



Chem 109 C

Bioorganic Compounds

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<http://labs.chem.ucsb.edu/~zakariangroup/courses.html>

- **Textbook: "Organic Chemistry" 8th edition by P. Y. Bruice and [Solutions Manual and Study Guide]**

- **website:**

<http://labs.chem.ucsb.edu/~zakariangroup/courses.html>

- **email - zakarian@chem.ucsb.edu**

make sure to include Subject: 109C

- **Office Hours**

Mon, Wed - 2:00-2:45 pm (or email)

Chemistry building, room 2217

- **website:**

<http://labs.chem.ucsb.edu/~zakariangroup/courses.html>

- 3 midterms + final
- 500 points total
- three midterm exams:
 - 100 points each
 - lowest scoring is dropped
- a 300 point final exam

➤ A	85-100%
➤ B	75-84.9%
➤ C	60-74.9%
➤ D	45-59.9%

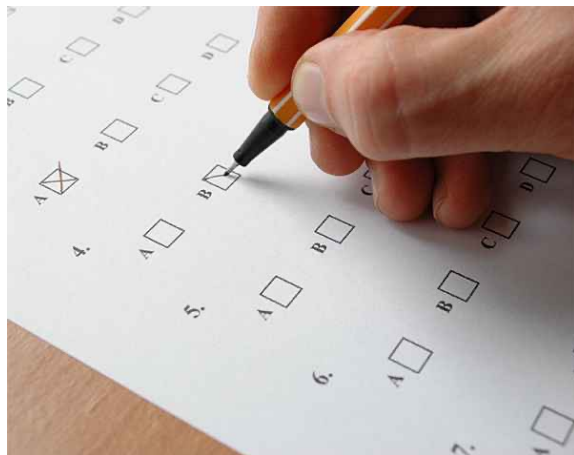
no make ups for any tests

- all exams will be in this room, HFH1104
- ALL electronic devices must remain stowed away during exams
- Bring a picture ID to the exam
- No makeups – a missed test will be the dropped test

- All tests will be a ~50:50 mix of multiple choice and regular questions by points

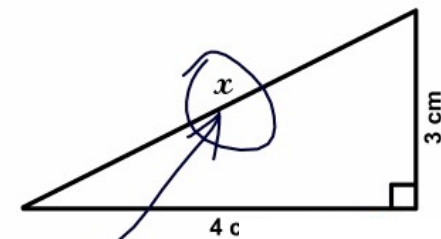
Midterms: non-cumulative 24 questions total 16 multiple choice, 8 regular

Final test: cumulative, 60 questions, 40 multiple choice, 20 regular



≈ 50 : 50

3. Find x.

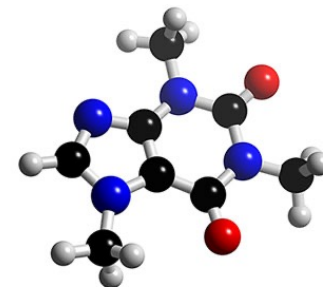


Here it is ~~x~~ 0

- **Thanksgiving Wednesday, 11/27-29**
- **Veteran's day Wednesday, 11/11**
- **Other days**

formula for success:

- **read the textbook before coming to class**
- **come to class**
- **do the suggested problems**
- **do the suggested problems again**

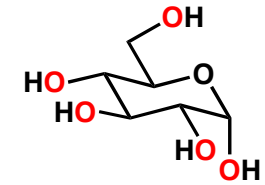


Part 7: Bioorganic Compounds

- **Chapter 20 – Carbohydrates**
- **Chapter 21 – Amino Acids, Peptides, and Proteins**
- **Chapter 22 – Catalysis and Enzymes**
- **Chapter 23 – The Organic Chemistry of the Coenzymes**
- **Chapter 24 – The Organic Chemistry of the Metabolic Pathways**
- **Chapter 25 – The Organic Chemistry of the Lipids**
- **Chapter 26 – The Chemistry of Nucleic Acids**

