



BIOLOGY MIND

# Edexcel

## A-Level

# BIOLOGY

Biological Molecules

Carbohydrates 3

Time allowed

**55 minutes**

**QUESTION PAPER**



Score

/46

Percentage

%



# Carbohydrates

1 Plants produce a variety of material useful to humans, such as starch, cellulose and fibres.

(a) Starch can be used to form packaging.

Explain why it may be better to make packaging from starch rather than from oil-based products.

(2)

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(b) The table below gives three statements about starch and cellulose.

Complete the table by placing a tick (✓) in the box, if the statement is correct, and if the statement is incorrect, place a cross (✗) in the appropriate box.

(3)

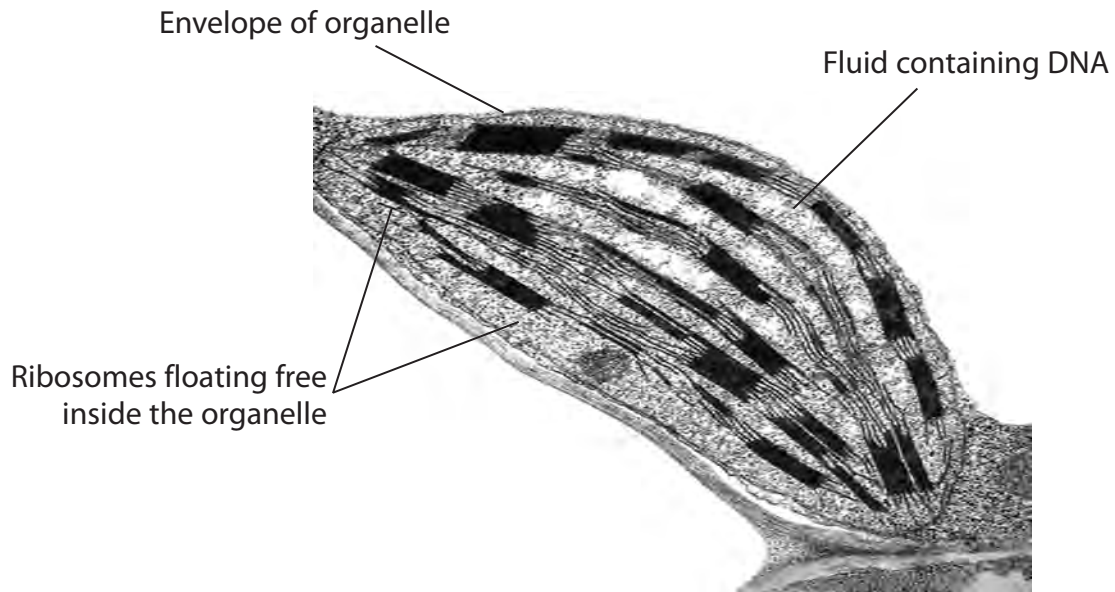
Statement	Starch	Cellulose
Consists of microfibrils held together by hydrogen bonds		
Found in amyloplasts		
Made up of $\beta$ -glucose monomers		





# Carbohydrates

- (c) The organelle, shown in the electron microscope image below, contains the monomers of starch.



Magnification x10 000

Dr. Jeremy Burgess / Science Photo Library

A student incorrectly identified this organelle as rough endoplasmic reticulum because it had ribosomes inside it.

- (i) Name this organelle.

(1)

- (ii) Using the labels on the diagram and your own knowledge, give **two** reasons why it is **not** rough endoplasmic reticulum.

(2)

Reason 1 .....

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Reason 2 .....

