Rewarding Learning

Centre Number

71

Candidate Number

ADVANCED SUBSIDIARY (AS)
General Certificate of Education
2011

Biology

Assessment Unit AS 1

assessing

Molecules and Cells

[AB111]

AB111

MONDAY 13 JUNE, AFTERNOON

TIME

1 hour 30 minutes.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
Write your answers in the spaces provided in this question paper.
Answer **all nine** questions.
You are provided with **Photograph 1.4** for use with Question 4 in this paper.
Do not write your answers on this photograph.

INFORMATION FOR CANDIDATES

The total mark for this paper is 75.
Section A carries 60 marks. Section B carries 15 marks.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
You are reminded of the need for good English and clear presentation in your answers.
Use accurate scientific terminology in all answers.
You should spend approximately **20 minutes** on Section B.
You are expected to answer Section B in continuous prose.
Quality of written communication will be assessed in **Section B**, and awarded a maximum of 2 marks.

For Examiner's use only	
Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
8	
9	
Total Marks	

Section A

1 The following statements describe events within stages of meiosis.

Identify the stage in each case.

- Bivalents are formed when homologous chromosomes pair

  _____

- Chromatids separate and are pulled to opposite poles

  _____

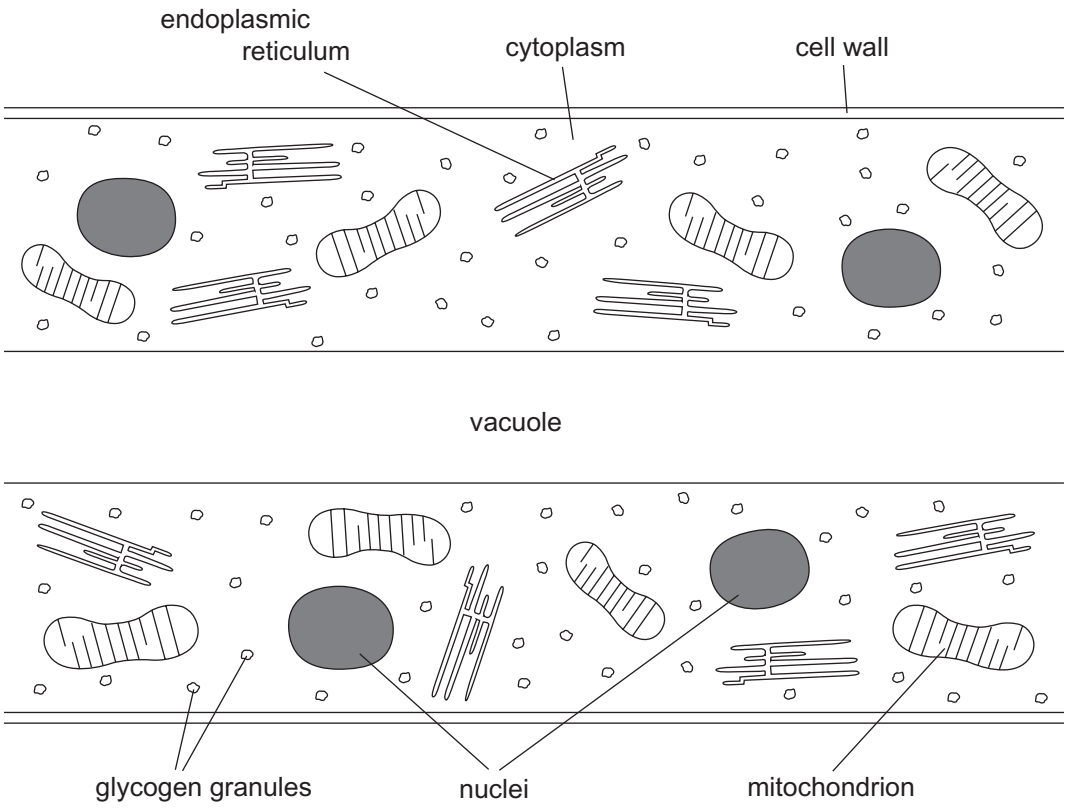
- Four haploid nuclei are formed

  _____

- Chiasmata occur

  _____ [4]

2 Fungi are composed of eukaryotic cells, similar to both plant and animal cells. The cellular structure of a fungus is represented in the diagram.



