



**Model Answer Chemistry of fat and oil( 417Ch) Final Exam. ; for 4<sup>th</sup> level ( Spec. Chem.). Students.**

**1<sup>st</sup> Quest. Part A : Select the more correct answer from the following ( 1 x24 =24 Mark).**

1. A lipid is any substance of biochemical origin that is

- A) soluble in water but insoluble in nonpolar solvents
- B) insoluble in both water and nonpolar solvents
- C) insoluble in water but soluble in nonpolar solvents
- D) soluble in both nonpolar solvents and water

2. In which of the following pairs of fatty acids does the first listed have a higher melting point than the second listed acid?

- A) 17:1 acid and 17:0 acid
- B) 24:0 acid and 19:0 acid
- C) 18:2 acid and 18:1 acid
- D) 17:1 acid and 18:0 acid

3. Which of the following fatty acids is both polyunsaturated and an omega-6 fatty acid?

- A)  $\text{CH}_3-(\text{CH}_2)_{18}-\text{COOH}$
- B)  $\text{CH}_3-(\text{CH}_2)_7-\text{CH}=\text{CH}-(\text{CH}_2)_7-\text{COOH}$
- C)  $\text{CH}_3-(\text{CH}_2)_4-(\text{CH}=\text{CH}-\text{CH}_2)_2-(\text{CH}_2)_6-\text{COOH}$
- D)  $\text{CH}_3-\text{CH}_2-(\text{CH}=\text{CH}-\text{CH}_2)_4-(\text{CH}_2)_2-\text{COOH}$

4. Which of the following statements concerning fats and oils is incorrect?

- A) They are also called triacylglycerols.
- B) They are also called triglycerides.
- C) They are glycerol triesters.
- D) They are fatty acid salts.

5. Unsaturated fatty acids are structural components of

- A) Both Pure fats and pure oils.

- B) neither fats nor oils.
- C) Pure fats but not oils.
- D) Pure oils but not fats.

**6. How do simple triacylglycerols (STAGs) differ from mixed triacylglycerols (MTAGs)?**

- A) STAGs contain short-chain fatty acids and MTAGs contain long-chain fatty acids.
- B) STAGs contain unbranched fatty acids and MTAGs contain branched fatty acids.
- C) STAGs contain saturated fatty acids and MTAGs contain unsaturated fatty acids.
- D) STAGs contain only one kind of fatty acid and MTAGs contain more than one kind of fatty acid.

**7. How many different triglyceride molecules can be produced that contain glycerol, palmitic acid, arachidic acid, and linoleic acid residues?**

- A) two
- B) three
- C) four
- D) five

**8. The products of the hydrolysis of an oil are three fatty acids and**

- A) a long-chain alcohol.
- B) glycerol.
- C) phosphoric acid.
- D) an amino alcohol.

**9. Which of the following types of compounds are expected products from the saponification of a fat?**

- A) glycerol and fatty acids
- B) glycerol and fatty acid salts
- C) fatty acid salts and fatty acids
- D) glycerol, fatty acid salts and fatty acids

**10. Which of the following statements concerning fatty acids is incorrect?**

- A) Fatty acids are rarely found in the free state in nature
- B) Double bonds present in fatty acids are almost always in a cis-configuration
- C) at least 20 carbon atoms must be present in the carbon chain of a fatty acid
- D) some fatty acids needed in the human body must be obtained from food because they cannot be synthesized with the body

**11. In a glycerophospholipid, glycerin's three –OH groups are esterified, respectively, with**

- A) one fatty acid and two phosphoric acid molecules.

B) two fatty acid and one phosphoric acid molecules.

C) three phosphoric acid molecules.

D) one fatty acid, one phosphoric acid and one amino alcohol molecule.

**12. The “steroid nucleus” common to all steroid structures involves a fused-ring system involving**

A) four six-membered rings.

B) four five-membered rings.

C) three six-membered rings and one five-membered ring.

D) two six-membered rings and two five-membered rings.

**13. Which of the following types of lipids is a steroid?**

A) Trilinolein

B) Lecithin

C) Cephalin

D) Cholesterol.

**14. Which of the following types of lipids would be soluble in water?**

A) phospholipids

B) steroids

C) more than one correct response

D) no correct response

**15. Which of the following is a distinguishing characteristic between fats and oils?**

A) physical state at room temperature

B) alcohol component present in their structures

C) type of linkage between fatty acids and the alcohol present

D) more than one correct response

**16. The designation “polyunsaturated” applies to which of the following fatty acids?**

A) oleic acid (18:1)

B) palmitic acid (16:0)

C) arachidonic acid (20:4)

D) no correct response

**17. Partial hydrogenation of a fat or oil**

- A) produces fatty acid salts.
- B) increases the degree of fatty acid unsaturation.
- C) **increases the melting point.**
- D) more than one correct response

**18. Which of the following statements concerning the complete hydrolysis of fats and oils is correct?**

- A) Fats produce more fatty acids per molecule than do oils.
- B) Oils produce more glycerol per molecule than do fats.
- C) **Fats produce only saturated fatty acids and oils produce only unsaturated fatty acids.**
- D) more than one correct response

**19. i. Stearic acid is nonessential fatty acid.**

**ii. Palmitic acid is the nonessential fatty acid.**

**iii. linolenic acids is the essential fatty acid.**

- A) **All three statements are true.**
- B) Two of the three statements are true.
- C) Only one of the statements is true.
- D) None of the statements is true.

