Board Exam Desk

Medical Technology Reviewer

BS Medical Technology | MTLE | 120 original questions

2026 Edition | Updated November 2026

Practice clinical chemistry, microbiology, hematology, blood banking, clinical microscopy and laboratory management.

Practice questions

Clinical Chemistry

1. How many microliters are in 0.25 milliliters?

A. 25
B. 250
C. 2,500
D. 25,000

2. One part stock solution is mixed with nine parts diluent. What fraction of the final mixture is stock?

A. 1/2
B. 1/5
C. 1/9
D. 1/10

3. How many milliliters are in 1.5 liters?

A. 15
B. 150
C. 1,500
D. 15,000

4. A sample contains 4 mg in 2 mL. What is its concentration?

A. 2 mg/mL
B. 4 mg/mL
C. 6 mg/mL
D. 8 mg/mL

5. How many milligrams are in 0.6 grams?

A. 6
B. 60
C. 600
D. 6,000

6. What final volume results from combining 2 mL of stock with 8 mL of diluent, assuming additive volumes?

A. 4 mL
B. 6 mL
C. 8 mL
D. 10 mL

7. A 4 mg/mL stock is diluted to twice its original volume. What is the final concentration?

A. 2 mg/mL
B. 4 mg/mL
C. 6 mg/mL
D. 8 mg/mL

8. You need 10 mL of a 2 mg/mL solution from a 10 mg/mL stock. How much stock is required?

A. 1 mL
B. 2 mL
C. 5 mL
D. 8 mL

9. A fasting plasma glucose is reported as 7.2 mmol/L. Using a molecular weight of about 180 g/mol for glucose, what is the equivalent value in mg/dL?

A. 72 mg/dL
B. 100 mg/dL
C. 130 mg/dL
D. 162 mg/dL

10. A fasting lipid panel shows total cholesterol 220 mg/dL, HDL cholesterol 50 mg/dL and triglycerides 150 mg/dL. What is the LDL cholesterol estimated by the Friedewald equation?

A. 110 mg/dL
B. 140 mg/dL
C. 170 mg/dL
D. 190 mg/dL

11. A serum sample was left on the clot at room temperature for four hours before separation. Which result is most likely to be falsely decreased?

A. Glucose
B. Potassium
C. Lactate dehydrogenase
D. Inorganic phosphorus

12. Which analyte shows the greatest false elevation when a serum specimen is visibly hemolyzed in vitro?

A. Sodium
B. Chloride
C. Albumin
D. Potassium

13. A patient has jaundice with ALT and AST both more than 10 times the upper reference limit (ALT higher than AST) and only a mild rise in alkaline phosphatase. Which condition best fits this pattern?

A. Extrahepatic biliary obstruction
B. Acute myocardial infarction
C. Acute viral hepatitis
D. Acute pancreatitis

14. Which serum marker is currently preferred for diagnosing acute myocardial infarction because of its high cardiac specificity?

A. Total creatine kinase
B. Lactate dehydrogenase
C. Cardiac troponin I or T
D. Aspartate aminotransferase

15. The Jaffe reaction, in which an analyte forms a red-orange complex with alkaline picrate, is used to measure which substance?

A. Creatinine
B. Urea nitrogen
C. Uric acid
D. Total protein

16. Serum results: sodium 140 mmol/L, chloride 100 mmol/L, bicarbonate 24 mmol/L. What is the anion gap (without potassium)?

A. 12 mmol/L
B. 16 mmol/L
C. 20 mmol/L
D. 40 mmol/L

17. A 100 mg/dL standard gives an absorbance of 0.40 and a patient sample run under the same conditions gives 0.30. Assuming Beer's law holds, what is the patient concentration?

A. 75 mg/dL
B. 30 mg/dL
C. 133 mg/dL
D. 120 mg/dL

18. Arterial blood gas: pH 7.30, pCO2 60 mm Hg, bicarbonate 29 mmol/L. What is the primary acid-base disturbance?

A. Respiratory acidosis
B. Metabolic acidosis
C. Respiratory alkalosis
D. Metabolic alkalosis

19. Glycated hemoglobin (HbA1c) is used in diabetes monitoring because it reflects average blood glucose over approximately what period?

A. The previous 24 hours
B. The previous 2 to 3 weeks
C. The previous 2 to 3 months
D. The previous 12 months

20. A patient with pale stools, dark urine and elevated conjugated bilirubin is suspected of having a common bile duct stone. Which enzyme is expected to be the most markedly elevated?

A. Alkaline phosphatase
B. Creatine kinase
C. Amylase
D. Aldolase

21. Compared with serum amylase, why is serum lipase often preferred in evaluating suspected acute pancreatitis?

A. It rises within minutes and normalizes within six hours
B. It is not affected by renal function at all
C. It is also produced in large amounts by the salivary glands
D. It is more specific for the pancreas and stays elevated longer

22. Using the formula 2(Na) + glucose/18 + BUN/2.8, what is the calculated serum osmolality for sodium 140 mmol/L, glucose 90 mg/dL and BUN 14 mg/dL?

A. 280 mOsm/kg
B. 290 mOsm/kg
C. 300 mOsm/kg
D. 310 mOsm/kg

Microbiology and Parasitology

23. A wound isolate shows gram-positive cocci in clusters that are catalase positive and coagulase positive. What is the most likely organism?

A. Staphylococcus epidermidis
B. Staphylococcus aureus
C. Streptococcus pyogenes
D. Enterococcus faecalis

24. A throat culture grows beta-hemolytic, catalase-negative gram-positive cocci in chains that are PYR positive and susceptible to bacitracin. Identify the organism.

A. Streptococcus pyogenes
B. Streptococcus agalactiae
C. Streptococcus pneumoniae
D. Staphylococcus aureus

25. Sputum yields alpha-hemolytic, catalase-negative, lancet-shaped gram-positive diplococci that are optochin susceptible and bile soluble. What is the organism?

