

CH 102 Practice Exam 2

PCC-Sylvania

True/False

Indicate if the statement is true or false.

- _____ 1. Tertiary alcohols are not easily oxidized.
- _____ 2. Secondary alcohols can be oxidized to aldehydes.
- _____ 3. Primary alcohols can be oxidized either to aldehydes or carboxylic acids.
- _____ 4. Alcohols can form either alkenes or ethers upon dehydration.
- _____ 5. Thiols are easily oxidized to disulfides.
- _____ 6. Thiols are important in proteins.
- _____ 7. Phenol earned a place in history as an antiseptic.
- _____ 8. The IUPAC name for formaldehyde is methanal.
- _____ 9. The simplest ketone has three carbon atoms.
- _____ 10. Acetone is the common name for 2 propanone.
- _____ 11. Aldehydes are easier to oxidize than ketones.
- _____ 12. The smallest carboxylic acid is formic acid.
- _____ 13. The carboxyl group found in carboxylic acids must be on a terminal carbon, like the carbonyl of an aldehyde
- _____ 14. Carboxylic acids have the functional groups found in both aldehyde / ketones and alcohols.
- _____ 15. Pure liquid carboxylic acids are strongly hydrogen bonded.
- _____ 16. Butyric acid is composed of a molecule that is small enough to evaporate from the liquid state at room temperature and, therefore, stinks.
- _____ 17. Carboxylic acids are weaker acids than HCl.

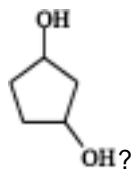
- _____ 18. Carboxylic acids react readily with sodium hydroxide to form salts.
- _____ 19. The other product in the formation of an ester from an acid and an alcohol is water.
- _____ 20. "O ic acid!" is a silly way to remember how to name a carboxylic acid

Multiple Choice

Identify the letter of the choice that best completes the statement or answers the question.

- _____ 21. What is the functional group that distinguishes alcohols?
- a) carboxyl
b) carbonyl
c) hydroxy
d) amide
- _____ 22. Which statement about both glycerol (1,2,3-propanetriol) and ethanol is true?
- a) They both contain 3 carbons in the skeleton.
b) They both are tertiary alcohols.
c) They both take part in hydrogen bonding
d) Glycerol is a triol while ethanol is a diol.
- _____ 23. What is the correct IUPAC name
- $$\begin{array}{c} \text{CH}_3\text{CH}_2\text{CHCH}_2\text{CH}_3 \\ | \\ \text{CH}_2 \\ | \\ \text{OH} \end{array}$$
- for _____ ?
- a) 3-methylpentanol
b) 2-ethyl-1-butanol
c) 2-ethylbutanol
d) 1-ethyl-2-butanol

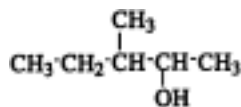
_____ 24. What is the correct IUPAC name



for

- a) 1,3-cyclopentadiol
- b) 1,4-cyclopentanediol
- c) 1,3-cyclopentanediol
- d) 1,4-cyclopentadiol

_____ 25. What is the correct classification



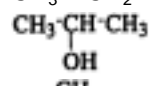
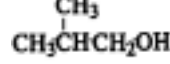
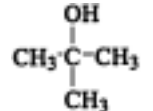
for this alcohol?

- a) primary
- b) secondary
- c) tertiary
- d) quaternary

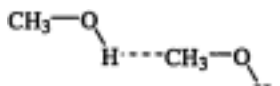
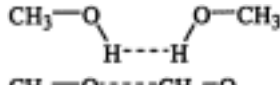
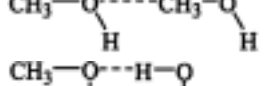

_____ 26. Which of the following compounds is correctly classified as a tertiary alcohol?

- a) 3-methyl-1-butanol
- b) 2-methyl-1-butanol
- c) 3-methyl-2-butanol
- d) 2-methyl-2-butanol

_____ 27. Which of the following is a secondary alcohol?

- a) $\text{CH}_3\text{—CH}_2\text{—OH}$
- b) 
- c) 
- d) 

_____ 28. Which of the following best represents hydrogen bonding in methanol?

- a) 
- b) 
- c) 
- d) 

_____ 29. Which of the following would be the least soluble in water?

- a) 1-propanol
- b) 2-propanol
- c) 1,5-pentanediol
- d) 1-hexanol

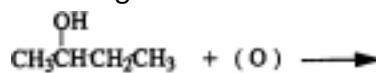
_____ 30. Which compound would be most soluble in water?

