

AAB Medical Technologist (MT) - Chemistry Practice Exam (Sample)

Study Guide



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SAMPLE

Questions

- 1. Which hormone is known to exhibit diurnal variation?**
 - A. Adrenaline**
 - B. Cortisol**
 - C. Insulin**
 - D. Thyroxine**
- 2. What can elevated troponin levels suggest?**
 - A. Heartburn**
 - B. Myocardial infarction**
 - C. Kidney dysfunction**
 - D. Hypoglycemia**
- 3. What results are consistent with compensated metabolic alkalosis?**
 - A. Increased pH, decreased CO₂, decreased HCO₃⁻**
 - B. Increased pH, decreased CO₂, increased HCO₃⁻**
 - C. Increased pH, increased CO₂, decreased HCO₃⁻**
 - D. Increased pH, increased CO₂, increased HCO₃⁻**
- 4. Which of the following is the major extracellular cation?**
 - A. Sodium**
 - B. Potassium**
 - C. Magnesium**
 - D. Chloride**
- 5. Lipemia is associated with an increased amount of which of the following?**
 - A. LDL cholesterol**
 - B. triglycerides**
 - C. HDL cholesterol**
 - D. bilirubin**

- 6. What is the consequence of low bicarbonate levels in a metabolic panel?**
- A. Acidosis**
 - B. Alkalosis**
 - C. Hyperkalemia**
 - D. Hypokalemia**
- 7. What is the most common method for measuring sodium levels in the laboratory?**
- A. Flame photometry**
 - B. Ion-selective electrode**
 - C. Colorimetric assay**
 - D. Mass spectrometry**
- 8. Which analyte must be measured to calculate the estimated glomerular filtration rate (eGFR)?**
- A. Urine creatinine**
 - B. Body surface area**
 - C. 24-hour urine volume**
 - D. Serum creatinine**
- 9. What is the purpose of coagulation tests in clinical labs?**
- A. To evaluate electrolyte balance**
 - B. To assess the blood's ability to clot and identify bleeding disorders**
 - C. To measure hemoglobin concentration**
 - D. To analyze cholesterol levels**
- 10. Which type of cuvette is necessary for measurements in the ultraviolet range of a spectrophotometer?**
- A. Glass cuvette**
 - B. Plastic cuvette**
 - C. Quartz cuvette**
 - D. Metal cuvette**

Answers

SAMPLE

1. B
2. B
3. D
4. A
5. B
6. A
7. B
8. D
9. B
10. C

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Explanations

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1. Which hormone is known to exhibit diurnal variation?

- A. Adrenaline
- B. Cortisol**
- C. Insulin
- D. Thyroxine

Cortisol is well known for its diurnal variation, which means that its levels fluctuate throughout the day, typically peaking in the early morning upon waking and gradually declining throughout the day, reaching their lowest levels late in the evening. This pattern is influenced by the body's internal clock, also known as the circadian rhythm, and is integral to various physiological processes, including metabolism, immune response, and stress management. Understanding cortisol's diurnal rhythm is essential in clinical chemistry, as it affects diagnostic interpretations. For example, abnormal cortisol levels at specific times may indicate conditions like Cushing's syndrome or adrenal insufficiency. Therefore, when measuring cortisol for diagnostic purposes, the timing of specimen collection is critical to achieve accurate assessment. In contrast to cortisol, other hormones like adrenaline, insulin, and thyroxine do not exhibit the same pronounced diurnal variation. Adrenaline levels can fluctuate based on stress and physical activity rather than a consistent daily pattern. Insulin secretion is more closely tied to dietary intake and blood glucose levels, rather than a strict daily rhythm. Similarly, while thyroxine levels can display some variation, they are not characterized by a clear diurnal cycle like cortisol. This distinction highlights why cortisol is the hormone best known for exhibiting di

2. What can elevated troponin levels suggest?

- A. Heartburn
- B. Myocardial infarction**
- C. Kidney dysfunction
- D. Hypoglycemia

Elevated troponin levels primarily indicate myocardial injury, most commonly associated with a myocardial infarction (heart attack). Troponin is a protein found in heart muscle cells, and when these cells are damaged, troponin is released into the bloodstream. This sensitivity and specificity make troponin measurement a crucial tool for diagnosing acute coronary syndromes. In the context of myocardial infarction, rising levels of troponin can help healthcare providers assess the timing and extent of heart muscle damage. The greater the troponin concentration, the more significant the myocardial injury is likely to be. Adequate intervention can then be planned according to this information. Other choices, although they may describe conditions that could affect heart function or overall health, do not correlate strongly with elevated troponin levels. Heartburn is related to gastrointestinal issues, kidney dysfunction may impact overall fluid balance and metabolic waste removal but does not directly cause troponin elevation, and hypoglycemia primarily affects blood sugar levels without directly involving cardiac muscle damage as a mechanism for troponin release.