A. Viridans streptococci
B. Streptococcus pneumoniae
C. Enterococcus faecium
D. Moraxella catarrhalis

26. Which selective medium is most appropriate for primary isolation of Neisseria gonorrhoeae from an endocervical swab?

A. Modified Thayer-Martin agar
B. MacConkey agar
C. Thiosulfate citrate bile salts sucrose agar
D. Lowenstein-Jensen medium

27. A stool isolate is a lactose non-fermenter on MacConkey agar, forms black-centered colonies on XLD agar and is urease negative. Which genus is most likely?

A. Shigella
B. Escherichia
C. Klebsiella
D. Salmonella

28. A urine isolate ferments lactose and gives the IMViC pattern indole +, methyl red +, Voges-Proskauer -, citrate -. What is the most likely identification?

A. Klebsiella pneumoniae
B. Enterobacter cloacae
C. Citrobacter freundii
D. Escherichia coli

29. A gram-negative rod from a urinary catheter spreads in waves across a blood agar plate and is strongly urease positive. What is the most likely organism?

A. Pseudomonas aeruginosa
B. Serratia marcescens
C. Morganella morganii
D. Proteus mirabilis

30. A burn wound culture grows an oxidase-positive, non-lactose-fermenting gram-negative rod producing a blue-green pigment and a grape-like odor. Identify the organism.

A. Acinetobacter baumannii
B. Pseudomonas aeruginosa
C. Stenotrophomonas maltophilia
D. Burkholderia cepacia

31. Which egg-based solid medium is traditionally used to culture Mycobacterium tuberculosis?

A. Sabouraud dextrose agar
B. Bordet-Gengou agar
C. Lowenstein-Jensen medium
D. Loeffler serum slant

32. Which standard condition is commonly used for steam sterilization of culture media and reusable items in an autoclave?

A. 100 degrees C at atmospheric pressure for 5 minutes
B. 160 degrees C dry heat for 30 minutes
C. 121 degrees C at 15 psi for at least 15 minutes
D. 56 degrees C for 30 minutes

33. Before Kirby-Bauer disk diffusion testing, the bacterial suspension is adjusted to match which turbidity standard?

A. 1.0 McFarland standard
B. 0.5 McFarland standard
C. 3.0 McFarland standard
D. No standard; any visible turbidity

34. An India ink preparation of CSF from an immunocompromised patient shows round budding yeasts surrounded by wide clear halos. Which organism is most likely?

A. Candida albicans
B. Cryptococcus neoformans
C. Histoplasma capsulatum
D. Aspergillus fumigatus

35. A yeast isolate incubated in serum at 37 degrees C for about 2 to 3 hours produces short hyphal extensions without constriction at the point of origin. What does this indicate?

A. Candida glabrata
B. Cryptococcus neoformans
C. Candida albicans
D. Rhodotorula species

36. A thin blood film shows crescent- or banana-shaped gametocytes in red cells. Which malaria species is indicated?

A. Plasmodium falciparum
B. Plasmodium vivax
C. Plasmodium malariae
D. Plasmodium ovale

37. A stool concentrate shows brown, barrel-shaped eggs with a clear plug at each end. Which helminth is present?

A. Trichuris trichiura
B. Ascaris lumbricoides
C. Necator americanus
D. Enterobius vermicularis

38. A child has nocturnal perianal itching. Which specimen collection method is best for detecting the suspected parasite?

A. Three random stool samples in formalin
B. Thick and thin blood films at midnight
C. Cellophane tape applied to the perianal skin in the early morning
D. Duodenal aspirate

39. Stool from a rice farmer in Leyte shows oval eggs with a small, inconspicuous lateral knob. Which parasite, endemic in the Philippines, is most likely?

A. Schistosoma japonicum
B. Schistosoma mansoni
C. Fasciola hepatica
D. Paragonimus westermani

40. A wet mount of dysenteric stool shows motile amoebic trophozoites containing ingested red blood cells. What is the most likely organism?

A. Entamoeba histolytica
B. Entamoeba coli
C. Endolimax nana
D. Iodamoeba buetschlii

41. A duodenal aspirate shows pear-shaped, bilaterally symmetrical flagellates with two nuclei and a ventral sucking disk. Identify the parasite.

A. Trichomonas vaginalis
B. Giardia duodenalis (lamblia)
C. Chilomastix mesnili
D. Balantidium coli

42. An anaerobic culture from a gas gangrene wound grows large, rectangular gram-positive rods that produce a double zone of beta-hemolysis on blood agar. What is the organism?

A. Clostridium tetani
B. Bacillus cereus
C. Clostridioides difficile
D. Clostridium perfringens

Hematology

43. A CBC shows RBC count 4.0 x 10^12/L, hemoglobin 12.0 g/dL and hematocrit 36%. What is the MCV?

A. 80 fL
B. 90 fL
C. 100 fL
D. 111 fL

44. A patient has hemoglobin 10.0 g/dL and hematocrit 36%. What is the MCHC, and how is the cell population described?

A. 27.8 g/dL, hypochromic
B. 33.3 g/dL, normochromic
C. 36.0 g/dL, hyperchromic
D. 25.0 g/dL, hyperchromic

45. An automated WBC count is 15.0 x 10^9/L, and the differential shows 25 nucleated RBCs per 100 WBCs. What is the corrected WBC count?

A. 11.3 x 10^9/L
B. 12.0 x 10^9/L
C. 13.5 x 10^9/L
D. 18.8 x 10^9/L

46. A woman has microcytic, hypochromic red cells, low serum ferritin, low serum iron and high total iron-binding capacity. What is the most likely diagnosis?

A. Anemia of chronic disease
B. Iron deficiency anemia
C. Beta-thalassemia minor
D. Sideroblastic anemia

47. A peripheral smear shows oval macrocytes and neutrophils with six or more nuclear lobes. These findings most strongly suggest which condition?

A. Iron deficiency anemia
B. Hereditary spherocytosis
C. Acute blood loss
D. Megaloblastic anemia from vitamin B12 or folate deficiency

48. Numerous fragmented red cells (schistocytes) and a low platelet count on a smear are most consistent with which process?

