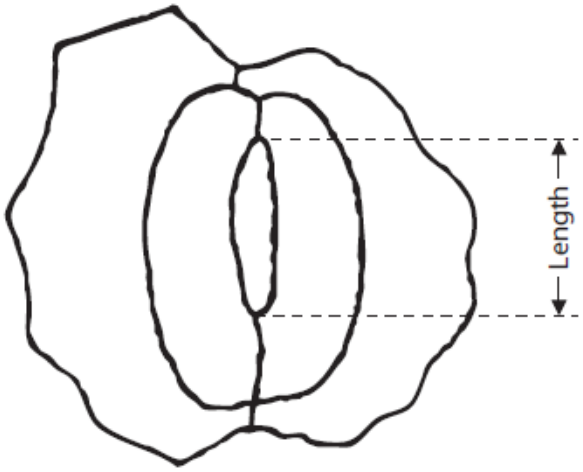
The following method was used:

- young coffee seedlings were separated into two groups
- one group was grown in bright light and the other group was grown in dim light
- leaves were selected from each group and their surfaces were painted with nail varnish
- the nail varnish was allowed to dry and then peeled off the leaf surface
- each nail varnish peel was observed using a light microscope.

The diagram shows an example of the field of view seen by the student when using the high power lens.



The diagram shows one of the stomata drawn by the student.



The actual length of this stoma is 20 µm.

Calculate the magnification of this drawing.

(2)

Answer .....

(Total for question = 2 marks)

Q5.

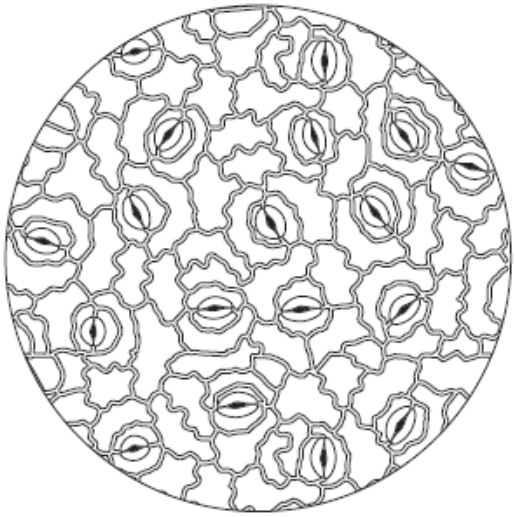
A student investigated the effect of light intensity on the development of stomata in coffee plant leaves.

The following method was used:

- young coffee seedlings were separated into two groups

- one group was grown in bright light and the other group was grown in dim light
- leaves were selected from each group and their surfaces were painted with nail varnish
- the nail varnish was allowed to dry and then peeled off the leaf surface
- each nail varnish peel was observed using a light microscope.

The diagram shows an example of the field of view seen by the student when using the high power lens.



Describe how a microscope should be used to observe the stomata using the high power lens.

(3)

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(Total for question = 3 marks)

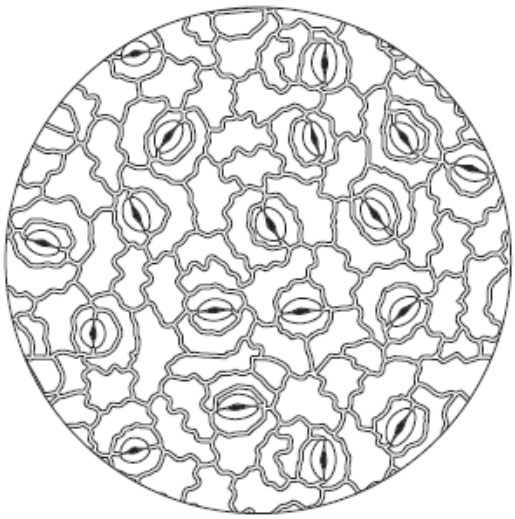
Q6.

A student investigated the effect of light intensity on the development of stomata in coffee plant leaves.

The following method was used:

- young coffee seedlings were separated into two groups
- one group was grown in bright light and the other group was grown in dim light
- leaves were selected from each group and their surfaces were painted with nail varnish
- the nail varnish was allowed to dry and then peeled off the leaf surface
- each nail varnish peel was observed using a light microscope.