3. What results are consistent with compensated metabolic alkalosis?

- A. Increased pH, decreased CO₂, decreased HCO₃⁻**
- B. Increased pH, decreased CO₂, increased HCO₃⁻**
- C. Increased pH, increased CO₂, decreased HCO₃⁻**
- D. Increased pH, increased CO₂, increased HCO₃⁻**

Compensated metabolic alkalosis is characterized by an elevated arterial blood pH due to an excess of bicarbonate in the blood and the body's attempt to restore normal pH levels through respiratory compensation. In this state, the body retains carbon dioxide (CO₂) to help increase acidity and counterbalance the alkalinity created by high bicarbonate (HCO₃⁻). When metabolic alkalosis occurs, the kidneys may retain bicarbonate or the condition may arise from excessive loss of acid (like vomiting). To compensate, the respiratory system will reduce the rate of breathing to retain CO₂, thereby increasing the partial pressure of CO₂ in the blood. This leads to an increased concentration of HCO₃⁻ in the blood as the primary driver of the alkalosis remains, while CO₂ is also high due to the respiratory compensation. The correct choice reflects the findings: an increased pH indicates a more alkaline environment, increased CO₂ due to respiratory compensation, and increased HCO₃⁻ confirming the metabolic alkalosis and the compensatory mechanisms in play. This understanding is crucial for medical technologists as it enables accurate interpretation of blood gas results in assessing a patient's acid-base status.

4. Which of the following is the major extracellular cation?

- A. Sodium**
- B. Potassium**
- C. Magnesium**
- D. Chloride**

Sodium is recognized as the major extracellular cation in the body, playing a crucial role in various physiological processes. It is predominantly found in the blood and the fluid surrounding cells, contributing significantly to the regulation of blood pressure, blood volume, and overall fluid balance. Sodium is essential for maintaining the osmotic balance of extracellular fluid and is vital in the conduction of nerve impulses and muscle contraction. In contrast, while potassium is also an important cation, it is primarily located within cells, making it the major intracellular cation rather than extracellular. Magnesium, while important for numerous enzymatic processes and also found in extracellular fluid, is present in much lower concentrations compared to sodium. Chloride, on the other hand, is primarily an anion, balancing the positive charges of cations like sodium but does not fit the criteria of being a cation itself. This distinction of sodium as the major extracellular cation is fundamental to understanding electrolyte balance and its implications for health and disease.

5. Lipemia is associated with an increased amount of which of the following?

- A. LDL cholesterol**
- B. triglycerides**
- C. HDL cholesterol**
- D. bilirubin**

Lipemia is characterized by an elevated level of lipids in the blood, particularly triglycerides. When triglyceride levels rise significantly, it results in a cloudy or milky appearance to the plasma, which is what is referred to as lipemia. Triglycerides are a major component of fat in the diet and are synthesized in the liver, making their elevation a key indicator of lipemic conditions. In the context of lipemia, the increase in triglycerides can be due to various factors, including dietary intake, genetic predispositions, and metabolic disorders. Understanding this relationship is crucial for laboratory diagnostics and patient management, as high triglyceride levels can contribute to other health concerns, such as pancreatitis. Other lipid fractions, like LDL and HDL cholesterol, do not directly correlate with lipemia. LDL cholesterol may also be elevated in certain conditions, but it is not a defining feature of lipemia. Similarly, HDL cholesterol is often referred to as "good" cholesterol and is typically associated with a protective role against cardiovascular disease rather than being a marker of lipemia. Bilirubin, a product of the breakdown of hemoglobin, is unrelated to the presence of lipids in the blood. Thus, the correct answer focuses on the primary lipid species associated with

6. What is the consequence of low bicarbonate levels in a metabolic panel?

- A. Acidosis**
- B. Alkalosis**
- C. Hyperkalemia**
- D. Hypokalemia**

Low bicarbonate levels in a metabolic panel indicate a deficiency of bicarbonate in the bloodstream, which plays a crucial role in maintaining the body's acid-base balance. Bicarbonate acts as a buffer that neutralizes excess acids in the body. When bicarbonate levels drop, the ability to neutralize acid decreases, leading to an accumulation of hydrogen ions and a resultant decrease in blood pH, which is defined as acidosis. Acidosis can manifest in two forms: metabolic acidosis and respiratory acidosis. In the case of low bicarbonate levels specifically, metabolic acidosis is typically the more relevant condition. This can occur due to various factors such as increased production of acids, loss of bicarbonate through the gastrointestinal tract, or renal failure, all of which lead to a lower blood pH and can have significant physiological implications. Understanding the role of bicarbonate is critical for interpreting metabolic panels and determining the underlying acid-base disorder.

