

Directions: Each of the questions or incomplete statements below is followed by four suggested answers or completions. Select the one that is best in each case and then blacken the corresponding space on the answer sheet.

1. To find the correct rheostat setting for a centrifuge to run an assay that specifies a centrifugal force of 300 X g, it is necessary to know which of the following?
 - A. make and model number of the centrifuge
 - B. rotation radius
 - C. size of the motor
 - D. size of the brushes
2. In a normal distribution of results, the mean value plus or minus two standard deviations will include which percentage of the population?
 - A. 45%
 - B. 68%
 - C. 95%
 - D. 99%
3. Which of the following is a peripheral device used to interface two computers via telephone lines?
 - A. modem
 - B. baud
 - C. code reader
 - D. floppy disk
4. The following objective is from the microbiology rotation of a clinical laboratory education program.

"Given all necessary equipment and supplies, the medical technology student will streak an agar plate and achieve isolation of colonies."

The criteria by which the student's performance will be judged is
 - A. the ability to streak an agar plate.
 - B. the achievement of colony isolation.
 - C. the use of all necessary equipment and supplies.
 - D. not stated in this objective.
5. The assayed value for a control of 80 mg/dL and one standard deviation equals 5 mg/dL. The control is run twice in the same run and the values are 68 and 67 mg/dL. Which of the following describes these results?
 - A. good precision and good accuracy
 - B. good precision and poor accuracy
 - C. poor precision and good accuracy
 - D. poor precision and poor accuracy
6. A diagram of a computer program is which of the following?
 - A. an organizational chart
 - B. an algorithm
 - C. a flow chart
 - D. a data base
7. Maslow's theory of human motivation, in conjunction with management styles, is based on the idea that
 - A. behavior is determined by unsatisfied needs.
 - B. education and training produce quality performance.
 - C. high salaries produce desired behavior.
 - D. most people lack ambition and want only security.
8. A chemical storage area was found to have dichromate, nitrates, and flammable liquids stored together. Which of the following statements is TRUE?
 - A. This combination poses no hazard if flammables are in safety cans.
 - B. This combination may form explosive compounds spontaneously.
 - C. Dichromates and nitrates increase the burning rate of combustible material and should not be stored with flammables.
 - D. This combination is harmless.
9. Increased organic compounds in a commercial reagent grade water system is an indication of a malfunctioning
 - A. cationic exchange resin.
 - B. anionic exchange resin.
 - C. charcoal filter.
 - D. particulate filter.

10. What is the normality of a concentrated HCl solution with a specific gravity of 1.215 and a purity assay of 90%?
(Molecular weight H = 1.0; Cl = 35.5)
- 1.2N
 - 3.0N
 - 12.2N
 - 30.0N
11. Which of the following is the purpose of proficiency testing programs?
- Highlight possible deficiencies in other laboratories.
 - Evaluate a laboratory's performance by comparing it to similar laboratories.
 - Increase anxiety and, therefore, motivate more careful work.
 - Motivate employees in special handling of important specimens.
12. The clinical laboratory scientist is changing the gas cylinder on the anaerobic chamber. While transporting the replacement cylinder, it accidentally rolls off the hand truck and crushes another employee's foot. Which of the following actions would be the **BEST** to avoid this type of accident?
- Stop laboratory employees from using hand trucks and request that maintenance perform all gas cylinder changes.
 - Have more than one employee take part in moving cylinders to ensure safer handling of the cylinders.
 - Circulate a memorandum stating that only laboratory supervisors will be allowed to replace cylinders in the laboratory.
 - Confirm that all hand trucks are equipped with safety chains and enforce the use of such chains.
13. The quantities of flammable and combustible liquids allowed in the work area of the laboratory are limited by which of the following?
- OSHA and NFPA standards
 - CDC guidelines
 - Medicare and Medicaid standards
 - EPA standards
14. A microscope with a 5X ocular has the following numbers on the objective: 45 X N.A./66. The total magnification is which of the following?
- 225
 - 330
 - 450
 - 2900
15. A method requires the use of an 8% (w/v) solution of NaOH. Which of the following available solutions is 8%?
(molecular weight Na = 23, O = 16, H = 1)
- 1N
 - 2N
 - 2.5N
 - 10N
16. The allowable range for a daily control serum is the mean \pm 2 standard deviation units calculated from 30 replicate measurements. The replicate measurements are **BEST** collected in which of the following?
- 1 run on a single day
 - 1 run per day for 30 days
 - 3 runs on a single day
 - 10 runs per day for 3 days
17. In a clinical laboratory cost accounting system, direct costs are which of the following?
- costs of laboratory space and utilities
 - costs of materials and personnel time
 - salaries of administrative personnel
 - expenditures incurred in over-ordering of supplies
18. Spectral transmittance (absorbance) curves can be used to determine which of the following?
- the optimal wavelength for a procedure
 - adherence to Beer's law by a procedure
 - the accuracy of the procedure
 - the optimal color reaction to be used
19. If a test procedure has a sensitivity of 98%, it gives
- 1% false positives and 1% false negatives.
 - 98% false positives.
 - 2% false positives.
 - 2% false negatives.
20. An effective way of teaching in the affective domain is
- lecture.
 - show and tell.
 - role modeling.
 - field trips.

IMMUNOLOGY
Items 21-40

Directions: Each of the questions or incomplete statements below is followed by four suggested answers or completions. Select the one that is best in each case and then blacken the corresponding space on the answer sheet.

21. Which of the following is the **BEST** way to confirm a biological false positive reagin test?
- A. Perform a quantitative RPR.
 - B. Repeat the tests after treatment.
 - C. Repeat the tests using spinal fluid rather than serum.
 - D. Perform a test for anti-*T. pallidum* such as the FTA-ABS.
22. The major importance of a positive C-Reactive Protein test is that it
- A. is a presumptive diagnosis of primary atypical pneumonia.
 - B. detects the presence of an inflammatory condition.
 - C. rules out the diagnosis of rheumatoid arthritis.
 - D. rules out a pneumococcal infection.
23. The IgM class of immunoglobulins is associated with which of the following characteristics?
- A. placental transfer
 - B. efficient complement fixation
 - C. dimeric form in serum
 - D. secretory piece
24. In analyzing inheritance of HLA antigens in a large family, the results will **MOST** likely indicate which of the following?
- A. The mother has HLA antigens identical to one or more of her children.
 - B. The mother and father have identical HLA antigens.
 - C. The mother shares half of her HLA antigens with each of her children.
 - D. All siblings will have the same HLA antigens.
25. In a serological serial dilution, if tube 1 has 1 mL of an undiluted specimen and doubling dilutions are used thereafter, what is the titer in tube 10?
- A. 200
 - B. 500
 - C. 512
 - D. 1024
26. Which of the following subsets of lymphocytes is preferentially infected by the human immunodeficiency virus (HIV)?
- A. normal B
 - B. T-suppressor
 - C. T-cytotoxic
 - D. T-helper
27. Which of the following intervals are **BEST** for the collection of acute and convalescent blood specimens for the serodiagnosis of viral infections?
- | Acute | Convalescent |
|-------------------------------------|--|
| A. 1-7 days after onset of illness | after 7 but before 14 days of illness |
| B. 1-7 days after onset of illness | after 14 days of illness |
| C. 1-10 days after onset of illness | before 14 days of illness |
| D. 1-10 days after onset of illness | after 10 but before 14 days of illness |
28. Which of the following statements is **TRUE** about the complement system?
- A. The potassium ion is required for the reaction to proceed.
 - B. The attachment of the C4b2a complex causes lysis of the cell.
 - C. One of the biological effects of complement activation is chemotaxis.
 - D. The amount of complement in human serum is increased during immunization.
29. In a patient's serum, detection of both IgG and IgM antibodies to the viral capsid antigen (VCA) of the Epstein-Barr virus is an indication of which the following?
- A. no infection
 - B. current infection
 - C. past infection
 - D. concurrent infection with cytomegalovirus

