AAB Medical Technologist (MT) – Generalist Practice Exam (Sample)

Study Guide

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Questions

1. **The following test results are consistent with which health condition: WBC 5,200 cells per uL, Lymphocytes 16%, CD4 7%?**
   - A. Hepatitis
   - B. HIV
   - C. Leukemia
   - D. Anemia

2. **What indicates a positive result in a complement fixation test?**
   - A. Presence of hemolysis
   - B. No hemolysis
   - C. Increased turbidity
   - D. Decline in antibody levels

3. **Which red blood cell abnormality is associated with the Rh-null phenotype?**
   - A. Stomatocytosis
   - B. Spherocytosis
   - C. Elliptocytosis
   - D. Target cells

4. **What X-linked recessive disease is characterized by the absence of mature B cells?**
   - A. X-linked agammaglobulinemia
   - B. Severe Combined Immunodeficiency
   - C. Common Variable Immunodeficiency
   - D. Wiskott-Aldrich Syndrome

5. **What is the formula used to calculate cell concentration from a blood sample?**
   - A. Total cells/mL = (Total cells counted x Dilution factor x Number of squares)
   - B. Total cells/mL = (Total cells counted x Dilution factor x 10,000 cells/mL) / Number of squares counted
   - C. Total cells/mL = (Total cells counted x 10) / Number of squares counted
   - D. Total cells/mL = (Number of squares counted x Dilution factor) / Total cells counted

6. What does the term "phenotype" refer to in blood typing?

A. The genetic makeup of an individual

B. The observable characteristics or traits

C. The presence of antibodies

D. The inheritance pattern of blood groups

7. Hemolytic anemia is best described morphologically as which type of cells?

A. Microcytic and hypochromic

B. Normocytic and normochromic

C. Macrocytic and hyperchromic

D. Macrocytic and normochromic

8. What is the primary indicator for performing a direct antiglobulin test?

A. To evaluate blood type

B. To check for hemolysis

C. To detect incompatible transfusions

D. To assess platelet function

9. Which of these anemias is hypochromic and microcytic?

A. Macrocytic anemia

B. Thalassemia

C. Aplastic anemia

D. Sickle cell anemia

10. According to AABB guidelines, how long can thawed fresh frozen plasma be refrigerated before discard?

A. 12 hours

B. 24 hours

C. 48 hours

D. 72 hours

Answers

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

Explanations

1. The following test results are consistent with which health condition: WBC 5,200 cells per uL, Lymphocytes 16%, CD4 7%?

A. Hepatitis

B. HIV

C. Leukemia

D. Anemia

The test results presented indicate a white blood cell (WBC) count of 5,200 cells per micro-liter, a lymphocyte percentage of 16%, and a CD4 count of 7%. In the context of these values, the health condition that aligns with them is HIV. Individuals with HIV often exhibit a significantly reduced CD4 T-cell count, which is crucial for a healthy immune response. A CD4 count of 7% is indicative of immunosuppression, which is common in the later stages of HIV infection or in untreated cases. The lymphocyte percentage also shows a deviation, as typically, a greater proportion should be present if the immune system is functioning properly. In contrast, the other conditions do not correlate with these specific laboratory findings. Hepatitis might present with elevated liver enzymes or other abnormalities rather than altered lymphocyte distribution. Leukemia could present with a higher WBC count and significant changes in various blood components, not a markedly low CD4 percentage. Anemia primarily affects red blood cell levels and would not directly impact the WBC differential or CD4 counts in this manner. Therefore, the results strongly suggest an HIV diagnosis, making it the most fitting health condition among the options provided.

2. What indicates a positive result in a complement fixation test?

A. Presence of hemolysis

B. No hemolysis

C. Increased turbidity

D. Decline in antibody levels

In a complement fixation test, a positive result is indicated by the absence of hemolysis. The test is based on the principle that if antibodies specific to the antigen are present in the serum, they will bind to the antigen and fix complement. This bound complement is then unavailable to lyse indicator red blood cells added to the system. As a result, if hemolysis occurs, the antibodies were not present to fix the complement, resulting in a negative test. Conversely, if no hemolysis is observed, it suggests that the complement has been fixed by the antibody-antigen complex, confirming a positive result. This understanding is essential for interpreting the results correctly. The presence of hemolysis would actually indicate a lack of specific antibodies, signifying a negative outcome. Increased turbidity is generally not a direct measure of a positive result in this context; it's not the standard indicator. A decline in antibody levels does not relate directly to the interpretation of the complement fixation test, which primarily assesses the presence of antibodies through their ability to fix complement instead. Thus, the absence of hemolysis is the key indicator of a positive complement fixation test.

