Kémia angolul

Szerkesztő: MacLean Ildikó

Kedves Diákok!

A Kémia angolul fordítási verseny a 2016/2017-es tanévben tovább folytatódik. Remélem, megújult erővel egyre többen küldtök be fordításokat.

A fordításokat a KÖKÉL 2010/4. számának 281-282. oldalán megjelent irányelvek alapján pontozzuk.

Maximálisan 100 pontot lehet kapni hibátlan fordításra. Ha valaki nem tudja befejezni a teljes szöveget határidőre, dolgozatát akkor is küldje be, hiszen a részszöveg fordításával elért pontok is beleszámítanak a pontversenybe.

A pontversenyre benevezni **a http://kokel.mke.org.hu** weblapon keresztül lehetséges, és a fordításokat is csak itt tölthetitek fel.

A pontverseny első három helyezettje jutalomban részesül.

A formai követelményekre ügyeljetek: minden egyes lap bal felső sarkában, a fejlécben szerepeljen a beküldő teljes neve, iskolája és osztálya. Fordításaitokat szaktanárotoknak is érdemes elküldeni a többszöri átolvasást követően.

Beküldési határidő: 2016. november 10.

Jó fordítást, jó versenyzést kívánok!

Exhibition Chemistry

Chirality in sugars

There are a number of classic contexts for teaching about optical activity. There can't be many chemistry classrooms around that haven't heard tell of the rise and fall (and rise) of thalidomide, but of course there are chiral molecules all around us which can also provide simple, effective demonstrations. A classic example is the enantiomers of carvone which give rise to the smells of spearmint and caraway. In sugars however, we find an even more familiar example whose optical properties can be revealed by the use of polarizers.

Kit

- polarizing filters (at least one should be a minimum of 15 cm wide for best effect).
- Four 100 cm^3 beakers
- sucrose (table sugar)
- D-glucose
- Fructose (available from supermarket sugar sections as fruit sugar)
- lemon juice
- heating apparatus
- a backing light consisting of an overhead projector or light box.

Procedure

Preparation

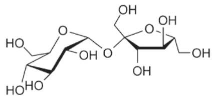
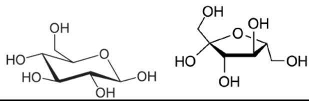
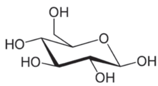
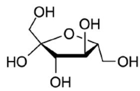
Carefully turn the backing light on its side, ensuring that any cooling fans remain clear. Cover as much of the light with your polarizing filter as is possible. Obscure the rest of the light's surface. This is more for the comfort of the audience and will also avoid you being dazzled. If the rest of the surface is not obscured and the base of the light includes a Fresnel lens, it will be easy for you to stray into the intense light at the focal point during the demonstration which should be avoided. Prepare each beaker by dissolving 40 cm^3 of sugar in 20 cm^3 of warm water (this should be done well in advance of the demonstration as it can take some time). For the demonstration you will need two beakers of sucrose and one each of the other two sugars.

In front of the audience

Dim the lights to improve the contrast between the backing light and the surroundings. The audience should sit so they can see through two polarizers. They can either hold small ones in their hands or you can have a larger one in front of the beakers that you can rotate. ensure that everyone can see that the combination of the two polarizers blocks out the backing light and explain how this works. Show them the fructose solution and point out that (obviously) it isn't glowing. As you place it in front of the light box (and the first filter), the solution will appear to 'light up' as it rotates the polarized light passing through the first filter, into the correct orientation to pass through the second filter. Now add the two sucrose solutions which will also appear to be 'glowing' and ask the audience to begin rotating the second filter. The effect will be that the sucrose solutions and the fructose solution appear to chase each other through the colour changes. This occurs because the component colors of white light experience different rotations according to their individual wavelengths (and according to the differing specific rotations of the solutions), effectively creating a 'rainbow of rotations'. as the second filter is rotated, the viewer will see each of the components of the rainbow in turn. At this point, remove one of the sucrose samples, add approx. 1 cm3of lemon juice and gently boil it for 5 minutes. This provides a good break in which to explain to the students what they were seeing. When the sucrose has finished boiling, return it to the backing light between the other sucrose and the fructose. When the second polarizer is rotated this time, the colour changes associated with the boiled sucrose will come between the colour changes of the other two. A wave of blues, purples and yellows will move across the backing light from one side to the other.