**20. Statements:**

**(1) Steroids have structures based on a fused-three-ring system.**

**(2) Glycerophospholipids have “head-and-two-tails” structures.**

**(3) Both fats and oils are TAG mixtures.**

- A) All three statements are true.
- B) **Two of the three statements are true.**
- C) Only one of the statements is true.
- D) None of the statements is true.

**21. Statements:**

**(1) Triacylglycerols can be hydrolyzed under acidic conditions to produce salts of fatty acids.**

**(2) Hydrogenation of a fat or oil increases its degree of unsaturation.**

(3) lignoceric ( C 24: 0 ) is polyunsaturated fatty acids.

- A) All three statements are true.
- B) Two of the three statements are true.
- C) Only one of the statements is true.
- D) **None of the statements is true.**

22. Statements:

(1) Omega-3 fatty acids are unsaturated fatty acids containing three double bonds.

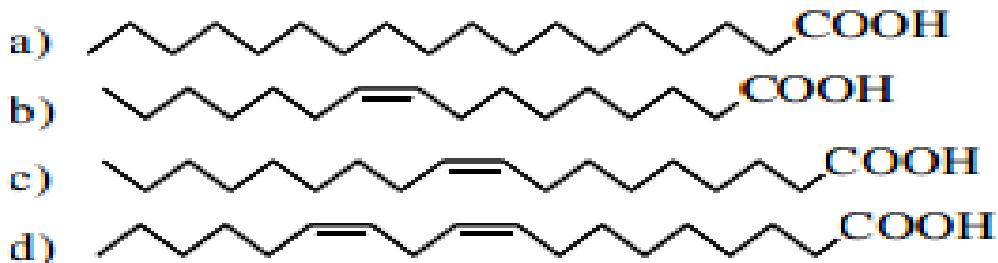
(2) (C20:4 $\Delta$ 5, 8, 11, 14) is membered from Glycerophospholipids.

(3) In general, lipids are substances that are soluble in water.

- A) All three statements are true.
- B) Two of the three statements are true.
- C) **Only one of the statements is true.**
- D) None of the statements is true.

- Use the following to answer questions 23-24:

For each of the fatty acid characterizations, select from the response list the structure of the correct fatty acid. Responses may be used more than once or need not be used at all.



23. Polyunsaturated fatty acid [ a] [b] [c] **[d]**

24. Omega-6 fatty acid [ a] [b] [c] **[d]**

**\* Note Please my Student:**

**The Final Exam. Contain two parts**

**1. Part A**

**(MCQ 24 x 1 = 24 Mark ).**

**Follow the writing part B  
2<sup>nd</sup> , 3<sup>rd</sup> and 4<sup>th</sup>  
questions**



## 2. Part B

( Writing Part = 24 Mark).

### Part B:

2<sup>nd</sup> . Define: ( 1x 4 = 4 Mark).

- Iodine Value : **The amount of iodine, in grams, that is taken up by 100 grams of the oil, fat, or wax.**

Acid Value: The number of milligrams of Alcoholic potassium hydroxide (KOH) that is required to neutralize one gram of the oil, fat, or wax.

- Peroxide value : The peroxide value IP is the number that expresses in milliequivalents of active oxygen the quantity of peroxide contained in 1000 g of the substance

- Saponification Value: The number of milligrams of Alcoholic potassium hydroxide (KOH) that is required to saponify one gram of the oil, fat, or wax.

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3<sup>rd</sup>. An oil sample storage in open container exposed to atmospheric oxygen and moisture, **show the effect of the mentioned conditions on the quality of the oil sample, and write short note on the practical determination of factors effects, and the one method for processing the extraction of the crude oil?** ( 10 Mark).

**Soln:**

1- Processing method for extraction of oil sample

2- Change of chemical characteristic for oil

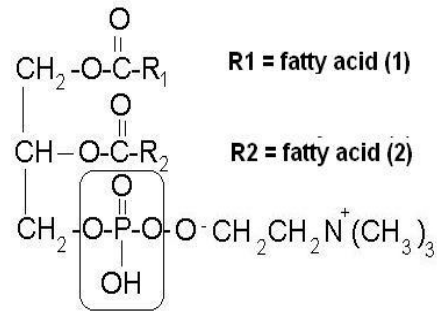
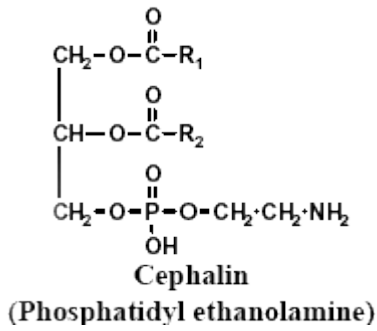
e.g. Acid Value - Peroxide Value - Iodine Value  
(Rancidity for oil) – ( change of colour)

3- Discuss on rancidity short note.