- Chapter 27: optional reading - Synthetic Polymers

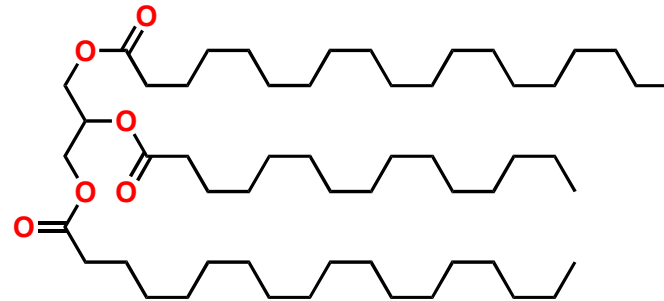
- **carbohydrates, sugars, saccharides**
 >50% of all biomass



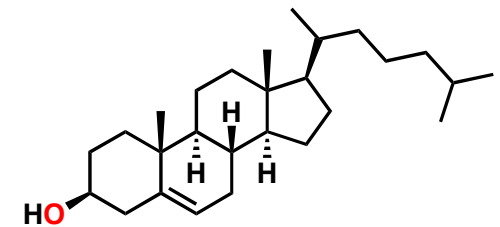
D-glucose

- **lipids**

fats/oils
terpenes
steroids, etc.

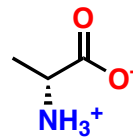


butter

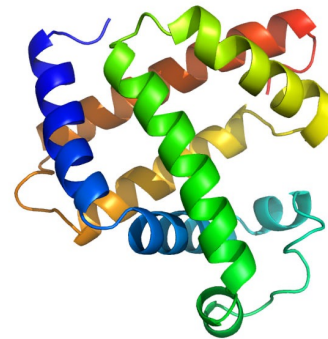


cholesterol

- **amino acids, peptides, proteins**



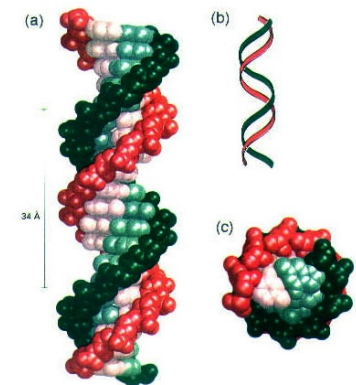
L-alanine



- **nucleotides, nucleosides, RNA,**

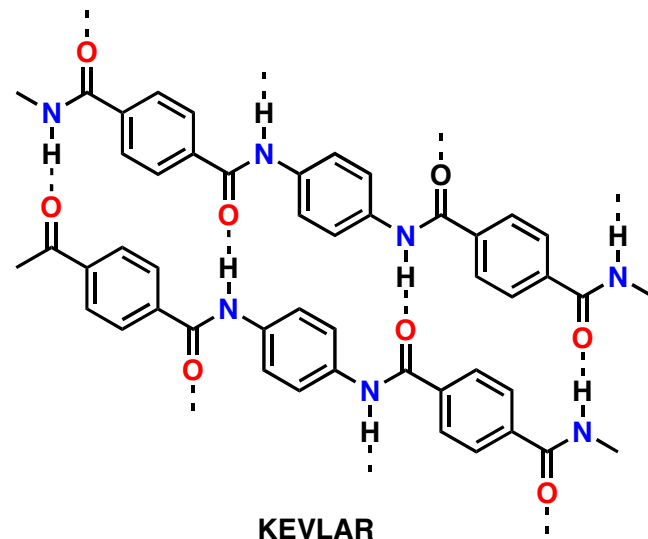
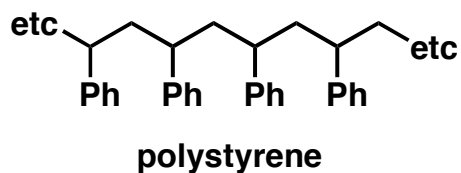