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(d) The stem of a plant contains xylem vessels and sclerenchyma fibres.  
Compare the functions of xylem vessels with the functions of sclerenchyma fibres. (3)

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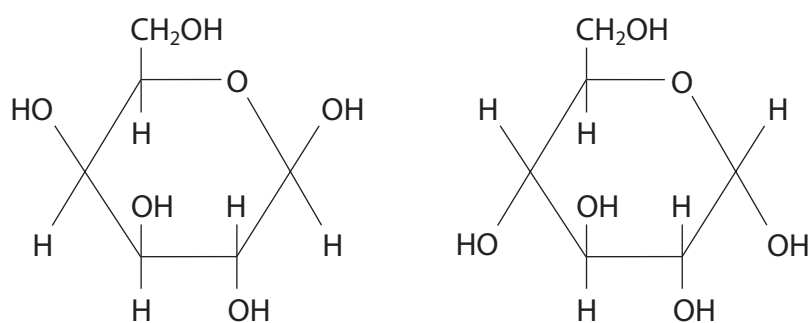
**(Total for Question 1 = 11 marks)**



- 2 Galactosaemia is a genetic disorder that affects an individual's ability to metabolise the monosaccharide galactose.

Dairy products contain the disaccharide lactose, which is broken down into galactose and glucose during digestion. If the galactose is not broken down further this may result in damage to the brain, kidneys or liver.

- (a) The diagram below shows the structure of a galactose molecule and a glucose molecule.



- (i) In the space below, draw a diagram to show the products formed when these two molecules join together to form lactose.

(3)





# Carbohydrates

- (ii) Name the chemical reaction that joins the galactose and glucose molecules together.

(1)

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- (iii) Name the bond that joins the galactose and glucose molecules together.

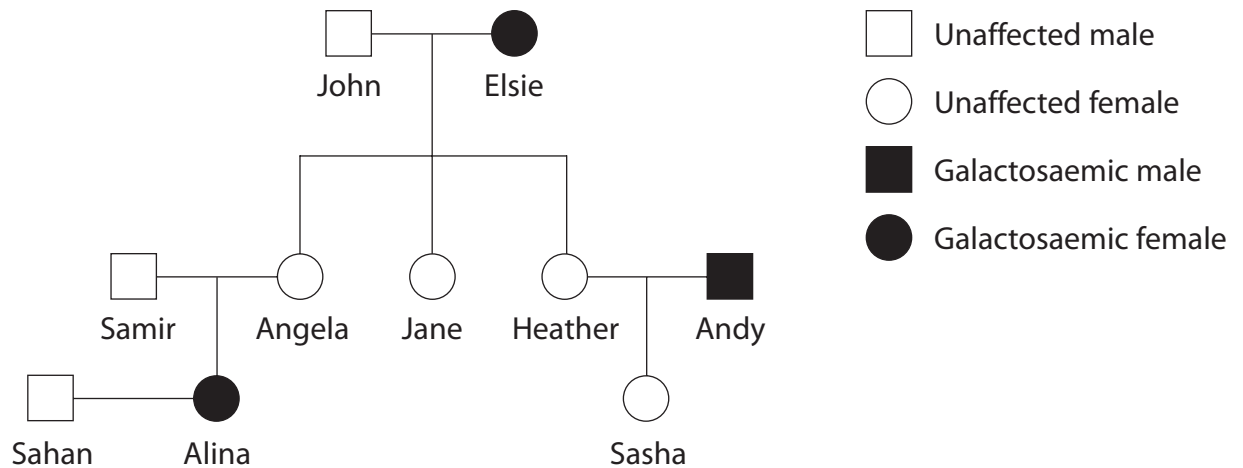
(1)

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# Carbohydrates

(b) The pedigree diagram below shows the inheritance of galactosaemia in a family.



The normal allele is represented by G and the defective recessive allele by g.

(i) An allele is a

- ☐ A form of a gene
- ☐ B length of DNA
- ☐ C part of a gene
- ☐ D protein

(ii) If John is heterozygous for galactosaemia, Jane's genotype must be

- ☐ A GG
- ☐ B Gg
- ☐ C gg
- ☐ D impossible to tell

(iii) Samir's genotype must be

- ☐ A GG
- ☐ B Gg
- ☐ C gg
- ☐ D impossible to tell





- (c) (i) Use a genetic diagram to calculate the probability that Sahan and Alina’s first child will be heterozygous (a carrier) if Sahan is heterozygous. (4)

Answer .....