30. A blood sample for cold agglutinin titer arrives in the laboratory at 10:00 p.m. According to laboratory policy, this test is performed only during the day shift. The sample is placed in a 37° C water bath and allowed to clot. The serum is separated from the clot and stored at 4° C. The next morning a titer is performed on the serum sample. It is expected that the result will be
- invalid due to the presence of hemolysis.
 - invalid due to cellular absorption of antibody.
 - invalid due to loss of complement.
 - accurate.
31. Which of the following antinuclear antibodies is **MOST** diagnostic of systemic lupus erythematosus?
- anti-single stranded DNA
 - anti-kinetoplast
 - anti-ribonucleoprotein
 - anti-acetyl choline
32. Which of the following immunological methods is the most analytically sensitive?
- direct agglutination
 - immuno-electrophoresis
 - radioimmunoassay
 - immunoprecipitation
33. In an indirect immunofluorescence assay, which of the following reagents is labeled with fluorescein dye?
- antigen
 - patient's serum
 - antiglobulin serum
 - complement
34. A physician orders a test for infectious mononucleosis. A presumptive antibody titer is 1:224. The titer drops following both guinea pig absorption and beef cell absorption. Which of the following is the **MOST** probable diagnosis?
- acquired toxoplasmosis
 - serum sickness
 - infectious mononucleosis
 - rheumatoid arthritis
35. Serial human chorionic gonadotropin (hCG) levels showing irregular fluctuations between levels of 10,000 and 100,000 mIU/mL indicate which of the following?
- hydatidiform mole
 - threatened spontaneous abortion
 - ectopic pregnancy
 - normal pregnancy
36. Screening tests for syphilis **FIRST** become reactive for most patients after the
- gumma appears.
 - latent stage.
 - secondary rash appears.
 - primary chancre appears.
37. The following results were obtained in a mitogen-induced blastogenic transformation test.
- + = lymphocyte response
0 = no lymphocyte response
- | | |
|--------------------|---|
| Pokeweed mitogen | + |
| Concanavalin A | 0 |
| Phytohemagglutinin | 0 |
- The group of lymphocytes **MOST** likely responding in this test is
- B lymphocytes.
 - natural killer (NK) cells.
 - T-helper lymphocytes.
 - T-suppressor lymphocytes.
38. An ASO titer shows no hemolysis in the titer using patient serum and no hemolysis in the titer using the positive control serum. The red cell control and the streptolysin control also show no hemolysis. Which of the following is the **MOST** probable explanation of these results?
- Both the patient and control sera have extremely high ASO titers.
 - A 10% suspension of indicator cells was used instead of a 5% suspension.
 - The streptolysin O antigen was rehydrated 4 hours prior to setting up the titer.
 - The cells were diluted in normal saline rather than streptolysin O buffer.
39. The presence of a double precipitin ring in a radial immunodiffusion test for IgG may indicate
- antigen excess.
 - antibody excess.
 - the presence of more than one antibody in the agar.
 - overfilling of the antigen well.
40. The antistreptolysin-O test is an example of which of the following principles of antigen-antibody detection?
- agglutination
 - precipitation
 - complement fixation
 - neutralization

CHEMISTRY
Items 41-80

Directions: Each of the questions or incomplete statements below is followed by four suggested answers or completions. Select the one that is best in each case and then blacken the corresponding space on the answer sheet.

41. The substrate concentration used in an enzyme measurement is significantly greater than required for maximum velocity of the reaction in order to avoid which of the following?
- A. substrate exhaustion
 - B. product inhibition
 - C. substrate inhibition
 - D. noncompetitive inhibition
42. Which of the following is the routine test of choice for evaluating glomerular filtration rate?
- A. creatinine clearance
 - B. creatine clearance
 - C. urea clearance
 - D. insulin clearance
43. A physician ordered the following tests for a liver profile on a patient.
- #1 aspartate aminotransferase
 - #2 alanine aminotransferase
 - #3 gamma glutamyl transferase
 - #4 creatine kinase
- The clinical laboratory scientist suspects a transcription error and calls to verify the tests listed. One test had been incorrectly listed. Which of the tests will **NOT** give significant information regarding liver function?
- A. #1
 - B. #2
 - C. #3
 - D. #4
44. The recommended sample for routine urinalysis is
- A. collected 2 hours after a meal.
 - B. preserved by the addition of toluene.
 - C. the urine formed after discarding the first morning specimen.
 - D. the first morning specimen.
45. Which of the following is a product in the reaction of glucose with glucose oxidase?
- A. hydrogen peroxide
 - B. Schiff base
 - C. sucrose
 - D. p-toluidine
46. A patient with diabetes insipidus should respond to injected vasopressin (antidiuretic hormone) by
- A. decreased creatinine clearance.
 - B. decreased urine volume.
 - C. a fall in arterial blood pressure.
 - D. increased urinary sodium excretion.
47. The following urinalysis results are reported for a patient.
- Oliguria
Specific gravity 1.035
Hematest - positive
Albumin - positive
50-100 red blood cells/HPF
5-10 white blood cells/HPF
8-10 casts/LPF (hyaline, blood)
Several epithelial cells/LPF
- Which of the following is the **MOST** likely diagnosis?
- A. acute glomerulonephritis
 - B. acute cystitis
 - C. pyelonephritis
 - D. normal kidneys following strenuous exercise
48. Beta-HCG levels are observed to approximately double every 2 to 3 days during the first trimester of pregnancy in
- A. abruptio placenta.
 - B. normal gestation.
 - C. tubal pregnancy.
 - D. gestational diabetes.
49. Enzymatic methods for serum cholesterol which employ the two enzymes, cholesterol esterase and cholesterol oxidase, measure which of the following?
- A. all steroids present in the sample
 - B. only the free cholesterol in the sample
 - C. both free cholesterol and cholesterol esters in the sample
 - D. only cholesterone in the sample

50. Serum osmolality normally depends **MOST** on the concentration of
- glucose.
 - chloride.
 - sodium.
 - urea.
51. Which of the following serum enzyme activities relates **BEST** to the degree of myocardial damage?
- MM isoenzyme of CK
 - MB isoenzyme of CK
 - LD₁
 - Total CK
52. A patient is admitted to the emergency room with symptoms of insulin shock. The serum glucose value obtained upon admission is 265 mg/dL. This value
- is consistent with the diagnosis of insulin shock.
 - is consistent with a diagnosis of insulin overdose.
 - is not consistent with the provisional diagnosis.
 - reflects no abnormal condition.
53. T₃ and T₄ results indicate that serum levels of both hormones are **DECREASED**. The serum level of TSH is within normal limits. A resin T₃ uptake (RT₃U) test would likely show which of the following?
- decreased RT₃U due to increased TBG
 - decreased RT₃U due to decreased TBG
 - increased RT₃U due to increased TBG
 - increased RT₃U due to decreased TBG
54. The enzymatic methods for serum triglycerides are based on spectrophotometric measurement of the amount of liberated
- acetyl CoA.
 - glycerol.
 - formaldehyde.
 - formic acid.
55. Myoglobinuria will result in a false-positive reaction with which of the following urine tests?
- ketone
 - protein
 - occult blood
 - urobilinogen

56. The following results were obtained on a patient's serum.

Sodium	136 mmol/L
Potassium	4.3 mmol/L
Chloride	95 mmol/L
Bicarbonate	22 mmol/L
Osmolality	302 mOsm/kg
Glucose	99 mg/dL
Urea nitrogen (BUN)	25 mg/dL

In considering these data, which of the following statements is true?

- The electrolytes are in balance, and the value obtained for osmolality correlates with the other data.
 - The electrolytes are **NOT** in balance, but the value obtained for osmolality correlates with the other data.
 - The electrolytes are in balance, but the value obtained for osmolality does **NOT** correlate with the other data.
 - The electrolytes are **NOT** in balance, and the value obtained for osmolality does **NOT** correlate with the other data.
57. Sodium reabsorption in the kidney is regulated by the action of a hormone on the
- Bowman's capsule.
 - distal convoluted tubules.
 - loops of Henle.
 - proximal convoluted tubules.
58. Droplets in urinary sediment which stain red with Sudan III contain predominately
- triglycerides.
 - hemoglobin.
 - glycogen.
 - nitrite.
59. Which of the following is the serum protein fraction most likely to be **DECREASED** in a nephrotic syndrome?
- albumin
 - alpha₂ globulin
 - beta globulin
 - gamma globulin

60. Amniotic fluid from a suspected high-risk pregnancy demonstrates a progressive increase in bilirubin as determined by serial, twice-monthly amniocentesis from the 28th week of gestation. During the 38th week, the following results are reported.

