ESTERS

1. Draw the structures of the following compounds.
A. methyl benzoate B. isopropyl propanoate
C. ethyl benzoate

2. Name the following compounds.
A. $HCOOCH_2CH_2CH_3$ B. $C_6H_5COOCH(CH_3)_2$
C. $CH_3COOC_6H_5$

3. Write an equation for
A. the esterification of benzoic acid with ethanol.
B. reaction of butanoic acid with 1-propanol.
(Name also organic products and show necessary conditions and catalyst)

4. Complete the equation for each of the following reactions.

A. $CH_3CH_2CH_2COOH + CH_3CH_2OH \xrightarrow{H^+}$

B. $C_6H_5COOCH_2CH_3 \xrightarrow[t]{LiAlH_4}$

C. $CH_3CH_2COOCH_3 + NaOH \xrightarrow{t,\ H^+}$

D. $CH_3COOC_6H_5 + H_2O \rightarrow$

5. Write the reactions of glyceryl trioleate with
A. sodium hydroxide B. hydrogen, nickel

6. When 12 g of acetic acid react with sufficient amount of ethyl alcohol, 10.56 g of ethyl acetate is obtained. What is the percentage yield in the process?

7. How many grams of glycerol are required to obtain glyceryl trioleate from 14.1 g of oleic acid?

8. If the alcohol produced from the hydrolysis of 14.8 g of methyl acetate reacts with sufficient amount of metallic sodium, what volume of hydrogen gas can be produced at STP?

9. A 55.6 g sample of sodium salt of a saturated fatty acid contains 4.6 g of sodium. Find the formula of this soap.

10. What is the molecular weight of the fatty acid which is formed from the hydrolysis of a simple triglyceride whose molecular weight is 806 g/mole?

MULTIPLE CHOICE QUESTIONS

1. Which one of the following compounds is an ester?
A. $CH_3OC_2H_5$
B. CH_3COONa
C. CH_3COOH
D. CH_3CONH_2
E. CH_3COOCH_3

2. Which one of the following pairs may be used to obtain the ester propyl acetate?
A. CH_3OH-C_3H_7COOH B. CH_3OH-C_3H_7CHO
C. C_3H_7OH-$HCOOH$ D. C_3H_7OH-CH_3COOH
E. C_2H_5OH-C_3H_7COOH

3. Which one of the following statements defines fats and oils? They are
A. long-chain carboxylic acids.
B. sodium salts of long-chain carboxylic acids.
C. esters formed from glycerol and long chain carboxylic acids.
D. long-chain fatty acid halides.
E. long-chain fatty acid anhydrides.

4. Which one of the following acids is found in the structure of fats which are solid at room temperature?
A. $C_{17}H_{35}COOH$ B. $C_{17}H_{33}COOH$
C. $C_{17}H_{31}COOH$ D. $C_{15}H_{29}COOH$
E. $C_{17}H_{29}COOH$

5. Which one of the following is not a property of esters?
A. They are hydrolyzed to give alcohol and carboxylic acid.
B. They have higher boiling points than the acids from which they are obtained.
C. They have characteristic pleasant odor.
D. They do not form hydrogen bonds.
E. They give alcohols when reduced.

6. A 35.2 g sample of ethyl acetate is obtained when 23 g of ethyl alcohol solution react completely with acetic acid. What is the percentage of alcohol in the solution?
A. 80 B. 70 C. 60 D. 50 E. 40

7. Predict the product of the following reaction.

$$CH_3\text{-}\overset{\overset{O}{\|}}{C}\text{-}Cl + C_2H_5ONa \rightarrow\ ?\ +\ NaCl$$

A. methyl B. methyl ethanoate
C. methyl acetate D. ethyl methanoate
E. ethyl ethanoate

8. Which acid must react with an alcohol in order to obtain the ester, $CH_3COOCH_2CH_2CH_3$?
A. methanoic acid B. ethanoic acid
C. butanoic acid D. propanoic acid
E. pentanoic acid

9. Give the name used for the type of the following reaction.

$$CH_3CH_2COOCH_3 + NaOH \xrightarrow{t}$$

A. esterification B. saponification
C. addition D. substitution
E. hydrolysis

10. What is the general formula of esters?
A. R-COR B. R-O-R C. R-COOR
D. R-OH E. R-COH

11. What is of the product the following esterification reaction?

$$CH_3COOH + CH_3OH \xrightarrow{H^+} ?$$

A. methyl formate B. ethyl acetate
C. methyl propanoate D. ethyl formate
E. methyl acetate

12. Which one of the following compounds is an ester?
A. $CH_3OC_2H_5$ B. CH_3COONa
C. CH_3COOH D. CH_3CONH_2
E. CH_3COOCH_3

13. Which one of the following pairs can be used to obtain propyl acetate?
A. CH_3OH-C_3H_7COOH
B. CH_3OH-C_3H_7CHO
C. C_3H_7OH-HCOOH
D. C_3H_7OH-CH_3COOH
E. C_2H_5OH-C_3H_7COOH

14. What is the name of CH_3COOCH_3?
A. methyl methanoate
B. ethyl ethanoate
C. ethyl acetate
D. methyl acetate
E. methyl formate

15. Carboxylic acids and alcohols can react with each other to produce …… and ……..
A. salt and water
B. salt and hydrogen
C. ester and water
D. only salt
E. none

16. Which one of the following acids is found in the structure of fats?
A. $C_{17}H_{35}COOH$ B. $C_{17}H_{33}COOH$
C. $C_{17}H_{31}COOH$ D. $C_{15}H_{29}COOH$
E. $C_{17}H_{29}COOH$

17. Which one of the following is **not** a property of esters?
A. They are hydrolyzed to give alcohol and carboxylic acid.
B. They have higher boiling points than the acids from which they are obtained.
C. They have characteristic pleasant odor.
D. They do not form hydrogen bonds.
E. They give alcohols when reduced.

18. Which of the given pairs of compounds are isomers of each other?
I. methyl acetate and methyl propanoate
II. phenyl acetic acid and methyl propanoate
III. benzoic acid and phenyl formate
A. I only B. III only C. I and III
D. II and III E. I, II, III

19. What is the product of the following reaction?

$$CH_3\text{-}\overset{\overset{O}{\|}}{C}\text{-}Cl + C_2H_5ONa \rightarrow ? + NaCl$$

A. methyl
B. methyl ethanoate
C. methyl acetate
D. ethyl methanoate
E. ethyl ethanoate

20. Which acid must react with an alcohol in order to obtain the ester, $CH_3COOCH_2CH_2CH_3$?
A. methanoic acid
B. ethanoic acid
C. butanoic acid
D. propanoic acid
E. pentanoic acid

21. What is the type the following reaction?

$$CH_3CH_2COOCH_3 + NaOH \xrightarrow{t}$$

A. esterification B. saponification
C. addition D. substitution
E. hydrolysis

22. I. Formic acid II. Acetic acid III. Propionic acid
Which of the above acids does not have an ester isomer?
A. I only B. II only C. III only
D. II and III E. I, II, III

23. Which one of the following statements defines fats and oils? They are
A. long-chain carboxylic acids.
B. sodium salts of long-chain carboxylic acids.
C. esters formed from glycerol and long chain carboxylic acids.
D. long-chain fatty acid halides.
E. long-chain fatty acid anhydrides.