- (ii) What is the probability that their second child would also be a carrier? (1)

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**(Total for Question 2 = 13 marks)**

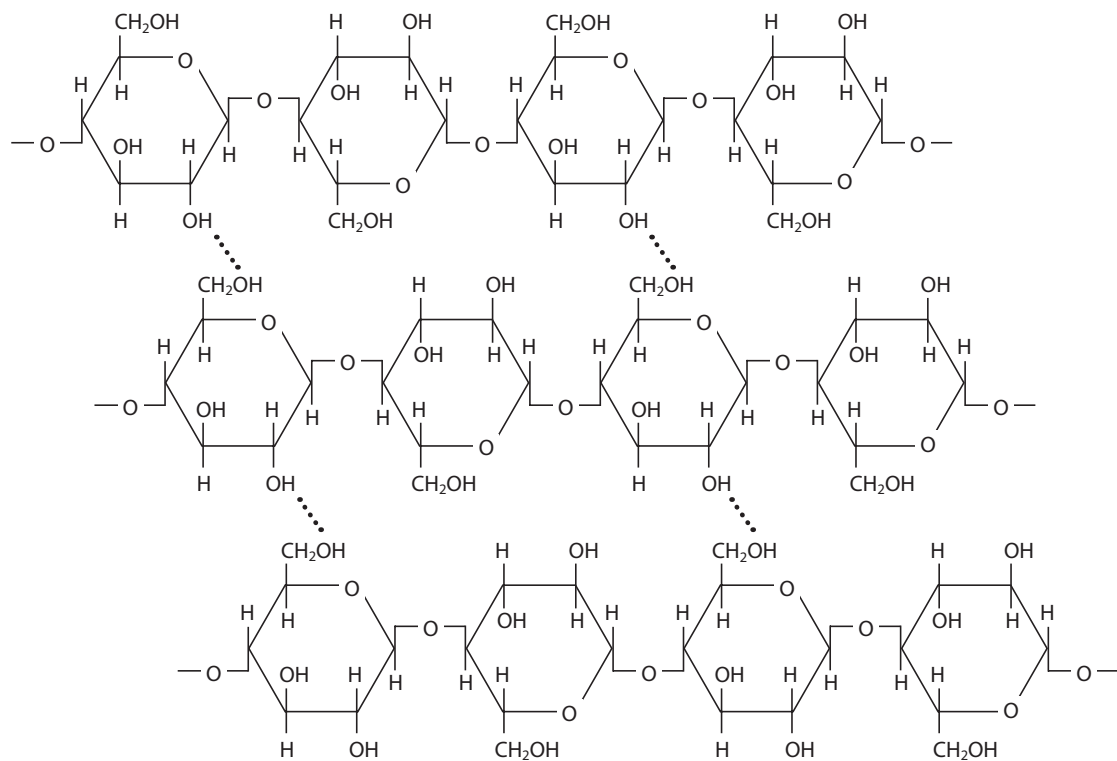




# Carbohydrates

## 3 Cellulose and mineral ions are important components of a plant.

(a) The diagram below shows part of a cellulose microfibril.



- (i) On the diagram above, draw a circle labelled **G** round **one** of the glycosidic bonds.
- (ii) On the diagram above, draw a circle labelled **H** round **one** of the hydrogen bonds.