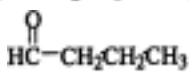
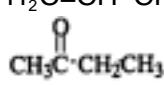
- a) $\text{CH}_3\text{—O—CH}_2\text{—CH}_2\text{—CH}_3$
- b) $\text{CH}_3\text{—CH}_2\text{—CH}_2\text{—CH}_2\text{—CH}_3$
- c) $\text{CH}_3\text{—CH}_2\text{—O—CH}_2\text{—CH}_3$
- d) $\text{CH}_3\text{—CH}_2\text{—CH}_2\text{—CH}_2\text{—OH}$

_____ 31. Which of the following would be made from an alcohol by a dehydration reaction?

- a) alkyne
- b) alkene
- c) alkane
- d) alkyl halide

_____ 32. What is the product of the following reaction:



- a) 
- b) $\text{H}_2\text{C=CH—CH}_2\text{—CH}_3$
- c) 
- d) $\text{CH}_3\text{—O—CH}_2\text{—CH}_2\text{—CH}_3$

_____ 33. Oxidation of $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{—OH}$

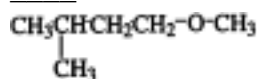
produces $\text{CH}_3\text{CH}_2\text{CH}_2\overset{\text{O}}{\parallel}\text{C—H}$ which may be further oxidized to

- a) $\text{CH}_3\overset{\text{O}}{\parallel}\text{C—CH}_2\text{CH}_3$
b) $\text{CH}_3\text{CH}_2\text{CH}_2\overset{\text{O}}{\parallel}\text{C—OH}$
c) $\text{H}_2\text{C=CH—CH}_2\text{—CH}_3$
d) $\text{CH}_3\text{—O—CH}_2\text{—CH}_2\text{—CH}_3$

_____ 34. When phenol dissolves in water, it functions as

- a) a weak base
b) a weak acid
c) an oxidizing agent
d) a reducing agent

_____ 35. Select the correct IUPAC name of



- a) 3-methyl-1-methylbutane
b) 1-methoxy-3-methylpentane
c) methyl-3-methylpentyl ether
d) 1-methoxy-3-methylbutane

_____ 36. Oxidation of a thiol produces a

- a) salt
b) aldehyde
c) ketone
d) Disulfide

_____ 37. What structural characteristic is shared by the aldehydes and the ketones?

- a) They both are straight chain compounds.
b) They both are stinky.
c) Aldehydes and ketones both contain a carbonyl group (C=O)
d) Aldehydes and ketones have no shared characteristics.

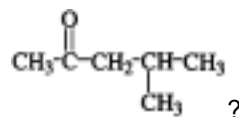
_____ 38. In the IUPAC nomenclature system, the name of which of the following would end in *-al*?

- a) an alcohol
b) an aldehyde
c) an alkane
d) a ketone

_____ 39. In the IUPAC nomenclature system, the name of which of the following would end in *-one*?

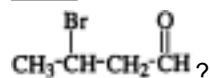
- a) an alcohol
b) an aldehyde
c) an alkane
d) a ketone

_____ 40. What is the IUPAC name for



- a) 2-methyl-2-pentanone
b) 2-methyl-4-pentanone
c) 4-methyl-2-pentanone
d) methylethylpentanononone

_____ 41. What is the IUPAC name for



- a) 3-bromobutanal
b) 2-bromobutanal
c) 3-bromobutanone
d) 2-bromobutanone

_____ 42. Acetone has the structure

- a) $\text{CH}_3\text{CH}_2\overset{\text{O}}{\parallel}\text{CH}$
b) $\text{CH}_3\text{CH}_2\overset{\text{O}}{\parallel}\text{C—CH}_3$
c) $\text{CH}_3\overset{\text{O}}{\parallel}\text{CH}$
d) $\text{CH}_3\overset{\text{O}}{\parallel}\text{C—CH}_3$

_____ 43. Which of the following products is formed when hydrogen is reacted with 3-methyl-2-butanone?

- a) a primary alcohol
- b) a secondary alcohol
- c) a tertiary alcohol
- d) an acetal

_____ 44. Which of the following is required for a positive Tollen's test?

- a) A methyl ketone.
- b) Any ketone.
- c) A primary alcohol.
- d) An aldehyde.