(a) Identify which structures labelled in the diagram above are also found

- in both plant and animal cells

_____

_____

- in plant cells but not in animal cells

_____

- in animal cells but not in plant cells

_____

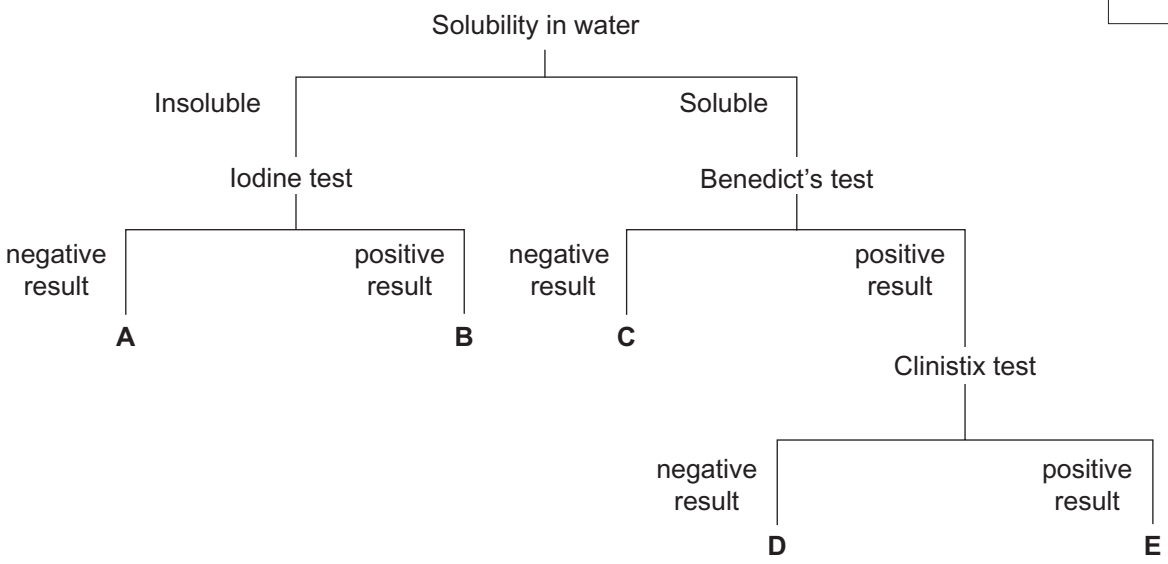
[3]

(b) Identify **one** feature which is unique to the cells of fungi.

_____ [1]

3 Using a series of tests, a key was produced to identify the following carbohydrates:

cellulose, glucose, maltose, starch and **sucrose.**



Using the key identify each of the carbohydrates **A** to **E**.

A _____

B _____

C _____

D _____

E _____ [5]

Examiner Only	
Marks	Remark

4 **Photograph 1.4** is a section through part of the ileum.

(a) Identify the structures labelled **A** to **E**.

A _____

B _____

C _____

D _____

E _____ [5]

(b) Suggest an interpretation for the area labelled **F**.