purine

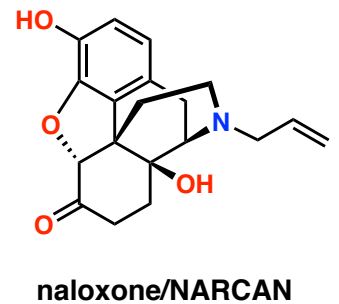
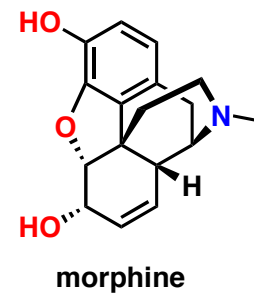
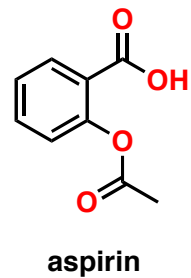
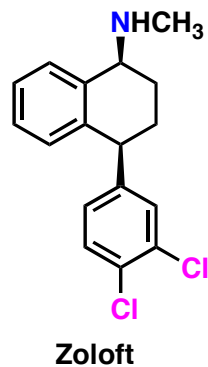
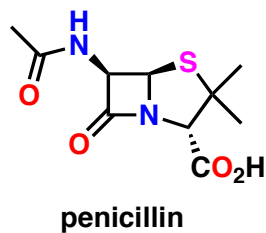


Synthetic (man-made) Compounds:

- polymers (plastics):

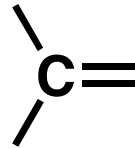
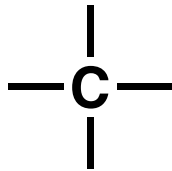


- pharmaceuticals

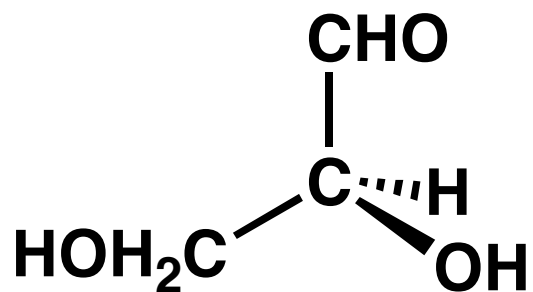


Review of Stereochemistry

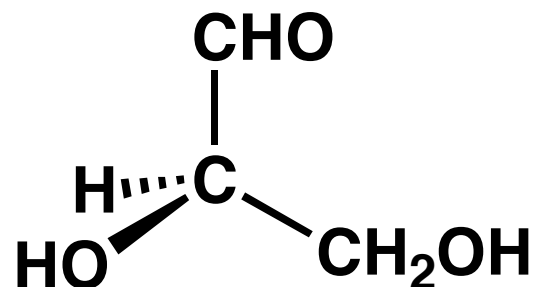
- **Organic chemistry - chemistry of carbon, C**
- **Valence number: 4**



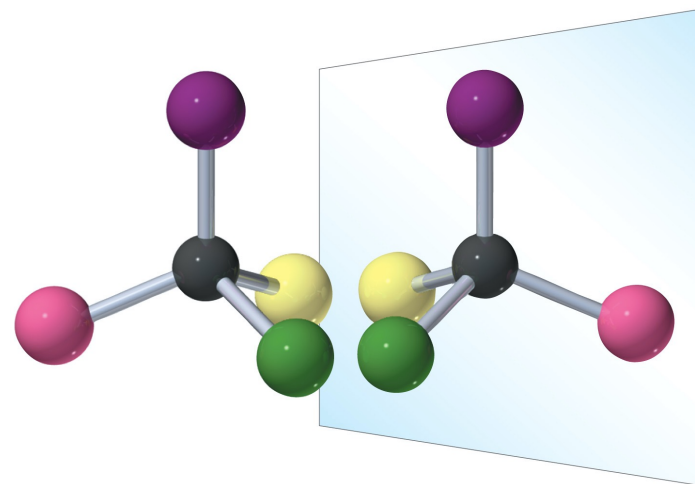
Review of Stereochemistry



D-glyceraldehyde

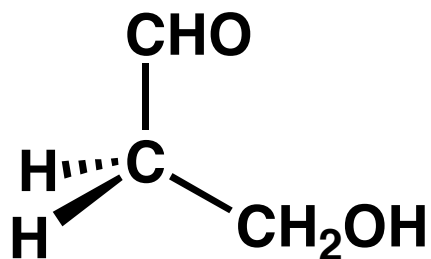
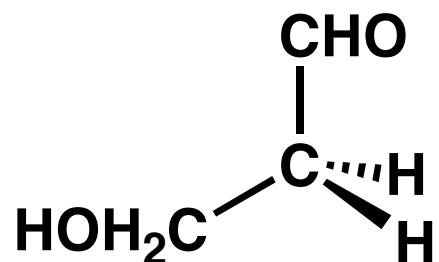