	Patient Values	Normal Range
Bilirubin	0.35 mg/dL	0-0.025 mg/dL at 40 weeks
Delta Abs at 450 nm	0.28 A	0-0.02 A at 40 weeks
Lecithin	0.12 mg/dL	
L/S	3.0	≥ 2.0 at 40 weeks

These data suggest which of the following?

- A. a transitory increase in bilirubin due to repeated amniocentesis at short intervals and inadequate fetal lung development
- B. severe hemolytic process and inadequate fetal lung development
- C. severe hemolytic process and adequate fetal lung development
- D. mild hemolytic process and immature fetal lung development
-
61. Which of the following is the cause of the potential measured by a glass pH electrode?
- A. Hydrogen ion diffusion through the glass changes the pH of the filling solution.
- B. Voltage pulses are transmitted through the layers of the glass.
- C. The current generated as hydrogen ions are reduced at the cathode.
- D. Hydrogen ion activity on each side of the glass membrane is different.
62. Ketone bodies in the urine **MOST** likely indicate which of the following?
- A. The body is using carbohydrates as the primary energy source.
- B. Muscle glycogen is being utilized as an auxiliary fuel source.
- C. Storage lipid is being utilized as the primary energy source.
- D. Carbohydrates have been ingested in excessive amounts.
63. Which of the following drug assays displays the highest specificity?
- A. enzyme-mediated immunoassay (EMIT)
- B. fluorescence polarization immunoassay (FPIA)
- C. high performance liquid chromatography (HPLC)
- D. gas chromatography with a mass spectrometer (GC-MS)
64. In relation to electrophoresis, endosmosis (or electroendosmosis) refers to the
- A. flow of current.
- B. protein diffusion on membranes.
- C. heat effect that leads to denaturation of proteins.
- D. flow of buffer salts opposite to protein migration.
65. Patients who have an increased catabolism of purines **MOST** likely will have a corresponding increase in the serum concentration of which of the following?
- A. catecholamines
- B. phenylalanine
- C. pyrimidine
- D. uric acid
66. A substance is said to fluoresce when it absorbs light at one wavelength and emits light of
- A. a lower energy.
- B. a shorter wavelength.
- C. a higher energy.
- D. the same wavelength.

67. A patient has the following laboratory results.

		Reference Values
Unconjugated serum bilirubin	5.0 mg/dL	(0 - 1.0)
Conjugated serum bilirubin	0.8 mg/dL	(0 - 0.2)
Urinary urobilinogen	3 Ehrlich units/dL	(0 - 1)

These laboratory findings are compatible with which of the following?

- A. acute hemolytic anemia
- B. biliary obstruction
- C. early viral hepatitis
- D. renal disease

68. Transudates are characterized by which of the following?

- A. specific gravity less than 1.015
- B. the presence of numerous inflammatory cells
- C. high protein and fibrin content
- D. their association with malignant tumors only

69. If a blood specimen with normal pO_2 is drawn into a syringe containing a large air bubble, which of the following errors may occur?

- A. decreased pH, decreased pCO_2 , increased pO_2
- B. increased pH, increased pCO_2 , increased pO_2
- C. decreased pH, decreased pCO_2 , decreased pO_2
- D. increased pH, decreased pCO_2 , increased pO_2

70. In the kidney, the conversion of vitamin D to its hormonally-active form (1,25 dihydroxycholecalciferol) is stimulated by

- A. calcitonin.
- B. parathyroid hormone.
- C. ionized calcium.
- D. cholecalciferol.

71. Which of the following is the **MOST** likely explanation if a serum urea nitrogen/creatinine ratio is greater than 20?

- A. There is increased urine flow through the tubules, which results in greater urea nitrogen reabsorption.
- B. Glomerular damage is present in the patient's kidneys.
- C. The test results are incorrect, since it is impossible to have a ratio greater than 20.
- D. Slow urine flow through the tubules allows increased urea nitrogen reabsorption.

72. The following results are obtained for a patient.

Sodium	187 mmol/L
Potassium	3.3 mmol/L
Chloride	157 mmol/L
CO_2	28 mmol/L
Glucose	750 mg/dL

Which of the following is the **MOST** likely explanation for these serum results?

- A. Addisonian crisis
- B. diabetic ketoacidosis
- C. grossly hemolyzed specimen
- D. the sample is contaminated with IV fluid

73. Movement of fluids into the tissues from the vascular space is **MOST** often associated with

- A. hypoalbuminemia.
- B. hyperglobulinemia.
- C. hyperproteinemia.
- D. hypoglobulinemia.

74. In competitive immunoassay, the amount of labeled ligand bound by the antibody is

- A. inversely proportional to the sensitivity of the antigen.
- B. inversely proportional to the specificity of the antibody.
- C. directly proportional to the concentration of the separating agent.
- D. inversely proportional to the concentration of the unlabeled ligand.

75. Which of the following procedures is required to modify a pH meter to measure potassium?
- A. Change the calomel reference electrode to a silver/silver chloride electrode.
 - B. Use an indicator electrode with valinomycin as an absorbent.
 - C. Fill the glass electrode with saturated KCl.
 - D. Remove H^+ ions to prevent interference.
76. A urine sediment shows 50-100 RBC/hpf, but the dipstick test is negative for heme. Which of the following is a **POSSIBLE** cause for this discrepancy?
- A. alkaline pH
 - B. large amount of ascorbic acid
 - C. low specific gravity
 - D. urine left at room temperature for several hours
77. Renal clearance tests are effective measures of the excretory capacity of the kidney because they measure
- A. total renal function.
 - B. the ratio of a substance in the urine to the same substance in the plasma.
 - C. reabsorption and passive diffusion processes of the kidney.
 - D. substances which are not influenced by renal blood flow.
78. When p-nitrophenyl phosphate is used as the substrate for determination of alkaline phosphatase activity in serum, which of the following is the colored end product?
- A. phenyl ion
 - B. phenyl phosphate
 - C. nitrophenalein phosphate
 - D. p-nitrophenoxide
79. Which of the following is likely to cause acute respiratory alkalosis?
- A. respiratory distress syndrome
 - B. emphysema
 - C. salicylate intoxication
 - D. hypoventilation
80. Following electrophoretic separation of serum proteins, the proteins have migrated the usual distance, but they are excessively diffuse bands instead of the usual distinctly separated bands. Which of the following is the **MOST** likely source of the problem?
- A. The buffer pH was too alkaline.
 - B. The proteins were not adequately fixed after separation.
 - C. The temperature of electrophoresis was too low.
 - D. The time of electrophoresis was too short.

HEMATOLOGY
Items 81-120

Directions: Each of the questions or incomplete statements below is followed by four suggested answers or completions. Select the one that is best in each case and then blacken the corresponding space on the answer sheet.

81. A comprehensive preoperative coagulation screening battery consists of a bleeding time, platelet count, prothrombin time, and
- A. an activated partial thromboplastin time.
 - B. a clot retraction.
 - C. a Lee-White clotting time.
 - D. a serum prothrombin time.

82. Infectious mononucleosis is characterized by which of the following?
- A. lymphocytosis
 - B. lymphocytopenia
 - C. eosinopenia
 - D. monocytosis

83. A patient has a hemoglobin concentration of 7.5 g/dL with erythrocytes that appear normochromic. Which of the following is the hematocrit value that correlates with these data?
- A. 0.13 L/L
 - B. 0.23 L/L
 - C. 0.29 L/L
 - D. 0.32 L/L

84. Heterozygous sickle cell trait is best differentiated from homozygous sickle cell disease by which of the following?
- A. examination of the Wright's stained peripheral blood smear
 - B. dithionite-phosphate buffer solubility test
 - C. sodium metabisulfite reduction test
 - D. hemoglobin electrophoresis

85. Of the following, heparin therapy is most often used to treat patients with
- A. disseminated intravascular coagulation.
 - B. hemophilia.
 - C. primary fibrinolysis.
 - D. von Willebrand's disease.