A. Hereditary spherocytosis
B. Aplastic anemia
C. Microangiopathic hemolytic anemia such as DIC or TTP
D. Iron deficiency anemia

49. Which stain is used to count reticulocytes because it stains residual RNA in living (unfixed) cells?

A. Wright stain
B. New methylene blue
C. Prussian blue
D. Sudan black B

50. A manual WBC count uses a 1:20 dilution. A total of 200 cells are counted in the 4 large corner squares (each 1 mm2) of a hemocytometer with 0.1 mm depth. What is the WBC count?

A. 5,000 cells/uL
B. 10,000 cells/uL
C. 20,000 cells/uL
D. 40,000 cells/uL

51. For routine prothrombin time and activated partial thromboplastin time testing, which tube and blood-to-anticoagulant ratio are required?

A. K2 EDTA at 4 parts blood to 1 part anticoagulant
B. Lithium heparin at 9 parts blood to 1 part anticoagulant
C. Sodium fluoride at 1 part blood to 1 part anticoagulant
D. 3.2% sodium citrate at 9 parts blood to 1 part anticoagulant

52. A patient on a continuous intravenous unfractionated heparin infusion is most commonly monitored with which test?

A. Prothrombin time with INR
B. Bleeding time
C. Activated partial thromboplastin time
D. Platelet count alone

53. A patient's prolonged aPTT corrects to normal after mixing the plasma 1:1 with normal pooled plasma. What does this suggest?

A. A circulating inhibitor such as lupus anticoagulant
B. A clotting factor deficiency
C. Thrombocytopenia
D. Increased fibrinolysis

54. Blasts in a bone marrow aspirate contain slender red-staining rod-shaped cytoplasmic inclusions. These inclusions indicate which lineage?

A. Lymphoid (acute lymphoblastic leukemia)
B. Erythroid (pure red cell aplasia)
C. Myeloid (acute myeloid leukemia)
D. Plasma cell (multiple myeloma)

55. A 70-year-old has a lymphocyte count of 40 x 10^9/L with small mature-looking lymphocytes and many smudge cells on the smear. What is the most likely diagnosis?

A. Chronic lymphocytic leukemia
B. Infectious mononucleosis
C. Acute lymphoblastic leukemia
D. Hairy cell leukemia

56. The Philadelphia chromosome, t(9;22) producing the BCR-ABL1 fusion gene, is the defining genetic abnormality of which disorder?

A. Polycythemia vera
B. Chronic lymphocytic leukemia
C. Acute promyelocytic leukemia
D. Chronic myeloid leukemia

57. Which handling error falsely increases the Westergren erythrocyte sedimentation rate?

A. Testing a refrigerated sample without warming it
B. Using excess EDTA relative to blood volume
C. Tilting the ESR tube away from vertical
D. Delaying the test for 24 hours at room temperature

58. Alkaline hemoglobin electrophoresis of an anemic child shows most hemoglobin in the S position, no hemoglobin A, and a small amount of F. What is the most likely interpretation?

A. Sickle cell trait (Hb AS)
B. Sickle cell anemia (Hb SS)
C. Beta-thalassemia minor
D. Hemoglobin C trait

59. A battery factory worker has anemia, and his smear shows red cells with fine to coarse blue granules throughout the cytoplasm. Which condition is suggested?

A. Post-splenectomy state
B. Hereditary spherocytosis
C. Vitamin B12 deficiency without other findings
D. Lead poisoning

60. Small, round, dark purple DNA remnants in red cells are frequently seen after which event?

A. Acute blood loss
B. Iron supplementation
C. Splenectomy
D. Heparin therapy

61. In a normocytic, normochromic specimen with hemoglobin 13.0 g/dL, what hematocrit is expected using the rule of three?

A. 26%
B. 33%
C. 39%
D. 43%

62. Platelet aggregation studies show no response to ristocetin but normal responses to ADP, collagen and epinephrine, and the smear shows giant platelets. What is the most likely diagnosis?

A. Glanzmann thrombasthenia
B. Aspirin effect
C. Storage pool disease
D. Bernard-Soulier syndrome

Blood Banking and Serology (Immunohematology and Immunology)

63. Forward grouping: anti-A negative, anti-B 4+. Reverse grouping: A1 cells 4+, B cells negative. What is the ABO group?

A. Group A
B. Group B
C. Group AB
D. Group O

64. In an emergency where the patient's type is unknown, which plasma is considered compatible with all ABO groups?

A. Group O plasma
B. Group A plasma
C. Group AB plasma
D. Group B plasma

65. An Rh(D)-negative mother with no anti-D delivers an Rh(D)-positive baby. What is the recommended action?

A. Give Rh immune globulin within 72 hours of delivery
B. Give Rh immune globulin only if the baby is jaundiced
C. Transfuse the mother with Rh-positive red cells
D. No action is needed after the first pregnancy

66. A newborn's red cells are tested directly with anti-human globulin to check for maternal antibody coating. Which test is this?

A. Indirect antiglobulin test
B. Direct antiglobulin test
C. Antibody screen
D. Reverse grouping

67. Which antibody is typically IgM, often naturally occurring, and reacts best at room temperature or below?

A. Anti-Lea
B. Anti-K
C. Anti-Fya
D. Anti-Jka

68. A patient develops hemolysis a week after transfusion, but the pretransfusion antibody screen had been negative. Antibodies of which system are notorious for falling to undetectable levels and causing this?

A. Lewis
B. P
C. MNS (anti-M)
D. Kidd

69. How are platelet concentrates stored in the blood bank?

A. At 1 to 6 degrees C without agitation
B. Frozen at -18 degrees C or colder
C. At 37 degrees C in a water bath
D. At 20 to 24 degrees C with continuous gentle agitation

70. A patient with hypofibrinogenemia needs a concentrated source of fibrinogen. Which blood component is most appropriate?

A. Platelet concentrate
B. Packed red blood cells
C. Cryoprecipitated antihemophilic factor
D. Albumin 5%

71. A patient types as group O in forward grouping, but the serum agglutinates A1, B and group O reagent cells strongly. The red cells do not react with anti-H lectin. What is the most likely phenotype?