L-glyceraldehyde



nonsuperimposable
mirror images

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CHAPTER 20

THE ORGANIC CHEMISTRY OF

CARBOHYDRATES

Carbohydrates: Introduction

extremely widespread in biosphere, >50% of all biomass

- main functions: 1) source of energy

 - 2) cell-cell communication, recognition

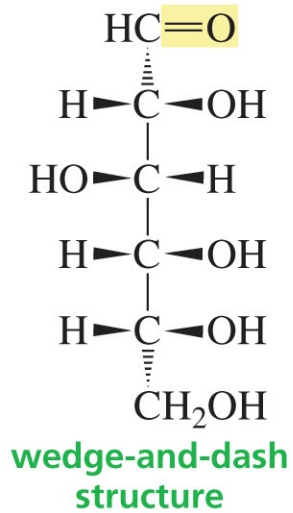
- origin of name: “carbo” (C) + “hydrates” (H₂O) = C_n(H₂O)_n = C_nH_{2n}O_n

- main source: photosynthesis in plants

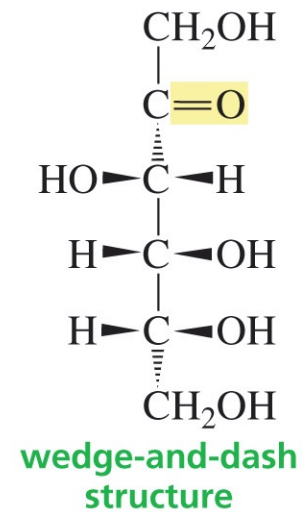
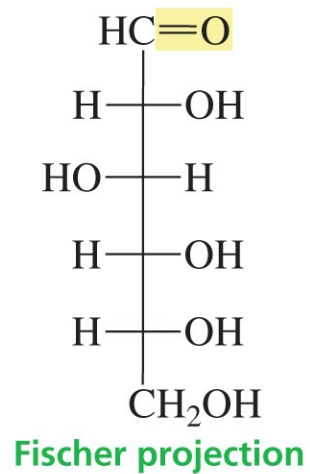
photosynthesis process:



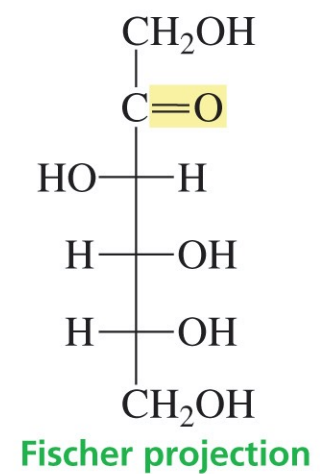
Carbohydrates: Introduction



D-glucose
a polyhydroxy aldehyde



D-fructose
a polyhydroxy ketone



Carbohydrates: **Classification**

based on number of single carbohydrate units

monosaccharides (simple carbohydrates)