_____ 45. Predict the resultant compound class when an aldehyde is hydrogenated.

- a) ketone
- b) alcohol
- c) carboxylic acid
- d) no reaction

_____ 46. Which reaction requires platinum as a catalyst?

- a) oxidation of an aldehyde or ketone
- b) hydrogenation of an aldehyde or ketone
- c) reaction of an aldehyde or ketone with an alcohol
- d) All of the responses are reactions that are catalyzed by platinum.

_____ 47. The result of a hydrolysis reaction is

- a) adding water to a compound
- b) splitting a reactant into two components
- c) water as one of the products
- d) one that results in an alcohol

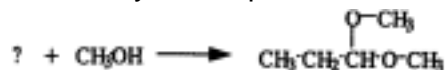
_____ 48. The result of a hydration reaction is

- a) adding water to a compound
- b) splitting a reactant into two components
- c) water as one of the products
- d) one that results in an alcohol

_____ 49. The result of a dehydration reaction is

- a) adding water to a compound
- b) splitting a reactant into two components
- c) water as one of the products
- d) one that results in an alcohol

_____ 50. What starting material (?) is necessary to complete the reaction below?

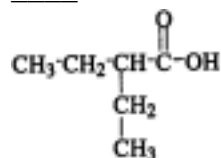


- a) $\text{CH}_3\text{CH}_2\overset{\text{OH}}{\text{C}}\text{H}-\text{O}-\text{CH}_3$
- b) $\text{CH}_3-\text{CH}_2-\text{CH}_2-\text{O}-\text{CH}_3$
- c) $\text{CH}_3-\text{CH}_2-\text{CH}_2-\text{OH}$
- d) $\text{CH}_3\text{CH}_2\overset{\text{CH}_3}{\text{C}}\text{HCH}_3$

_____ 51. The functional group for a carboxylic acid is

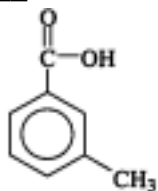
- a) COH
- b) COC
- c) COOH
- d) CHO

_____ 52. A correct IUPAC name for



- a) 3-ethylbutanoic acid
- b) 2-ethylbutanoic acid
- c) 2-pentanoic acid
- d) 2-ethylpentanoic acid

_____ 53. What is the correct IUPAC name



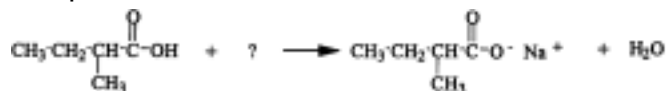
for

- a) 1-methyl-3-benzoic acid
- b) 3-methyl-1-benzoic acid
- c) 3-methylbenzoic acid
- d) 3-methylbenzoate

_____ 54. As $\text{CH}_3\text{C}(=\text{O})\text{OH}$ dissolves in water, H_3O^+ and _____ are formed.

- a) $\text{CH}_3\text{C}(=\text{O})\text{OH}$
- b) $\text{CH}_3\text{C}(=\text{O})\text{OCH}_3$
- c) $\text{CH}_3\text{OH} + \text{CO}_2$
- d) $\text{CH}_3\text{C}(=\text{O})\text{O}^-$

_____ 55. What reagent (?) is necessary to complete the reaction

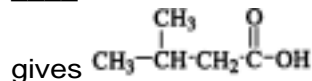


- a) Na
- b) NaCl
- c) NaOH
- d) NaO

_____ 56. A carboxylic acid reacted with an alcohol produces _____

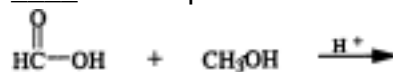
- a) a lester
- b) a hester
- c) an ester
- d) a mess sir

_____ 57. Which alcohol, when oxidized,



- a) CH_3OH
- b) $\text{CH}_3\text{CH}_2\text{OH}$
- c) $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$
- d) $\text{CH}_3\overset{\text{CH}_3}{\text{CH}}\text{CH}_2\text{CH}_2\text{OH}$

_____ 58. A product of this reaction is



- a) $\text{CH}_3\text{O}-\overset{\text{O}}{\parallel}{\text{C}}-\text{OH}$
- b) $\text{CH}_3-\overset{\text{O}}{\parallel}{\text{C}}-\text{O}-\text{CH}_3$
- c) $\text{HC}-\text{CH}_3$
- d) $\text{HC}-\overset{\text{O}}{\parallel}{\text{O}}-\text{CH}_3$

_____ 59. The IUPAC name of the ester formed from butanoic acid and ethanol is

- a) butyl ethanate
- b) butyl ethanonate
- c) ethyl propanoate
- d) ethyl butanoate

