

TEST for CHAPTER 4

Question 1. The following scheme shows a kind of transesterification catalyzed by lipase.



Choose the correct name of this reaction.

1. Acidolysis
2. Alcoholysis
3. Ester synthesis
4. Hydrogenation

Question 2. The following scheme shows aminolysis reaction catalyzed by lipase, but the names of the products are hidden.



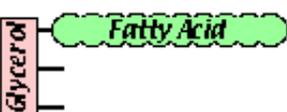
Choose the correct names of the two products.

1. alcohol
2. acid
3. amide
4. ester

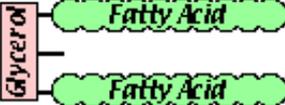
Question 3. There is a lipase having strict 1,3-positional specificity. TAG shown below is partially hydrolyzed by this lipase.



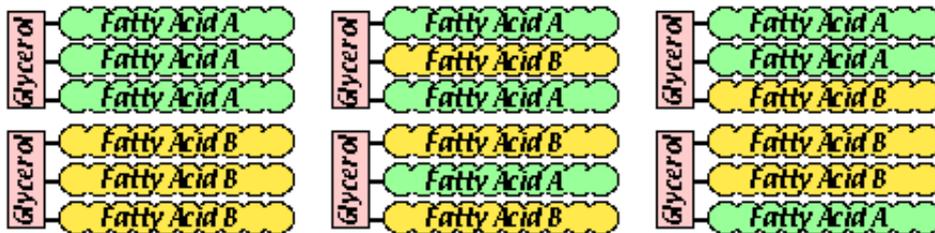
Assume that non-enzymatic acyl migration is ignorable. What of the followings are expected to be formed? (There might be one or more correct answers.)

1. 
2. 
3. 
4. 

Question 4. If the hydrolysis in the previous question (Question 3) is carried out completely, what of the followings is expected as the final product?

1. 
2. 
3. 
4. 

Question 5. There is a lipase with strict 1,3-positional specificity. The lipase acts on Fatty acid A, but not Fatty acid B, due to fatty acid specificity. An equimolar mixture of six kinds of TAGs shown below is hydrolyzed with this lipase.



Assume that non-enzymatic acyl migration is ignorable. Calculate the expected composition of Fatty acids A and B (in mol%) in the glyceride fraction at the end of the reaction. Choose the best answer.

1.

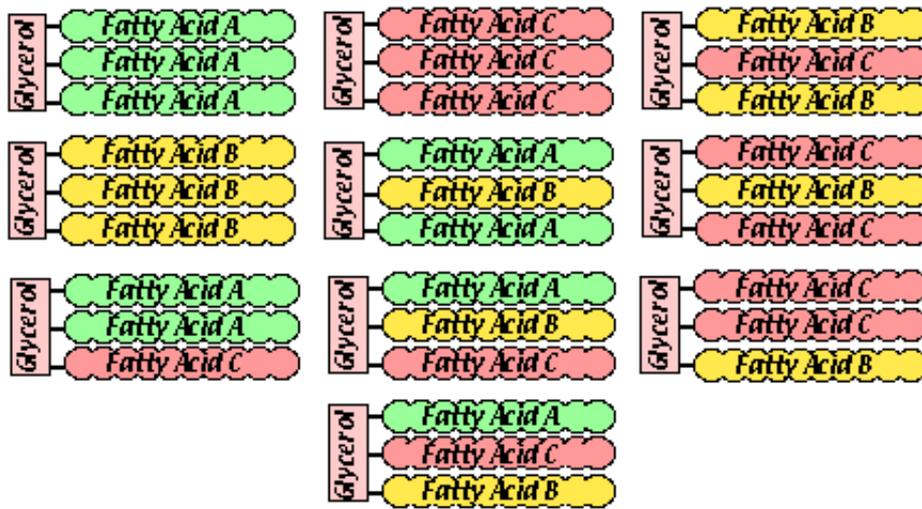
Fatty acids	Contents
Fatty acid A	15%
Fatty acid B	85%
2.

Fatty acids	Contents
Fatty acid A	25%
Fatty acid B	75%
3.

Fatty acids	Contents
Fatty acid A	35%
Fatty acid B	65%
4.

Fatty acids	Contents
Fatty acid A	45%
Fatty acid B	55%

Question 6. There is a lipase with strict 1,3-positional specificity. The lipase acts on Fatty acids A and B, but not Fatty acid C, due to fatty acid specificity. An equimolar mixture of ten kinds of TAGs shown below is hydrolyzed with this lipase.



Assume that non-enzymatic acyl migration is ignorable. Calculate the expected glyceride composition (in mol%) of at the end of the reaction. Choose the best answer.

1.

Glycerides	Contents
1-MAG	10%
2-MAG	40%
1,2(2,3)-DAG	30%
1,3-DAG	0%
TAG	20%

2.

Glycerides	Contents
1-MAG	0%
2-MAG	50%
1,2(2,3)-DAG	30%
1,3-DAG	0%
TAG	20%

3.

Glycerides	Contents
1-MAG	20%
2-MAG	50%
1,2(2,3)-DAG	10%
1,3-DAG	10%
TAG	10%

4.