disaccharides

oligosaccharides: 3 to 10 units

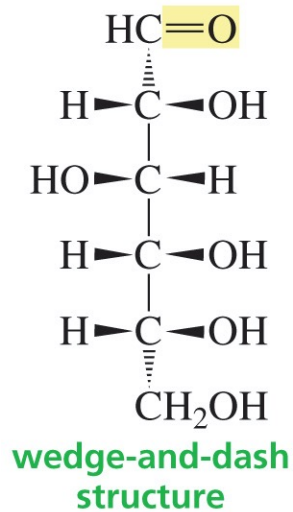
polysaccharides: >10 units

Carbohydrates: Classification

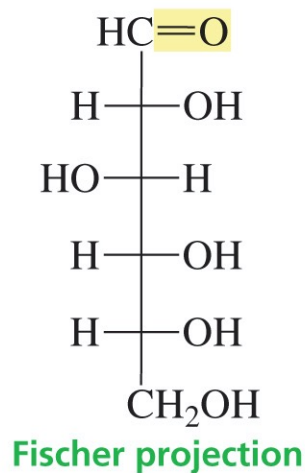
based on carbonyl group

aldoses

have aldehyde group



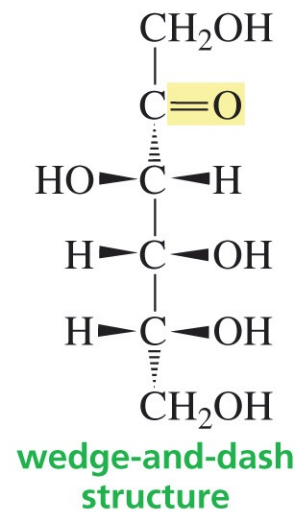
D-glucose
a polyhydroxy aldehyde



Fischer projection

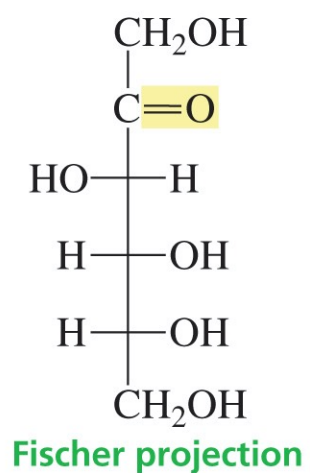
ketoses

have ketone group



wedge-and-dash structure

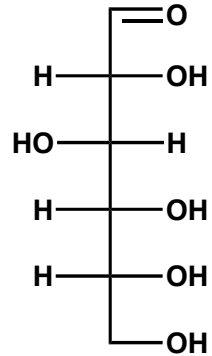
D-fructose
a polyhydroxy ketone



Fischer projection

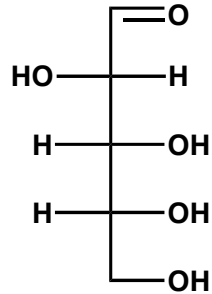
Carbohydrates: **Classification**

based on # of carbons in chain

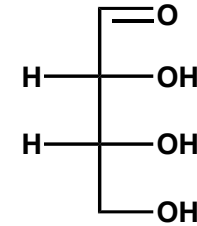


D-glucose

a hexose



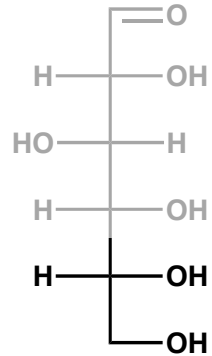
D-arabinose



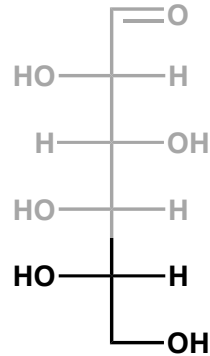
D-erythrose

Carbohydrates: **Classification**

The D and L notation



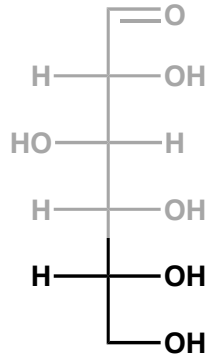
D-glucose



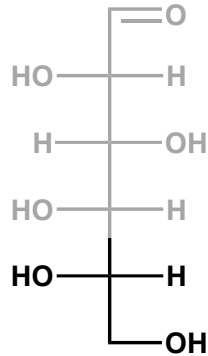
L-glucose

Carbohydrates: Classification

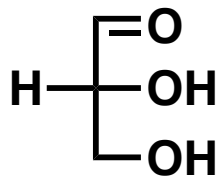
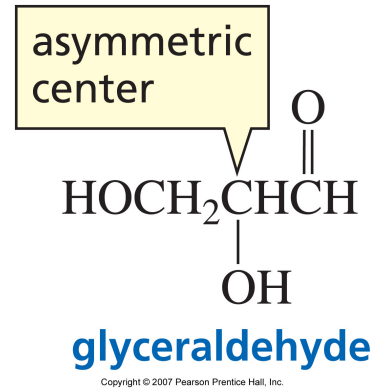
The D and L notation



