



Rewarding Learning

ADVANCED SUBSIDIARY (AS)
General Certificate of Education
January 2014

Centre Number

71

Candidate Number

Biology

Assessment Unit AS 1

assessing

Molecules and Cells

[AB111]



WEDNESDAY 8 JANUARY, MORNING

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.

There is an extra lined page at the end of the paper if required.

Answer **all eight** questions.

You are provided with **Photograph 1.3** for use with Question 3 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	

Total
Marks

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- proteins called _____ . [5]

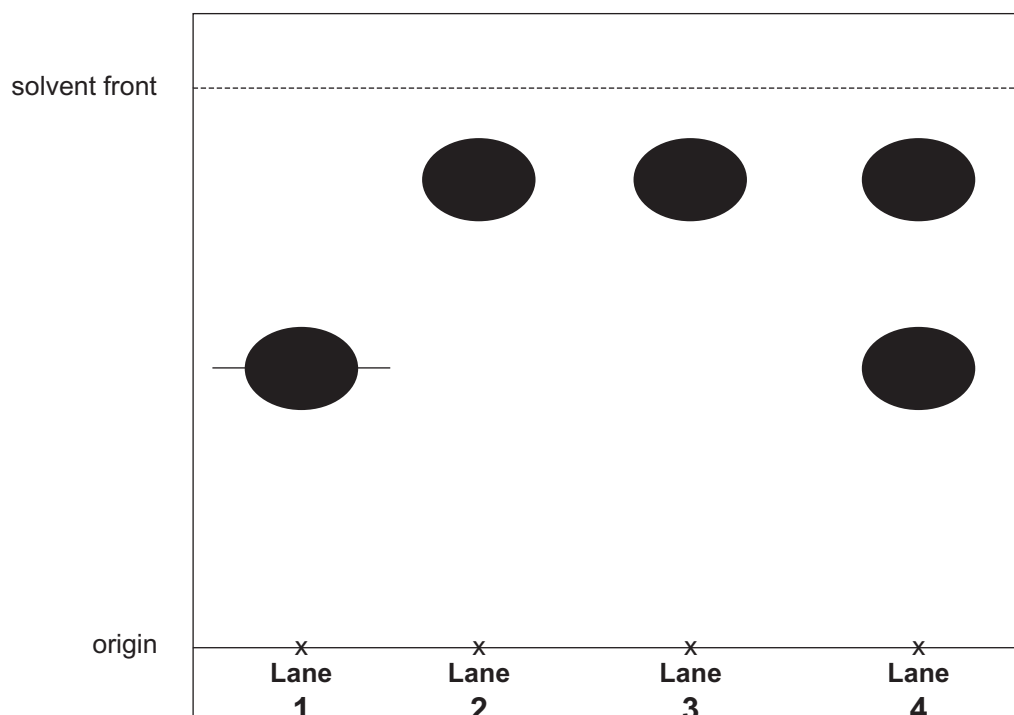
Marks	Remark
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[2]

The following carbohydrate solutions were applied to the origin:

- Glucose
- Fructose
- Maltose treated with α -glucosidase (hydrolyses glycosidic bonds)
- Sucrose treated with α -glucosidase (hydrolyses glycosidic bonds)

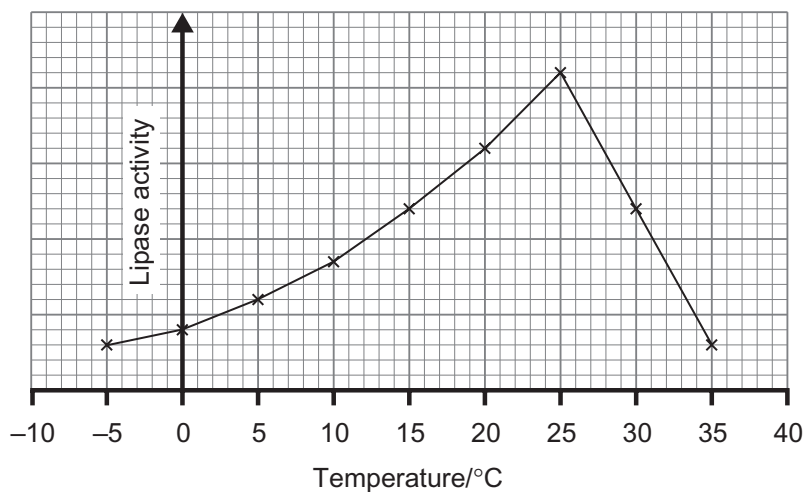
One solution was added to each of the four lanes on the origin. The resulting chromatogram is shown below.