A. Group O with a cold autoantibody
B. Weak subgroup of A
C. Bombay (Oh)
D. Acquired B phenotype

72. A patient develops fever, chills and back pain 10 minutes into a red cell transfusion. What should the nurse or technologist do first?

A. Slow the transfusion rate and observe
B. Stop the transfusion and keep the IV line open with normal saline
C. Finish the unit quickly and then investigate
D. Give the next unit from the same donor

73. A reactive RPR result in a pregnant patient should be followed by which type of test to confirm syphilis?

A. A repeat RPR on the same sample
B. A Widal test
C. An antistreptolysin O titer
D. A treponemal test such as FTA-ABS or TPPA

74. Hepatitis B markers: HBsAg negative, anti-HBs positive, anti-HBc total negative. What is the most likely interpretation?

A. Acute hepatitis B infection
B. Chronic hepatitis B carrier
C. Immunity from hepatitis B vaccination
D. Window period of acute infection

75. A jaundiced patient is positive for HBsAg and IgM anti-HBc. What does this pattern indicate?

A. Acute hepatitis B infection
B. Past resolved infection with immunity
C. Successful vaccination
D. False-positive due to vaccination

76. A serum with a very high antibody concentration gives a negative agglutination result that turns positive when the serum is diluted. What explains this?

A. Postzone effect from antigen excess
B. Prozone effect from antibody excess
C. Rouleaux formation
D. Complement inactivation

77. Which immunoglobulin class is the first to appear in a primary immune response?

A. IgG
B. IgA
C. IgE
D. IgM

78. A child develops cola-colored urine and edema three weeks after a sore throat. Which serologic test best supports a recent group A streptococcal infection?

A. Heterophile antibody test
B. Widal test
C. Antistreptolysin O titer
D. Rheumatoid factor

79. The Widal test detects antibodies against the O and H antigens of which organism?

A. Salmonella Typhi
B. Rickettsia species
C. Leptospira interrogans
D. Brucella abortus

80. An indirect antiglobulin test is negative, but the IgG-coated check cells added afterward fail to agglutinate. What is the correct interpretation?

A. The patient has no unexpected antibodies and the result can be reported
B. The patient has a warm autoantibody
C. The negative result is invalid; the AHG may have been neutralized or omitted, so the test must be repeated
D. The reagent red cells were over-washed, which confirms the negative result

81. Which group of packed red blood cells is generally chosen for emergency release before the recipient's ABO and Rh type are known, especially for females of childbearing potential?

A. Group AB Rh(D)-positive
B. Group A Rh(D)-negative
C. Group O Rh(D)-negative
D. Group B Rh(D)-positive

Clinical Microscopy

82. The protein pad of a urine reagent strip, based on the protein error of indicators, is most sensitive to which protein?

A. Bence Jones protein
B. Hemoglobin
C. Albumin
D. Immunoglobulin G heavy chains

83. After a crush injury, a patient's urine strip is strongly positive for blood, but no red cells are seen microscopically and the plasma is clear (not pink). What is the most likely cause?

A. Myoglobinuria
B. Hematuria
C. Hemoglobinuria from intravascular hemolysis
D. Bilirubinuria

84. Red blood cell casts in a urine sediment most strongly suggest which condition?

A. Lower urinary tract infection
B. Glomerulonephritis
C. Strenuous exercise only
D. Renal calculi in the bladder

85. A febrile patient with flank pain has white blood cell casts in the urine. Which diagnosis is most likely?

A. Cystitis
B. Urethritis
C. Prostatitis
D. Acute pyelonephritis

86. Oval fat bodies that show Maltese cross patterns under polarized light, together with heavy proteinuria, are characteristic of which condition?

A. Acute cystitis
B. Diabetes insipidus
C. Nephrotic syndrome
D. Prerenal azotemia

87. Colorless prism-shaped crystals resembling coffin lids are seen in an alkaline urine. What are they?

A. Triple phosphate (ammonium magnesium phosphate)
B. Calcium oxalate dihydrate
C. Uric acid
D. Cystine

88. Colorless, flat hexagonal plates are found in a fresh, acidic urine from a young patient with recurrent kidney stones. Which inherited condition should be considered?

A. Cystinuria
B. Phenylketonuria
C. Alkaptonuria
D. Maple syrup urine disease

89. A urine with 2 g/dL glucose reads 1.030 on a refractometer. Correcting by 0.004 for each g/dL of glucose, what is the corrected specific gravity?

A. 1.018
B. 1.022
C. 1.026
D. 1.038

90. Which situation most likely produces a false-negative nitrite result in a patient with an E. coli urinary tract infection?

A. Urine voided after staying in the bladder for less than an hour
B. A first morning specimen
C. A specimen left unrefrigerated for several hours before testing
D. A specimen contaminated with a dye that colors the urine red

91. The sodium nitroprusside reaction on a urine reagent strip mainly detects which ketone body?

A. Beta-hydroxybutyric acid
B. Lactic acid
C. Pyruvic acid
D. Acetoacetic acid

92. An unpreserved urine specimen remains at room temperature for several hours. Which change is expected?

A. Glucose increases
B. Bacteria decrease
C. Casts become more numerous
D. The pH increases

93. Three tubes of CSF are collected in order. Which tube is usually sent for cell counts?

A. Tube 1
B. Tube 2
C. Any tube, since all have the same composition
D. Tube 3

94. CSF from a febrile infant shows a high WBC count with predominantly neutrophils, markedly decreased glucose and increased protein. What is the most likely diagnosis?

A. Viral meningitis
B. Multiple sclerosis
C. Subarachnoid hemorrhage
D. Bacterial meningitis

95. Visible blood in CSF decreases steadily from tube 1 to tube 3, and the centrifuged supernatant is clear. What is the most likely explanation?

A. Subarachnoid hemorrhage
B. Traumatic tap
C. Bacterial meningitis
D. Elevated CSF bilirubin from jaundice

96. Synovial fluid from a swollen big toe contains needle-shaped crystals that are strongly negatively birefringent under compensated polarized light. What is the diagnosis?