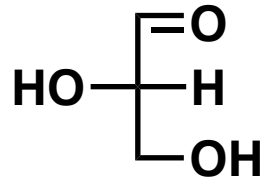
D-glucose



L-glucose



D-glyceraldehyde

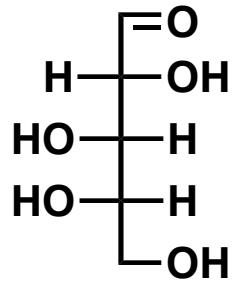


L-glyceraldehyde

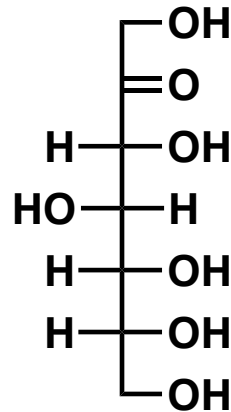
Carbohydrates: **Classification**

PROBLEM 1 (modified)

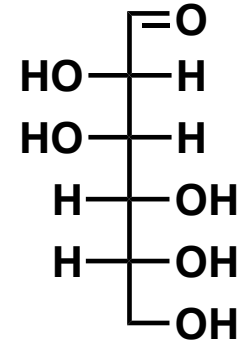
Classify the following monosaccharides



arabinose



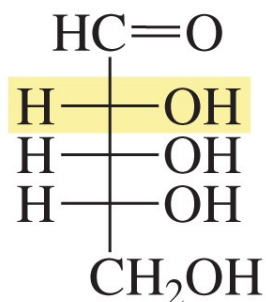
sedoheptulose



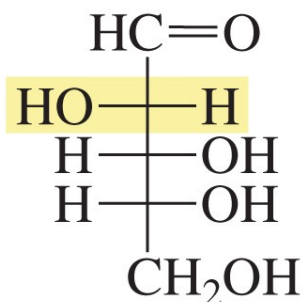
mannose

Carbohydrates: Epimers

epimers: diastereomers that differ in configuration at only one asymmetric center

