Good luck on the exam!

Key MWF

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

   4 3 2 1

   COOH = $\overset{1}{C}OH$

   4 = butyl = butanoic acid

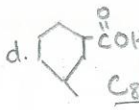
   a. Butanal
   b. Benzoic acid
   c. Butyl acid
   d. Butanoic acid

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

   a. Hexanoic acid ② $CH_3CH_2CH_2CH_2CH_2\overset{6}{C}OH$ $C_6H_{12}O_2$ X

   b. 3-methyl-2-pentanone ⑥ $CH_3\overset{2}{C}(=O)CH(CH_3)CH_2CH_3$ $C_6H_{12}O$ ✓

   c. 4-methyl-3-hexanone ⓒ $CH_3CH_2\overset{3}{C}(=O)CH(CH_3)CH_2CH_3$ $C_7H_{14}O$ 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 → carb. acid

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

   3° alcohol → N.R.

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

5. The reduction of pentanal yields — d

   aldehyde reduces to alcohol

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

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

   an ether; alc. part

   $CH_3CH_2CH_2CH_2\overset{1}{C}(=O)OCH_2CH_2CH_2CH_3$

   carb. acid part

   $C_9H_{18}O_2$

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

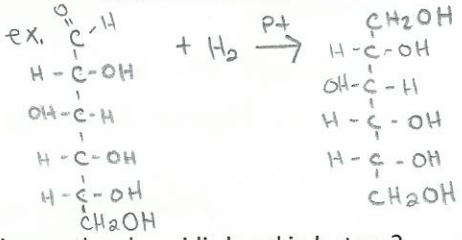
* 7. Which of the following is NOT a reducing sugar? — b

   a. Maltose
   b. Sucrose
   c. Glucose
   d. Galactose

   *rember, to be a reducing sugar, there must be 1 available anomeric -OH. There are no available anomeric -OHs on sucrose because it has a 1,2 linkage (showing the link on $C^{\#}1$ from the aldose and $C^{\#}2$ from the ketose

8. The formation of sugar alcohols comes from the _____ of monosaccharides. C

   a. Oxidation
   b. Fermentation
   c. Reduction
   d. Halogenation

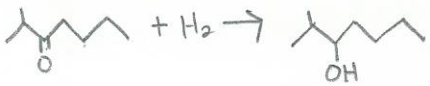


9. What is the name of the enzyme that cleaves the glycosidic bond in lactose? b

   a. Lactese
   b. Lactase
   c. Sucrose
   d. Benzanoic acid

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 > aldehydes, ketones > ethers > alkanes

12. Which of the following is NOT soluble? a

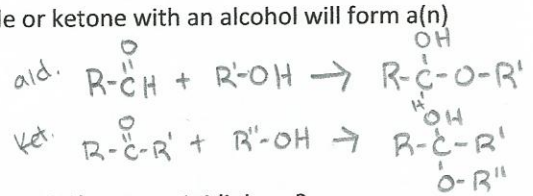
   a. 2-hexanone
   b. Butanone
   c. Pentanal
   d. Butanal

Table 14.1

as the alkyl chain increases, solubility decreases

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



14. Which of the following does NOT have a α-1,4 linkage? C

   a. Glycogen
   b. Amylopectin
   c. Cellulose → has a β-1,4 linkage
   d. Amylose

CH_3COOH acetic acid $HCOOH$ formic acid

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

a. Ether
b. Alcohol
c. Alkane
d. Aldehyde

$R\text{-}COOH + R'\text{-}OH \rightarrow R\text{-}COO\text{-}R' + H_2O$
*this is called esterification

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)
-OH

acid + base → salt + water

18. The neutralization of acetic acid by KOH produces b

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

$CH_3COOH + KOH \rightarrow CH_3COO^-K^+ + H_2O$

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

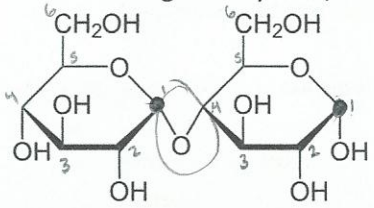
a. Ether
b. Carboxylic acid salt
c. Ester
d. Hemiacetal

see number 15

20. The reaction in number 19 is known as c

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

21. In the following carbohydrate, identify the linkage. d

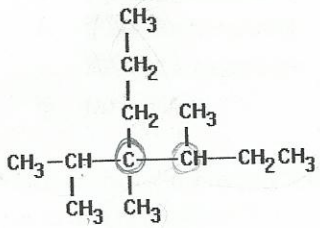


a. ~~α-1,2~~ α-1,3
b. β-1,4
c. Υ-1,4
d. ~~α-1,2~~ α-1,4

alpha away (from the O in the ring)
beta beside (the O in the ring)

• = anomeric carbons

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



e. 4
f. 3
g. 2
h. 8

23. What determines if a molecule is a reducing sugar? a

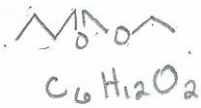
a. It has an anomeric –OH available
b. It is a monosaccharide
c. It is a disaccharide
d. It must be a β linkage

