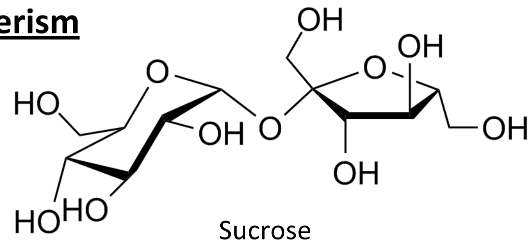
Introduction to Optical Isomerism



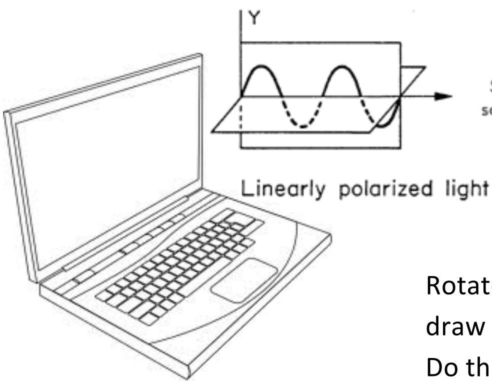
Sucrose

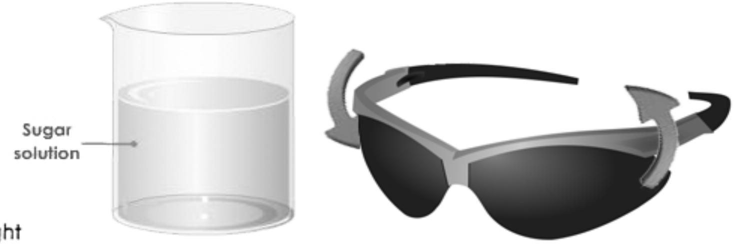
Things you will need:

Access to a laptop (or flat screen monitor)
A pair of polarising sunglasses (or polarising lens)
A glass container (anything will do)
Sugar
Warm Water
A Modelling Kit

There are three parts to this sheet – work through them in order. You should not need to make notes as you can read all the key points later – you just need to try to get to grips with what is going on…

1) **You need to know that optical isomers can be identified because they rotate the plane of plane polarised light**. This is a fact, but what does it mean? Well don't worry – it is just a property like boiling point or electron spin. It can be observed easily (given the right conditions). Set up your equipment like the diagram below:



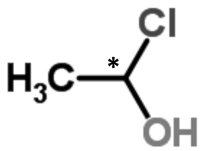


Rotate the sunglasses until they block the most polarised light – draw a line on the glass showing the angle you had to hold them. Do this with water and then sugar solution; is the angle the same?

If you have time, repeat this experiment with honey dissolved in the water instead of sugar. Do you get the same or different result? See the box at the bottom for more information about this part of the experiment.

2) So when we do we get optical isomerism? There are several situations where it can occur, and you will need to know several of these, but for today we can simplify things and say;

Optical isomerism is observed when we have a chiral carbon
(this is a carbon that has 4 different groups attached to it) like this one →



Using your modelling kit build a model of 1-chloroethanol (above). Compare your model with people around you. Are they the same? Are they different? How are they different? Consider holding the models on top of each other and checking the positions of the groups. With luck you will notice that some models are not quite the same. The groups are arranged as a mirror image of each other – this is what optical isomerism looks like!

3) If you have the time, build a model of sucrose using the skeletal diagram at the top – don't worry if you find this hard, it won't be in the exam! Can you find the chiral carbon(s) that caused the light to rotate in part 1. Answers are below – you might need help from your teacher to explain them all, but should spot the ones marked **!

Part 1 (the extension experiment)	Part 3 Answers (upside down, * marks a chiral carbon)
Honey is a hydrolysed version of sucrose. It contains a mixture of fructose and glucose (you can make this yourself by boiling your sucrose solution with lemon juice to catalyse the hydrolysis). Fructose and glucose each show optical isomerism and we see and average of the two rotations – what's interesting is this average is different from sucrose!