3. Which red blood cell abnormality is associated with the Rh-null phenotype?

A. Stomatocytosis

B. Spherocytosis

C. Elliptocytosis

D. Target cells

The Rh-null phenotype is characterized by a complete absence of Rh antigens on red blood cells. Individuals with this phenotype can exhibit stomatocytosis, which refers to the presence of red blood cells that have a mouth-like or oval-shaped appearance due to changes in their membrane and water balance. This shape is often the result of altered cell membrane PH and ionic changes, which can be associated with the lack of certain blood group antigens, including those found in the Rh blood group system. Stomatocytosis in the context of Rh-null individuals can lead to varying clinical implications, such as increased fragility and susceptibility to hemolysis. This abnormality serves as a key indicator within hematological investigations when assessing Rh-null individuals, providing crucial information for the diagnosis and management of their condition. The other conditions listed, such as spherocytosis, elliptocytosis, and target cells, relate to different mechanisms and disorders. Spherocytosis typically arises from issues with the spectrin protein in the cell membrane, elliptocytosis is associated with genetic defects causing elliptical-shaped red blood cells, and target cells are often related to hemoglobinopathies. Each of these abnormalities has distinct causes and clinical implications separate from those associated with the Rh-null phenotype. Thus

4. What X-linked recessive disease is characterized by the absence of mature B cells?

A. X-linked agammaglobulinemia

B. Severe Combined Immunodeficiency

C. Common Variable Immunodeficiency

D. Wiskott-Aldrich Syndrome

X-linked agammaglobulinemia is characterized by the absence of mature B cells due to a mutation in the BTK gene, which is critical for B cell development. This disease results in a profound deficiency of antibodies because, without mature B cells, the body cannot produce immunoglobulins effectively. Patients with this condition are highly susceptible to infections, particularly those caused by encapsulated bacteria. The other conditions listed do not specifically exhibit the absence of mature B cells or are not solely linked to X-linked recessive inheritance. For example, severe combined immunodeficiency is a broader category affecting multiple aspects of the immune system and can involve T cells and B cells but is not exclusively linked to the absence of mature B cells. Common variable immunodeficiency affects both B cell numbers and function but is not primarily characterized by an absence of B cells nor is it X-linked. Wiskott-Aldrich syndrome is an X-linked condition but is defined by a triad of eczema, thrombocytopenia, and recurrent infections, and does not specifically involve the absence of mature B cells alone. Thus, X-linked agammaglobulinemia is distinctive for this characteristic feature.

5. What is the formula used to calculate cell concentration from a blood sample?

A. Total cells/mL = (Total cells counted x Dilution factor x Number of squares)

B. Total cells/mL = (Total cells counted x Dilution factor x 10,000 cells/mL) / Number of squares counted

C. Total cells/mL = (Total cells counted x 10) / Number of squares counted

D. Total cells/mL = (Number of squares counted x Dilution factor) / Total cells counted

The formula for calculating cell concentration from a blood sample is accurately expressed in the second choice. It considers the total number of cells counted along with the dilution factor, which is essential when samples have been diluted to achieve a count that's manageable and accurate under a microscope. In this formula, the total cells counted refers to the actual number of cells observed during the counting process. The dilution factor accounts for the proportion of the original sample being counted compared to the diluted sample used. It ensures that the final concentration reflects the actual amount of cells in the original undiluted sample. The division by the number of squares counted is also crucial. When using a counting chamber, such as a hemacytometer, the observer counts cells within specific square areas defined on the chamber. Since the total volume analyzed is limited to only a fraction of the entire sample volume, the formula incorporates the number of squares counted to extrapolate the total concentration per milliliter. Using this formula allows for accurate adjustments based on the dilution and specific area counted, thereby yielding a reliable concentration of cells in the original blood sample.