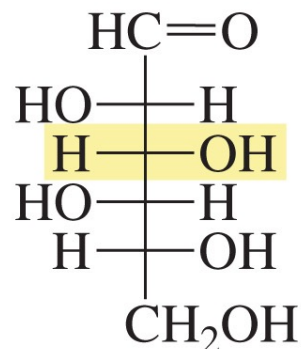


D-ribose

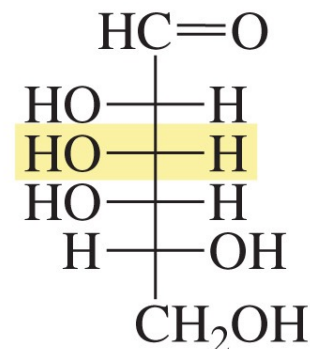


D-arabinose

C-2 epimers



D-idose

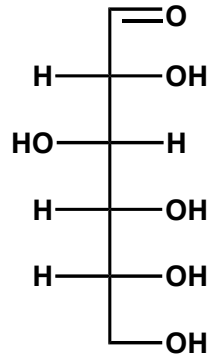


D-talose

C-3 epimers

Carbohydrates: Configurations of Aldoses

Number of stereoisomers = 2^n
n is number of stereocenters



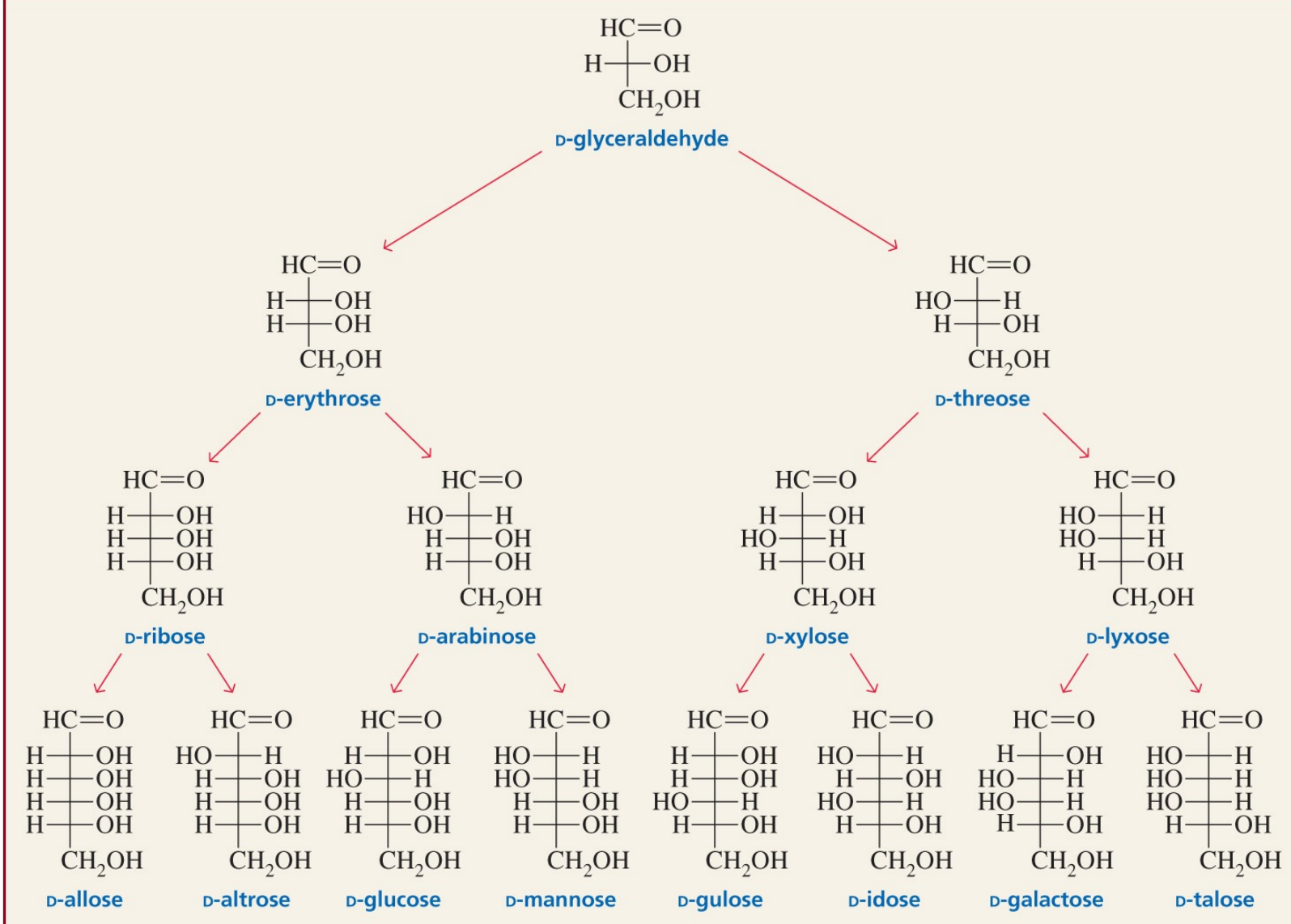
D-glucose

total number of stereoisomers for aldohexoses?

total number of stereoisomers for D-aldohexoses?