_____

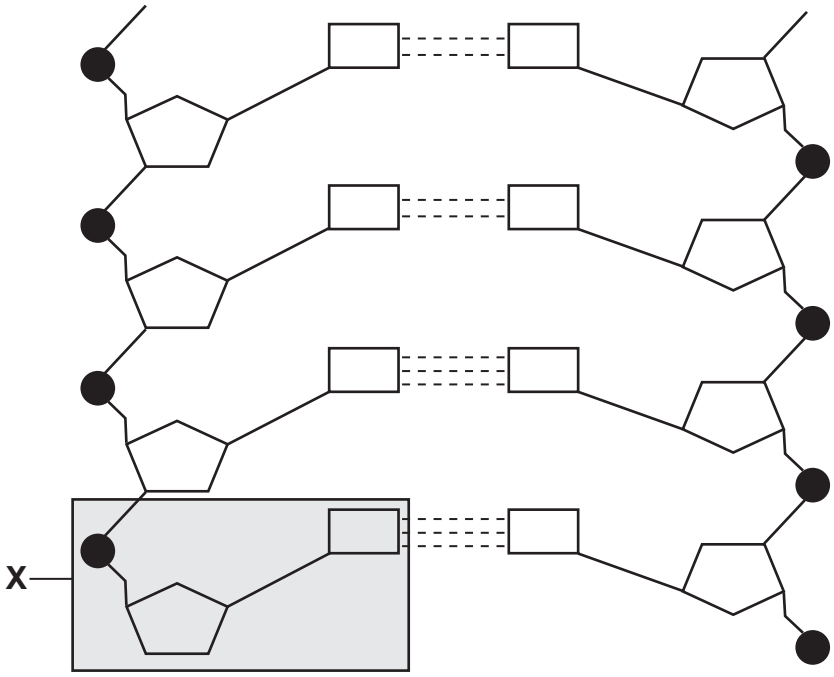
_____ [1]

(c) Describe the role of the lacteal within each villus of the ileum.

_____

_____ [1]

5 **(a)** The diagram below represents the structure of DNA.



Identify the part of the DNA structure shown in the box **X**.

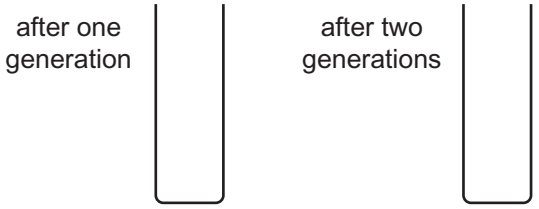
_____ [1]

(b) In a classic experiment, Matthew Meselsöhn and Frank Stahl grew bacteria in a medium where the nitrogen source contained the 'light' nitrogen isotope, ^{14}N. The bacteria were then placed in a medium with a nitrogen source containing the 'heavy' nitrogen isotope, ^{15}N, and allowed to reproduce. After many generations, all DNA in the bacteria contained this 'heavy' ^{15}N isotope. This DNA was termed 'heavy' DNA.

DNA extracted from bacterial cells was centrifuged and observed under ultra-violet light. The DNA appeared as a black band in the centrifuge tube. The band produced by 'heavy' DNA was much lower in the centrifuge tube than that produced by 'light' DNA. They are shown in the diagrams below.

The bacteria containing 'heavy' DNA were then transferred to a medium with a nitrogen source containing the 'light' nitrogen isotope, ^{14}N and allowed to reproduce. After one generation, samples of the bacteria were removed and their DNA was extracted and centrifuged. This process was repeated after a further generation.

(i) Complete the diagrams below to show the position of the extracted DNA by **drawing appropriate bands**.



[2]

(ii) Explain the result produced after one generation.

_____

_____

_____

_____ [2]

6 Enzymes can be immobilised for use in biotechnology.

(a) Outline **two** methods used to immobilise enzymes.

