1. Which of the following is INCORRECT regarding sources of fructose?

A. The major dietary source of fructose is sucrose, which upon intestinal digestion releases equal amounts of fructose and glucose.

B. Fructose is found as a free monosaccharide in high-fructose corn syrup, fruits, and honey.

C. High-fructose corn syrup contains approximately 55% fructose and 45% glucose.

D. Fructose is primarily obtained from glycogen breakdown within liver cells under fasting conditions.

2. Which of the following is INCORRECT regarding fructose entry into cells?

A. Entry of fructose into cells does not require insulin for transport.

B. Fructose does not stimulate insulin secretion in contrast to glucose.

C. Fructose uptake into cells is entirely dependent on insulin-mediated transporters.

D. Fructose metabolism differs from glucose metabolism in its hormonal regulation.

3. Which of the following is INCORRECT regarding phosphorylation of fructose?

A. Fructose can be phosphorylated by hexokinase or fructokinase.

B. Fructokinase is found in liver, kidney, and intestinal mucosa.

C. ATP serves as the phosphate donor in fructose phosphorylation.

D. Fructose is directly converted into fructose-6-phosphate exclusively by fructokinase in all tissues.

4. Which of the following is INCORRECT regarding fructose-1-phosphate cleavage?

A. Aldolase B cleaves fructose-1-phosphate into DHAP and glyceraldehyde.

B. DHAP can directly enter glycolysis or gluconeogenesis pathways.

C. Glyceraldehyde cannot be metabolized further in any metabolic pathway.

D. Fructose metabolism produces triose intermediates.

5. Which of the following BEST explains why fructose metabolism is faster than glucose metabolism?

A. Fructose metabolism requires less ATP compared to glucose metabolism.

B. Fructose metabolism bypasses phosphofructokinase, the major rate-limiting enzyme in glycolysis.

C. Fructose metabolism produces more NADH directly than glucose metabolism.

D. Fructose metabolism occurs exclusively in mitochondria unlike glucose metabolism.

6. Which of the following is INCORRECT regarding kinetics of fructose metabolism?

A. Fructose metabolism is more rapid than glucose metabolism.

B. Fructose-derived trioses bypass the phosphofructokinase regulatory step.

C. Fructose metabolism is slower due to regulatory checkpoints identical to glucose metabolism.

D. The pathway leads to rapid production of glycolytic intermediates.

7. Which of the following is INCORRECT regarding lipogenesis from fructose?

A. Intravenous fructose administration increases lipogenesis.

B. Increased acetyl-CoA production contributes to lipid synthesis.

C. Fructose metabolism has no effect on lipid synthesis pathways.

D. Enhanced triose production contributes indirectly to fatty acid synthesis.

8. Which of the following is INCORRECT regarding fructokinase deficiency?

A. It is considered a benign condition.

B. It leads to accumulation of fructose in blood and urine.

C. It causes severe liver failure and hypoglycemia.

D. It is sometimes referred to as essential fructosuria.

9. Which of the following is INCORRECT regarding hereditary fructose intolerance (HFI)?

A. It is caused by aldolase B deficiency.

B. Fructose-1-phosphate accumulates in cells.

C. ATP and inorganic phosphate levels decrease significantly.

D. It has no effect on liver or kidney metabolism.

10. Which of the following BEST describes the clinical consequences of HFI?

A. Mild asymptomatic condition with no metabolic consequences.

B. Severe metabolic disturbances including hypoglycemia, vomiting, jaundice, and hepatomegaly.

C. Increased insulin secretion leading to hyperglycemia.

D. Increased glycogen storage without any cellular damage.

11. Which of the following is INCORRECT regarding mannose metabolism?

A. Mannose is phosphorylated by hexokinase to mannose-6-phosphate.

B. Mannose-6-phosphate is converted to fructose-6-phosphate.

C. The conversion is catalyzed by phosphomannose isomerase.

D. Mannose cannot be converted into any glycolytic intermediate.

12. Which of the following is INCORRECT regarding sorbitol pathway?

A. Glucose is converted to sorbitol by aldose reductase.

B. Sorbitol is converted to fructose by sorbitol dehydrogenase.

C. This pathway is important in seminal vesicles for energy production.

D. Sorbitol is immediately exported from cells and cannot accumulate.

13. Which of the following is INCORRECT regarding sorbitol accumulation in diabetes?

A. Occurs in tissues such as retina, lens, kidney, and nerve cells.

B. Leads to osmotic water retention inside cells.

C. Causes complications such as cataracts and neuropathy.

D. Prevents any cellular damage by reducing osmotic stress.

14. Which of the following is INCORRECT regarding galactose metabolism?

A. The primary dietary source of galactose is lactose.

B. Galactose is phosphorylated to galactose-1-phosphate.

C. Galactose metabolism does not involve any nucleotide sugar intermediates.

D. ATP is used as a phosphate donor in galactose phosphorylation.

15. Which of the following BEST describes the role of galactose-1-phosphate uridyltransferase?

A. Converts galactose directly into glucose without intermediate steps.

B. Catalyzes exchange between galactose-1-phosphate and UDP-glucose to form UDP-galactose.

C. Converts galactose into sorbitol in diabetic conditions.

D. Hydrolyzes lactose into glucose and galactose in the intestine.

16. Which of the following is INCORRECT regarding UDP-galactose?

A. It can be converted to UDP-glucose.

B. It participates in biosynthesis of glycoproteins and glycolipids.

C. It cannot enter glycolysis or gluconeogenesis pathways.

D. It plays a role in lactose synthesis.

17. Which of the following is INCORRECT regarding classic galactosemia?

A. Caused by deficiency of galactose-1-phosphate uridyltransferase.

B. Leads to accumulation of galactose-1-phosphate and galactitol.

C. Results in liver damage, cataracts, and developmental issues.

D. Has no clinical consequences and is always asymptomatic.

18. Which of the following BEST describes lactose synthesis?

A. Occurs in all body tissues equally.

B. Occurs in mammary glands and involves transfer of galactose to glucose.

C. Does not require any enzyme complex for its synthesis.

D. Occurs independently of hormonal regulation.

19. Which of the following is INCORRECT regarding lactose synthase components?

A. Protein A is β-galactosyltransferase.

B. Protein B is α-lactalbumin.

C. Protein B is present in all tissues of the body.

D. Protein B modifies enzyme specificity in mammary glands.

20. Which of the following is INCORRECT regarding lactose synthesis regulation?

A. α-lactalbumin is produced in response to prolactin.

B. Lactose synthesis occurs during lactation.

C. The enzyme complex changes substrate specificity to form lactose.

D. Lactose is synthesized without involvement of UDP-galactose.

Model Answers

1. D
2. C
3. D
4. C
5. B
6. C
7. C
8. C
9. D
10. B
11. D
12. D
13. D
14. C
15. B
16. C
17. D
18. B
19. C
20. D