6. What does the term "phenotype" refer to in blood typing?

A. The genetic makeup of an individual

B. The observable characteristics or traits

C. The presence of antibodies

D. The inheritance pattern of blood groups

The term "phenotype" specifically refers to the observable characteristics or traits of an individual, which can be the expression of various genes in the context of blood typing. In blood typing, the phenotype would describe the blood group that is visible and can be tested, such as A, B, AB, or O, based on the presence or absence of specific antigens on the surface of red blood cells. This definition highlights the physical expression of genetic information, distinguishing it from the underlying genetic makeup or genotype, which encompasses the alleles an individual carries. In blood typing, while the genotype may determine the phenotype, it is the observable blood group that is relevant for transfusion compatibility and other clinical considerations, reinforcing why the observable characteristics are central in this context.

7. Hemolytic anemia is best described morphologically as which type of cells?

A. Microcytic and hypochromic

B. Normocytic and normochromic

C. Macrocytic and hyperchromic

D. Macrocytic and normochromic

Hemolytic anemia is characterized by the premature destruction of red blood cells, leading to a compensatory increase in erythropoiesis. Morphologically, the red blood cells in hemolytic anemia are typically classified as normocytic and normochromic. This means that the cells maintain a normal size (normocytic) and have a normal amount of hemoglobin (normochromic), even though their lifespan is reduced due to hemolysis. In the case of hemolytic anemia, the bone marrow responds to the decreased circulating red blood cells by producing new red blood cells, which usually appear normal in size and color at this stage of the condition. This contrasts with other forms of anemia, where the morphologic features of the cells can differ significantly due to underlying causes, such as iron deficiency or vitamin B12 deficiency.

8. What is the primary indicator for performing a direct antiglobulin test?

A. To evaluate blood type

B. To check for hemolysis

C. To detect incompatible transfusions

D. To assess platelet function

The primary indicator for performing a direct antiglobulin test (DAT) is to detect incompatible transfusions. This test is crucial in the context of hemolytic reactions, where it checks for the presence of antibodies attached to the surface of red blood cells (RBCs). In cases of incompatible blood transfusions, the recipient's immune system may produce antibodies against the donor’s red blood cells, leading to hemolysis. By performing the DAT, medical technologists can identify whether these antibodies are present, which confirms that a hemolytic reaction has occurred due to incompatible blood transfusion. The test is often used in scenarios where patients display symptoms of hemolytic anemia or when there is suspicion of transfusion reactions, making it a vital component in ensuring patient safety during blood transfusion procedures. While evaluating blood type, checking for hemolysis, and assessing platelet function are all important in the field of transfusion medicine, they do not specifically focus on detecting antibodies bound to RBCs as the direct antiglobulin test does, which is why they are not considered the primary indicators for this specific test.

9. Which of these anemias is hypochromic and microcytic?

- A. Macrocytic anemia
- B. Thalassemia
- C. Aplastic anemia
- D. Sickle cell anemia

Hypochromic and microcytic anemias are characterized by red blood cells that are smaller than normal (microcytic) and have less hemoglobin, which causes a paler appearance (hypochromic). Thalassemia is a classic example of this type of anemia because it results from an inherited defect in hemoglobin synthesis, leading to reduced production of one of the globin chains. This deficiency affects the formation of hemoglobin within the red blood cells, making them smaller and less pigmented. Macrocytic anemia, resulting from deficiencies such as vitamin B12 or folate deficiency, shows larger than normal red blood cells, thus does not fit the hypochromic and microcytic classification. Aplastic anemia is characterized by a deficiency of all blood cell types due to failure of bone marrow function, and sickle cell anemia leads to abnormal shape rather than size or hemoglobin content reductions. Therefore, thalassemia stands out as the only condition that specifically exhibits both hypochromic and microcytic properties in its anemic presentation.

10. According to AABB guidelines, how long can thawed fresh frozen plasma be refrigerated before discard?

- A. 12 hours
- B. 24 hours
- C. 48 hours
- D. 72 hours

Thawed fresh frozen plasma (FFP) can be stored in the refrigerator for up to 24 hours before it must be discarded, according to AABB guidelines. This time frame is established to ensure the quality and safety of the plasma, as the components within the plasma can degrade over time, impacting its efficacy when transfused. FFP is typically used in transfusion medicine to replace clotting factors and to manage coagulopathy. After thawing, if it's not used within this 24-hour window, the risk of bacterial growth and the deterioration of clotting factor levels increases, making the product less effective for patient management. Keeping these guidelines in mind ensures compliance with safety standards and promotes positive patient outcomes. Other time options like 12, 48, or 72 hours exceed this recommended period and would contravene patient safety protocols.