A. Pseudogout (calcium pyrophosphate crystals)
B. Septic arthritis
C. Gout (monosodium urate crystals)
D. Osteoarthritis with cholesterol crystals

97. A semen sample has low volume and absent fructose. Which structure is most likely absent or obstructed?

A. Seminal vesicles
B. Prostate gland
C. Bulbourethral glands
D. Epididymis alone

98. A pleural fluid has a fluid-to-serum protein ratio of 0.6 and a fluid-to-serum LD ratio of 0.7. How is this effusion classified?

A. Transudate
B. Exudate
C. Chylous effusion only
D. Cannot be classified without a cell count

99. Which stain is used for a qualitative microscopic screen of neutral fecal fat in a patient with suspected steatorrhea?

A. Sudan III
B. Gram stain
C. Prussian blue
D. Methylene blue for leukocytes

100. A vaginal wet mount shows squamous epithelial cells whose borders are obscured by many small coccobacilli, and the discharge has a fishy odor with KOH. What is the most likely diagnosis?

A. Trichomoniasis
B. Bacterial vaginosis
C. Vulvovaginal candidiasis
D. Gonococcal cervicitis

101. A jaundiced patient has a positive urine bilirubin and a urine urobilinogen that is absent or very low. Which type of jaundice does this suggest?

A. Obstructive (posthepatic) jaundice
B. Hemolytic (prehepatic) jaundice
C. Physiologic jaundice of the newborn
D. Gilbert syndrome

Histopathologic and Cytologic Techniques, MT Laws and Laboratory Management

102. Which law is known as the Philippine Medical Technology Act of 1969?

A. Republic Act No. 5527
B. Republic Act No. 4688
C. Republic Act No. 7719
D. Republic Act No. 9288

103. Which government agency, through its professional regulatory board, administers the medical technologist licensure examination and issues certificates of registration?

A. Professional Regulation Commission
B. Department of Health
C. Commission on Higher Education
D. Philippine Association of Medical Technologists

104. Which fixative is most widely used for routine histopathology specimens?

A. 95% ethyl alcohol
B. Absolute acetone
C. Glacial acetic acid alone
D. 10% neutral buffered formalin

105. In routine paraffin tissue processing, which step immediately follows dehydration in graded alcohols?

A. Fixation
B. Embedding
C. Staining
D. Clearing

106. In a hematoxylin and eosin stained section, what color do cell nuclei normally appear?

A. Blue to purple
B. Pink to red
C. Green
D. Black

107. What is the typical section thickness cut from paraffin blocks on a rotary microtome for routine light microscopy?

A. 0.5 to 1 micrometer
B. 4 to 6 micrometers
C. 15 to 20 micrometers
D. 50 to 100 micrometers

108. A tissue section shows deposits that appear apple-green under polarized light after staining. Which stain and substance are involved?

A. Periodic acid-Schiff for glycogen
B. Masson trichrome for collagen
C. Congo red for amyloid
D. Oil red O for neutral lipid

109. Which stain demonstrates hemosiderin as blue granules in tissue sections?

A. Ziehl-Neelsen
B. Von Kossa
C. Mucicarmine
D. Perls Prussian blue

110. Cervical smears for Papanicolaou staining are traditionally wet-fixed immediately in which solution?

A. 95% ethyl alcohol
B. 10% neutral buffered formalin
C. Bouin solution
D. Zenker solution

111. During surgery, a surgeon requests a rapid diagnosis on fresh tissue. Which instrument is used to cut frozen sections?

A. Sliding microtome for celloidin
B. Ultramicrotome
C. Cryostat
D. Rocking microtome at room temperature

112. Which decalcifying agent works by chelation, is slow, and gives the best preservation of morphology and nucleic acids?

A. Nitric acid
B. Hydrochloric acid
C. Formic acid
D. EDTA

113. On a Levey-Jennings chart, a single control value falls beyond +3 SD from the mean. What is the appropriate response?

A. Accept the run because only one control is out
B. Reject the run and investigate; this violates the 1-3s rule, usually indicating random error
C. Accept the run but note a trend
D. Shift the mean to include the new value

114. Control values for an analyte abruptly move to a new level and stay on one side of the mean for six consecutive runs. What is this pattern called?

A. Trend
B. Random error
C. Shift
D. Outlier

115. Repeated measurements of a reference material agree closely with one another but are all well above the assigned value. How is the method best described?

A. Accurate but imprecise
B. Precise but inaccurate
C. Both accurate and precise
D. Neither accurate nor precise

116. A new screening test is evaluated: 80 true positives, 20 false negatives, 95 true negatives and 5 false positives. What is its diagnostic specificity?

A. 80%
B. 83%
C. 94%
D. 95%

117. A centrifuge's power cord begins to smoke and flame. Which class of fire extinguisher is appropriate?

A. Class A
B. Class B
C. Class D
D. Class C

118. Culturing and manipulating Mycobacterium tuberculosis isolates should be performed at what biosafety level?

A. Biosafety level 1
B. Biosafety level 2 on an open bench
C. Biosafety level 3
D. No containment is needed

119. A technologist splashes a corrosive reagent on the forearm. What is the correct first aid?

A. Neutralize immediately with a strong base or acid
B. Cover with a dry dressing and continue working
C. Wipe with alcohol
D. Flush the area with running water for at least 15 minutes

120. Under Philippine Department of Health health care waste guidelines, what color bin or bag is used for infectious and pathological waste?

A. Black
B. Green
C. Orange
D. Yellow

Answer key

Medical Technology

1. B. 250

One milliliter contains 1,000 microliters, so 0.25 mL equals 250 µL.

2. D. 1/10

The final mixture contains ten equal parts, one of which is stock.

3. C. 1,500

One liter contains 1,000 milliliters, so 1.5 liters equals 1,500 milliliters.

4. A. 2 mg/mL

Concentration is mass divided by volume: 4 mg ÷ 2 mL = 2 mg/mL.

5. C. 600

One gram contains 1,000 milligrams, so 0.6 grams equals 600 milligrams.