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(Questions continue overleaf)

- 4 Mature seeds contain an embryo plant and a store of energy-rich food. In some seeds, such as soybean, the main energy store is lipid. When seeds are planted in springtime they absorb water, which activates enzymes such as lipase.

The graph below shows the relative activity of soybean lipase at various temperatures.



- (a) (i) Describe precisely the trends evident in this graph.

[2]

Examiner Only	
Marks	Remark

- 5 The earliest method of producing a genetic fingerprint involved an analysis of RFLPs. In this method, DNA is cut into pieces using enzymes, such as *EcoRI* and *BamHI*, and the resulting fragments are separated using electrophoresis.

(a) (i) What term is used to describe enzymes such as *EcoRI* and *BamHI*?

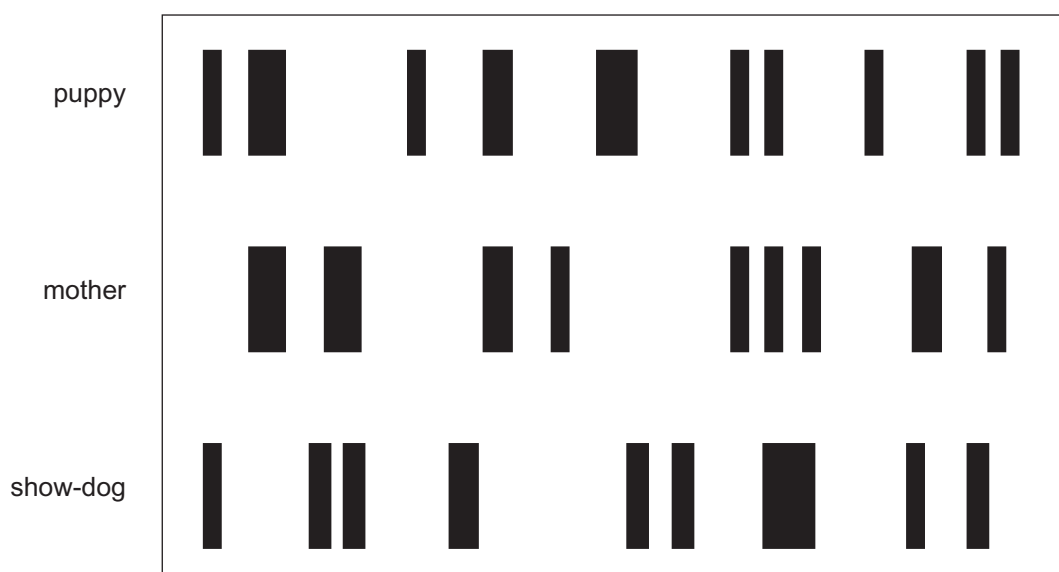
_____ [1]

(ii) DNA is the substrate of both *EcoRI* and *BamHI*. However, the active site of the two enzymes is slightly different. Explain the effect of this difference.

_____ [2]

One use of genetic fingerprinting is in paternity investigations. In dog breeding, it can be beneficial to have evidence of a dog's parentage.

One breeder claimed that a litter of puppies had been fathered by an award-winning show-dog. A buyer had cause to doubt this, based on the development of an inherited illness in a puppy that she had bought, and so sought evidence of parentage from the breeder. Genetic fingerprints of the puppy, its mother and the show-dog were produced. The results are shown below.



[2]

-
-
-
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-
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-
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-
-
- [3]

-
- [1]

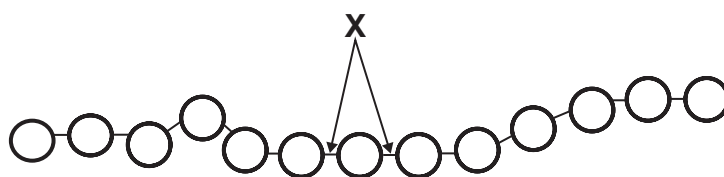
Examiner Only	
Marks	Remark

6 Proteins can be described as organic macromolecules.

(a) Explain the term 'organic macromolecule'.

[2]

(b) Gluten is a type of protein found in grains such as wheat, barley and rye. It is a 'composite' protein, made up of two simpler proteins called glutenin and gliadin. The following diagram represents the primary structure of part of a gliadin molecule.