Glycerides	Contents
1-MAG	0%
2-MAG	40%
1,2(2,3)-DAG	50%
1,3-DAG	0%
TAG	10%

Question 7. What of the followings promote non-enzymatic acyl migration? (There might be one or more correct answers.)

1. acid
2. alkali
3. high temperature
4. low pressure

Question 8. What of the followings is NOT appropriate as the advantage in using enzymes in organic media?

1. The thermodynamic equilibrium can be shifted to favor synthesis over hydrolysis.
2. It allows reactions with substrates insoluble and/or unstable in water.
3. It can eliminate microbial contamination.
4. It enables reactions under milder conditions.

Question 9. In “solvent-free systems”, how are enzymatic reactions carried out?

1. Reactions are carried out in aqueous buffer without organic solvent.
2. Reactions are carried out in aqueous buffer containing organic solvent.
3. Reactions are carried out in organic solvents.
4. Reactions are carried out in liquid substrates without solvent.

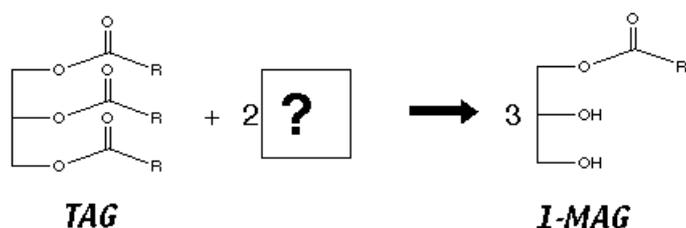
Question 10. What of the followings are NOT suitable as reaction media for food processing? (There might be one or more correct answers.)

1. ethanol
2. acetone
3. methanol
4. benzene

Question 11. 1-MAG produced by chemical glycerolysis at high temperature and high pressure contains a lot of impurities. What of the following methods is used for the industrial purification of 1-MG?

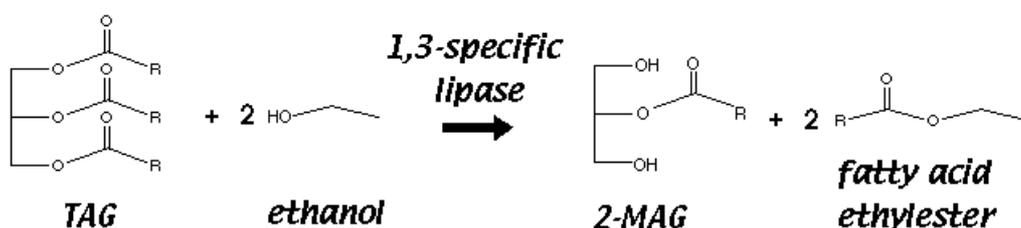
1. recrystallization
2. column chromatography
3. distillation
4. solvent extraction

Question 12. The following scheme depicts enzymatic synthesis of 1-MAG, but one of the substrates is hidden.



Write the name of the hidden substrate.

Question 13. The following scheme shows deacylation of TAG by lipase-mediated ethanolysis for the synthesis of 2-MAG .



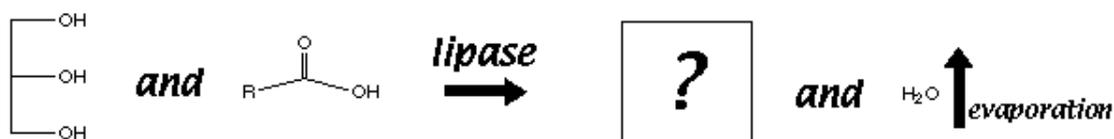
Although deacylation may be possible by hydrolysis as well, ethanolysis is favorable for some reasons. Choose the appropriate reasons for it. (There might be one or more correct answers.)

1. Acyl-migration is suppressed in ethanol rather than in water.
2. Ethanol is suitable for processing of food-grade products.
3. Removal of the remaining ethanol is easier than water, after the reaction.

Question 14. Choose the correct description for 1,3-DAG.

1. 1,3-DAG can be used for a specialty oil, because it has lower calories than TAG.
2. 1,3-DAG can be used for a specialty oil, because it is not digested in human body.
3. 1,3-DAG can be used for specialty oil, because it is not reconstituted into TAGs.
4. 1,3-DAG can be used for specialty oil, because it is not absorbed in human body.

Question 15. The following scheme depicts a reaction for preparation of a glyceride using a 1,3-positional-specific lipase under reduced pressure. The starting substrate mixture contains 1molar equivalent of glycerol and 4 molar equivalent of fatty acid. The reaction temperature is low so that acyl-migration is negligible.



What of followings is expected as the major product?

1. 1-MAG
2. 2-MAG
3. 1,3-DAG
4. TAG

Question 16. If the reaction in the Question 15 is carried out at high temperature, (at which acyl migration is promoted), what of followings is expected as the major product?

1. 1-MAG
2. 2-MAG
3. 1,3-DAG
4. TAG

Question 17. If the reaction in the Question 15 is carried out with a non-positional-specific lipase, what of the followings is expected as the major product?

1. 1-MAG
2. 2-MAG
3. 1,3-DAG
4. TAG

Question 18. If the starting substrate mixture containing 10 molar equivalent of glycerol and 1 molar equivalent of fatty acid is used for the reaction in the Question 15, what of the followings is expected as the major product?

1. 1-MAG
2. 2-MAG
3. 1,3-DAG
4. TAG