Key - TR

Mock Exam for CH 107 Exam 2. This is a similar format to the exam. Remember to pace yourself with the questions; you do not want to run out of time.

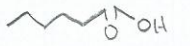
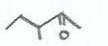
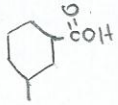
1. What is the IUPAC name for this molecule? $CH_3CH_2CH_2COOH$ — d

   COOH: $-\overset{O}{\overset{\|}{C}}OH$

   a. Butanal
   b. Benzoic acid
   c. Butyl acid
   d. Butanoic acid

   4 = butyl
   : butanoic acid

2. Which of the following molecules have the formula $C_6H_{12}O$ — b

   a. Hexanoic acid — a.  $C_6H_{12}O_2$ X
   b. 3-methyl-2-pentanone — b.  $C_6H_{12}O$ ✓
   c. 4-methyl-3-hexanone — c.  $C_7H_{14}O$ X
   d. 3-methylcyclohexanoic acid — d.  $C_8H_{14}O_2$ X

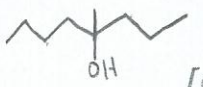
3. Primary alcohols react to form — e

   a. Aldehydes
   b. Ketones
   c. Carboxylic acids
   d. A and B
   e. A and C

   1° alc. $\xrightarrow{[O]}$ aldehydes $\xrightarrow{[O]}$ carb. acid

4. 4-methyl-4-octanol oxidizes to form — d

   a. 4-methyl-4-octanal
   b. 4-methyl-4-octanone
   c. Butyl butanoate
   d. None of the above

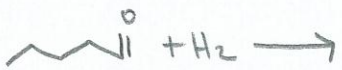
   

   $\xrightarrow{[O]}$ N.R.

   3° alc $\xrightarrow{[O]}$ N.R. - there will be five bonds to Carbon 4 which you can't do!

5. The reduction of pentanal yields — d

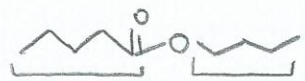
   a. 2-pentanol
   b. Pentene
   c. Pentanoic acid
   d. 1-pentanol

   aldehydes reduce to primary alcohols

6. What is the molecular formula for butyl pentanoate? - an ether — d

   a. $C_9H_{20}O_2$
   b. $C_9H_{18}O$
   c. $C_8H_{16}O_2$
   d. $C_9H_{18}O_2$

   $C_9H_{18}O_2$

   carb. acid part — alcohol part

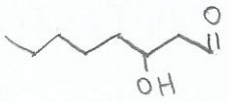
* 7. Which of the following is the R-formula for an ester? — d

   a. R-O-R
   b. R-(CO)-R
   c. R-CHO
   d. R-(CO)-O-R

   $R-\overset{O}{\overset{\|}{C}}-O-R$ ester

8. What is the molecular formula for 3-hydroxyoctanal? c

a. $C_8H_{18}O$
b. $C_8H_{16}O$
c. $C_8H_{16}O_2$
d. $C_8H_{18}O_2$



$C_8H_{16}O_2$

9. _____ and _____ are required to form butyl hexanoate. d

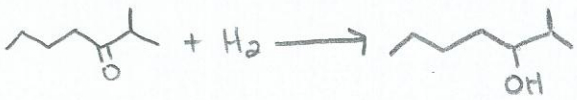
a. Hexanol Butane
b. Hexanol Butanoic acid
c. Butanol Hexanal
d. Butanol Hexanoic acid

carb. acid + alcohol → ester + H_2O

hexanoic acid + butanol

10. The reduction of 2-methyl-3-heptanone will yield c

a. 2-methyl-2-heptanol
b. 2-methylheptanal
c. 2-methyl-3-heptanol
d. Ethyl pentanoate



