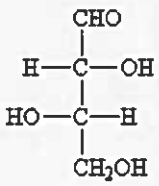
Chem 51, Spring 2016 Name K29

Exam 6 (Chp 6, Carbohydrates) 120 pt

Use your scantron to answer questions 1-40. Write answers to the questions without numbers directly on the exam.

1. What functional groups are in *Mark all that apply*



A) ketone B) aldehyde C) carboxylic acid D) alcohol

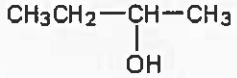
2. Which monosaccharide is the most common in nature?

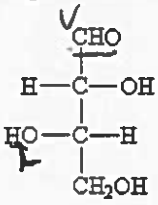
A) D-gulose B) D-glucose C) L-glucose D) sucrose E) D-fructose AB) starch

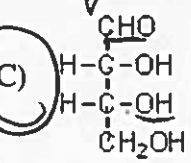
3. What are some of the functions of carbohydrates in living organisms?

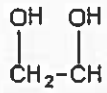
A) Communication between cells B) Energy storage C) Energy D) all of these

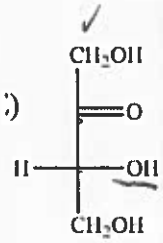
4. Which of the following compounds is classified as a D-aldotetrose?

A) 

B) 

C) 

D) 



all 3 are true

5. How many monosaccharides are there in an oligosaccharide?

A) 1 B) 2 C) 3-10 D) 1,000

6. Which of the following is a common disaccharide?

A) glucose B) maltose C) fructose D) galactose

7. Starch is a common polysaccharide. What is the function of starch and what monosaccharide is it made from?

A) structural / glucosamine
B) structural / glucose
C) energy storage / galactose
D) energy storage / glucose

Select the compound from the right that matches the descriptions below.

8. This compound is used to preserve biological specimens. B

9. This compound is a metabolite from fatty acid metabolism and occurs in diabetics and persons on the Atkins diet (a low carb diet). A

A) 

B) 

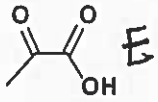
18 pt

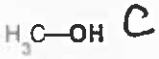
The following compounds are very common. Match these structures with their names on the right. ***Use each answer only once.***

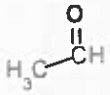
10.  CD

11.  AB

12.  D

13.  E

14.  C

15.  B

A) ethylene glycol

B) acetaldehyde

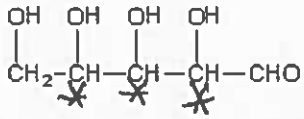
C) methanol

D) ethanol

E) pyruvic acid

AB) formaldehyde

CD) acetone

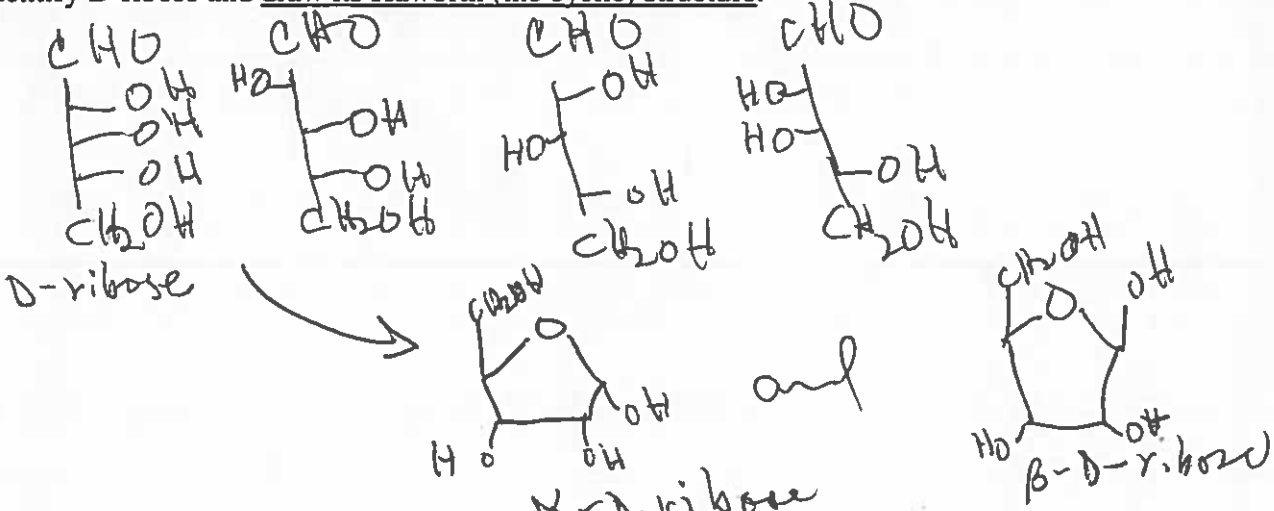
Given the following structure (*the stereochemistry is not shown*): 

