## Chapter 12: Quick Activities

# Organic Compounds

### Rubbing the Wrong Way

See firsthand the destructive action of isopropyl alcohol on proteins.

#### PROCEDURE

1. Crack open an egg and place the egg white and the yolk into two separate bowls.

2. Pour a capful of isopropyl alcohol into the egg white and observe what happens.

3. In the second bowl, scramble the yolk with a fork. Add a capful of isopropyl alcohol to the stirred yolk and observe what happens.


#### ANALYZE AND CONCLUDE

1. What happens to the color of egg whites when they are cooked? What happened to the color of the egg whites when they were treated with isopropyl alcohol? How is this similar to or different from what happened with the egg yolk?

2. How might the proteins within microbes respond to isopropyl alcohol? How might the tissues of your mouth and digestive system respond to isopropyl alcohol? (Hint: isopropyl alcohol is a serious poison when ingested. Do NOT ingest isopropyl alcohol.) Are all proteins destroyed by isopropyl alcohol? Might the proteins of your skin be different from the type of proteins found in your digestive system?

3. Why is isopropyl alcohol useful for cleaning your skin prior to a shot? Might skin oils, grime, and dirt be easily wiped away with a cotton swab soaked in isopropyl alcohol? Why or why not?

### Twisting Jellybeans

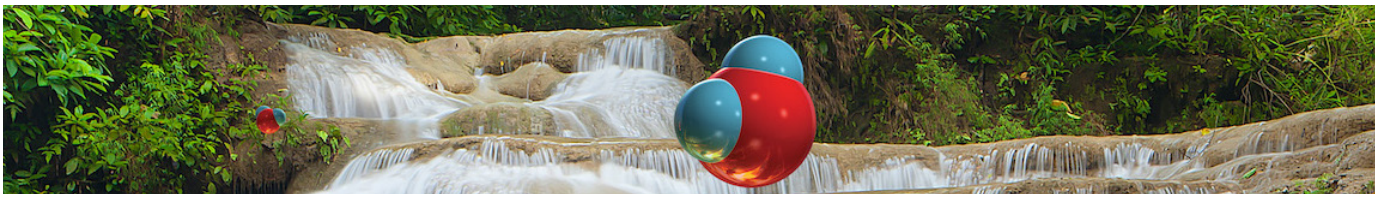
Two carbon atoms connected by a single bond can rotate relative to each other. This ability to rotate can give rise to numerous conformations (spatial orientations) of an organic molecule. Is it also possible for two carbon atoms connected by a *double bond* to rotate relative to each other?

Hold two toothpicks side by side and attach one jellybean (or similar) to each end such that each

jellybean has both toothpicks poked into it. Hold one while rotating the other. What kind of rotations are possible? Relate what you observe to the carbon–carbon double bond. Which structure of Figure 12.8 do you suppose has more possible conformations: butane or *cis*-2-butene? What do you suppose is true about the ability of atoms connected by a carbon–carbon triple bond to twist relative to each other?

**Glass Transition**

A property of polymers is their *glass transition temperature*, $T_g$, which is the approximate temperature below which the polymer is hard and rigid, but above which the polymer is soft and flexible. The $T_g$ of polyethylene is a chilly -125°C, which is why polyethylene food wrap is flexible at ambient temperatures. Consider the two polymers polyethylene terephthalate (PETE) and polystyrene (PS). Which do you suppose has the higher $T_g$? Dip some bits of these two polymers in boiling water to find out. Also, a common polymer used to make chewing gum is polyvinyl acetate, which has a $T_g$ of about 28°C, which is below body temperature but above room temperature. That's why most chewing gums are hard until they soften up in your warm mouth. Drink ice water while chewing and note how the gum quickly hardens.



## Author Responses to Quick Activities

**Rubbing the Wrong Way**

1. The egg whites and yolk both solidify and become opaque, as if they were cooked. When the proteins in the egg are exposed to isopropyl alcohol, they become denatured. This means that the shape the proteins need in order to be functional is destroyed. Isopropyl alcohol does this by disrupting the intramolecular attractions, discussed in Chapter 13, that occur between different segments of the large protein molecule.

2. The isopropyl alcohol is destructive to the proteins within microbes. The tissues of your mouth and digestive system would be affected in the same way the egg was—not good! The tissues of the mouth and digestive system are mucous membranes, which are different from skin tissues which, as described in Chapter 13, are made from tougher proteins, such as keratin.

3. The isopropyl alcohol alters the proteins of the microbes, which kills them. Skin oils dissolve in isopropyl alcohol, which allows them to be easily wiped away.

**Twisting Jellybeans**

Two carbons connected by a double bond are not able to rotate relative to each other. The structure of butane has many more conformations than that of *cis*-2-butene, which cannot rotate around the double bond.

**Glass Transition**

PETE has a $T_g$ of around 69°C, which is why a PETE 2 liter bottle deforms so easily when placed in boiling water. Ziplock sandwich bags are also commonly made of PETE. People who wash their ziplock bags in hot water (rather than throwing them away) will note that the Ziplock bags are much softer and flexible in hot water than at room temperature. The $T_g$ of polystyrene is around 100°C. This is good news for polystyrene (Styrofoam) coffee cups, which would otherwise not be able to hold hot water very well.