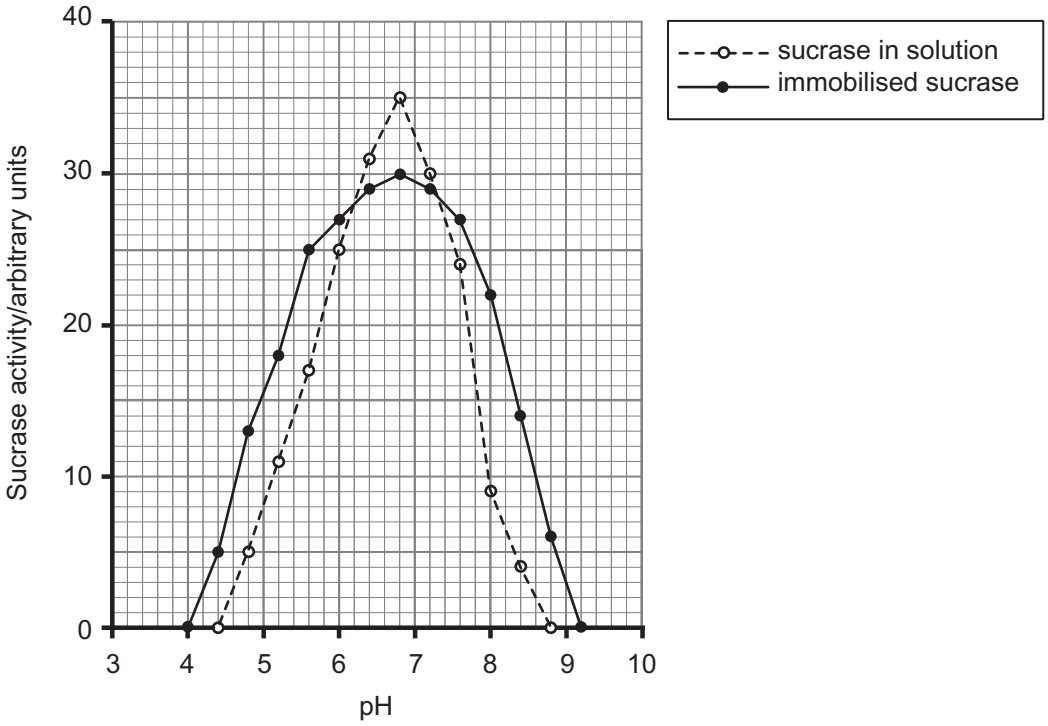
1. _____

_____

2. _____

_____ [2]

(b) The graph below shows the effect of pH on the enzyme sucrase when in solution and when immobilised.



(i) The graph shows that enzyme immobilisation reduces the activity of sucrase at the optimum pH. Calculate the percentage reduction in the rate of the activity for this immobilised sucrase.

Answer _____ [3]

(ii) Explain the reduction in the activity of the immobilised sucrase.

_____

_____

_____

_____ [2]

(iii) Using the information in the graph, describe and explain **one** other difference in the activity of the sucrase in solution and when immobilised.

_____

_____

_____

_____ [2]

7 An experiment was carried out on the rate of absorption of two monosaccharide sugars by living intestinal cells and intestinal cells that have been poisoned with cyanide (a chemical which inhibits production of ATP in cells by inhibiting cell respiration). The results are shown in the table below.

Monosaccharide	Rate of absorption/arbitrary units	
	Living intestinal cells	Cyanide-treated intestinal cells
Glucose	1.00	0.33
Arabinose	0.29	0.29

(a) Describe the trends evident in the data above.

_____

_____

_____

_____

_____

_____ [3]

(b) Identify which of the two monosaccharides is entirely absorbed by diffusion. Explain your answer.

_____

_____

_____

_____

_____

_____ [3]

(c) Once absorbed into the intestinal cells, glucose may be converted into a polysaccharide for storage. Name the polysaccharide stored in animal cells and describe how it is synthesised from glucose.

_____

_____

_____

_____

_____

_____

_____

_____ [4]

(d) Cyanide, which was used in this investigation to inhibit cell respiration, can be described as a non-competitive enzyme inhibitor. Explain what is meant by the term 'non-competitive'.

_____

_____

_____

_____ [2]

8 **(a)** The water potential of a cell (ψ_{cell}) has two components, the solute potential (ψ_s) and the pressure potential (ψ_p).

(i) Explain why the solute potential of a cell's contents is always less than zero.