A) (5 pt) Identify each chiral carbon with a "*". There are 8 possible stereoisomers for this compound.
(fill in blank)

$2^n = 2^3 = 8$ where n = #stereocenters

B) (12 pt) Draw **Fisher projections** for only the **naturally occuring** stereoisomers and label them as either D or L. Identify D-ribose and draw its Haworth (the cyclic) structure.

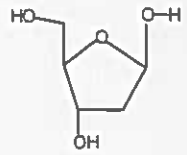
only D =



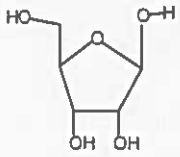
29 pt

Use the structures at the right to answer Questions 16-23. Some answers are used more than once.

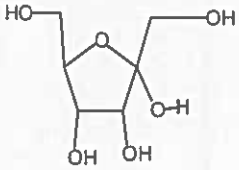
A)



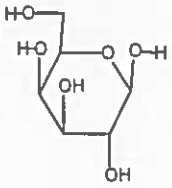
B)



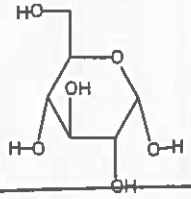
C)



D)



E)



16. This carbohydrate is known as blood sugar. D-glucose E

17. A carbohydrate classified as a ketohexose C

18. This combines with glucose to make lactose. galactose D

19. This is the carbohydrate found in DNA. deoxyribose A

20. This is the carbohydrate found in RNA. ribose B

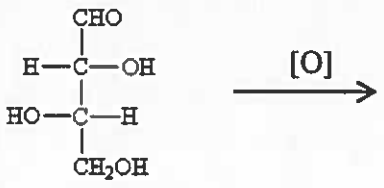
21. This carbohydrate is known as fruit sugar or levulose. .

A) maltose B) D-fructose C) D-glucose D) D-ribose E) D-galactose

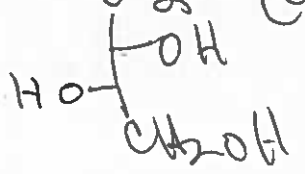
22. When an organic molecule loses hydrogens it is said to be:
A) reduced B) oxidized C) both oxidized and reduced D) neither oxidized or reduced

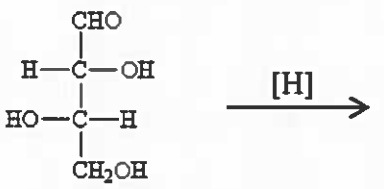
23. When a substance is oxidized it is called a(n):
A) oxidizing agent B) reducing agent C) both D) neither

(4 pt) Complete the oxidation and reduction reactions for the following monosaccharide.

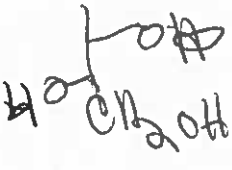


CO_2H (carboxylic acid)