(1)

(1)

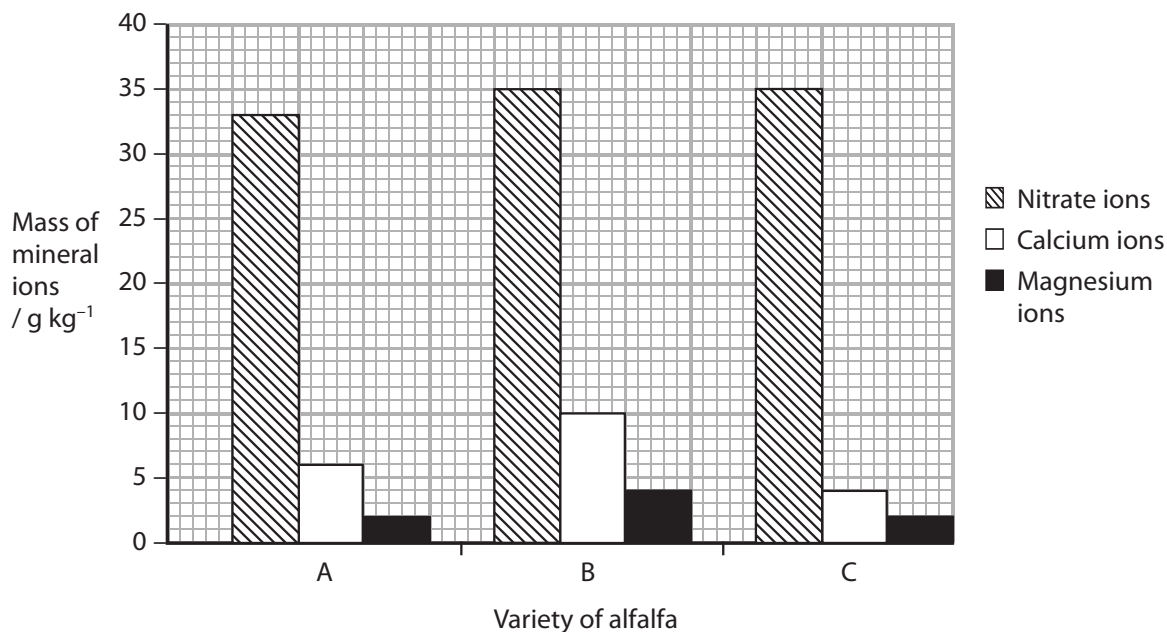




# Carbohydrates

- (b) An investigation was carried out to find the mass of mineral ions in three varieties (A, B and C) of the alfalfa plant.

The results of this investigation are shown in the graph below.



- (i) Using the information in the graph, suggest which variety of alfalfa could have the highest concentration of chlorophyll. Give a reason for your answer.

(2)

Variety .....

Reason .....

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- (ii) Using the information in the graph, suggest which variety of alfalfa could have the strongest cell walls. Give an explanation for your answer.

(3)

Variety .....

Explanation .....

.....