24. Amylose is a principle component of _____. b

a. Blood
b. Plant starch
c. Wood
d. Chondroitin

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. $C_6H_{12}O$



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

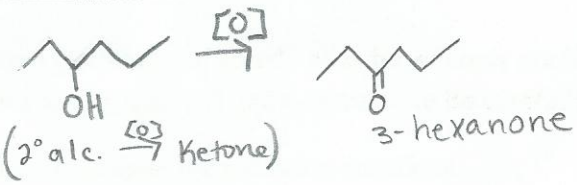
a. Chiral
b. Structural isomers
c. Stereoisomers
d. Enantiomers

they have the same molecular formula but different bonding

29. [redacted]3-hexanol will oxidize to form _____.

b

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



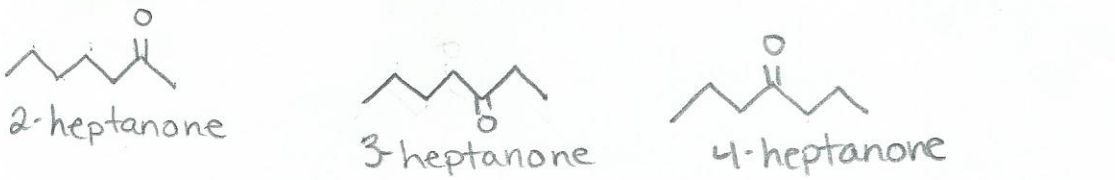
30. Which of the following is a major component of the exoskeletons of insects and crustaceans?

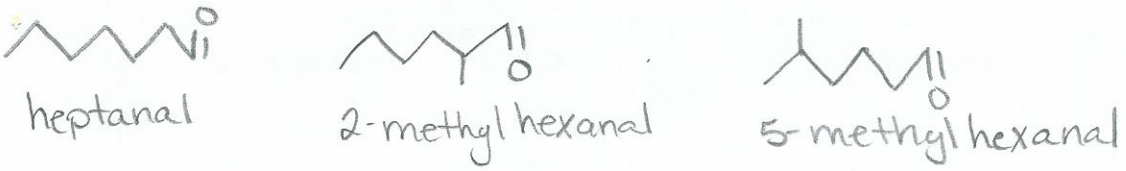
c

*

a. Cellulose
b. Chondroitin
c. Chitin
d. N-Acetyl-glucosamine

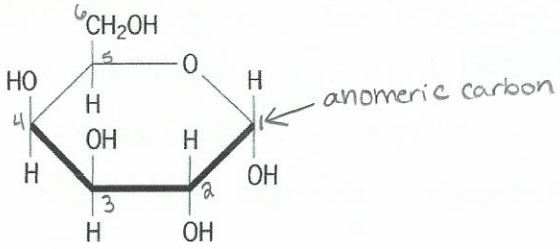
36. $C_7H_{14}O$





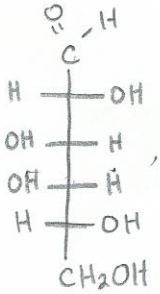
Short Answer: Answer any 4 of the following 6 questions. If you do all 6, he will only grade the first 4 (even if you got number 5 right and number 3 wrong, you will get ¾ correct...so be careful!)

31. Given the following structure of galactose, answer the following questions.



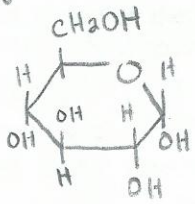
1. Number the carbons and label the anomeric carbon.
2. Draw the Fischer projection of galactose.
3. Is this α-galactose or β-galactose?
4. Glucose differs from galactose in that carbon #4's – OH is D. Draw the ringed form of glucose.

(2)



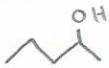
(3) α-galactose

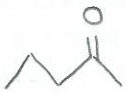
(4)



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

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



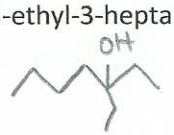


2-pentanone

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

3-ethylheptanal

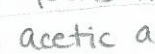
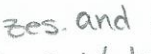
c. 3-ethyl-3-heptanol $\xrightarrow{[O]}$ H_2O + no reaction



33. Compare and contrast amylose and amylopectin; include at least 4 points. Bullet statements are fine.

- both are the principle components of plant starch
- both have α-1,4 linkages
- amylose has linear chains
- amylopectin branches (α-1,6 branches)
- amylopectin is quicker to digest due to the branching
- both have non-rigid structures

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

Salicylic acid is an aromatic carboxylic acid with a hydroxy group. It's structure is  . It is commonly used as a fever reducer 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 aspirin 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 because of the salicylic acid in it!

35. Discuss the difference between blood types. Include an explanation universal donors and universal recepients.

The difference between type O, type A, and type B is that type A and type B has an additional sugar on the galactose molecule. Type A has N-AcGal while type B has another galactose. Think of type O as the basis for types A and B. Since A and B have the same skeleton as O, O is the universal donor (it can go to A, B, or AB). Type AB is the universal recepient because any type can go in because it has every unit. A can only receive A or O, and B can only receive B or O. O can only receive O.
see picture in slide

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

see page 5 for this