

Superposition Pale Ale tasting sheet; ASMbly lab 2014

1. What colour is your beer on the SRM scale?

SRM Beer Color Chart



2. Is your beer cloudy or clear?

3. Does your beer have a good head of foam on top?

4. Does your beer smell woody, herby or floral?

5. Does your beer smell like a skunk?

6. Does your beer taste bitter?

7. Does your beer taste of butterscotch?

8. Does your beer taste of fruity, like pears?

9. Does your beer taste sour?

10. Does your beer taste or smell of banana?

11. Does your beer taste solvent-like?

12. How would you rate this beer compared to other commercial beers you have tried?

Think about which of the above characteristics might be desirable or undesirable in your beer.

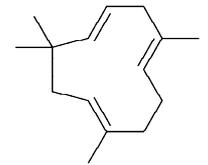
Turn over to find out how these visual aspects, aromas and flavours likely arise in your beer and whether they would be considered good or bad characteristics in this brew.

1. Our beer is, based on its recipe, predicted to have an **SRM of about 6**. This colour comes from the malted barley used in the mash that provides the sugars for the yeast to ferment to alcohol. Much darker colours would likely occur due to nonenzymatic browning caused by caramelisation of sugars or Maillard reactions between sugars and proteins during the boil (this is similar to the browning reactions that take place in a piece of steak when it is cooked). For a beer, we want to keep these caramelisation and Maillard reactions to a minimum.

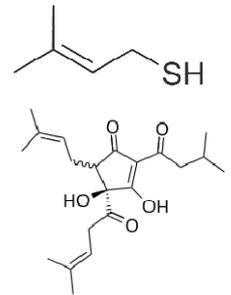
2. We were **aiming to make our beer as clear as possible** for aesthetic reasons. We used Irish Moss in the brew to minimise haze proteins, we used a highly flocculant strain of yeast and we cold crashed our beer to promote sedimentation of yeasts and haze proteins out of solution. However, if it still appears cloudy then don't worry, this is fairly normal for home brewed beer and is only aesthetic; it won't affect the overall taste significantly.

3. We used torrified wheat in the mash to get a good protein content to stabilize the beer foam. The beer is well hopped, where hop extracts also help to stabilize beer foam. Yesterday we forced carbonated the beer with CO₂. A weak head might be a sign that the Irish Moss and cold crashing steps removed too many of these surface active molecules that stabilize the beer foam. Hopefully you are enjoying a **good head of foam** on your beer.

4. Earthy, floral, spicy and woody aromas come from the essential oils in the hops. Our WGV hops may be giving you a slight piney/citrus aroma to the beer. **Humulene** is one of the most abundant essential oils in hops that gives a woody/earthy and even peppery character to the beer.

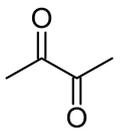


5. Oh dear! Beer skunkiness is associated with "**light-struck flavour**". It occurs when the beer is exposed to direct sunlight. Blue/UV light causes the photocleavage on one of the hop's bittering agents, isohumulone, in the presence of riboflavin (vitamin B₂) that results in the production of **3-methyl-2-butene-1-thiol (MBT)**, which is a major constituent of a skunk's scent!

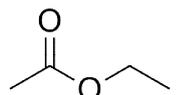


6. We hope so. The isomerisation of alpha acids in the hops to **iso-alpha acids** gives the beer its bitter flavour. Our beer is very hoppy for its style with an estimated 46 IBU.

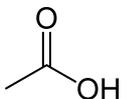
7. Oh dear! Buttery and butterscotch flavours aren't usually seen as favourable in beers. **Diacetyl** is a by-product of the yeast metabolism during fermentation. Higher quantities are produced when fermenting at higher temperatures. Normally the yeast would "clean up" after itself and break down most of the diacetyl once fermentation is complete. We did not have time for a diacetyl rest in our speed brewing experiment.



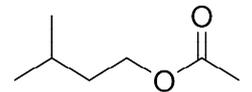
8. This is ok! **Ethyl acetate** is a natural minority by-product of the yeast fermentation and gives a fruity, pear-drop flavour to the beer in low concentrations that is often a characteristic of English ales.



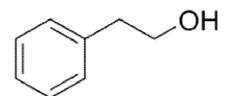
9. Yikes! This likely means that our beer became contaminated with natural bacteria and yeasts that have formed lactic acid or oxidised alcohol to form **acetic acid** (vinegar!).



10. Banana flavours can be another product of the natural esters (for banana this is **isoamyl acetate**) produced by yeast strains. It is very common in Belgian wheat beer strains but should be less pronounced in an English style ale. However speed brewing our beer (fermenting as warm as possible and no rest time for the beer to mature) is likely to lead to a higher element of fruity flavours in our final beer.



11. That's not so good! There are a few possible reasons for this. One is that the ethyl acetate concentration is too high giving the beer solvent undertones. Also fusel alcohols (e.g. butanol, **phenoethyl alcohol**) give a harsh alcohol aftertaste. These are also by-products of yeast metabolism and often occur when fermentation takes place outside of the optimal temperature range for the yeast strain.



12. We hope you enjoyed the beer and learnt something about the science behind how it looks, tastes and smells.

For more information on the brewing of Superposition Pale Ale and amazing beer science facts, **visit our blog** at:

<http://bioleeds.wordpress.com/2014/08/30/superposition-pale-ale-asmby-2014/>