6. D. 10 mL

Add the two volumes to obtain 10 mL.

7. A. 2 mg/mL

The amount of solute is unchanged. Doubling the volume halves the concentration.

8. B. 2 mL

The final solution needs 20 mg of solute. At 10 mg per mL, 2 mL of stock supplies that amount.

9. C. 130 mg/dL

Multiply mmol/L by 18 (180 g/mol divided by 10 to convert per liter to per deciliter): 7.2 x 18 = about 130 mg/dL.

10. B. 140 mg/dL

LDL = total cholesterol - HDL - (triglycerides / 5) = 220 - 50 - 30 = 140 mg/dL.

11. A. Glucose

Red and white cells continue glycolysis in unseparated specimens, consuming glucose; potassium, LD and phosphorus tend to rise instead.

12. D. Potassium

Red cells contain far more potassium than plasma, so releasing their contents markedly raises serum potassium.

13. C. Acute viral hepatitis

Marked aminotransferase elevation with ALT exceeding AST indicates hepatocellular injury such as viral hepatitis; obstruction raises ALP predominantly.

14. C. Cardiac troponin I or T

Cardiac troponins are specific to heart muscle and remain elevated for days, unlike CK, LD and AST, which are found in many tissues.

15. A. Creatinine

Creatinine reacts with picric acid in alkaline solution to form a colored Janovski-type complex (Jaffe reaction).

16. B. 16 mmol/L

Anion gap = Na - (Cl + HCO3) = 140 - (100 + 24) = 16 mmol/L.

17. A. 75 mg/dL

Concentration of unknown = (absorbance of unknown / absorbance of standard) x standard concentration = (0.30 / 0.40) x 100 = 75 mg/dL.

18. A. Respiratory acidosis

Low pH with high pCO2 means a respiratory acidosis; the raised bicarbonate reflects partial renal compensation.

19. C. The previous 2 to 3 months

Glucose binds hemoglobin irreversibly over the red cell lifespan of about 120 days, so HbA1c reflects the preceding 2 to 3 months.

20. A. Alkaline phosphatase

Cholestasis induces hepatobiliary alkaline phosphatase (often with GGT), making ALP the hallmark enzyme of biliary obstruction.

21. D. It is more specific for the pancreas and stays elevated longer

Lipase comes mainly from the pancreas and remains elevated for several days, while amylase also has a salivary source and falls sooner.

22. B. 290 mOsm/kg

2(140) + 90/18 + 14/2.8 = 280 + 5 + 5 = 290 mOsm/kg.

23. B. Staphylococcus aureus

Catalase-positive cocci in clusters are staphylococci; coagulase production distinguishes S. aureus from coagulase-negative species.

24. A. Streptococcus pyogenes

Group A streptococci are beta-hemolytic, catalase negative, PYR positive and bacitracin susceptible.

25. B. Streptococcus pneumoniae

Optochin susceptibility and bile solubility separate the pneumococcus from other alpha-hemolytic streptococci.

26. A. Modified Thayer-Martin agar

Modified Thayer-Martin is enriched chocolate agar with antimicrobials that suppress normal genital flora while supporting pathogenic Neisseria.

27. D. Salmonella

H2S production (black colonies) by a lactose non-fermenter that is urease negative suggests Salmonella; Shigella does not produce H2S.

28. D. Escherichia coli

The ++-- IMViC pattern in a lactose fermenter is characteristic of E. coli; Klebsiella and Enterobacter are typically --++.

29. D. Proteus mirabilis

Swarming motility together with rapid urease production is typical of Proteus mirabilis.

30. B. Pseudomonas aeruginosa

Pyocyanin pigment, fruity grape-like odor and a positive oxidase test are classic features of P. aeruginosa.

31. C. Lowenstein-Jensen medium

Lowenstein-Jensen contains coagulated egg and malachite green, supporting slow-growing mycobacteria while inhibiting contaminants.

32. C. 121 degrees C at 15 psi for at least 15 minutes

Saturated steam at 121 degrees C (about 15 psi above atmospheric) for 15 minutes or more destroys spores; 56 degrees C only inactivates complement.

33. B. 0.5 McFarland standard

A 0.5 McFarland suspension (about 1.5 x 10^8 CFU/mL) gives the standardized inoculum that zone-size breakpoints assume.

34. B. Cryptococcus neoformans

The clear halo in India ink is the polysaccharide capsule of Cryptococcus neoformans.

35. C. Candida albicans

A positive germ tube test is a rapid presumptive identification of Candida albicans (and the closely related C. dubliniensis).

36. A. Plasmodium falciparum

Crescent-shaped gametocytes are diagnostic of P. falciparum; the other species have round gametocytes.

37. A. Trichuris trichiura

The whipworm egg is barrel or football shaped with bipolar hyaline plugs.

38. C. Cellophane tape applied to the perianal skin in the early morning

Enterobius vermicularis females lay eggs on perianal skin at night, so eggs are rarely found in stool; the tape method recovers them.

39. A. Schistosoma japonicum

S. japonicum eggs have only a minute lateral knob, unlike the large lateral spine of S. mansoni; it is endemic in parts of the Visayas and Mindanao.

40. A. Entamoeba histolytica

Erythrophagocytosis is the most reliable morphologic sign distinguishing pathogenic E. histolytica from nonpathogenic amoebae.

41. B. Giardia duodenalis (lamblia)

The two nuclei and ventral adhesive disk give Giardia trophozoites their characteristic face-like appearance.

42. D. Clostridium perfringens

The inner zone of complete and outer zone of partial hemolysis is a classic feature of C. perfringens, the main agent of gas gangrene.

43. B. 90 fL

MCV = (Hct % x 10) / RBC in 10^12/L = (36 x 10) / 4.0 = 90 fL.

44. A. 27.8 g/dL, hypochromic

MCHC = (Hgb / Hct) x 100 = (10.0 / 36) x 100 = 27.8 g/dL, below the usual 32 to 36 g/dL, so the cells are hypochromic.