7. What is the most common method for measuring sodium levels in the laboratory?

- A. Flame photometry**
- B. Ion-selective electrode**
- C. Colorimetric assay**
- D. Mass spectrometry**

The most common method for measuring sodium levels in the laboratory is the ion-selective electrode (ISE) technique. This method utilizes a special electrode that is sensitive specifically to sodium ions. The ISE generates a potential difference that correlates directly with the concentration of sodium in the sample. This technique has several advantages, including its ability to provide quick results, ease of use, and relatively low cost compared to other methods. Additionally, ISE can be used on various sample types, including serum, plasma, and urine, making it versatile for clinical settings. Because it is a direct measurement method, it is often preferred for routine sodium testing due to its accuracy and precision in reflecting physiological levels of sodium in the body. Other methods such as flame photometry, colorimetric assays, and mass spectrometry are used in certain contexts but are not as frequently employed for routine sodium measurement. Flame photometry is effective but may lack the specificity observed with ISE technology. Colorimetric assays are generally not as sensitive for low concentrations of sodium, and mass spectrometry, while highly accurate, is typically reserved for more complex analyses rather than routine sodium testing due to its complexity and cost.

8. Which analyte must be measured to calculate the estimated glomerular filtration rate (eGFR)?

- A. Urine creatinine**
- B. Body surface area**
- C. 24-hour urine volume**
- D. Serum creatinine**

The estimated glomerular filtration rate (eGFR) is an important clinical measure used to assess kidney function and determine how well the kidneys are filtering blood. The primary analyte required to calculate eGFR is serum creatinine. Creatinine is a byproduct of muscle metabolism that is produced at a relatively constant rate and is excreted by the kidneys. Because creatinine levels in the serum can indicate how well the kidneys are functioning, measuring serum creatinine provides a reliable estimate of the kidney's filtration capabilities. While other elements such as body surface area can be utilized in the calculations for eGFR, they do not stand alone; thus, they do not serve as the primary analyte. For example, the most commonly used equations to estimate GFR, such as the Cockcroft-Gault or the MDRD (Modification of Diet in Renal Disease) equation, use serum creatinine values as the foundational component. Additionally, 24-hour urine volume and urine creatinine are not utilized to calculate eGFR directly, as they involve different assessments of kidney function. Therefore, serum creatinine is the crucial component required for the calculation of eGFR.

9. What is the purpose of coagulation tests in clinical labs?

- A. To evaluate electrolyte balance
- B. To assess the blood's ability to clot and identify bleeding disorders**
- C. To measure hemoglobin concentration
- D. To analyze cholesterol levels

The purpose of coagulation tests in clinical labs is to assess the blood's ability to clot and identify bleeding disorders. These tests are crucial for diagnosing conditions related to abnormal bleeding, identifying clotting factor deficiencies, and monitoring anticoagulant therapy. Coagulation tests such as prothrombin time (PT), activated partial thromboplastin time (aPTT), and platelet counts are vital in determining how well and how quickly blood will clot. They help clinicians understand the hemostatic process and can suggest underlying issues such as liver disease, vitamin K deficiency, or the presence of inhibitors against clotting factors. Other options focus on areas that are not directly related to coagulation testing. For instance, evaluating electrolyte balance and measuring hemoglobin concentration pertain to different diagnostic specialties, while analyzing cholesterol levels is a part of lipid panels, which are again unrelated to coagulation assessments. Thus, the emphasis on the blood's clotting capability and the detection of bleeding disorders highlights the significance of coagulation tests as a fundamental part of clinical hematology and pathology.

10. Which type of cuvette is necessary for measurements in the ultraviolet range of a spectrophotometer?

- A. Glass cuvette
- B. Plastic cuvette
- C. Quartz cuvette**
- D. Metal cuvette

In spectrophotometry, the choice of cuvette material is critical, particularly when measuring absorbance in the ultraviolet (UV) range of the spectrum. Quartz cuvettes are specifically designed for this purpose because they have excellent transmission properties in the UV region, typically from about 200 nm to 400 nm. Unlike glass and plastic, which can absorb UV light and may alter the readings, quartz allows for accurate measurement of UV wavelengths without interference. This transparency is essential for obtaining reliable and precise absorbance data in biochemical analyses. Metal cuvettes, on the other hand, are not suitable either, as they reflect light and do not permit transmission for spectrophotometric measurements. Therefore, the need for a cuvette material that can handle the specific wavelengths of UV light while providing minimal absorption makes quartz the appropriate choice for such measurements.