86. Which of the following is the basic cause of sickle cell anemia?

- A. substitution of the 6th amino acid in the beta chain; glutamic acid to valine
- B. substitution of the 6th amino acid in the beta chain; glutamic acid to lysine
- C. substitution of the 121st amino acid in the beta chain; glutamic acid to glutamine
- D. repeated crystallization of oxyhemoglobin

87. A patient's blood sample is stained for leukocyte alkaline phosphatase (LAP), and the following results are obtained.

Number of Cells	Score
52	0
20	1
16	2
10	3
2	4

What is the LAP total score?

- A. 90
- B. 100
- C. 142
- D. 190

88. A medium-sized cell with a 1:1 nuclear/cytoplasmic ratio has a round eccentric nucleus with a clumped, coarse chromatin pattern. The cytoplasm is basophilic, with a thin, colorless crescent-shaped area next to the nucleus. This cell is most likely a

- A. myeloblast.
- B. plasma cell.
- C. reactive lymphocyte.
- D. polychromatic normoblast.

89. A laboratory's Wright stained blood smears have recently been too pink in color. Which of the following should the clinical laboratory scientist do to correct this situation?

- A. Make all blood smears thinner.
- B. Increase the methanol content of the stain.
- C. Shorten the staining (buffer) time.
- D. Make the buffer more alkaline.

90. While performing a differential count on a 4-year-old child, the clinical laboratory scientist counts 88% blastic cells and notes the following parameters.
- | | |
|-------------------|---------------------|
| Hemoglobin | 9.0 g/dL |
| Total white count | $9.2 \times 10^9/L$ |
| Platelet count | $21 \times 10^9/L$ |
- Which of the following is the most likely diagnosis?
91. Which of the following erythrocyte morphologic findings is properly paired with its major component?

MORPHOLOGIC FINDING	COMPONENT
---------------------	-----------

- | | |
|---------------------------------|----------------------|
| A. Howell-Jolly body | RNA |
| B. basophilic stippling | denatured hemoglobin |
| C. reticulum (in reticulocytes) | DNA |
| D. Pappenheimer body | iron |
92. The leukocyte most consistently increased in actively progressing tuberculosis is the
93. An electronic cell counter indicates a mean corpuscular volume of 81 fL and an erythrocyte count of $4.53 \times 10^{12}/L$. The hematocrit would be calculated as which of the following?
94. The typical chromatin pattern and nuclear shape of a monocyte are best described as

95. Which of the following coagulation abnormalities is inherited as a sex-linked recessive trait?
96. The initial leukocyte count on a patient is $35.0 \times 10^9/L$. The differential shows 92 metarubricytes (orthochromic normoblasts) and 18 rubricytes (polychromatic normoblasts) per 100 leukocytes. The corrected leukocyte count is closest to which of the following?
97. Particles between 2-20 fL in volume are counted on multichannel impedance cell counters as
98. Fifty platelets are counted in the center square millimeter on one side of a hemocytometer (Neubauer ruled). The center square on the other side also contains 50 platelets. A 1/100 dilution with 1% ammonium oxalate was used. What is the platelet count?
99. The following results are obtained for a patient's plasma.
- | | |
|------|------------------------|
| PT | 27 sec; control 12 sec |
| APTT | 83 sec; control 35 sec |
- The tests were repeated using a mixture of the patient's plasma and fresh normal plasma with the following results.
- | | |
|------|--------|
| PT | 25 sec |
| APTT | 72 sec |
- These data most likely indicate

100. Extramedullary hematopoiesis most often occurs in the
- spleen.
 - bone marrow.
 - kidney.
 - liver.
101. A white cell count is performed on a spinal fluid specimen. It is mounted undiluted on a Neubauer hemocytometer. A total of 163 cells in 2 square millimeters are counted. The count should be reported as
- 163 WBC/ μ L.
 - 408 WBC/ μ L.
 - 815 WBC/ μ L.
 - 1,630 WBC/ μ L.
102. All of the following tests can be used to quantitate hemoglobin F EXCEPT
- hemoglobin electrophoresis.
 - dithionite solubility.
 - alkali denaturation.
 - Kleihauer-Betke.
103. Prothrombin is converted to thrombin by which of the following?
- a complex of activated factors V, X, platelet factor 3, and calcium
 - fibrinogen and calcium
 - a complex of activated factors VIII, IX, platelet factor 3, and calcium
 - a complex of tissue factor, factor VII, and calcium
104. A bone marrow contains many blast cells which stain strongly positive for nonspecific esterase (alpha naphthyl acetate or butyrate) activity. This reaction indicates that these cells are most likely
- erythroblastic.
 - lymphoblastic.
 - monoblastic.
 - myeloblastic.
105. The hereditary Pelger-Huet anomaly includes which of the following features?
- autosomal recessive inheritance
 - clinically aggressive course
 - bilobed nuclei of neutrophils
 - abnormal lysosomes in the white blood cells
106. Which of the following tests are usually abnormal in von Willebrand's disease?
- factor V assay, factor VIII assay, bleeding time
 - factor VIII assay, factor IX assay, platelet adhesiveness
 - platelet aggregation with ristocetin, factor VII assay, factor VIII assay
 - bleeding time, factor VIII assay, platelet adhesiveness
107. When comparing two different multiparameter hematology instruments, precision is best evaluated by which of the following statistical functions?
- coefficient of variation
 - Levey-Jennings chart
 - correlation coefficient
 - Youden plots
108. A Wright-Giemsa stain of bone marrow shows many blast cells, some of which contain a single rod-shaped, red-purple inclusion in the cytoplasm. Which of the following pathologic conditions is most likely?
- acute myeloblastic leukemia
 - acute lymphoblastic leukemia
 - chronic myelocytic leukemia
 - chronic lymphocytic leukemia
109. A xanthochromic cerebrospinal fluid from an adult with three mononuclear cells per microliter and two red blood cells per microliter is most characteristic of which of the following?
- viral meningitis
 - bacterial meningitis
 - subarachnoid hemorrhage
 - normal CSF
110. The vitamin K-dependent plasma coagulation factors are
- adsorbed onto barium sulfate.
 - unstable in stored plasma.
 - found in cryoprecipitate.
 - completely consumed during the clotting process.
111. Phospholipids are important in accelerating the production of which of the following?
- factor Xa
 - factor IXa
 - factor XIa
 - factor XIIa

112. Increased fibrinogen levels are most likely to be associated with which of the following?

- A. liver disease
- B. newborns
- C. inflammation
- D. vitamin K deficiency

113. In a patient with hereditary spherocytosis, the M:E (myeloid:erythroid) ratio in the bone marrow is closest to which of the following?

- A. 1:1
- B. 4:1
- C. 7:1
- D. 10:1

114. A patient's blood sample is processed through an automated hematology analyzer which operates on the impedance principle. Repeated values show the following results.

RBC	$2.72 \times 10^{12}/L$
Hct	0.285 L/L
Hgb	12.1 g/dL
MCV	101 fL
MCH	42.6 pg
MCHC	43.9 g/dL

Based on this information, the patient most likely has

- A. a macrocytic anemia.
- B. hereditary spherocytosis.
- C. a high titer of cold agglutinins.
- D. a high reticulocyte count.

115. What effect will a blood sample collected in powdered EDTA and filled to only one-quarter of the tube have on the packed cell volume?

- A. Packed cell volume value will not be affected.
- B. Hematocrit will be affected only if an electronic cell counter is used.
- C. Centrifuged hematocrit value will be low due to shrinkage of cells.
- D. High hematocrit will be due to dilution effect.

116. Fibrinogen degradation products (FDP) include fragments X, Y, D, and E. To test for these fragments, the tube in which the blood is collected should contain which of the following?

- A. buffered citrate
- B. thrombin
- C. heparin
- D. sodium azide and calcium chloride

117. The following data are available.

Hemoglobin standard assay	60.0 mg/dL
Dilution	0.02 mL blood added to 5.0 mL diluent
Absorbance readings	standard 0.300 unknown 0.250

Based on these data, what is the hemoglobin concentration of the unknown?

- A. 11.0 g/dL
- B. 11.5 g/dL
- C. 12.0 g/dL
- D. 12.5 g/dL

118. An electronic leukocyte count is 12,300/ μ L. The estimate from a well-prepared blood smear shows an average of 55 to 60 leukocytes/low power (10x) field. If the physician needs the results as soon as possible, which of the following is the best course of action for the clinical laboratory scientist?

