

Quantitative Determination of Carbohydrates and Lipids

Advanced Multiple Choice Questions

This document contains 20 advanced multiple-choice questions with detailed answer choices based on the uploaded Experiment 10 Biochemistry Laboratory file. Model answers are included at the end for revision and exam preparation.

Question 1. Which of the following BEST describes glucose according to the laboratory manual?

- A) A polysaccharide composed of repeating fructose units connected by peptide bonds.
- B) A monosaccharide classified as an aldohexose containing six carbon atoms and an aldehyde group.
- C) A non-reducing disaccharide synthesized exclusively in skeletal muscle tissue.
- D) A ketone-containing lipid derivative used primarily for long-term energy storage.

Question 2. The primary physiological role of insulin in glucose metabolism is to:

- A) Increase blood glucose concentration through glycogenolysis in hepatocytes.
- B) Stimulate breakdown of proteins into amino acids for gluconeogenesis.
- C) Lower blood glucose concentration through regulation of carbohydrate metabolism.
- D) Promote secretion of glucagon from pancreatic alpha cells.

Question 3. Which metabolic process refers to the synthesis and storage of glycogen from excess glucose molecules?

- A) Glycogenolysis
- B) Glycogenesis
- C) Lipolysis
- D) Ketogenesis

Question 4. In the enzymatic glucose assay, glucose oxidase (GOD) catalyzes the conversion of glucose into:

- A) Pyruvic acid and molecular oxygen.
- B) Gluconic acid and hydrogen peroxide.
- C) Cholesterol and free fatty acids.
- D) Glycerol-3-phosphate and ATP.

Question 5. The red quinoneimine dye in the glucose assay is produced through the reaction of hydrogen peroxide with:

- A) Chloro-4-phenol and 4-amino-antipyrine in the presence of peroxidase.
- B) Sodium chloride and sulfuric acid in alkaline conditions.
- C) Glucose oxidase and glycerol kinase at acidic pH.
- D) ATP and lipoprotein lipase in the presence of ethanol.

Question 6. Why should serum samples always be considered hazardous during laboratory procedures?

- A) Serum samples naturally contain corrosive alkali substances capable of damaging equipment.
- B) Serum may contain infectious microorganisms including hepatitis viruses and HIV.
- C) Blood samples spontaneously release toxic gases during incubation at 37°C.
- D) Serum samples rapidly oxidize and generate explosive hydrogen peroxide concentrations.

Question 7. In the glucose assay procedure, vigorous shaking of the tubes is discouraged because it:

- A) Causes precipitation of glucose crystals within the reagent mixture.
- B) Produces bubbles that interfere with absorbance measurements.
- C) Neutralizes the activity of glucose oxidase completely.
- D) Converts gluconic acid back into glucose molecules.

Question 8. The reagent blank in spectrophotometric assays is primarily used to:

- A) Increase the concentration of glucose in the sample solution.
- B) Eliminate the effect of the intrinsic color of the reagent on absorbance readings.
- C) Convert non-reducing sugars into reducing sugars before analysis.
- D) Prevent oxidation of chromogenic compounds during incubation.

Question 9. According to Beer-Lambert law, absorbance is directly proportional to:

- A) Concentration and path length of the sample solution.
- B) Temperature and density of the solvent only.
- C) Volume of sample and molecular weight of glucose exclusively.
- D) Incubation time regardless of chromogen concentration.

Question 10. A fasting blood glucose level of 130 mg/dL would most likely be interpreted as:

- A) Normal fasting glucose level.
- B) Hypoglycemia.
- C) Prediabetes with impaired fasting glucose.
- D) Hyperglycemia consistent with diabetes mellitus.

Question 11. Which statement regarding cholesterol is MOST accurate according to the experiment manual?

- A) Cholesterol is synthesized exclusively in adipose tissue and absent from animal foods.
- B) Cholesterol serves as a precursor for steroid hormones, cortisone, and vitamin D.
- C) Cholesterol is a carbohydrate polymer responsible for glycogen formation.
- D) Cholesterol exists only in HDL particles and not in LDL particles.

Question 12. High-density lipoprotein (HDL) is commonly referred to as “good cholesterol” because it:

- A) Carries cholesterol from tissues back to the liver.
- B) Deposits cholesterol into peripheral arteries for storage.

- C) Directly hydrolyzes triglycerides into glycerol molecules.
- D) Converts saturated fats into polyunsaturated fatty acids.

Question 13. Elevated levels of LDL cholesterol contribute to atherosclerosis primarily because LDL:

- A) Removes cholesterol from arterial walls and transports it to the liver.
- B) Facilitates rapid excretion of triglycerides through the kidneys.
- C) Promotes accumulation of cholesterol plaques within arterial walls.
- D) Prevents formation of coronary artery blockages.

Question 14. In the cholesterol enzymatic assay, cholesterol esterase functions to:

- A) Hydrolyze cholesteryl esters into cholesterol and fatty acids.
- B) Oxidize glucose into gluconic acid and hydrogen peroxide.
- C) Convert triglycerides into glycerol-3-phosphate.
- D) Reduce hydrogen peroxide into molecular oxygen.

Question 15. The color produced in the cholesterol assay remains stable for at least:

- A) 5 minutes in direct sunlight.
- B) 10 minutes at room temperature only.
- C) 30 minutes when protected from light.
- D) 2 hours at boiling temperature.

Question 16. A total cholesterol concentration of 250 mg/dL is classified as:

- A) Desirable cholesterol level.
- B) Borderline high cholesterol level.
- C) High cholesterol level.
- D) Hypocholesterolemia.

Question 17. Triglycerides are chemically defined as:

- A) Esters formed from fatty acids and glycerol molecules.
- B) Steroid hormones synthesized from phospholipids.
- C) Nitrogen-containing compounds involved in DNA synthesis.
- D) Water-soluble monosaccharides used for rapid ATP production.

Question 18. During triglyceride determination, lipoprotein lipase (LPL) catalyzes:

- A) Hydrolysis of triglycerides into glycerol and free fatty acids.
- B) Oxidation of cholesterol into cholestenone.
- C) Conversion of gluconic acid into glucose molecules.
- D) Reduction of hydrogen peroxide into water and oxygen.

Question 19. In the triglyceride assay, glycerol-3-phosphate oxidase (GPO) converts glycerol-3-phosphate into:

- A) Cholesterol esters and ATP.
- B) Dihydroxyacetone phosphate and hydrogen peroxide.
- C) Glucose and phospholipids.
- D) Lactate and pyruvate molecules.

Question 20. A triglyceride concentration of 550 mg/dL would be interpreted as:

- A) Desirable triglyceride level.
- B) Borderline high triglyceride level.
- C) High triglyceride level.
- D) Very high triglyceride level.

Model Answers

1. B

2. C

3. B

4. B

5. A

6. B

7. B

8. B

9. A

10. D

11. B

12. A

13. C

14. A

15. C

16. C

17. A

18. A

19. B

20. D