**CHE 2060: Practice with sugar stereoisomers - KEY**

This exercise relates to Soderberg’s 3.6: Molecules with more than one chiral center.

*In addition to the specific questions asked:*

* *Mark all chiral carbons with an asterisk.*
* *Determine the chirality of each chiral center.*

**Glucose** is a six-carbon sugar, shown here as **D-glucose**, the most common form in nature.



**1.** How many stereoisomers of glucose are there?

24 = 16 stereoisomers of glucose

**2.** What properties to these stereoisomers share? What properties are different?

Chemical and physical properties are the same, or quite similar.  
Biological properties differ since each stereoisomer will interact with chiral receptors or enzymes.

**3.** What is the relationship between these two six-carbon sugars?



D-glucose and D-gulose are diasteromers because some of their chiral centers are the same and some are different.

**4.** What is the relationship between these two six-carbon sugars?



D-glucose and D-mannose have the same stereochemistry except at C2. So they are epimers.

**5.** What is the relationship between these two six-carbon sugars?



D-glucose and L-glucose have opposite stereochemistry at each chiral center. They are mirror images, equal but opposite, so they are enantiomers.

**6.** What is the relationship between these two six-carbon sugars?



While D-glucose and D-fructose are both six-carbon sugars, they don’t have the same bonding pattern. D-glucose has an aldehyde at C1 while D-fructose has an alcohol. So they are constitutional, or structural, isomers but not stereoisomers.

**7.** What is the relationship between these two sugars?



While D-glucose and D-ribose are both sugars, they don’t share the same number of carbons. Their bonding patterns are similar since both are aldehydes at C1. They aren’t stereoisomers or even constitutional (structural) isomers.