Carbohydrates: Configurations of Aldoses

Table 21.1 Configurations of the D-Aldoses

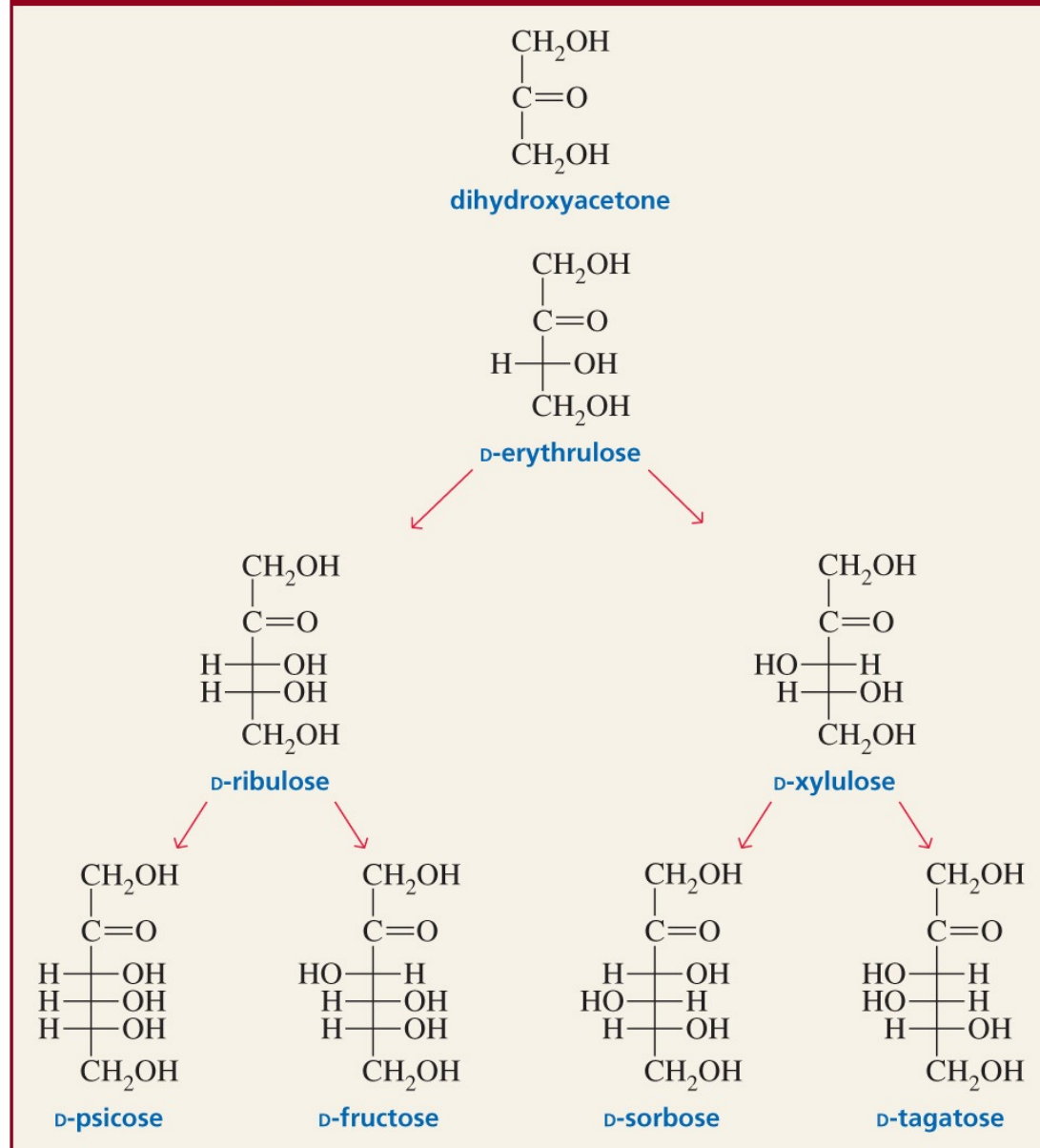


Carbohydrates: **Configurations of Aldoses**

Rebuilding Table 21.1 (p. 982)

Carbohydrates: Configurations of Ketoses

Table 21.2 Configurations of the D-Ketoses



PROBLEM 8 (modified)

How many stereoisomers are possible for

a. 2-ketohexose

a. an aldoheptose

b. a ketotriose

a. [3-ketopentose?]