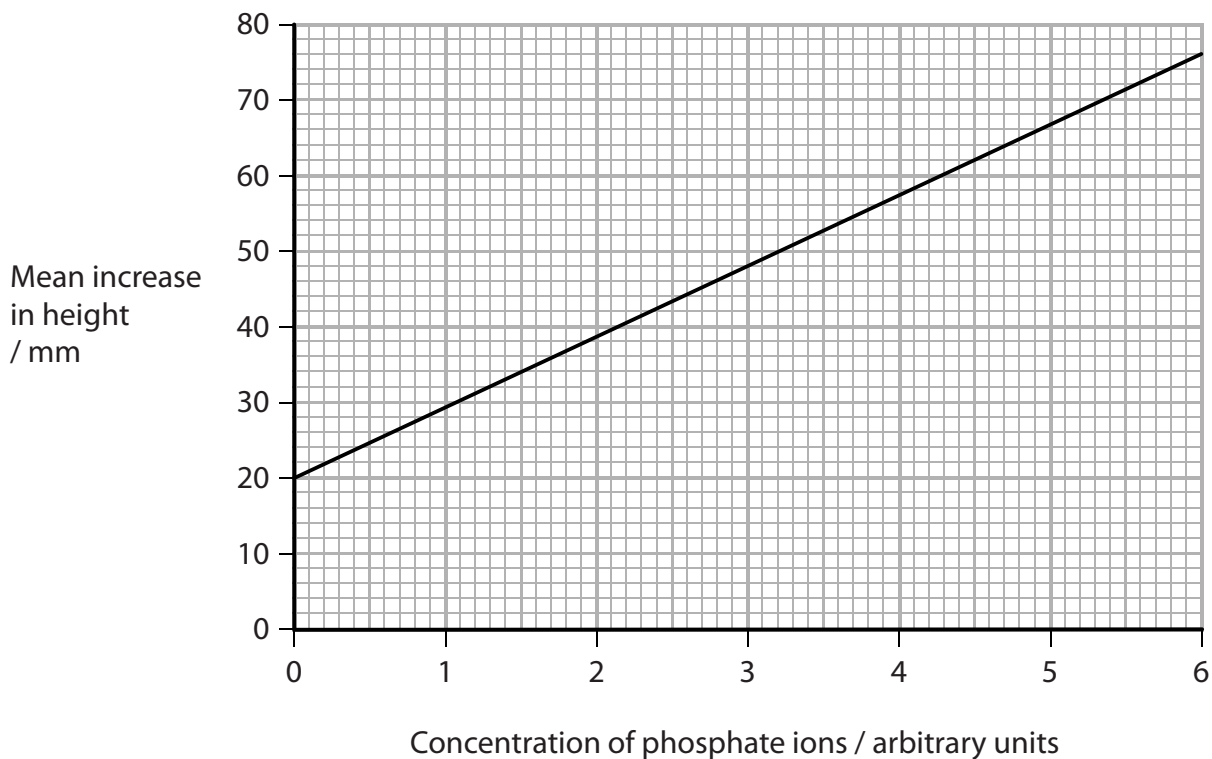


- (c) An investigation was carried out to find the concentration of phosphate ions in a soil sample.

Five wheat seedlings were grown in a solution containing all necessary mineral ions, except for phosphate ions. After three weeks, the increase in height of each seedling was measured and the mean increase in height was calculated.

This procedure was repeated for solutions containing different concentrations of phosphate ions.

The results are shown in the graph below.



- (i) Another five wheat seedlings were grown in a sample of soil for three weeks and their mean increase in height was found to be 45 mm.

Use the graph to estimate the concentration of phosphate ions in this sample of soil.

(1)

Answer ..... arbitrary units





(ii) In this investigation, all the seedlings were grown from seeds from the same wheat plant. Suggest why this would improve the validity of the results.

(1)

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(iii) Suggest **two** factors, other than the time for growth and the source of the seeds, that should have been kept constant in this investigation.

(2)

1 .....

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2 .....

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(Total for Question 3 = 11 marks)





**4** Plants are multicellular organisms that contain organic molecules such as starch and cellulose.

(a) Multicellular organisms contain organs and tissues.  
Suggest why organs are considered more complex than tissues.

(2)

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\*(b) (i) Compare the structure of a cellulose molecule with the structure of starch.

(4)

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# Carbohydrates

- (ii) Cellulose molecules form cellulose microfibrils.  
Explain how the arrangement of cellulose microfibrils contributes to the physical properties of plant fibres.

(2)

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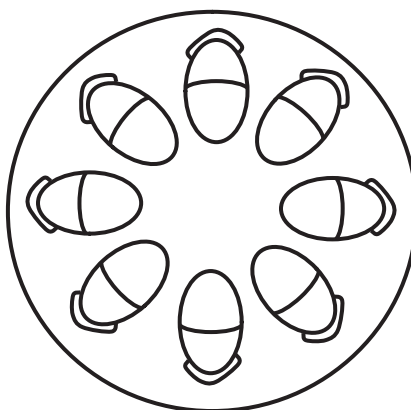
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- (c) (i) The diagram below shows a transverse section through a stem.  
On the diagram, put a label **X** to indicate where xylem vessels are present.

(1)



- (ii) Give **two** functions of xylem vessels.

(2)

1 .....

2 .....

(Total for Question 4 = 11 marks)