(i) Identify the building blocks of proteins, as represented by circles in the diagram.

[1]

(ii) Identify the type of bond labelled **X**.

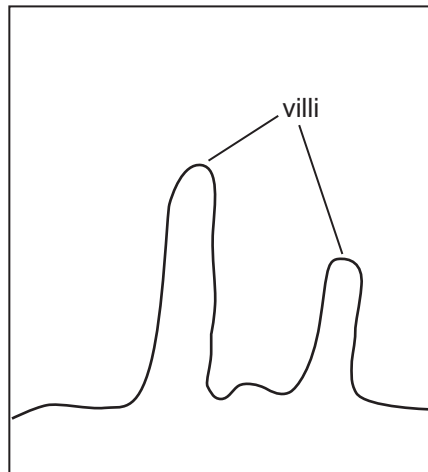
 [1]

Examiner Only	
Marks	Remark



A diagram showing a series of finger-like projections called villi. Two lines point from the word "villi" to two of the projections.

normal



coeliac sufferer

- (i) Describe the effect of coeliac disease on the structure of the ileum.

[1]

- (ii)** Coeliac sufferers are often nutrient-deficient. With reference to the damage caused to the ileum, suggest an explanation for this.

[2]

- (iii) When investigating the ileum of a potential sufferer for signs of coeliac disease, several biopsies (tissue samples) are taken, each from a different region of the ileum. Suggest why.

[1]

Examiner Only	
Marks	Remark

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- 7 An experiment was carried out to investigate the effect of cyanide poison on cell organelles extracted from a sample of liver tissue.

Organelles can be separated from the rest of the cell contents using a centrifuge. Ground-up tissue is placed in a tube, which the centrifuge then spins at high speeds. The cell contents are separated into 'fractions', depending on their size. The smaller the organelle, the higher the speed required to separate it from the other cell contents.

- (a) **Circle** the name of the organelle fraction which would require the slowest spinning speed in order to separate it from the rest of the cell contents.

mitochondria ribosomes nuclei [1]

- (b) A fraction of mitochondria was obtained using the technique outlined above. These mitochondria were placed in a buffer which was isotonic to the liver tissue (i.e. with the same water potential as the liver tissue).

- (i) Explain fully the purpose of the isotonic buffer.

 [2]

Two test tubes (**A** and **B**) were then prepared as follows:

- 2 cm³ of mitochondria in buffer solution was added to each tube
- 1 cm³ of cyanide solution was added to tube **A**
- 1 cm³ of the isotonic buffer was added to tube **B**

- (ii) Suggest why an extra 1 cm³ of buffer was added to tube **B**, as detailed above.

 [1]

Examiner Only	
Marks	Remark

8 The cell membrane consists of a phospholipid bilayer with various proteins embedded in it. This structure enables different substances to travel through the membrane by either simple diffusion, facilitated diffusion or active transport.

- (a)** Describe the similarities and differences between simple diffusion, facilitated diffusion and active transport. [6]
- (b)** Large and small molecules, as well as ions, must be able to travel through the cell membrane. Explain why the different methods of transport named in part **(a)** are necessary to allow each of these substances to pass through and also how they may allow the membrane to be selective. [7]

Quality of written communication [2]

- (a)** Describe the similarities and differences between simple diffusion, facilitated diffusion and active transport.

This image shows a single sheet of white paper with horizontal blue or grey ruling lines. The lines are evenly spaced and run across the width of the page. There are approximately 20 lines visible. The paper has a slight shadow on the right side, suggesting it's resting on a surface.

Examiner Only	
Marks	Remark

[illegible][illegible]