The diagram shows an example of the field of view seen by the student when using the high power lens.



The diameter of the field of view is 0.4 mm.

Calculate the number of stomata per mm^2 on the leaf surface.

The area of a circle is πr2, where π is 3.142.

(2)

Answer ..... mm^{-2}

(Total for question = 2 marks)

Q7.

Biodiversity is monitored by conservationists.

The photograph shows a hedge.



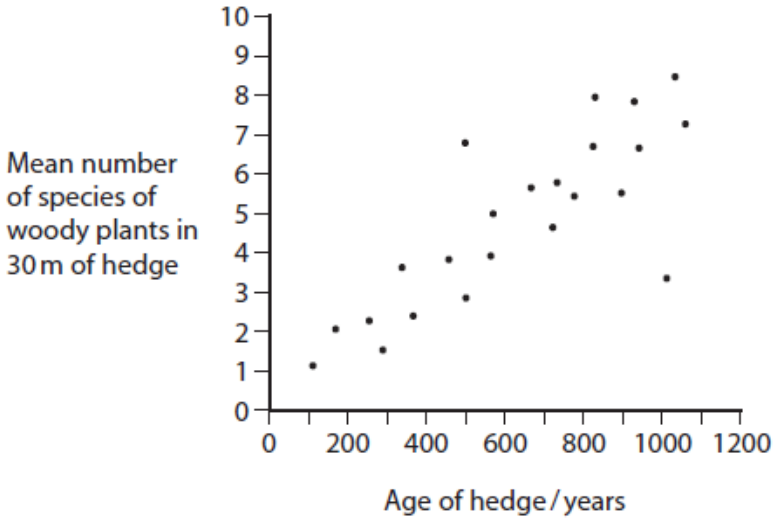
(Source: © 1000 Words/Shutterstock)

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.



The conservationists observed that the plants in older hedges contained more wood than the plants in younger hedges.

Wood consists of xylem tissue.

(i) Give an advantage for older plants of containing more wood.

(1)

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(ii) Describe a method to show that the stem of an older plant contains more wood.

(3)

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(Total for question = 4 marks)

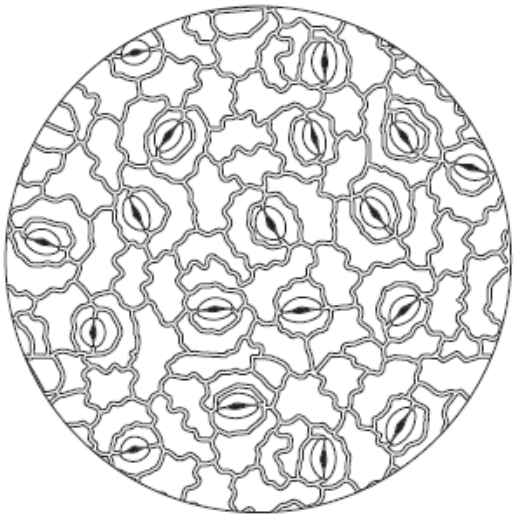
Q8.

A student investigated the effect of light intensity on the development of stomata in coffee plant leaves.

The following method was used:

- young coffee seedlings were separated into two groups
- one group was grown in bright light and the other group was grown in dim light
- leaves were selected from each group and their surfaces were painted with nail varnish
- the nail varnish was allowed to dry and then peeled off the leaf surface
- each nail varnish peel was observed using a light microscope.

The diagram shows an example of the field of view seen by the student when using the high power lens.



The results of this investigation are shown in the table.

Leaf sample	Number of stomata mm^{-2}	
	Leaves in bright light	Leaves in dim light
1	184	143
2	190	138
3	182	140
4	185	132
5	192	136
Mean ($\bar{x}$) and SD	186.6 ± 4.2	137.8

(i) Calculate the SD for the leaves in dim light.

Use the formula

$$SD = \sqrt{\frac{\Sigma(x - \bar{x})^2}{n - 1}}$$

(2)

Answer .....

(ii) Describe how these nail varnish peel samples should be taken to allow a valid comparison between the mean numbers of stomata.

(2)

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(iii) Analyse the data to explain how fewer stomata might affect the growth of coffee plants.

