

FD SC 4300 Prelim 1

February 24, 2009

Directions: All questions will be equally weighted (2 points each)

Fill in the letter corresponding to the best answer for each question on the answer sheet provided. Please hand in only the answer sheet. You may keep the questions.

1. Red wines from a particular region are described as having an "earthy", "barnyard" and "vegetative" aromas. Which one of these statements is **least** likely to explain how these aromas could be associated with this wine region?

- a. The poorly-drained, nutrient-rich soils result in fast growing vines, which shades the fruit and changes the fruit chemistry such that more vegetative smelling compounds are present at harvest.
- b. Volatile aroma compounds with "earthy" aromas are taken up from the region's clay-heavy soils through the roots, transported via the xylem, and accumulate in the fruit.**
- c. Local winemakers do not inoculate their red wines, nor do they sanitize their oak barrels, and the native micro-flora generate "earthy, vegetative, barnyard" aromas during fermentation and storage.
- d. The region has a high density of pig farms, which continuously release volatile aroma compounds into the local vineyards. These aroma compounds could be absorbed onto the berry, or absorbed into the berry and stored as glycosides.

2. Which of these statements about 1,1,6-trimethyldihydronaphthalene (TDN) is **not** true?

- a. The concentration of TDN in wine generally increases with increasing storage time in bottle
- b. The aroma descriptors associated with TDN are usually "petrol, rubber, kerosene"
- c. Higher levels of TDN are usually associated with hotter, sunnier climates
- d. TDN precursors in grapes and wines are likely formed by degradation of specific grape proteins**

3. The tropical and cat pee aromas of Sauvignon Blanc are associated with what kind of flavor precursor?

- a. Volatile phenols bound to sugars to form glycosides
- b. Hydrolysis of thiols that exist as S-conjugates of cysteine, an amino acid**
- c. Monoterpenes bound to sugars to form glycosides
- d. Unsaturated fatty acids found in the grape cell walls

4. Floral aromas in Riesling and Muscat are associated with what kind of flavor precursor?

- a. Hydrolysis of volatile phenols bound to sugars to form glycosides.
- b. Hydrolysis of monoterpenes bound to sugars to form glycosides.**
- c. Enzymatic degradation of unsaturated fatty acids found in the grape cell walls
- d. Hydrolysis of thiols that exist as S-conjugates of cysteine, an amino acid.

5. Which statement about glutathione is **incorrect**?
- It is an antioxidant found both in plants and in animals.
  - It can form conjugates with toxic compounds, and the resulting conjugate will have reduced solubility compared to the original compound.**
  - It is a putative precursor to S-cysteine conjugates, which are in turn a precursor to volatile thiols.
  - It can form conjugates with toxic compounds in grapes, reducing the toxicity of these compounds.
6. Which one of these statements about the chemical ecology of grapes is **least supported** by existing data?
- The strong weasel-like aromas of *V. labrusca* (i.e. "Concord"-type) grapes evolved to discourage consumption by birds
  - The small berry size and upward growth pattern of wild *V. vinifera* indicates that its seeds were likely initially dispersed by birds
  - The partial hydrolysis of S-cysteine conjugates in most *V. vinifera* wine grapes during ripening is likely to release aromas attractive to bird frugivores**
  - V. vinifera* grapes with high levels of "bound" volatiles were likely selected for by human winemakers, as this property is desirable for winemaking but not for frugivores
7. Which of these statements about "free" and "bound" compounds in winegrapes is **not true**?
- The term "glycoside" refers to a compound, including aroma compounds, bound to sugars
  - Enzyme preparations to convert "bound" compounds in wines to "free" compounds are available to winemakers
  - Secondary aromas in wines are associated with "free" aroma compounds in grapes that are not degraded during winemaking**
  - The majority of monoterpenes in freshly pressed juice exist as glycosides
8. Concord grapes are:
- Native to Europe and grow as small vines
  - Native to North America and grow as small vines
  - Native to Europe and grow as big vines
  - Native to North America and grow as big vines**
9. Riesling grapevines in New York state are:
- Growing onto their own roots
  - Grafted onto rootstocks to keep them small
  - Grafted onto rootstocks that are resistant to the phylloxera root pest**
  - Grafted onto rootstocks that are resistant to weasels