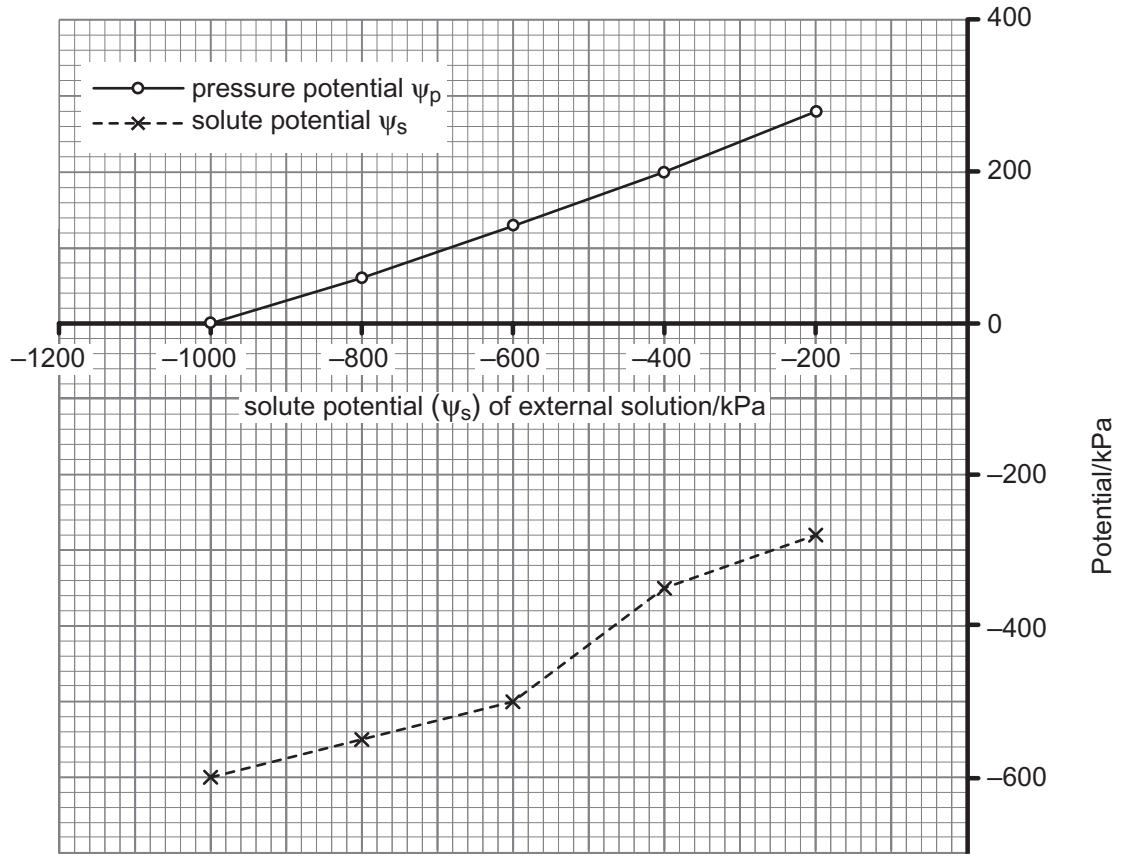
_____

_____ [1]

(ii) State the term which is used to describe a plant cell when its pressure potential (ψ_p) is zero.

_____ [1]

(b) The solute and pressure potentials of carrot tissue were determined after immersion in five external solutions (differing in their solute potential). These are shown in the graph below.



(i) The water potential of the carrot tissue was calculated using the values for solute and pressure potentials shown in the graph opposite. Three of the values are shown in the table below.

Complete the table by calculating the two missing values.

Solute potential of the external solution /kPa	Water potential of the carrot tissue /kPa
–200	0
–400	–150
–600	–370
–800	
–1000	

[2]

(ii) Plot the water potential values, including those you have calculated, on the graph opposite and draw an appropriate line of best fit. [2]

Full turgor occurs when no more water can enter the tissue.

(iii) Using the graph, determine the solute potential of the external solution at the point of full turgor.

_____ [1]

(c) A weighing method can be used to determine the average water potential (ψ_{cell}) of plant tissues, such as potato.

(i) Briefly describe the procedure for the weighing method.

[3]

(ii) Explain how you would analyse the results to obtain an estimate of the water potential of potato cells.

[2]

(iii) Explain the biological basis of the weighing method as a means of determining the average water potential of the cells in a plant tissue.

[2]

Section B

Quality of written communication is awarded a maximum of 2 marks in this section. [2]

9 Give an account of the structure of proteins and their roles in the cell-surface membrane. [13]

Structure of proteins.

Role of proteins in the cell-surface membrane.

THIS IS THE END OF THE QUESTION PAPER

111070

GCE Biology Advanced Subsidiary (AS)

Assessment Unit AS 1: Molecules and Cells

Summer 2011

Photograph 1.4

(For use with Question 4)