- A. The results correlate; the count should be reported.
- B. The results do not correlate; report the electronic count.
- C. The results do not correlate; report an average count from the leukocyte estimate and electronic count.
- D. The results do not correlate; prepare and stain new smears and perform the electronic count again.

119. All of the following findings are seen in the peripheral blood as a result of splenectomy EXCEPT

- A. circulating nucleated red blood cells.
- B. Howell-Jolly bodies.
- C. thrombocytosis.
- D. spherocytosis.

120. Which of the following anticoagulants is associated with the *in vitro* adhesion of platelets to neutrophils (platelet satellitism)?

- A. EDTA
- B. heparin
- C. sodium citrate
- D. sodium fluoride

IMMUNOHEMATOLOGY
Items 121-160

Directions: Each of the questions or incomplete statements below is followed by four suggested answers or completions. Select the one that is best in each case and then blacken the corresponding space on the answer sheet.

121. The blood bank receives an order for 4 units of blood for a surgical patient. Blood typing results are as follows.

Cell Grouping		Serum Grouping		Rh Typing		Autocontrol
anti-A	+	A cells	+	Rh _o (D)	0	0
anti-B	0	B cells	+	D ^u	0	
anti-A,B	+					

Which of the following is the **NEXT** step to resolve this problem?

- A. Perform a Lui freeze-thaw elution.
 B. Repeat the serum grouping using an increased amount of serum.
 C. Test the patient's serum with A₂ cells and red cells with anti-A₁ lectin.
 D. Repeat the ABO-antigen typing using 3x-washed saline-suspended cells.
-
122. The genotypes of a mother and her two children are as follows.
- | | |
|----------------|------------------|
| Mother | R ₁ r |
| Child number 1 | rr |
| Child number 2 | R ₂ r |
- Which of the following is the father's genotype?
- A. R₁R₂
 B. R₁r
 C. R₂r
 D. R₂R₂
123. Proficiency testing should be performed by
- A. all personnel who routinely perform the procedure.
 B. individuals on the day shift.
 C. section supervisors.
 D. newer personnel whose performance requires monitoring.
124. Which of the following temperature ranges **MUST** be maintained during shipment of whole blood and red blood cells packed in insulated containers?
- A. 1-10° C
 B. 11-18° C
 C. 19-22° C
 D. 25-37° C
125. Leukocyte-poor blood is the blood component of choice for which of the following clinical situations?
- A. disseminated intravascular coagulation
 B. agranulocytosis
 C. congestive heart failure
 D. febrile transfusion reaction
126. The Food and Drug Administration requires that antiglobulin reagents marketed as "polyspecific" contain which of the following?
- A. anti-IgG and anti-C3d
 B. anti-C3b, anti-C3d, and anti-C4
 C. anti-IgG, anti-IgM, and anti-IgA
 D. anti-IgM and anti-C4
127. A 23-year-old female who types as A Rh_o(D) negative has received 6 units of A Rh_o(D) negative blood. She now requires additional blood transfusions, and no A Rh_o(D) negative blood is available. Which of the following groups and types of red blood cells should be given to this patient?
- A. O Rh_o(D) positive
 B. O Rh_o(D) negative
 C. A Rh_o(D) positive
 D. AB Rh_o(D) negative

128. Delayed hemolytic transfusion reactions are usually due to which of the following?
- errors in labeling the blood for transfusion
 - technical errors in antibody detection
 - samples drawn from the wrong patient
 - patient antibodies below detectable levels
129. A father is Rh_o positive (R₁r) and a mother is Rh_o negative (rr). What percent of their children will be Rh_o positive?
- 0%
 - 50%
 - 75%
 - 100%
130. Which of the following is the minimum allowable donor weight for donating 450 ± 45 mL of blood, as well as up to 30 mL for processing tubes?
- 48 kg (105 lbs)
 - 50 kg (110 lbs)
 - 52 kg (115 lbs)
 - 55 kg (120 lbs)
131. A patient's serum reacts in the indirect antiglobulin test with 10 out of 10 donor units as well as a two-cell antibody screen. The patient's autocontrol is negative. Which of the following is the **MOST** likely explanation for these results?
- an antibody to a high incidence antigen
 - the presence of a private family antigen
 - a diagnosis of warm autoimmune hemolytic anemia
 - the donor bloods are contaminated by bacteria
132. A patient develops hives and itching after receiving 250 mL of whole blood. Which of the following is the **MOST** probable explanation of these symptoms?
- infusion of hypotonic fluids
 - bacterial infection
 - allergic transfusion reaction
 - circulatory overload
133. The following results are obtained in ABO testing on a 35-year-old man.
- | | |
|--|----|
| Patient's cells + anti-A | 0 |
| Patient's cells + anti-B | 0 |
| Patient's cells + anti-A,B | w+ |
| Patient's serum + A ₁ cells | 4+ |
| Patient's serum + B cells | 0 |
- Which of the following **BEST** explains these results?
- The patient's red cells are T-activated.
 - The patient has an unexpected alloantibody.
 - The patient has the AB phenotype.
 - The patient is a subgroup of B.
134. A patient is admitted to the hospital and requires two units of blood. On crossmatching, one donor who is group A R₂R₂ shows 3+ agglutination with the patient's serum at 37° C. A second donor who is group A R₁r is compatible. Which of the following is the antibody **MOST** likely to be present in this patient's serum?
- anti-c
 - anti-C
 - anti-e
 - anti-E
135. Enzymes enhance the reaction of which of the following antibodies?
- anti-M
 - anti-Fy^a
 - anti-N
 - anti-Le^a
136. Which of the following are two coagulation factors present in fresh frozen plasma, but not in stored blood?
- IV and VII
 - V and VIII
 - V and IX
 - VIII and X

137. A recipient's serum tested with an 8-cell panel yields the following reactions.

CC = Check cells

ND = Not done

PANEL CELL	D	C	E	c	e	k	K	Fy ^a	Fy ^b	Jk ^a	Jk ^b	37° C	AHG	CC
1	0	0	0	+	+	+	0	+	0	+	0	0	3+	ND
2	+	+	0	+	+	+	0	+	+	+	+	0	2+	ND
3	0	0	0	+	+	+	0	+	0	0	+	0	3+	ND
4	0	+	0	+	+	+	0	0	+	+	+	0	0	3+
5	+	0	0	+	+	+	0	0	0	+	+	0	0	3+
6	+	+	+	+	+	+	0	0	+	+	0	0	0	3+
7	+	+	0	0	+	+	0	+	+	0	+	0	2+	ND
8	+	+	0	0	+	0	+	0	+	+	+	0	0	3+

Which of the following antibodies is the **MOST** probable?

- A. anti-Jk^a
- B. anti-Fy^a
- C. anti-Fy^a and anti-c
- D. anti-Fy^a and anti-E

138. A patient's serum is tested against a reagent red cell panel. The following results are obtained in the antiglobulin phase of testing.

rr	3+
r'r	3+
R ₀ r	3+
R ₁ R ₂	2+
R ₁ R ₁	negative

Which of the following is the **MOST** likely antibody?

- A. anti-C
- B. anti-c
- C. anti-D
- D. anti-E

139. After birth, which of the following is the greatest danger to a baby with hemolytic disease of the newborn?

- A. kernicterus
- B. severe anemia
- C. calcium deficiency
- D. potassium overload

140. Which of the following is the autoantibody **MOST** frequently associated with cold autoimmune hemolytic anemia?

- A. anti-D
- B. anti-I
- C. anti-H
- D. anti-P

141. Daily quality assurance testing of polyspecific antiglobulin serum **MUST** consist of testing red blood cells coated with which of the following?

- A. C3c
- B. C3d
- C. IgM
- D. IgG

142. According to the AABB, the manual of standard operating procedures (SOP) of a blood bank must be

- A. maintained for 5 years.
- B. reviewed by the AABB before adoption.
- C. reviewed by the medical director annually.
- D. initialed by the clinical laboratory supervisor monthly.

143. Viability of platelet concentrates is dependent on all of the following factors **EXCEPT**

- A. storage temperature.
- B. the type of plastic storage bags.
- C. changes in pH.
- D. changes in 2,3-DPG levels.