10. Growing degree days are calculated to compare growing conditions in different viticulture regions. Growing degree days are calculated:
- Based on temperatures above 50° F, because grapevines grow when temperatures are above 50° F**
  - Based on temperatures of 28° F, because that's the optimal temperature for photosynthesis
  - Based on temperatures of 28° F, because green tissue freezes at temperatures below that
  - Based on temperatures of 90° F, because that's the optimal temperature for photosynthesis
11. A common hybrid grape cultivar grown in New York state is:
- Riesling
  - Seyval blanc**
  - Niagara
  - Albariño
12. Malt is a major contributor of all of the following to the beer making process except:
- Yeast nutrition
  - Processing aid
  - Processing difficulties
  - Bitterness**
13. The bitterness potential and the essential oils of hops are contained in the:
- Leaves
  - Lupulin glands**
  - Stems
  - Seeds
14. Beer ingredients always include:
- Malt, hops, water, and yeast**
  - Malt, hops, and yeast only
  - Malt, adjunct, hops, yeast, and water
  - Malt, adjunct, yeast, and water
15. Which is true about adjuncts in brewing?
- Adjuncts provide acids as nutrients for yeast
  - There are 20-35% adjuncts in German beers
  - Adjuncts provide some proteins and most minerals that help produce foam
  - Brewing adjuncts include syrups, sugars, and starches**

16. In brewing, a lauter tun:
- Uses malt husks as a filter medium**
  - Is used to boil the wort
  - Is the main site of enzymatic digestion
  - Is the vessel to which hops are added
17. During beer production, mashing is a step during which enzymes
- Make colored compounds
  - Produce most of beer flavor
  - Produce nutrients for yeast**
  - Are quickly inactivated
18. What is the correct order of steps in the traditional brewing process?
- Milling, malting, mashing, lautering, hopping, clarifying, fermenting
  - Malting, milling, lautering, mashing, hopping, clarifying, fermenting
  - Malting, milling, mashing, lautering, hopping, fermenting, clarifying**
  - Milling, malting, mashing, hopping, lautering, fermenting, clarifying
19. By the end of the malting process, the moisture content of the finished malt is:
- 42-46%
  - 11-12%
  - 6-10%
  - 3-5%**
20. What is a main purpose of fermentation on the skins when making red wine?
- To lower acidity
  - To extract color from skins**
  - To increase sugar content
  - To avoid oxidation and contamination before fermentation
21. You are trying to make a delicate red wine from Pinot Noir grapes. In order to achieve this style, you would be likely to use all of the following operations **except**:
- Punchdowns
  - Crushing the grapes
  - Rack-and-returns**
  - Putting the grapes in stainless steel tanks
22. Identify the typical sequence of events in white winemaking:
- Pressing → Clarification → Alcoholic Fermentation → Stabilization → Bottling**
  - Clarification → Crushing → Alcoholic Fermentation → Pressing Off → Bottling
  - Harvest → Malolactic Fermentation → Stabilization → Pressing → Destemming
  - Alcoholic fermentation → Whole cluster press → Fining → Bottling

23. Before concerns about the health impacts of high SO<sub>2</sub>, it was not uncommon to add high levels of sulfites at the start of or during winemaking. What metabolic shift occurs if acetaldehyde is scavenged by SO<sub>2</sub> during anaerobic degradation of sugars in yeast?

- a. **Dihydroxyacetone phosphate is reduced to glycerol-3-phosphate to regenerate NAD<sup>+</sup> and this leads to increased formation of glycerol**
- b. Acetaldehyde is reduced to ethanol and thus leads to the reoxidation of dinucleotides (NADH to NAD<sup>+</sup>), thus maintaining glycolysis.
- c. Dihydroxyacetone phosphate is reduced to ethanol to regenerate NAD, thus maintaining glycolysis
- d. Acetaldehyde is reduced to glycerol-3-phosphate leading to the reoxidation of dinucleotides (NADH and NAD<sup>+</sup>) leading to decreased formation of glycerol

24. What is **not** a main effect of malolactic fermentation?

- a. **Increase the production of alcohol**
- b. Increasing microbiological stability
- c. Acid reduction
- d. Aroma modifications

25. Which of the following microorganisms is the primary species involved in successful alcoholic fermentations in beer and wine?