Demonstration points

There are a number of points to demonstrate here. Firstly, that sucrose and fructose both rotate plane polarized light because they are chiral. sucrose and glucose are both dextrorotatory hence the latter also being known as 'dextrose'. Fructose (lesser known as 'levulose') is levorotatory (and more strongly so than glucose is dextrorotatory although this will not be particularly obvious in this qualitative demonstration). Following hydrolysis, the sucrose will begin to form invert sugar syrup – so named because the resulting mixture of fructose and glucose is now levorotatory instead of dextrorotatory. In the production of invert syrup, the progress of the reaction is actually followed by polarimetry. Students can be invited to compare the specific rotation of invert syrup with the figures for its components.

Sugar	Structure	Specific Rotation
Sucrose		+66,5°
Invert(ed) sugar syrup (glucose+fructose)		–39° (when fully hydrolysed)
Glucose (D-glucose or dextrose)		+52,7°
Fructose (levulose)		–92°

The optical activity is not the result of any specific chiral centre but a property of the molecule as a whole. This is clearly seen by the fact that sucrose and invert syrup rotate so dramatically differently despite being so similar in terms of their internal framework.

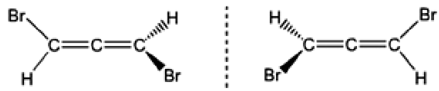
And let's see some extra text to translate:

Unusual cases of chirality

As a general rule of thumb, chiral molecules must have at least one chiral center--that is, a carbon that has four unique substituents coming off of it. However, like most rules of thumb, there are exceptions, and there are indeed examples of chiral molecules that have no chiral centers, a few classes of which are mentioned below.

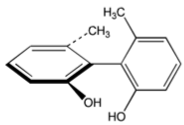
The Allenes

Allenes, for example, compounds containing side-by-side double bonds, can be separated into enantiomers, even though there are no chiral centers. The central carbon in an allene is sp hybridized and the substituents at either end are orthogonal to one another, with one side of substituents going up and down in the vertical plane, and the other side coming into and out of the horizontal plane. Because of the rigidity of the double bonds, free rotation cannot occur at normal temperatures and pressures, and there is no interconversion between the two enantiomers, and they can be separated from each other.



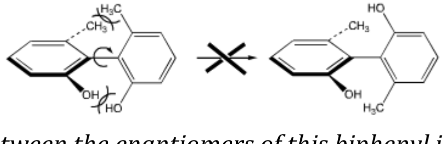
The Biaryls

Another class of compounds that can be chiral despite a lack of a chiral center is the bi-aryls. Bi-aryls, compounds that have two aromatic rings joined by a single bond, can be chiral if they have bulky groups in their ortho positions that provide a barrier to the single bond free rotation.



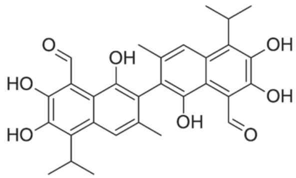
A biphenyl that can be separated into enantiomers

These compounds are chiral because the steric bulk of the groups in the ortho positions provide a large energy barrier to the free rotation around the carbon-carbon single bond, and the conformations are not easily interconverted. Such stereoisomers that can be interconverted through a single bond rotation are called atropisomers. Butane, for example, has conformations that are atropisomers; however, unlike the biaryls, the barrier to rotation is so small that they are interconverted rapidly at room temperature, and they are, for practical purposes, achiral.



Interconversion between the enantiomers of this biphenyl is extremely slow at room temperature because of the high barrier to rotation.

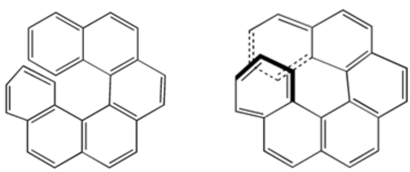
A practical application of such enantiomerism is gossypal, a binapthalene derivative, and a natural product that can be separated into enantiomers because the barrier to free rotation around the single bond is so high. One enantiomer of this compound (shown below) was investigated by pharmaceutical companies for use as a male contraceptive drug. Unfortunately, it was abandoned because while it was shown to be successful as a contraceptive, it was also found to be toxic (so in a sense unintended by the pharmaceutical companies, it is perhaps the ultimate contraceptive!).



Gossypol, a natural product

The hexahelicenes

The hexahelicenes are also an interesting case of chirality. Hexahelicenes are large polycyclic aromatic hydrocarbons, that, in theory, are flat because each carbon is sp2 and planar. In reality, the aromatic rings are not flat, and wind into helices of either a clockwise or counterclockwise rotation. In that sense, they are similar to screws, which can be twisted in using either a clockwise or counterclockwise motion of the screwdriver depending on which way the threads are aligned



Forrás:

http://www.rsc.org/education/eic/issues/2012January/chirality-in-sugars.asp

http://www.chemhelper.com/unusualchirality.html