**4<sup>th</sup> . Write the chemical Structure of the following**

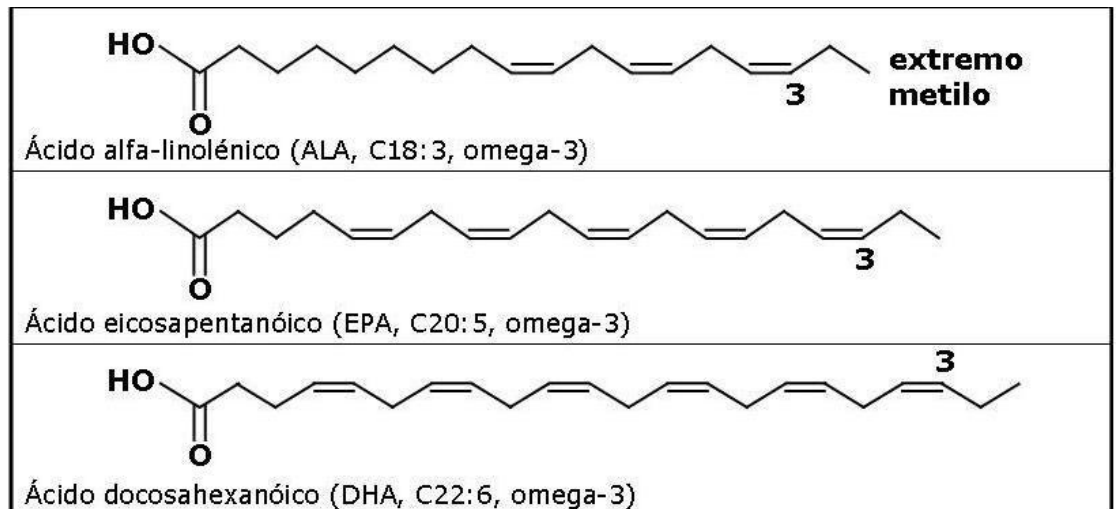
**( 2x 5 = 10 Mark)**

- **α-Cephalin**

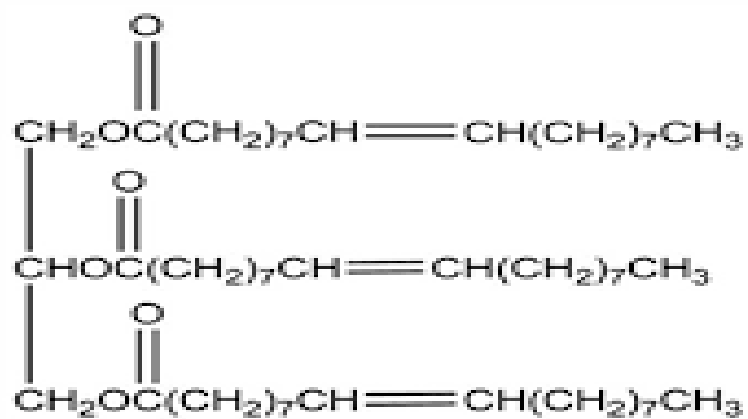


Lecithin

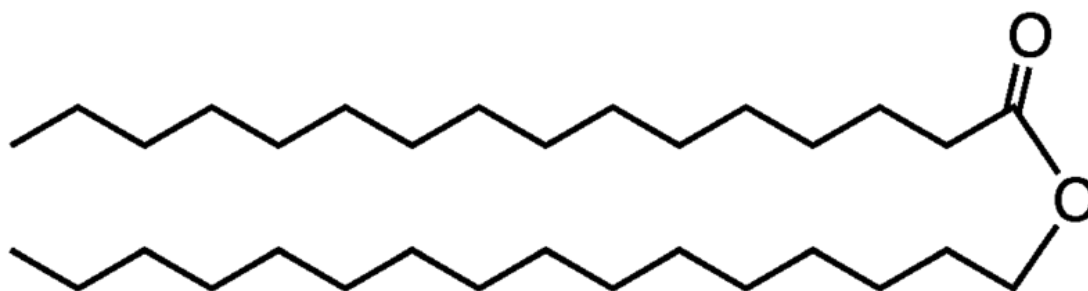
- **Omega- 3**



-Triolein



- Wax



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GOODLUCK *With my Best Regard*

*Prof. Dr. Wagdy J. El-Dougdoug*