- a. *Brettanomyces buxellensis*
- b. ***Saccharomyces cerevisiae***
- c. *Zygosaccharomyces spp.*
- d. *Oenococcus Oeni*

26. Which of the following is **not** a likely effect of wine production in a hot climate?

- a. Higher alcohol
- b. Higher sugar
- c. **Higher acidity**
- d. Higher pH

27. Why are musts with very high sugar concentrations more likely to create problems with slow or stuck fermentations?

- a. High sugar levels lower the pH, and yeast cannot live at low pH levels
- b. **High sugar levels create an osmotic stress response in yeast, which may inhibit their growth.**
- c. High sugar levels cause reactions with acetaldehyde and tannins in the must to produce acetyl-tannin glycosides, which are toxic to yeast
- d. High sugar levels can lower the must temperature to as low as 10° C, at which point yeast die

28. If you would like malolactic fermentation to occur in your wine, what would you **not** do?

- a. Warm up the wine
- b. Add a starter culture
- c. **Add SO<sub>2</sub> to kill off other microorganisms**
- d. Make a nutrient addition

29. What is DAP?

- a. An antimicrobial agent used in high-gravity worts
- b. A pesticide used to kill leaf mites
- c. The compound responsible for “diesel” aroma in Riesling
- d. **A kind of Nitrogen must nutrient**

30. Which of these sensory attributes is detected by the chemesthetic receptors on the trigeminal nerve?

- a. **Astringency**
- b. Sweet
- c. Umami
- d. Sour

31. Among the thousands of chemicals found in grape juice and wine a few have biological activities and some of these are present in trace levels. Among those chemicals present at less than the picogram level ( $<10^{-12}$  g/L) are those that are:

- a. Intoxicating
- b. Fattening
- c. Tastants
- d. **Odorants**

32. The chemical process introduced sometime after the classical Greek period that allowed for the chemical protection of wine in storage was:

- a. The addition of pure sugar and acid.
- b. The addition of pine pitch.
- c. **The burning of brimstone to make SO<sub>2</sub> inside the storage vessel.**
- d. The introduction of ceramic glaze as an oxygen barrier.

33. The Hellenic Greeks diluted wine with water in the golden ratio, 1.6:1. Why did they dilute?

- a. **Undiluted wines were undrinkably acidic.**
- b. Adding water to the wine helped improve the wine’s aroma.
- c. Undiluted wines were too high in alcohol, and not conducive to prolonged drinking.
- d. Dilution inhibited microorganisms that converted wine into vinegar.

34. What is the primary organic acid found in finished wine?
- Malic acid
  - Lactic acid
  - Tartaric acid**
  - Ascorbic acid
35. Where did we get much of our information about the way that Greeks produced wine?
- Phoenician sailing records
  - Depictions on amphorae**
  - Descriptions on the Rosetta stone
  - Papyri in Greek burial tombs
36. All of the following reactions commonly occur in wine during production or storage **except**:
- Glucose  $\rightarrow$  Ethyl alcohol + CO<sub>2</sub>
  - Malic acid  $\rightarrow$  Lactic acid + CO<sub>2</sub>
  - Ethyl alcohol + Oxygen  $\rightarrow$  Acetaldehyde
  - Ethyl alcohol + glycerol  $\rightarrow$  Ethyl acetate**
37. What is the compound responsible for the “passion fruit” aroma present in many Sauvignon Blancs?
- 3-mercaptohexanol (3-MH)**
  - 2,4,6-trichloroanisol (TCA)
  - 2-isobutyl-3-methoxypyrazine (IBMP)
  - Hydrogen sulfide (H<sub>2</sub>S)
38. Sensory perception has two parts: \_\_\_\_\_ and \_\_\_\_\_.
- Greenness and fruitiness
  - Chemesthesis and flavor
  - Quality and intensity**
  - Ophthalmicity and Mandibularity
39. Which of these is **not** a component of chemesthesis?
- Astringency
  - Hotness/Coolness
  - Pungency
  - Sourness**
40. When tasted at equal concentrations, \_\_\_\_\_ tastes sweeter than \_\_\_\_\_.
- Amylose...Lactose
  - Glucose...Sucrose
  - Fructose...Glucose**
  - Sucrose...Fructose

1. (Extra Credit) No test question is perfect.

For this question, please ask yourself a question that is something you studied for this exam, but was not asked above. Please write your question and answer on the attached answer sheet. Only complete questions and answers will be accepted to receive full credit (it does **NOT** need to be multiple-choice).

2. (Extra Credit) No test question is perfect.

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**Almost any acceptable question AND answer was accepted.**