Question (1): An 18-year-old woman presents with xanthomas on her eyelids and is found to have a rare genetic deficiency of lipoprotein lipase. She is diagnosed with type 1 hyperlipidemia. In this disorder, chylomicrons are abnormally elevated in the serum. In which cell or tissue does triacylglycerol packaging into chylomicrons occur?

A. Intestinal epithelial cell
They transport exogenous TAG from intestines to other tissues of the body to be used as a source of energy.
B. Liver cell.
C. Muscle cell.
D. Heart cell.
E. Adipose cell.

Question (2): An 18-year-old obese woman maintains a sedentary lifestyle and eats a high-fat, high-carbohydrate diet. Maintenance of this diet and lifestyle has led to lipogenesis and obesity. Which of the following statements correctly describes an aspect of lipogenesis?

A. The primary source of carbons for fatty acid synthesis is glycerol.
B. Fatty acids are synthesized from acetyl CoA in the mitochondria.
C. Fatty acid synthesis and esterification to glycerol to form triacylglycerols occurs primarily in muscle cells.
D. The fatty acyl chain on the fatty acid synthase complex is elongated two carbons at a time.
E. NAPD+, which is important for fatty acid synthesis, is produced by the pentose phosphate pathway.

Question (3): A 4-month-old infant presents with a seizure. His mother reports that her infant has been irritable and lethargic over the past several days. The infant is found to be profoundly hypoglycemic and have low ketones. Short-chain dicarboxylic acids are found to be elevated in the serum. The most likely enzyme deficiency is which of the following?

A. Medium-chain acyl CoA dehydrogenase (MCAD).
B. Carnitine acyltransferase 1 (CPT-1)
C. Hormone-sensitive lipase.
D. Pyruvate carboxylase.
E. Fatty acyl CoA synthetase.

Question (4): An infant is born with a high forehead, abnormal eye folds, and deformed ear lobes and shows little muscle tone and movement. After multiple tests, he is diagnosed with Zellweger syndrome, a disorder caused by peroxisome malformation. What type of fatty acid would you expect to accumulate in patients with Zellweger syndrome?

A. Short-chain fatty acids.
B. Acetyl CoA.
C. Dicarboxylic acids.
D. Long-chain fatty acids.
E. Very-long-chain fatty acids.

Question (5): **16-year-old girl presents with extreme slenderness (ضعيفه البنية) . Her body weight is 35% below expected. She feels as though she is obese and severely restricts her food intake. She is diagnosed with anorexia nervosa. In this patient, breakdown of fatty acids is required to provide energy. Before being oxidized, fatty acids are activated in the cytosol to form which of the following?**

A. ATP.
B. CoA.
C. Fatty acyl CoA.
D. Carnitine.
E. Malonyl CoA.

Question (6): **A 12-year-old boy presents with fatique, polydipsia (excessive thirst), polyuria (large production of urine), and polyphagia (increased appetite). A fingerstick glucose measurement shows a glucose level of 350 mg/dL in his serum. He is diagnosed with type 1 diabetes mellitus, a disease characterized by a deficiency of insulin (not produced from pancreas). Which one of the following is most likely occurring in this patient?**

A. Increased fatty acid synthesis from glucose in liver.
B. Decreased conversion of fatty acids to ketone bodies.
C. Increased stores of triacylglycerol in adipose tissue.
D. Increased production of acetone (increased ketogenesis).

Question (7): An infant is born prematurely at 28 weeks and increasingly has significant difficulty breathing, taking rapid breaths with intercostal retractions. The child soon becomes cyanotic. He is diagnosed with respiratory distress syndrome due to a deficiency of surfactant. Which of the following is the phospholipid in highest concentration in surfactant?

A. Dipalmitoy1 phosphatidylcholine
B. Dipalmitoyl phosphatidylethanolamine.
C. Dipalmitoyl phospathatidylglycerol.
D. Dipalmitoyl phosphatidylinositol.
E. Dipalmitoyl phosphatidylserine.

Question (8): A 47-year-old obese man complains of having to get out of bed three times a night to urinate (nocturia, polyuria), being constantly thirsty (polydipsia), and eating more often (polyphagia). The patient is diagnosed with insulin-resistent diabetes mellitus (type 2). If the patient's symptoms are due to a problem at the level of the glucose transporter, which one of the tissues indicated below will be most affected.

A. RBCs
B. Small intestine.
C. Muscle
Because the main transporter of glucose (GLUT-4) is found in heart, skeletal muscles and adipose tissue.
D. Brain.
E. Liver.

Question (9): In which one of the following scenarios would one expect to observe an increase in liver fructose 2,6-bisphosphate levels?

A. After the release of epinephrine.
B. In an individual who had just finished running a marathon.
C. In a patient exhibiting diabetic ketoacidosis.
D. After the consumption of a large bowl of ice cream.
E. In a patient with kwashiorkor.

Question (10): Which one of the following statements is correct concerning the formation of muscle lactate during exercise?

A. Lactate formation occurs when the NADH/NAD+ ratio is high because lactate is produce by adding hydrogen to pyruvate by the enzyme lactate dehydrogenase.
B. The liver preferentially converts lactate into carbon dioxide and water.
C. The heart preferentially converts lactate into glucose.
D. Lactate formation is less likely to be found in the RBCs than in other tissues.
E. The intracellular pH is typically increased when lactate is produced.

Question (11): A patient presents which dizziness, fatigue, and tremors a fingerstick test indicates a blood glucose of 36 mmol/L. Of the allosteric activators of glycolysis in the liver, which one of the following is the most important in allowing the liver to maintain a normal blood glucose level?

A. Citrate.
B. ATP.
C. Fructose 2,6-bisphosphate.
D. Glucose 6-phosphate.
E. Acetyl CoA.

Question (12): A 24-year-old woman complains of intermittent right upper quadrant pain that extends to the inferior tip of her scapula. An ultrasound confirms your suspicion of cholelithiasis (gallstone, and the patient undergoes cholecystectomy. Analysis indicates gallstones containing bilirubin. Measurement of metabolic intermediates, such as 2,3-bisphosphoglycerate and glucose 6-phospate, are elevated in her serum. A deficiency of which of the following enzymes most likely led to her pigmented gallstones and release of these metabolites into the blood?

A. Glucose 6-phosphate dehydrogenase.
B. PFK-1
C. Pyruvate Kinase.
D. Pyruvate dehydrogenase.
E. Pyruvate carboxylase.

Question (13): Emergency medical services are called to the scene of a diabetic patient who has collapsed and is in a confused state. The patient uses an insulin pump, which appears to have malfunctioned. The patient's blood sugar is found to be 12 mg/dL, and the squad is having difficulty getting intravenous access to administer intravenous glucose. On the way to the hospital, the squad administers an intramuscular injection of glucagon. Which one of the following statements is true regarding the use of glucagon?

A. It is synthesized in the liver.
B. It is inhibits gluconeogenesis.
C. It is secreted in the presence of somatostatin.
D. It is secreted in the presence of insulin.
E. It inhibits pyruvate formation.

Question (14): A pediatric hematologist sees an 18-month-old patient with jaundice, splenomegaly, and hemolytic anemia. A blood smear indicates RBCs that are more rigid in appearance than normal, and a diagnosis of pyruvate kinase deficiency is made. Because pyruvate kinase catalyzes the last step in the glycolytic pathway, products before this step of the pathway will accumulate. Which one of the following products associated with the pathway will be made in abnormal amounts?

A. Acetyl CoA.
B. Glucose.
C. 2,3-Bisphosphoglycerate
D. OAA.