45. B. 12.0 x 10^9/L

Corrected WBC = observed WBC x 100 / (100 + NRBC) = 15.0 x 100 / 125 = 12.0 x 10^9/L.

46. B. Iron deficiency anemia

Low ferritin is specific for depleted iron stores; TIBC rises as transferrin increases in iron deficiency, while it is low or normal in chronic disease.

47. D. Megaloblastic anemia from vitamin B12 or folate deficiency

Impaired DNA synthesis produces oval macrocytes and hypersegmented neutrophils, the hallmarks of megaloblastic anemia.

48. C. Microangiopathic hemolytic anemia such as DIC or TTP

Schistocytes form when red cells are sheared by fibrin strands or microthrombi in small vessels, as in DIC, TTP and HUS.

49. B. New methylene blue

Supravital stains such as new methylene blue precipitate ribosomal RNA into a visible reticulum in young red cells.

50. B. 10,000 cells/uL

Cells/uL = cells counted x dilution / (area x depth) = 200 x 20 / (4 x 0.1) = 10,000 cells/uL.

51. D. 3.2% sodium citrate at 9 parts blood to 1 part anticoagulant

Coagulation testing uses buffered 3.2% sodium citrate in a 9:1 ratio; underfilling changes the ratio and falsely prolongs clotting times.

52. C. Activated partial thromboplastin time

Unfractionated heparin mainly affects the intrinsic and common pathways, which the aPTT measures; warfarin is monitored with PT/INR.

53. B. A clotting factor deficiency

Normal plasma supplies the missing factor, so correction points to a deficiency; an inhibitor would also act on the added normal plasma and prevent correction.

54. C. Myeloid (acute myeloid leukemia)

Auer rods are fused primary granules and are found only in myeloid blasts.

55. A. Chronic lymphocytic leukemia

Persistent absolute lymphocytosis of mature small lymphocytes with smudge cells in an older adult is typical of CLL.

56. D. Chronic myeloid leukemia

BCR-ABL1 is present in virtually all cases of CML; acute promyelocytic leukemia instead carries t(15;17).

57. C. Tilting the ESR tube away from vertical

A tilted tube lets red cells slide down the wall and settle faster; the other errors tend to lower the ESR.

58. B. Sickle cell anemia (Hb SS)

Absence of Hb A with predominantly Hb S indicates homozygous sickle cell disease; sickle trait has more Hb A than Hb S.

59. D. Lead poisoning

Lead inhibits pyrimidine 5'-nucleotidase, leaving aggregated ribosomes visible as basophilic stippling.

60. C. Splenectomy

Howell-Jolly bodies are normally removed by the spleen, so they become common after splenectomy or in hyposplenism.

61. C. 39%

For normocytic normochromic cells, hematocrit is about three times hemoglobin: 13.0 x 3 = 39% (acceptable within plus or minus 3).

62. D. Bernard-Soulier syndrome

Bernard-Soulier syndrome lacks glycoprotein Ib-IX-V, the von Willebrand factor receptor, causing absent ristocetin aggregation and giant platelets.

63. B. Group B

B antigen on the red cells and anti-A in the serum (agglutinating A1 cells) define group B.

64. C. Group AB plasma

Group AB plasma has neither anti-A nor anti-B, so it will not attack recipient red cells of any ABO group.

65. A. Give Rh immune globulin within 72 hours of delivery

Rh immune globulin given within 72 hours clears fetal D-positive cells before the mother can form anti-D that could harm future pregnancies.

66. B. Direct antiglobulin test

The DAT detects antibody or complement already bound to red cells in vivo, as in hemolytic disease of the fetus and newborn.

67. A. Anti-Lea

Lewis antibodies are usually IgM cold-reacting antibodies, whereas Kell, Duffy and Kidd antibodies are usually IgG and react at 37 degrees C.

68. D. Kidd

Kidd antibodies are often weak and evanescent, so they are missed on screening and then rise anamnestically to cause delayed hemolytic reactions.

69. D. At 20 to 24 degrees C with continuous gentle agitation

Platelets lose function when chilled, so they are kept at room temperature with agitation to allow gas exchange; shelf life is short.

70. C. Cryoprecipitated antihemophilic factor

Cryoprecipitate is rich in fibrinogen, factor VIII, von Willebrand factor and factor XIII.

71. C. Bombay (Oh)

Bombay individuals lack H antigen and make anti-H, which agglutinates even group O cells; Ulex europaeus lectin does not react with their cells.

72. B. Stop the transfusion and keep the IV line open with normal saline

A suspected acute hemolytic reaction requires stopping the transfusion immediately while keeping venous access for treatment.

73. D. A treponemal test such as FTA-ABS or TPPA

RPR and VDRL are nontreponemal tests prone to biologic false positives, so a specific treponemal antibody test is used for confirmation.

74. C. Immunity from hepatitis B vaccination

Vaccination produces only anti-HBs; immunity from natural infection would also show anti-HBc.

75. A. Acute hepatitis B infection

IgM antibody to the core antigen appears early and marks a recent or acute hepatitis B infection.

76. B. Prozone effect from antibody excess

In antibody excess every antigen site is occupied by separate antibody molecules, so lattices do not form until the serum is diluted.

77. D. IgM

IgM, a pentamer, is produced first after initial antigen exposure, followed by a class switch to IgG.

78. C. Antistreptolysin O titer

A raised ASO titer indicates recent Streptococcus pyogenes infection, supporting post-streptococcal glomerulonephritis.

79. A. Salmonella Typhi

The Widal test is a tube or slide agglutination test for antibodies to Salmonella Typhi somatic (O) and flagellar (H) antigens.

80. C. The negative result is invalid; the AHG may have been neutralized or omitted, so the test must be repeated

Check cells must agglutinate if active AHG is present; failure means inadequate washing, omitted AHG or inactive reagent, so the result cannot be reported.

81. C. Group O Rh(D)-negative

Group O red cells lack A and B antigens, and D-negative units avoid sensitizing a D-negative woman to the D antigen.

82. C. Albumin

Indicator dyes such as tetrabromophenol blue respond most strongly to albumin; light chains may be missed.

