

Advanced Lipid Metabolism MCQs

1. Which of the following is INCORRECT regarding lipids?

- A. Lipids are organic molecules that are insoluble in water but can be extracted using nonpolar solvents such as ether or chloroform.
- B. Lipids can exist in biological systems as membrane-associated structures, lipoproteins, or triglyceride droplets stored in adipose tissue.
- C. Lipids are considered a minor and inefficient source of energy compared to carbohydrates in normal physiological conditions.
- D. Lipids play a role in dissolving fat-soluble vitamins that act as regulatory molecules or coenzymes.

2. Which of the following is INCORRECT regarding lipid digestion in humans?

- A. The digestion of dietary lipids begins in the stomach through the action of lingual lipase and gastric lipase.
- B. Pancreatic lipase is the primary enzyme responsible for digesting short and medium chain fatty acids in the stomach.
- C. Short and medium chain triglycerides (<12 carbons) are preferentially targeted by gastric and lingual lipases.
- D. These enzymes are especially important in neonates and in individuals lacking pancreatic lipase.

3. Which of the following is INCORRECT regarding bile salts?

- A. Bile salts are synthesized in the liver and stored in the gallbladder until needed for digestion.
- B. They are essential for emulsification of lipids in the duodenum, increasing surface area for enzymatic digestion.
- C. Bile salts directly hydrolyze triglycerides into free fatty acids and glycerol without enzyme involvement.
- D. They assist in the formation of mixed micelles that facilitate lipid absorption.

4. Which of the following is INCORRECT regarding pancreatic lipase activity?

- A. Pancreatic lipase hydrolyzes triacylglycerols into 2-monoacylglycerol and free fatty acids.
- B. Colipase binds pancreatic lipase in a 1:1 ratio and helps anchor it to the lipid-water interface.
- C. Colipase is activated by trypsin before interacting with pancreatic lipase.
- D. Pancreatic lipase converts triglycerides directly into glycerol and three fatty acids in one step.

5. Which of the following statements BEST describes the mechanism of action of Orlistat?
- A. It enhances the emulsification of lipids by increasing bile salt secretion and thereby promotes fat digestion.
 - B. It inhibits gastric and pancreatic lipases, leading to reduced hydrolysis of triglycerides and decreased intestinal fat absorption.
 - C. It stimulates the conversion of triglycerides into glycerol and free fatty acids inside enterocytes.
 - D. It increases the formation of micelles, facilitating faster lipid absorption across the intestinal membrane.
6. Which of the following is INCORRECT regarding cholesteryl ester digestion?
- A. Approximately 10–15% of cholesterol exists in esterified form in the diet.
 - B. Cholesteryl esters are hydrolyzed by pancreatic cholesterol esterase.
 - C. The hydrolysis results in cholesterol and free fatty acids.
 - D. The activity of cholesterol esterase decreases in the presence of bile salts.
7. Which of the following is INCORRECT regarding phospholipid digestion?
- A. Phospholipase A2 removes a fatty acid from the C2 position of phospholipids.
 - B. This reaction produces lysophospholipids as intermediate products.
 - C. Lysophospholipids are further hydrolyzed by lysophospholipase.
 - D. Phospholipase A2 removes both fatty acids simultaneously from phospholipids.
8. Which of the following is INCORRECT regarding hormonal control of lipid digestion?
- A. Cholecystokinin (CCK) stimulates the gallbladder to release bile.
 - B. CCK increases gastric motility to accelerate digestion.
 - C. CCK stimulates the pancreas to release digestive enzymes.
 - D. Secretin stimulates bicarbonate release to neutralize intestinal pH.
9. Which of the following is INCORRECT regarding secretin?
- A. It is secreted in response to low pH of chyme entering the intestine.
 - B. It stimulates pancreas and liver to release bicarbonate.
 - C. It increases acidity of the intestinal environment.
 - D. It helps create optimal pH for pancreatic enzymes.