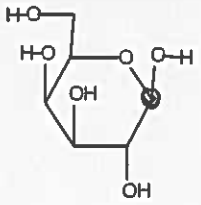
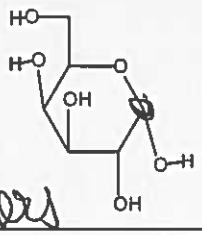
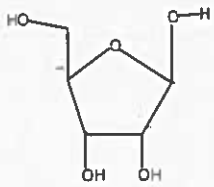
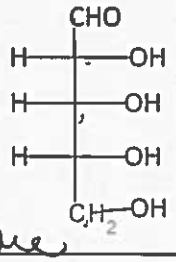
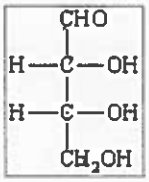
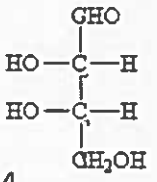
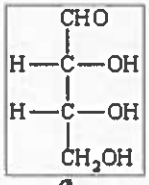
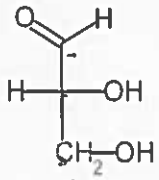
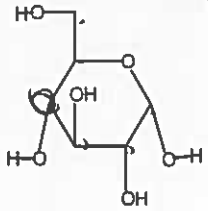
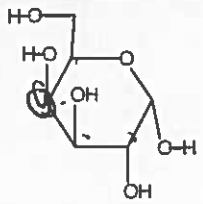
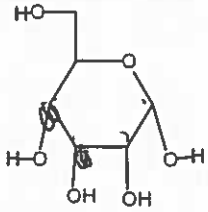
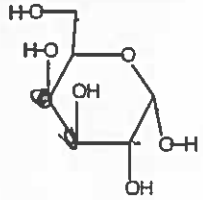


CH_2OH (alcohol)



20 pt

Listed in the right column are the names of the various stereoisomers that occur in carbohydrates. Consider the following pairs of carbohydrates and choose the best name for that pair. ***Use each answer once.***

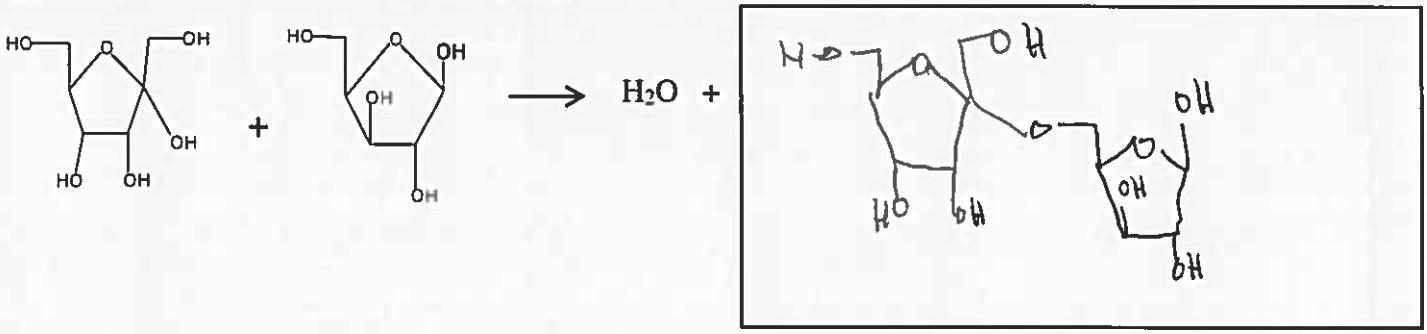
24.	 anomers	 D	A) Enantiomers
25.		 E	B) Diastereomers
26.	 mirror ↓ enantiomers	 A	C) Epimers
27.	 C4	 C3 AB	D) Anomers
28.	 epimers	 C	E) Same
29.	 diastereomer	 B	AB) Not stereoisomers and not the same.