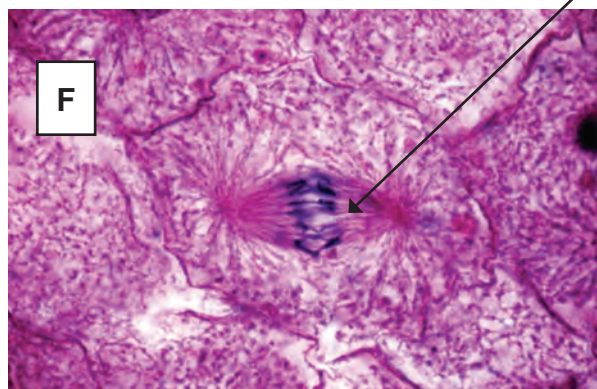
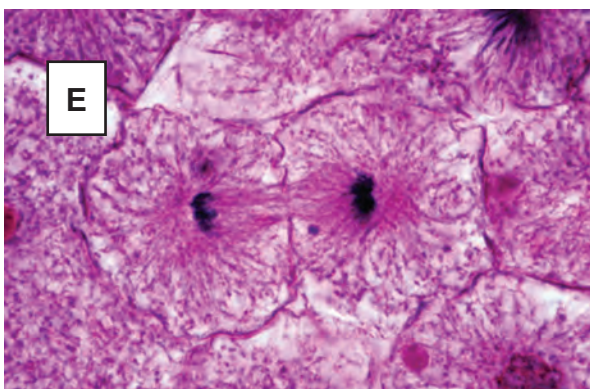
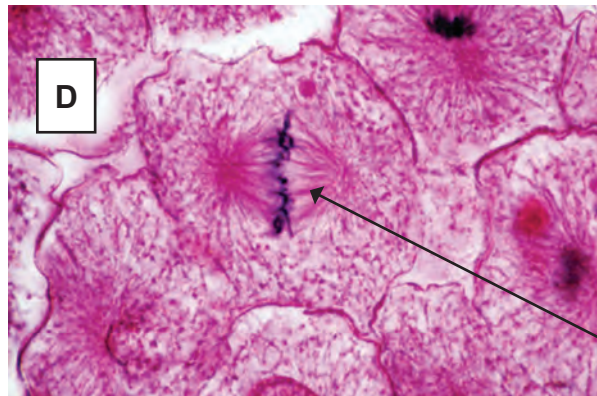
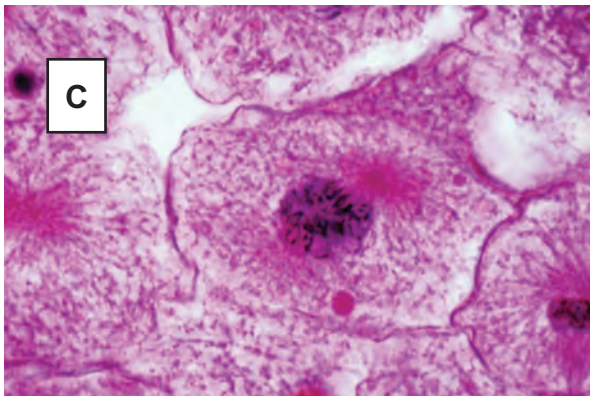
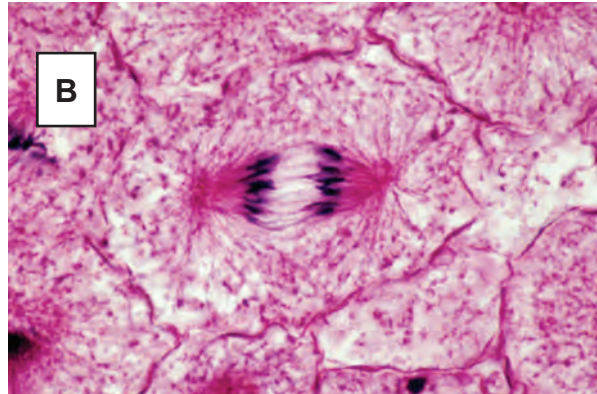
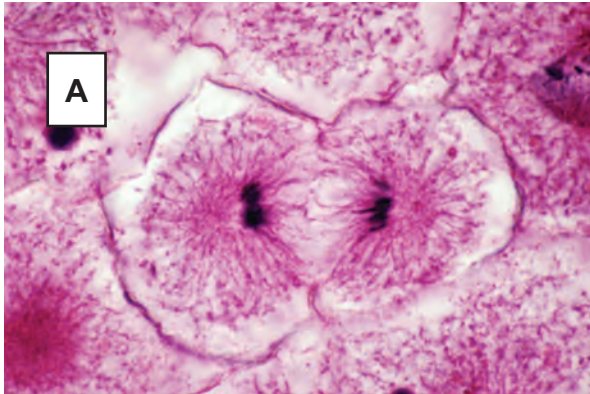
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Marks	Remark

THIS IS THE END OF THE QUESTION PAPER

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GCE Biology Advanced Subsidiary (AS)
Assessment Unit AS 1: Molecules and Cells
January 2014

Photograph 1.3
(For use with question 3)



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