83. A. Myoglobinuria

Free myoglobin from damaged muscle is rapidly cleared into urine and leaves plasma clear, whereas hemoglobinuria usually colors the plasma pink.

84. B. Glomerulonephritis

Red cells must enter the tubule and become trapped in protein matrix, which indicates glomerular bleeding.

85. D. Acute pyelonephritis

WBC casts show the inflammation is within the kidney tubules, distinguishing pyelonephritis from lower tract infection.

86. C. Nephrotic syndrome

Lipiduria with cholesterol-laden oval fat bodies accompanies the heavy proteinuria of nephrotic syndrome.

87. A. Triple phosphate (ammonium magnesium phosphate)

Coffin-lid prisms in alkaline urine are triple phosphate, often associated with urease-producing bacteria.

88. A. Cystinuria

Hexagonal cystine crystals are abnormal and indicate defective renal reabsorption of cystine and dibasic amino acids.

89. B. 1.022

Subtract 2 x 0.004 = 0.008 from 1.030 to get 1.022.

90. A. Urine voided after staying in the bladder for less than an hour

Bacteria need about four hours in the bladder to reduce enough nitrate to nitrite; old unrefrigerated urine and red pigments give false positives.

91. D. Acetoacetic acid

Nitroprusside reacts with acetoacetic acid (and with acetone if glycine is added) but not with beta-hydroxybutyrate.

92. D. The pH increases

Bacteria multiply and convert urea to ammonia, raising pH; they also consume glucose, and casts dissolve in alkaline urine.

93. D. Tube 3

The third tube is least likely to contain cells introduced by the puncture; tube 1 typically goes to chemistry and serology and tube 2 to microbiology.

94. D. Bacterial meningitis

Neutrophil pleocytosis with low glucose and high protein is the classic profile of bacterial meningitis; viral meningitis usually has lymphocytes and normal glucose.

95. B. Traumatic tap

Uneven blood distribution that clears in later tubes, without xanthochromia, indicates blood introduced during the puncture.

96. C. Gout (monosodium urate crystals)

Monosodium urate crystals are needle shaped and negatively birefringent; calcium pyrophosphate crystals are rhomboid and weakly positive.

97. A. Seminal vesicles

Fructose is secreted by the seminal vesicles, so its absence points to agenesis or obstruction of the seminal vesicles or ejaculatory ducts.

98. B. Exudate

By Light's criteria, a protein ratio above 0.5 or an LD ratio above 0.6 classifies an effusion as an exudate.

99. A. Sudan III

Sudan III (or oil red O) stains neutral fat globules orange-red.

100. B. Bacterial vaginosis

Clue cells and a positive whiff test are hallmark findings of bacterial vaginosis associated with Gardnerella vaginalis.

101. A. Obstructive (posthepatic) jaundice

Bile duct obstruction prevents bilirubin from reaching the intestine to form urobilinogen, while conjugated bilirubin spills into urine.

102. A. Republic Act No. 5527

RA 5527 regulates the practice of medical technology in the Philippines; RA 4688 is the clinical laboratory law, RA 7719 the blood services act and RA 9288 newborn screening.

103. A. Professional Regulation Commission

The PRC, through the Board of Medical Technology, conducts the licensure examination and registers medical technologists.

104. D. 10% neutral buffered formalin

Buffered formalin penetrates well, preserves morphology for routine stains and avoids acid formalin pigment.

105. D. Clearing

The order is fixation, dehydration, clearing (alcohol replaced by a paraffin-miscible agent such as xylene), infiltration and embedding.

106. A. Blue to purple

Hematoxylin, a basic dye after mordanting, stains nuclear chromatin blue-purple; eosin stains cytoplasm pink.

107. B. 4 to 6 micrometers

Routine paraffin sections are about 4 to 6 um; semithin plastic sections are about 1 um and thick sections are used for special purposes.

108. C. Congo red for amyloid

Congo red-stained amyloid shows characteristic apple-green birefringence under polarized light.

109. D. Perls Prussian blue

Ferric iron in hemosiderin reacts with potassium ferrocyanide in acid to form blue ferric ferrocyanide.

110. A. 95% ethyl alcohol

Immediate fixation in 95% ethanol prevents air-drying artifact and preserves nuclear detail for the Pap stain.

111. C. Cryostat

A cryostat is a microtome housed in a refrigerated chamber, used for intraoperative frozen sections.

112. D. EDTA

EDTA binds calcium ions without strong acid damage, preserving staining and molecular targets at the cost of speed.

113. B. Reject the run and investigate; this violates the 1-3s rule, usually indicating random error

A single result outside plus or minus 3 SD violates the 1-3s Westgard rule and is grounds for rejecting the analytical run.

114. C. Shift

A sudden sustained change in the mean is a shift (systematic error), such as from a new reagent lot; a trend is a gradual drift in one direction.

115. B. Precise but inaccurate

Close agreement among replicates means good precision; consistent deviation from the true value means poor accuracy (bias).

116. D. 95%

Specificity = true negatives / (true negatives + false positives) = 95 / 100 = 95%.

117. D. Class C

Class C fires involve energized electrical equipment and require a non-conducting agent such as CO2 or dry chemical.

118. C. Biosafety level 3

M. tuberculosis is transmitted by aerosol and causes serious disease, so culture work requires BSL-3 practices and facilities.

119. D. Flush the area with running water for at least 15 minutes

Prolonged flushing with water dilutes and removes the chemical; attempting neutralization can cause additional heat injury.

120. D. Yellow

Yellow containers are for infectious and pathological waste; black is for non-infectious dry waste, green for non-infectious wet waste and orange for radioactive waste.

Topics to review

- Specimen integrity and quality controls
- Clinical chemistry and hematology
- Microbiology and parasitology
- Immunohematology, serology and laboratory management

Online question banks and study resources

Medical Technology - Pass Harbor (Question bank)

Chemistry 2e - OpenStax (Open textbook)

Official PRC board information

Current PRC exam programs

Independent study material prepared by Board Exam Desk.