12 pt

30. The glycosidic bond that connects the two monosaccharides in lactose is:
A) α(1→4) B) β(1→4) C) α(1→6) D) α,β(1→2)

31. The following reaction is A) oxidation B) reduction C) condensation D) hydrolysis

(4 pt) ***Complete this reaction with a [α-2,5] glycoside bond***



Use the answers on the right for Questions 32 - 36

32. Maltose is also known as malt sugar and is formed from the breakdown of this polysaccharide. A

33. The polysaccharide the makes up the exoskeleton of insects is D.

34. Which of the polysaccharides is the structural polysaccharide in plants? C

35. Which of the following is the storage form of glucose in the liver and muscle tissue? B

36. The α(1→4) glycosidic bond connects the D-glucose units in this polysaccharide. A

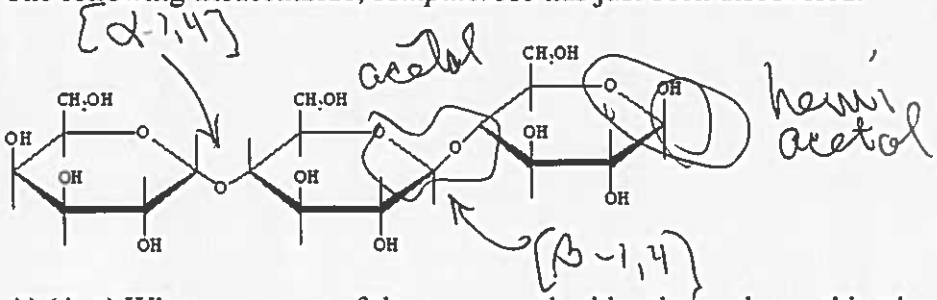
A. Starch
B. Glycogen
C. Cellulose
D. Chitin

(3 pt) Describe the differences in the structures of the two polysaccharides that comprise **starch.** Make sure you state their names and what type of linkage holds the monomer units together.

amylose and amylopectin are the two forms of starch. amylose only has (α-1,4) glycosidic bonds between glucose units and is a straight molecule (linear) amylopectin has both [α-1,4] and [α-1,6] glycosidic bonds between the glucose units and is a branched form of starch.

21 pt

The following trisaccharide, *computerose* has just been discovered.



A) (4 pt) What are names of the monosaccharides that make up this trisaccharide?

α-D-galactose and β-D-glucose

B) (2 pt) Is this trisaccharide **alpha, beta or neither**? beta

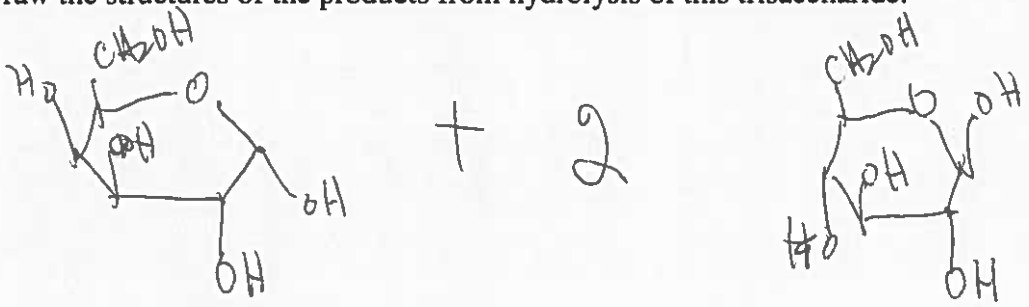
C) (4 pt) Circle one acetal group and one hemiacetal group in this trisaccharide

D) (4 pt) Is this trisaccharide a reducing sugar? *Why or why not*?

yes. It has a hemiacetal group.

E) (4 pt) Write the notation for each glycoside bond with an arrow pointing to the bond. there are two

G) (4 pt) Draw the structures of the products from hydrolysis of this trisaccharide.



(10 pt) Show the calculation for the percent glucose in 1.213 g of banana if 55.3 mL of water extract contain 300 mg/dL glucose.

$$\%\,\text{glucose} = \frac{\text{g glucose}}{\text{g banana}} \times 100 = \frac{0.1659\ \text{g glucose}}{1.213\ \text{g banana}} \times 100 = 13.7\,\%$$

$$\frac{300\ \text{mg}}{\text{dL}} = \frac{300\ \text{mg}}{\text{dL}} \times \frac{1\ \text{g}}{1000\ \text{mg}} = \frac{0.300\ \text{g}}{1\ \text{dL}} \times \frac{0.001\ \text{dL}}{0.100\ \text{mL}} = \frac{0.003\ \text{g}}{1\ \text{mL}} \times 55.3\ \text{mL} = 0.1659\ \text{g glucose}$$

32 pt