Chemistry 255 **Class Exercise – Stereochemistry** **Summer 2014**
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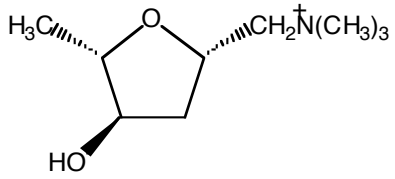
1. Dorothy Sayers, the famous mystery writer, wrote a novel called *Documents in Case* in which a murder was solved by a chemist using a polarimeter. The protagonist in the novel, a mushroom expert, was found slumped dead over a plate of poisonous *Amanita muscaria* mushrooms that he had apparently just fixed for supper on the stove. However, his son was convinced that Dad would never mistake the poisonous mushrooms for edible ones. On returning to England from America, the son demanded that the police reopen the case. He persuaded the authorities to exhume the body. They extracted the muscarine poison from the corpse and placed a solution of it in a polarimeter. The detective looked through the eyepiece and saw no deviation of the plane of polarization. "Aha", he declared, "your father was murdered!" How did the detective come to this conclusion?



Muscarine

2. Tartaric acid [$HO_2CCH(OH)CH(OH)CO_2H$] was an important compound in the history of stereochemistry. Two naturally occurring forms of tartaric acid are optically inactive. One form has a melting point of 206ºC, the other a melting point of 140ºC. The inactive tartartic acid with a melting point of 206ºC can be separated into two optically active forms of tartaric acid with the same melting point (170ºC). One optically active tartaric acid has $[\alpha]_D^{25} = +12°$, and the other, $[\alpha]_D^{25} = -12°$. All attempts to separate the other inactive tartaric acid (melting point 140ºC) into optically active compounds fail. (a) Write the three-dimensional structure of the tartaric acid with the melting point of 140ºC. (b) What are the possible structures for the optically active tartaric acids with melting points of 170ºC? (c) Can you be sure which tartaric acid in (b) has a positive rotation and which has a negative rotation? (d) What is the nature of the form of tartaric acid with a melting point of 206ºC?