144. A donor unit is found to be incompatible with all recipients in the immediate spin crossmatch. The most likely explanation for these results is that the unit

- A. is contaminated.
- B. has an incorrect Rh type.
- C. has a positive direct antiglobulin test.
- D. has an incorrect ABO type.

145. A patient with an antibody to a low frequency antigen requires a blood transfusion. One donor unit of the six chosen for compatibility testing is incompatible. To find a sixth compatible unit for this patient, the clinical laboratory scientist should do which of the following?

- A. Screen family members for antigen-negative blood.
- B. Consult the rare donor file to locate compatible blood.
- C. Choose another unit of suitable ABO and Rh type from inventory for crossmatching.
- D. Screen all suitable ABO and Rh type units in the inventory for antigen-negative blood.

146. A hospital blood bank receives units of whole blood from a regional blood center. In addition to ABO grouping, which of the following confirmatory tests must the hospital blood bank perform on each unit?

- A. Rh group and an antibody screen
- B. Rh group and a test for HBsAg
- C. Rh group on all D-negative units
- D. Rh group on all D-positive units

147. In blood banking, anti-K is found more frequently than anti-k for which of the following reasons?

- A. K is more antigenic than k.
- B. Anti-K is naturally occurring; anti-k is immune.
- C. The frequency of occurrence of K and k differ.
- D. Usual methods of detection are not sufficient to detect anti-k.

148. Which of the following are changes that occur in CPD-stored blood?

Plasma K ⁺	2,3-DPG	Plasma pH
A. decrease	increase	decrease
B. decrease	decrease	increase
C. increase	increase	increase
D. increase	decrease	decrease

149. Which of the following is the subgroup characterized by mixed-field reactions with anti-A, negative reactions with *Dolichos biflorus*, and the presence of both A and H substance in saliva?

- A. A₂
- B. A₃
- C. A_m
- D. A_x

150. Which of the following antibodies is **MOST** likely to show dosage?

- A. anti-P₁
- B. anti-A
- C. anti-Le^b
- D. anti-M

151. A 50-year-old male who had a hernia repair 7 months ago is a prospective blood donor. The following donor history is available.

Weight	95 kg (210 lbs)
Temperature	37° C (98.7° F)
Pulse	65 beats/min
Hgb	124 g/L (12.4 g/dL)
Blood pressure	120/68 mmHg

Based on this information, the donor should be

- A. accepted for whole blood donation.
- B. accepted for platelet pheresis only.
- C. rejected due to recent surgery.
- D. rejected due to low hemoglobin.

152. In some cases of hemolytic disease of the newborn, the infant's red cells may be coated with antibody so that the cells agglutinate in a typing serum that contains albumin, irrespective of the antibody content of that serum. Which of the following is the **FIRST** procedure to perform to solve this problem?

- A. Perform a 56° C heat elution and retype the red cells.
- B. Perform a freeze-thaw elution and retype the red cells.
- C. Treat the red cells with chloroquine diphosphate before typing.
- D. Use saline-reactive typing sera.

153. A donor sample is consistently incompatible in the antiglobulin phase of the major crossmatch with 9 of 9 different ABO and Rh compatible patient samples. Based on these findings, a predictable finding in the donor is a positive

- A. direct antiglobulin test.
- B. indirect antiglobulin test.
- C. test for anti-I.
- D. Sd^a antigen typing.

154. A freshly drawn blood specimen shows a cell grouping of A. Reverse grouping shows no agglutination with A or B cells. The serum also fails to react with group O cells. The **MOST** probable explanation is that the patient
- is group A₂ with anti-A₁.
 - is group A₃.
 - has a positive direct antiglobulin test.
 - is a poor antibody producer.

155. A person has the following genotype.

Lele HH sese AO

Based on this information, saliva from this person will contain which of the following?

- Le^a
 - H, Le^a, Le^b
 - A, H, Le
 - Le^a, Le^b
156. A patient's cell grouping results indicated 4+ agglutination with anti-A and no agglutination with anti-B. His serum grouping results showed no agglutination with A cells and 4+ agglutination with B cells. Which of the following is the most probable blood group for this patient?
- group A
 - group B
 - group AB
 - group O
157. A newborn is diagnosed as having hemolytic disease of the newborn due to anti-D. The child's genotype is **MOST** likely which of the following?
- CDe/CDe
 - Cde/cde
 - CDe/cde
 - cde/cde

158. A patient with autoimmune hemolytic anemia is suffering from life-threatening anemia. His direct antiglobulin test is positive, and his serum reacts with all cells tested. It is of primary importance to do which of the following?

- Avoid transfusion completely.
- Determine the titer of the antibodies present.
- Elute and identify the autoantibody.
- Identify any alloantibodies present.

159. A group A patient's serum reacts with the following red cells, giving these agglutination patterns at 4° C.

patient serum + group O screening cells	4+
patient serum + group O cord cells	negative
patient serum + group A ₁ adult cells	2+
patient serum + group A ₂ adult cells	4+

The **MOST** probable explanation for these reactions is that the patient has which of the following?

- anti-I
 - anti-i
 - anti-IH
 - anti-Pr
160. A significant fetomaternal hemorrhage in a group B, Rh₀(D) negative woman should be suspected if
- a positive direct antiglobulin test is noted on the cord red cells.
 - anti-D is detected in the maternal serum.
 - maternal alloantibody is detected in cord serum.
 - a weakly positive D^u test is found when maternal cells are tested.

MICROBIOLOGY
Items 161-200

Directions: Each of the questions or incomplete statements below is followed by four suggested answers or completions. Select the one that is best in each case and then blacken the corresponding space on the answer sheet.

161. A purulent cerebrospinal fluid drawn from an 18-year-old male reveals the following.
- | | |
|---------|-------------------------------|
| WBC | 200/ μ L, 98% neutrophils |
| Protein | 80 mg/dL |
| Glucose | 20 mg/dL (serum 95 mg/dL) |
- These findings are **MOST** consistent with
- A. late neurosyphilis.
B. bacterial meningitis.
C. tuberculous meningitis.
D. viral meningitis.
162. An organism whose biochemical reactions are compatible with a *Salmonella* is isolated from the blood of a patient with clinical typhoid fever. The organism fails to agglutinate with *Salmonella* antisera of groups A, B, C₁, C₂, D, E, and E₂. Which of the following is the **NEXT** step in identifying the organism?
- A. Report the organism as a *Salmonella* species, unable to agglutinate.
B. Boil the suspension to see if Vi antigen prevented grouping of the organism.
C. Report the isolation of a *Citrobacter* species.
D. Repeat the biochemical tests.
163. The enzyme that breaks penicillin into penicilloic acid is
- A. acid phosphatase.
B. beta-lactamase.
C. penicillin decarboxylase.
D. penicilloic synthetase.
164. A 53-year-old female is admitted to the emergency room with symptoms of meningitis. The cell count, glucose, and protein of the CSF were consistent with bacterial meningitis. Physical examination revealed a small, infected wound which, according to the patient's daughter, was a result of being bitten by the family cat. A Gram stain of the spinal fluid (CSF) revealed a pleomorphic gram-negative bacterium. The **MOST** probable etiologic agent associated with the patient's meningitis is
- A. *Acinetobacter lwoffii*.
B. *Flavobacterium odoratum*.
C. *Haemophilus aphrophilus*.
D. *Pasteurella multocida*.
165. Which of the following is the reagent used to detect bacterial production of indole and the substrate in the culture medium necessary for its formation?
- A. paraaminobenzoic acid and phenylalanine
B. paradimethylaminobenzaldehyde and tryptophan
C. alphanaphthylamine and tyrosine
D. ethylhydrocupreine-HCl and ornithine
166. A sailor who was stationed in the Far East 6 months ago presents in the emergency room with shaking chills and fever. The laboratory reports *Plasmodium vivax* in the blood smear. The VDRL test is weakly reactive and the FTA-ABS test is nonreactive. The serologic tests for syphilis indicate that the patient **MOST** likely has which of the following?
- A. yaws or pinta
B. secondary syphilis
C. tertiary syphilis
D. a false-positive reaction
167. A gram-negative bacillus was recovered from a facial abscess. This organism is nonsaccharolytic, produces pits in blood agar, and gives off the odor of of hypochlorite bleach. Which of the following is the **MOST** probable identity?
- A. *Haemophilus aphrophilus*
B. *Eikenella corrodens*
C. *Alcaligenes xylosoxidans*
D. *Acinetobacter calcoaceticus*
168. The formation of intranuclear inclusions in tissue culture cells infected with virus particles is an example of which of the following?
- A. cytopathic effect
B. hemagglutination inhibition
C. interference
D. toxic effect
169. Antibiotic-associated pseudomembranous enterocolitis is **MOST** often caused by cytotoxin produced by which of the following?
- A. *Bacillus cereus*
B. *Clostridium difficile*
C. *Pseudomonas aeruginosa*
D. *Yersinia enterocolitica*

