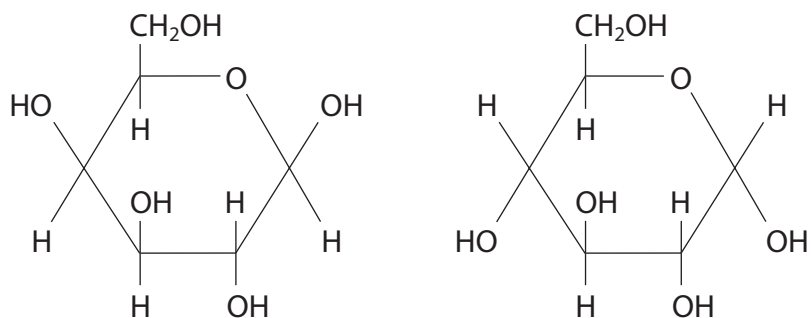


- 1 Galactosaemia is a genetic disorder that affects an individual's ability to metabolise the monosaccharide galactose.

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)

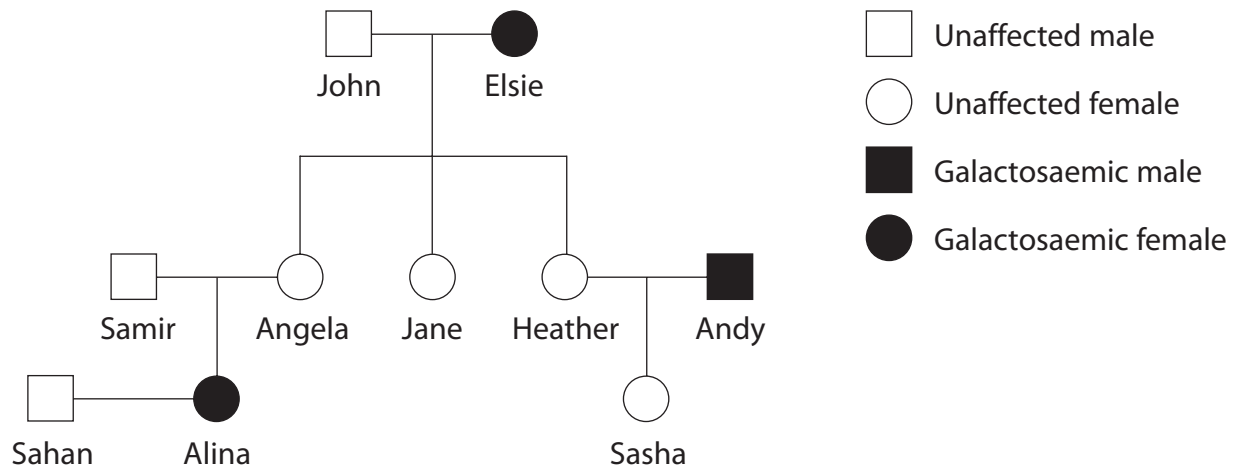
(ii) Name the chemical reaction that joins the galactose and glucose molecules together.

(1)

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

(1)

(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.

Place a cross in the box next to the correct letter that completes each of the following statements.

(i) An allele is a

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

(1)

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

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

(1)

(iii) Samir's genotype must be

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

(1)

(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 1 = 13 marks)

2 The scientific document you have studied is adapted from articles in New Scientist. Use the information from the article and your knowledge to answer the following questions.

(a) Outline the process by which 'more molecules of the enzymes' are produced (last paragraph on page 7).

(4)

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(b) Explain how the fluid mosaic model of membrane structure makes it possible to change the number of adrenoceptors (first paragraph on page 9).

(2)

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(c) Explain, using examples from the text, how scientific opinion can be 'deeply divided' when based on the same evidence.

(3)

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(ii) Compare the changes in brain chemistry that are linked to Parkinson's disease with those that are linked to depression.

(2)

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(e) Suggest similarities between nerve cells in *Caenorhabditis elegans* expressing the ChR2 gene and cells of the mammalian retina.

(3)

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(f) Using an example from the text, explain how a virus can introduce genes into specific cells.

(3)

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