**Learning Assessment!**

**Wine Profiling by NMR – Ages 18 and older**

*Note: Data collected is anonymous   
and will be used for research purposes.*

1. What did you learn about how NMR spectroscopy can be used to study wine?

No specific answer key here but example answers could be:  
- For quality control  
- To determine the chemicals present in wine  
- To determine regionality, wine class, wine characteristics  
- To uncover fraud and adulteration

1. List 3 chemical components of the wine you learned about from the profiling experiments:
   1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

See example of document for list

1. How will what you learned today influence your future wine selections?

No specific answer key here but example answers could be:

- N/A – not a wine drinker or similar  
- It provides confidence in current wine choice  
- Can better appreciate where the wine come from, its flavor, aroma, etc  
- Learning chemical components will directly alter my wine choice  
- This new knowledge lets me communicate to others drinking wine

**Learning Assessment!  
Wine Profiling by NMR – Ages 17 and younger**

*Note: Data collected is anonymous   
and will be used for research purposes (with parental support).*

Keep in mind the key here is not great since the students didn’t effectively communicate the correct answers (whoops)

1. **Circle all that apply**: how was the NMR instrument used to study wine today?
   1. to classify wines by region and wine type
   2. to determine the pH of different wines
   3. to understand the chemical components of wine that give it its flavor, aroma, and stability
   4. ~~to determine the cell counts in different wines~~
   5. to check for wine quality and chemical contamination
2. **Circle all that apply**: which of the following chemicals can be found in many wines?
   1. ~~halogenated acids, such as hydrochloric acid~~
   2. alcohols, such as ethanol
   3. sugars, such as glucose
   4. amino acids, such as proline
   5. organic acids, such as acetate
   6. ~~organic solvents, such as chloroform~~
3. Short answer: What do you think was the coolest or funnest part of the demo?

No specific answer key here but example answers could be:

- Smelling the wines  
- Seeing the magnet / machine work  
- Seeing the components of wine  
- Seeing scientists

List of wine components

* General

alcohols

organic acids

amino acid

sugars

nucleobases/nucleotides

vitamins

polyphenols (flavonols, flavanones, isoflavones, flavones, tannins)

wine “faults”

* Specific Compounds

|  |
| --- |
| Adenine |
| Acetate |
| Betaine |
| beta-Alanine |
| Acetoacetate |
| Carnitine |
| Citric acid |
| Choline |
| Xylose |
| Ethanol |
| 4-Aminobutyrate |
| Glucose |
| Glycerol |
| Fumarate |
| Formate |
| Galactose |
| Ethanolamine |
| Malate |
| Tyrosine |
| Phenylalanine |
| Alanine |
| L-Proline |
| Asparagine |
| Lactic acid |
| Aspartate |
| Oxoglutarate |
| myo-Inositol |
| Ornithine |
| Pyruvate |
| Succinate |
| Sucrose |
| Pyroglutamate |
| Uracil |
| 2-Hydroxyglutaric acid |
| Arabinose |
| Fructose |
| Indole-3-lactate |
| Leucine |
| Methionine |
| Propanol |
| Trigonelline |
| Ferulate |
| Tartarate |
| Acetone |
| Epicatechin |
| Methanol |
| Caffeate |
| Syringate |
| Cadaverine |
| Galacturonate |
| Catechin |
| Shikimate |
| 2,3-Butanediol |
| Acetoin |
| Tyrosol |
| Gallate |
| Isobutanol |
| Isoamylalcohol |
| Caftarate |
| Ethyl acetate |
| 2-Methylbutanol |
| Phenylethanol |
| Ethyl lactate |
| Acetaldehyde (bisulfite) |
| 1,3-Propanediol |
| Phasing compound |
| Phasing compound |
| DSS |