170. The palladium catalysts used in anaerobic jars should be replaced regularly because the pellets are readily inactivated by which of the following?
- carbon dioxide
 - moisture
 - nitrogen
 - desiccation
171. While examining a formalin-ether concentrate, an oval egg, approximately $50\ \mu \times 70\ \mu$, with an operculum on one end and a knob-like thickening on the opposite end is observed. This egg is characteristic of which of the following?
- Diphyllobothrium latum*
 - Hymenolepis nana*
 - Taenia solium*
 - Taenia saginata*
172. An organism that produces beta-lactamase will be resistant to which of the following antimicrobial agents?
- ampicillin
 - erythromycin
 - nafcillin
 - oxacillin
173. A fecal specimen is inoculated to Hektoen enteric agar. Blue-green colonies are isolated. Biochemical screening produces the following key characteristics.
- | | |
|-------------------------|--------------|
| Glucose | acid, no gas |
| Lactose | negative |
| Motility | nonmotile |
| Lysine decarboxylase | negative |
| Phenylalanine deaminase | negative |
- The isolate **MOST** probably belongs to which of the following genera?
- Proteus*
 - Shigella*
 - Pseudomonas*
 - Salmonella*
174. Which of the following is a technique that allows the **MOST** rapid diagnosis of some acute viral infections?
- direct antigen testing
 - isolation and identification of the virus
 - neutralization test
 - electron microscopic examination
175. An anaerobic gram-negative bacillus is grown from a pleural fluid. The organism produces a red fluorescence under UV light after 48 hours incubation and develops a black pigment on laked blood agar. The organism is inhibited by 20% bile, and the major metabolic product is succinic acid as demonstrated by gas liquid chromatography. Which of the following is the **MOST** probable identity of the organism?
- Fusobacterium nucleatum*
 - Campylobacter fetus*
 - Bacteroides melaninogenicus*
 - Bacteroides fragilis*
176. A throat culture is obtained on a patient suspected of having scarlet fever. Which of the following tests will be needed to identify the causative organism?
- catalase and optochin susceptibility
 - catalase and bacitracin susceptibility
 - bile esculin and bile solubility
 - oxidase and carbohydrate fermentation
177. There is no growth in any of the tubes of a minimal inhibitory concentration (MIC) test, including the control tube. The **MOST** probable explanation for these results is that the
- antibiotic was not added.
 - concentration of the antibiotic was too high.
 - concentration of the antibiotic was too low.
 - broth did not support growth of the organism.
178. A neonate is acutely ill with symptoms of meningitis and septicemia. Gram-stained smears of cerebrospinal fluid and buffy coat indicate the presence of gram-positive diphtheroid organisms. Growth on the sheep blood plate shows small, grayish colonies with a small zone of beta hemolysis. The organism is sodium hippurate hydrolysis-positive, bile esculin hydrolysis-positive, and motile at 25°C . Which of the following is the **MOST** probable identity of the organism?
- Listeria monocytogenes*
 - Erysipelothrix rhusiopathiae*
 - Streptococcus agalactiae*
 - Propionibacterium acnes*

179. A diagnosis of syphilis in the primary stage can **BEST** be made by
- cultural isolation of *Treponema pallidum* from a genital lesion.
 - darkfield microscopic observation of the organisms from the lesion.
 - demonstration of reagin in the patient's serum specimen.
 - a positive *Treponema pallidum* immobilization (TPI) test.

180. A patient suffered a skull concussion in a fall from a barn loft. Several months later, the patient was diagnosed with a brain abscess. The organism isolated was aerobic, partially acid-fast, exhibited uneven beaded staining by Gram stain, grew on brain heart infusion agar, did not hydrolyze casein and was lysozyme resistant. The most probable identity is which of the following?

- Actinomyces israelii*
- Nocardia asteroides*
- Streptomyces madurae*
- Nocardia brasiliensis*

181. A specimen from a peritoneal abscess is sent to the laboratory for culture. Following 24 hours of incubation, the results below are obtained.

Sheep blood	no growth
Colistin-nalidixic acid agar	no growth
MacConkey agar	no growth
Sheep blood agar anaerobic	3+ gram-negative bacilli
Phenylethylalcohol agar anaerobic	3+ gram-negative bacilli
Tryptic soy broth with 0.15% agar	gram-negative bacilli

These results suggest the isolation of which of the following?

- Bacteroides* sp.
- Enterobacter* sp.
- Clostridium* sp.
- Acinetobacter* sp.

182. The trichrome permanent-staining technique is **MOST** reliable for detection and identification of protozoa when a specimen has been preserved in which of the following?

- 10% formalin
- merthiolate-iodine-formalin (MIF)
- polyvinyl alcohol (PVA)
- sodium acetate-acetic acid-formalin (SAF)

183. An acid-fast photochromogen isolated from a sputum specimen grows slowly at 35° C. It is strongly catalase-positive, niacin-negative, and nitrate-positive. The **MOST** probable identity of the isolate is which of the following?

- Mycobacterium tuberculosis*
- Mycobacterium kansasii*
- Mycobacterium marinum*
- Mycobacterium fortuitum*

184. Preformed enterotoxin produced in food causes diarrheal illness from which of the following?

- Staphylococcus aureus*
- Yersinia enterocolitica*
- Shigella dysenteriae*
- Vibrio parahaemolyticus*

185. Oxidase-positive, gram-negative diplococci isolated from Thayer-Martin media are subcultured to CTA carbohydrates. After 24 hours of incubation at 35° C, the following reactions occur.

Glucose	acid
Maltose	acid
Sucrose	acid
Lactose	acid

Which of the following is the **NEXT** step in identifying the gram-negative diplococci?

- Subculture and Gram stain carbohydrates to check for purity.
- Perform a direct oxidase test from the carbohydrates.
- Subculture the organisms from the CTA carbohydrates to fresh CTA carbohydrates.
- Perform a fluorescent antibody test on the organisms in the CTA glucose.

186. Upon examination, a 7-day-old infant is found to have mucopurulent discharge from his eye. A smear of his conjunctiva shows intracellular inclusions upon performing a Giemsa stain. The **MOST** probable organism is which of the following?

- Chlamydia trachomatis*
- Neisseria gonorrhoeae*
- Haemophilus influenzae*
- Staphylococcus aureus*