11. Which of the following will have the highest water solubility? b

a. 2-methylpentanal
b. 1-pentanol
c. Pentane
d. Methyl butyl ether

H_2O solubility:
alcohols > ald./ketones > ethers > alkanes

12. Which of the following is NOT soluble? a

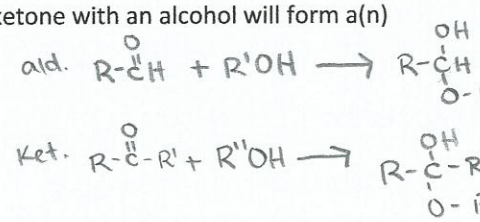
a. 2-hexanone
b. Butanone
c. Pentanal
d. Butanal

as the alkyl chain increases, solubility decreases

Table 14.1

13. The reaction of an aldehyde or ketone with an alcohol will form a(n) b

a. Acetal
b. Hemicacetal
c. Carboxylic acid
d. Ester



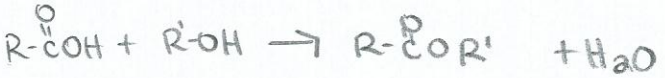
C-O-C-OH

14. What is the name of the reaction between a carboxylic acid and an alcohol? a

a. Esterification
b. Dehydration
c. Oxidation
d. Reduction

15. The reaction of a carboxylic acid with a(n) _____ forms an ester. b

a. Ether
b. Alcohol



c. Alkane
d. Aldehyde

16. What is the name of this molecule? $CH_3CH_2CH_2COOCH_2CH_3$ d

carb. acid alc.

a. Pentyl ester
b. Propyl ethanoate
c. Propyl acetate
d. Ethyl ~~propanoate~~ butanoate

ethyl butanoate

17. These tend to have pleasant odors and are used for flavor. d

a. Ethers
b. Carboxylic acids
c. Carbohydrates
d. Esters

good smell = esters
bad smell = thiols (-SH)

18. The neutralization of acetic acid by KOH produces b

acid + base → salt + water

a. Potassium acetylaldehyde
b. Potassium acetate + H_2O
c. Potassium permanganate
d. Ethyl alcohol

$CH_3\overset{O}{\overset{\|}{C}}OH + KOH \rightarrow CH_3\overset{O}{\overset{\|}{C}}O^-K^+ + H_2O$

19. The reaction of a carboxylic acid with an alcohol with produce a(n) c

a. Ether
b. Carboxylic acid salt
c. Ester
d. Hemiacetal

see number 15

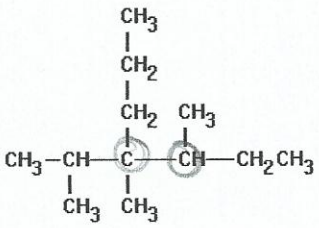
20. The reaction in number 19 is known as c

a. Saponification
b. Neutralization
c. Esterification
d. Reduction

21. Which of the following will alcohols NOT react to form? B

a. Ketones
b. Ethers
c. Aldehydes
d. Carboxylic acids
e. Esters

22. Identify how many chiral carbons are in the following molecule. c



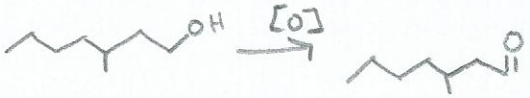
a. 4
b. 3
c. 2
d. 8

23. Which of the following Greek letters refers to carbon number 3 in carboxylic acids? b

a. α
b. β
c. ϒ
d. δ

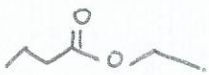
24. The product of the oxidation of 3-methylheptanol is: c

a. 3-methylheptanone
b. 3-methyl-2-heptanal
c. 3-methylheptanal
d. 3-methylheptene



25. Which of the following is the molecular formula for ethyl butanoate? c

a. $C_6H_{10}O_2$
b. $C_7H_{12}O$
c. $C_6H_{12}O_2$
d. $C_6H_{12}O$



$C_6H_{12}O_2$

26. Which of the following is the basis for aspirin and oil of wintergreen? b

a. Acetic acid
b. Salicylic acid
c. Hexanol
d. Formic acid

27. Under acidic conditions, esters hydrolyze to _____ and _____ d

a. Carboxylic acid and a base
b. Carboxylic acid and water
c. Carboxylic acid salt and base
d. Carboxylic acid and alcohol

goes back to what formed it under acidic conditions

ex. $R-\overset{O}{\overset{\|}{C}}-O-R' + H_2O \xrightarrow{H^+} R-\overset{O}{\overset{\|}{C}}OH + R'-OH$