(3)

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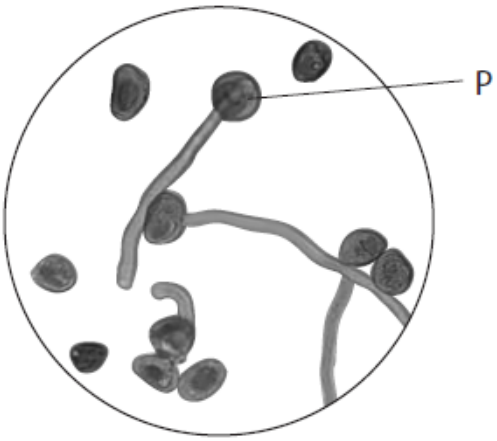
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(Total for question = 7 marks)

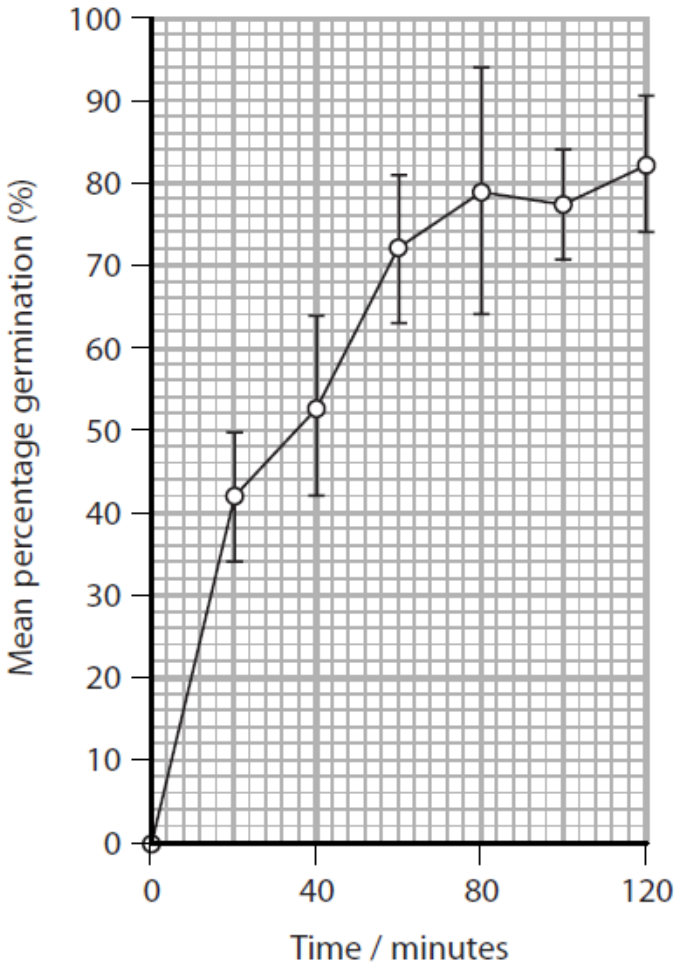
Q9.

A student used a light microscope to determine the mean percentage germination of pollen grains.

The photograph shows one high power field of view observed by the student.



The graph shows the results of the investigation.



(i) Explain why the student plotted standard deviation bars on the graph.

(2)

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(ii) Determine the time when the photograph was taken.

(2)

Answer ..... minutes

(Total for question = 4 marks)

Q10.

Sickle cell anaemia is caused by a mutation in the β-globin gene which codes for part of haemoglobin.

The diagram shows the first 10 amino acids in this part of haemoglobin, in a healthy person and in a person with sickle cell anaemia.

Healthy person:	val – his – leu – thr – pro – glu – glu – lys – ser - ala
Person with sickle cell anaemia:	val – his – leu – thr – pro – val – glu – lys – ser – ala

People who are homozygous for the HbS allele develop sickle cell anaemia.

People who are heterozygous for HbS produce both forms of haemoglobin.
These individuals have some sickled red blood cells.

People with the HbS allele are less likely to get malaria.

You are provided with a blood sample from a patient with malaria and a blood sample from a healthy individual.

Devise a method that would allow you to distinguish between the two blood samples.

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Q11.

Plant stems contain xylem and phloem, tissues specialised for transport.

The photomicrograph shows a longitudinal section of phloem tissue.



(i) Draw the cell labelled **X**.

(2)

(ii) Explain how phloem tissue is adapted for its function.

(3)

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