187. A 40-year-old male was admitted to the hospital with an acute respiratory tract infection. Sputum specimens were collected for bacterial and fungal cultures. Five days after inoculation, growth appeared on the Sabouraud agar with cycloheximide and chloramphenicol as a membranous colony growing close to the surface of the agar. A few days later, the colony was white and cottony. A preparation made with lactophenol cotton blue from the colony demonstrates septate hyphae with arthroconidia (arthrospores) in alternate cells. Which of the following is the MOST probable identity of the fungus?
- Coccidioides immitis*
 - Trichosporon capitatum*
 - Geotrichum candidum*
 - Cryptococcus neoformans*
188. One purpose for the addition of sodium polyanethol sulfonate (SPS) to blood culture bottles is to
- enrich the basal medium.
 - activate penicillin-type antibiotics.
 - inhibit phagocytosis by white cells.
 - stimulate growth of anaerobes.
189. L-forms differ from *Mycoplasma* in that L-forms
- will only replicate in a cell free medium.
 - can revert to bacterial forms with complete cell walls.
 - grow in "fried-egg" colonies.
 - are sensitive to penicillin.
190. Which of the following precautions is NOT necessary when entering a patient's room labeled for respiratory isolation?
- gowns and gloves worn by all persons
 - handwashing on entering and leaving
 - disinfection of all articles with patient secretions
 - masks worn by all persons susceptible to disease
191. Which of the following is the MOST established procedure for distinguishing between strains of *Staphylococcus aureus* when isolated in clinical settings as nosocomial pathogens?
- phage typing
 - antibiograms
 - mannitol fermentation
 - DNase production
192. The addition of 1% Tween-80 (Polysorbate-80) to cornmeal agar stimulates which of the following?
- germ tube production
 - growth of *Candida* species
 - production of pseudohyphae
 - production of chlamydospores
193. Which of the following pairs of organisms checks the appropriate reactions of motility-indole-ornithine (MIO) media?
- | | MIO+++ | MIO000 |
|----|-------------------------------|-------------------------------|
| A. | <i>Enterobacter aerogenes</i> | <i>E. coli</i> |
| B. | <i>E. coli</i> | <i>Klebsiella pneumoniae</i> |
| C. | <i>Klebsiella pneumoniae</i> | <i>Proteus vulgaris</i> |
| D. | <i>Proteus vulgaris</i> | <i>Enterobacter aerogenes</i> |
194. Saprobiic fungi include all of the following organisms EXCEPT
- Penicillium* sp.
 - Aspergillus* sp.
 - Scopulariopsis* sp.
 - Sporothrix* sp.
195. Which of the following pairs of organisms would provide adequate positive and negative control for Columbia base colistin naladixic acid agar?
- E. coli* and *Salmonella typhimurium*
 - Gardnerella vaginalis* and Group A streptococci
 - Group D enterococcus and *Pseudomonas aeruginosa*
 - Staphylococcus aureus* and *Staphylococcus epidermidis*
196. Large, multi-segmented, smooth-walled macroaleurioconidia borne singly or in clusters of two to three and an absence of microaleurioconidia suggest which of the following?
- Epidermophyton floccosum*
 - Trichophyton verrucosum*
 - Microsporium canis*
 - Fusarium moniliforme*

197. Susceptibility testing of a *Staphylococcus aureus* strain produces the following antibiogram.

Kirby-Bauer antimicrobial susceptibility test results.

Note: R = resistant S = susceptible

Penicillin	- R	Clindamycin	- S	Chloramphenicol	- R
Methicillin	- R	Erythromycin	- S	Amikacin	- S
Cephalothin	- S	Tetracycline	- R	Vancomycin	- S

The clinical laboratory scientist should report which of the following to the clinician?

- A. the results exactly as shown above
- B. only the methicillin results
- C. all results except for penicillin
- D. all results except for cephalothin

198. Twenty patients on a surgical ward developed urinary tract infections after catheterization. In each case, the organism was a gram-negative motile bacillus, oxidase negative, and H₂S negative. Additional biochemical test results were as follows.

Lysine decarboxylase	positive
Phenylalanine deaminase	negative
Urease	negative
Indole	negative
Citrate	positive
Omithine decarboxylase	positive
DNase	positive
Rhamnose	alkaline

Which of the following is the **MOST** probable identity of this organism?

- A. *Klebsiella pneumoniae*
- B. *Enterobacter cloacae*
- C. *Escherichia coli*
- D. *Serratia marcescens*

199. Unsheathed microfilariae which are recovered from a "skin snip" are which of the following?

- A. *Dipetalonema perstans*
- B. *Onchocerca volvulus*
- C. *Mansonella ozzardi*
- D. *Wuchereria bancrofti*

200. A gram-positive coccus was isolated from the bone marrow of a 5-year-old leukemic patient. Results of several tests indicate the organism could be either *Staphylococcus epidermidis* or a *Micrococcus* species. Which of the following is a test that is used to differentiate the two organisms?

- A. susceptibility to novobiocin
- B. catalase
- C. coagulase
- D. glucose fermentation

ANSWER KEY CLS SELF-ASSESSMENT EXAMINATION

The answers to the 200-item Self-Assessment Examination and the examination content areas are indicated below. Column one contains the item number; column two is the correct answer; and column three is the examination content area. The designation in column three corresponds to the test content areas on Page 1 of the "Directions and Explanations" booklet.

Item #	Correct Answer	Content Area	Item #	Correct Answer	Content Area	Item #	Correct Answer	Content Area	Item #	Correct Answer	Content Area
1.	B	VI C	51.	B	I A	101.	C	II B	151.	D	III A
2.	C	VI D	52.	C	I A	102.	B	II B	152.	D	III D
3.	A	VI C	53.	D	I A	103.	A	II A	153.	A	III C
4.	B	VI G	54.	B	I A	104.	C	II B	154.	D	III B
5.	B	VI D	55.	C	I B	105.	C	II B	155.	A	III B
6.	C	VI C	56.	D	I A	106.	D	II A	156.	A	III A
7.	A	VI F	57.	B	I B	107.	A	II B	157.	C	III B
8.	C	VI A	58.	A	I B	108.	A	II B	158.	D	III D
9.	C	VI B	59.	A	I A	109.	C	II B	159.	C	III B
10.	D	VI B	60.	C	I A	110.	A	II A	160.	D	III D
11.	B	VI E	61.	D	I A	111.	A	II A	161.	B	IV A
12.	D	VI A	62.	C	I B	112.	C	II A	162.	B	IV A
13.	A	VI E	63.	D	I A	113.	A	II B	163.	B	IV E
14.	A	VI C	64.	D	I A	114.	C	II B	164.	D	IV A
15.	B	VI B	65.	D	I A	115.	C	II B	165.	B	IV A
16.	B	VI D	66.	A	I A	116.	B	II A	166.	D	IV C
17.	B	VI F	67.	A	I A	117.	D	II B	167.	B	IV A
18.	A	VI C	68.	A	I A	118.	A	II B	168.	A	IV D
19.	D	VI D	69.	D	I A	119.	D	II B	169.	B	IV A
20.	C	VI G	70.	B	I A	120.	A	II B	170.	B	IV A
21.	D	V C	71.	D	I A	121.	C	III B	171.	A	IV C
22.	B	V C	72.	D	I A	122.	C	III B	172.	A	IV E
23.	B	V A	73.	A	I A	123.	A	III F	173.	B	IV A
24.	C	V D	74.	D	I A	124.	A	III E	174.	A	IV D
25.	C	V B	75.	B	I A	125.	D	III C	175.	C	IV A
26.	D	V A	76.	B	I B	126.	A	III B	176.	B	IV A
27.	B	V C	77.	B	I B	127.	B	III C	177.	D	IV E
28.	C	V A	78.	D	I A	128.	D	III C	178.	A	IV A
29.	B	V C	79.	C	I A	129.	B	III B	179.	B	IV A
30.	D	V C	80.	B	I A	130.	B	III A	180.	B	IV A
31.	B	V C	81.	A	II A	131.	A	III B	181.	A	IV A
32.	C	V B	82.	A	II B	132.	C	III C	182.	C	IV C
33.	C	V B	83.	B	II B	133.	D	III B	183.	B	IV A
34.	B	V C	84.	D	II B	134.	D	III B	184.	A	IV A
35.	A	V D	85.	A	II A	135.	D	III B	185.	A	IV A
36.	D	V C	86.	A	II B	136.	B	III C	186.	A	IV A
37.	A	V A	87.	A	II B	137.	B	III B	187.	A	IV B
38.	C	V C	88.	B	II B	138.	B	III B	188.	C	IV A
39.	C	V B	89.	D	II B	139.	A	III D	189.	B	IV A
40.	D	V C	90.	B	II B	140.	B	III B	190.	A	IV F
41.	A	I A	91.	D	II B	141.	D	III B	191.	A	IV F
42.	A	I B	92.	D	II B	142.	C	III F	192.	D	IV B
43.	D	I A	93.	C	II B	143.	D	III C	193.	B	IV A
44.	D	I B	94.	C	II B	144.	D	III B	194.	D	IV B
45.	A	I A	95.	A	II A	145.	C	III C	195.	C	IV A
46.	B	I B	96.	C	II B	146.	C	III A	196.	A	IV B
47.	A	I B	97.	B	II B	147.	C	III B	197.	D	IV E
48.	B	I A	98.	B	II B	148.	D	III E	198.	D	IV A
49.	C	I A	99.	D	II A	149.	B	III B	199.	B	IV C
50.	C	I A	100.	A	II B	150.	D	III B	200.	D	IV A