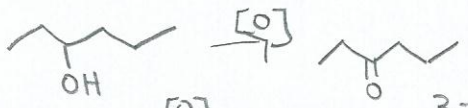
28. Alcohols and ethers are considered to be _____. b

a. Chiral
b. Structural isomers
c. Stereoisomers
d. Enantiomers

they have the same molecular formula but different bonding

29. 3-hexanol will oxidize to form _____. b

a. 3-hexanal
b. 3-hexanone
c. 3-hexanoate
d. No reaction



3-hexanone

(2° alcohol $\xrightarrow{[O]}$ ketone)

30. Tertiary alcohols can react to form: e

a. Aldehydes
b. Ketones
c. Carboxylic acids
d. A and c
e. No reaction

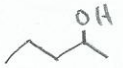
Short Answer: Answer any 4 of the following 6 questions. If you do all 6, he will only grade the first 4 (even if you got number 5 right and number 3 wrong, you will get ¾ correct...so be careful!)

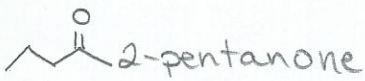
31. Write the complete esterification reaction for the formation of an ester of your choice that has 10 carbons. Name the reactants and products.

hexanoic acid + butanol → butylhexanoate + water

32. Name and draw the product for the following oxidation reactions.

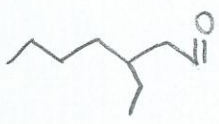
a. 2-pentanol $\xrightarrow{[O]}$ H_2O +





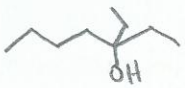
2-pentanone

b. 3-ethyl-1-heptanol $\xrightarrow{[O]}$ H_2O +



3-ethylheptanal

c. 3-ethyl-3-heptanol $\xrightarrow{[O]}$ H_2O + No reaction

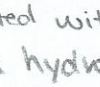


★ 33. Complete the following reaction. Give the name of the reaction as what the general terms for the reactant and products. *saponification

$CH_2\text{-}O(CO)\text{-}CH_3$
$CH\text{-}O(CO)\text{-}CH_2CH_2CH_3$ + 3NAOH → $CH_2\text{-}OH$, $CH\text{-}OH$, $CH_2\text{-}OH$ + $CH_3CO^-Na^+$ + $CH_3CH_2CH_2CO^-Na^+$ + $CH_3CH_2CH_2CH_2CH_2CO^-Na^+$
$CH_2\text{-}O(CO)\text{-}CH_2CH_2CH_2CH_2CH_3$

34. Discuss salicylic acid, including the molecules that it is the basis for.

Salicylic acid is an aromatic carboxylic acid with a hydroxy group. Its structure is 

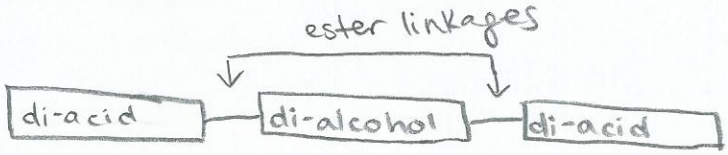
. It is commonly used as a fever reducer and and pain reliever and can be found in the bark of willow trees. When salicylic acid is reacted with acetic acid, asprin (

) is formed with water. When asprin hydrolyzes and sits for a while, it smells strongly of vinegar (this is the salicylic acid being produced). When salicylic acid reacts with methanol, oil of wintergreen (

) and water are formed. Oil of wintergreen is a flavor agent in some gums.

Fun Fact!
Back before pain relievers were created, women in labor would be given the bark of willow trees to chew on. This would relieve pain blc of the salicylic acid.

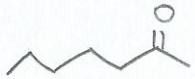
35. Draw a cartoon for a polyester and label the components and linkages. How are polyesters formed?



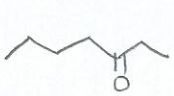
formed from the esterification of a dicarboxylic acid with a diacid

36. Draw and name any 5 molecules with the formula $C_7H_{14}O$. (on the back is okay)

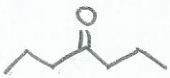
36. $C_7H_{14}O$



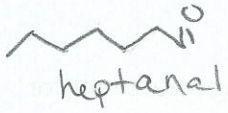
2-heptanone



3-heptanone



4-heptanone



heptanal

2-methyl hexanal
or methyl hexanal

5-methyl hexanal

α = 2
β = 3
γ = 4