_____ 60. The structure of methyl propanoate is

- a) $\text{CH}_3-\overset{\text{O}}{\parallel}{\text{C}}-\text{O}-\text{CH}_2\text{CH}_3$
- b) $\text{CH}_3-\overset{\text{O}}{\parallel}{\text{C}}-\text{O}-\text{CH}_3$
- c) $\text{CH}_3\text{CH}_2-\overset{\text{O}}{\parallel}{\text{C}}-\text{O}-\text{CH}_3$
- d) $\text{HC}-\overset{\text{O}}{\parallel}{\text{O}}-\text{CH}_3$

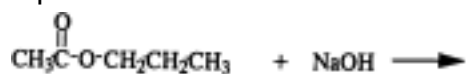
_____ 61. The IUPAC name of the ester formed from methanol and benzoic acid is called

- a) methyl benzoic acid
- b) methanol benzoate
- c) methyl benzoate
- d) benzyl methanoate

_____ 62. Soap is often made by reacting a long chain fatty acid with _____

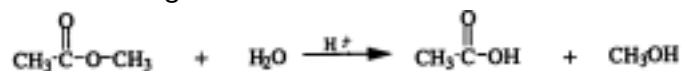
- a) an alcohol
- b) an strong acid, like HCl
- c) a french fry
- d) a strong base, like NaOH

_____ 63. Which of the following materials is a product from the reaction



- a) $\text{CH}_3-\text{CH}_2-\text{OH}$
- b) $\text{CH}_3\text{CH}_2\overset{\text{O}}{\parallel}\text{C}-\text{O}^- \text{Na}^+$
- c) $\text{CH}_3-\overset{\text{O}}{\parallel}\text{C}-\text{O}^- \text{Na}^+$
- d) $\text{CH}_3-\overset{\text{O}}{\parallel}\text{C}-\text{OH}$

_____ 64. Which terms correctly describes the following reaction?



- a) esterification
- b) dissociation
- c) hydrolysis
- d) saponification

_____ 65. The correct order of increasing boiling point for compounds with the same number of carbons is:

- a) hydrocarbons/ethers < aldehydes/ketones < alcohols < carboxylic acids
- b) carboxylic acids < alcohols < aldehydes/ketones < hydrocarbons/ethers
- c) hydrocarbons/ethers < carboxylic acids < alcohols < aldehydes/ketones
- d) carboxylic acids < aldehydes/ketones < alcohols < hydrocarbons/ethers

Answer Section

1. T ease of oxidation of alcohols $1^\circ > 2^\circ > 3^\circ$
2. F
3. T
4. T
5. T egg whites
6. T thiols in proteins: whipped egg whites, and hair perms
7. T
8. T
9. T
10. T
11. T
12. T
13. T
14. T Carboxylic acids contain a carbonyl group ($C=O$) like aldehydes and ketones and a hydroxy group (OH) like an alcohol
15. T
16. T
17. T
18. T
19. T it's a dehydration reaction
20. T it really is...
21. C
22. C
23. B
24. C
25. B
26. D the numbers have to be the same
27. B secondary = the carbon with the OH has to be bonded to 2 other carbons
28. D the O is negative ($-$), and attracted to the H which is positive ($+$)
29. D longer the chain = less soluble in water
30. D alcohols ($R-OH$) can H-bond with water
31. B alkene + water (hydration) \rightarrow alcohol
alcohol - water (dehydration) \rightarrow alkene
32. C 2° alcohol + $O \rightarrow$ ketone
33. B 1° alcohol + $O \rightarrow$ aldehyde + $O \rightarrow$ carboxylic acid
34. B the benzene ring stabilizes the negative charge left when phenol donates its proton (H^+) as an acid
35. D
36. D $R-SH + R-SH + O \rightarrow R-S-S-R$
37. C
38. B aldehyde
39. D ketone
40. C
41. A
42. D
43. B ketone + $H_2 \rightarrow$ a 2° alcohol
44. D
45. B
46. B
47. B
48. A
49. C
50. A
51. C
52. B
53. C
54. D
55. C
56. C
57. D
58. D
59. D ester-ate, ester names: (alcohol \rightarrow alkyl) + carboxylic acid \rightarrow "ate" ie (ethanol \rightarrow) ethyl + (butanoic acid \rightarrow) butanoate
60. C
61. C
62. D
63. C carboxylic acid + a strong base ($NaOH$, KOH) = a carboxylate salt
64. C splitting an ester into an alcohol and a carboxylic acid is dissociation, the opposite of making an ester
65. A