10. Which of the following is CORRECT regarding mixed micelle formation and function?

- A. Mixed micelles consist of a hydrophilic core and hydrophobic outer surface that interact with intestinal enzymes.
- B. Mixed micelles transport hydrophobic lipid digestion products across the unstirred water layer to the brush border membrane.
- C. Mixed micelles are essential only for the absorption of short-chain fatty acids but not long-chain fatty acids.
- D. Mixed micelles directly enter the bloodstream without interacting with intestinal epithelial cells.

11. Which of the following is INCORRECT regarding absorption of fatty acids?

- A. Short and medium chain fatty acids can be absorbed without micelle formation.
- B. These fatty acids enter portal circulation directly.
- C. They are transported in blood bound to albumin.
- D. They are first converted into CoA derivatives inside enterocytes before entering blood.

12. Which of the following is INCORRECT regarding enterocyte metabolism?

- A. Triacylglycerols are resynthesized inside enterocytes.
- B. Cholesteryl esters are also resynthesized inside enterocytes.
- C. Short chain fatty acids are re-esterified into triglycerides before entering circulation.
- D. Lipid components are packaged into lipoproteins for transport.

13. Which of the following is INCORRECT regarding chylomicrons?

- A. They contain triacylglycerols and cholesteryl esters in their core.
- B. Their outer layer contains phospholipids and apolipoprotein B-48.
- C. They are released directly into blood without passing through lymphatic system.
- D. They give chyle a milky appearance.

14. Which of the following is INCORRECT regarding lipid malabsorption?

- A. Cystic fibrosis can lead to lipid malabsorption.
- B. Shortened bowel can reduce lipid absorption.
- C. Lipid malabsorption results in increased lipids in feces.
- D. Lipid malabsorption leads to increased absorption of fat-soluble vitamins.

15. Which of the following BEST describes the physiological role of lipoprotein lipase?

- A. It catalyzes the synthesis of triglycerides inside hepatocytes for storage in adipose tissue.
- B. It hydrolyzes triglycerides present in circulating chylomicrons into free fatty acids and glycerol at the capillary level.
- C. It converts cholesterol into bile acids inside the liver during digestion.
- D. It functions mainly within the nucleus of adipocytes to regulate lipid metabolism gene expression.

16. Which of the following is INCORRECT regarding fatty acid fate?

- A. Fatty acids can enter muscle cells for energy production.
- B. They can circulate in blood bound to albumin.
- C. All cells are incapable of oxidizing fatty acids for energy.
- D. Adipocytes can re-esterify fatty acids to form triglycerides.

17. Which of the following is INCORRECT regarding glycerol metabolism?

- A. Glycerol is mainly utilized by the liver.
- B. It is converted into glycerol-3-phosphate.
- C. It can enter glycolysis or gluconeogenesis pathways.
- D. It is directly oxidized in all tissues equally without modification.

18. Which of the following statements CORRECTLY describes emulsification of lipids?

- A. Emulsification decreases the surface area of lipids, making enzymatic digestion less efficient.
- B. Emulsification occurs in the stomach through the action of gastric lipase alone.
- C. Emulsification in the duodenum increases surface area of lipids, enhancing the efficiency of enzymatic digestion.
- D. Emulsification eliminates the need for pancreatic enzymes during lipid digestion.

19. Which of the following is INCORRECT regarding lipid digestion products?

- A. Products include free fatty acids, monoacylglycerols, and cholesterol.
- B. These products form mixed micelles with bile salts.
- C. These products are directly absorbed without interaction with intestinal membranes.
- D. These products are transported to the brush border membrane for absorption.

20. Which of the following is INCORRECT regarding steatorrhea?

- A. It refers to excess fat in feces.
- B. It is associated with decreased lipid absorption.
- C. It results from conditions like cystic fibrosis.
- D. It is characterized by increased digestion and absorption of lipids.

Model Answers

1. C

2. B

3. C

4. D

5. B

6. D

7. D

8. B

9. C

10. B

11. D

12. C

13. C

14. D

15. B

16. C

17. D

18. C

19. C

20. D