

## Chapter 8 Answers Carbohydrates

Book questions: 6 and 9

1) Draw the following  
Fructose,

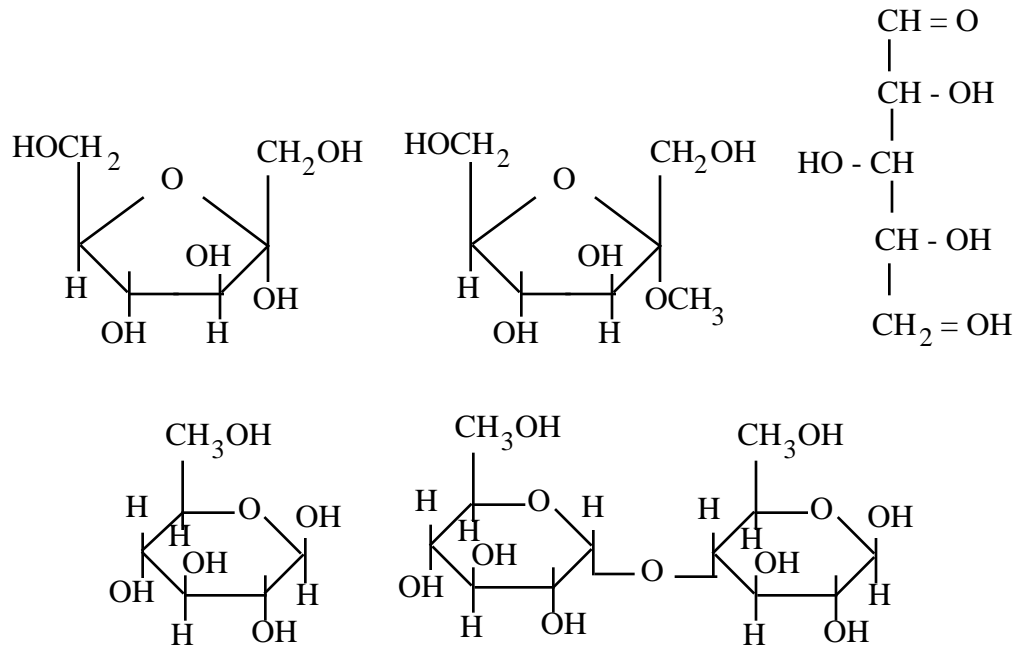
Lactose,

glucose  $\beta$  (1, 4)- glucose,

Fructose 6-Phosphate

2) Which sugar is a reducing sugar?

From right to left: Yes, No (it is methylated on the anomeric carbon), yes, the whole idea is that when it is in the open form it can be a reducing agent, yes and yes. The last sugar has two anomeric carbons (it is a disaccharide) and one of the anomeric carbons can still open. However, if the carbohydrate is a long polymer it is not considered a reducing sugar as most of the monomers are not reducing.



3) Draw an a glycosidic bond

4) Describe where you would expect to see a carbohydrate with two glycosidic bonds

*The branch points of glycogen or amylopectin*

5) Why does cellulose form dense linear fibrils, whereas amylose forms open helices?

*Look at the structure of the two polysaccharides, particularly the interactions between strands of cellulose.*

7) The terms reducing and non-reducing are often applied to the ends of polysaccharides. How would you describe the ratio of the reducing:nonreducing ends in glycogen and cellulose.

- a) Glycogen 1:1, Cellulose 1:1
- b) Glycogen 1:1, Cellulose many:1
- c) Glycogen many:1, Cellulose 1:1 \*\*\*
- d) Glycogen 1:many, Cellulose 1:1
- e) Glycogen 1:1, Cellulose 1:many

*There are many more reducing ends in glycogen than cellulose due to the many branch points in glycogen.*

8) What is maltose?

- a) A disaccharide made of galactose and glucose
- b) A disaccharide composed of glucose
- c) A disaccharide composed of galactose and fructose
- d) a non-reducing sugar
- e) A monosaccharide

9) Identify the anomeric carbon of glucose.

10) Consider the structure of ATP. Describe the saccharide in that molecule. What kind of glycosidic bond does it have.

*Look up the structure in your book – you should recognize a ribose.*

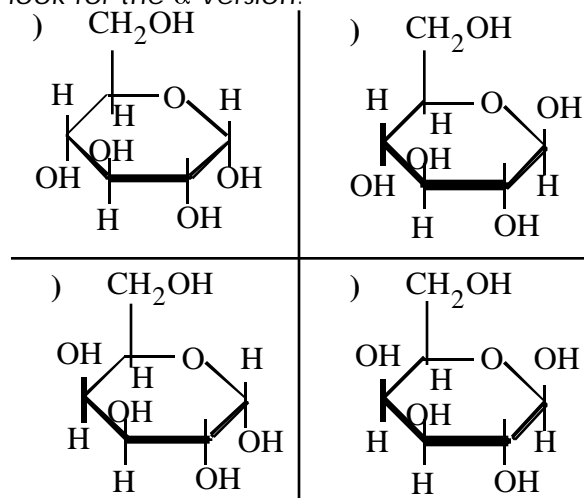
11) Which inborn metabolic disease is due to the build up of galactose?

*Galactosemia not tay-sachs*

12) Lactose intolerance is characterized by the inability to hydrolyze:

- a) -1,4 fructosidic bonds
- b)  $\beta$ -1,6 galactosidic bonds
- c)  $\beta$ -1,4 glycosidic bonds \*\*\*\* *Think about what lactose is.*
- a) -1,6 glycosidic bonds

13) Which of the following compounds is  $\alpha$ -D-galactose: (*don't let the D confuse you look for the  $\alpha$  version:*



14) Conversion of the  $\alpha$  anomer to the  $\beta$  anomer is called

- a) rotation
- b) mutation
- c) epimeration
- d) mutarotation \*\*\*\*
- e) hydroxylase turnaroundase

- 15) The disaccharide \_\_\_\_\_ consists of galactose and glucose
- a) sucrose
  - b) fructose
  - c) lactose \*\*\*\*
  - d) maltose
  - e) Cellobiose

16) Glycogen and starch are extensively branched high-molecular weight polymers. Give two reasons why such a structure is advantageous for a fuel-storage molecule?

*Simply put there are several reducing ends to the glycogen, therefore there are more ends that can be hydrolyzed at one time. This will give rise to many more glucose monomers being released than from starch.*

- 17) Draw the  $\beta$  anomeric Haworth structure of the following molecule:

