- Demonstrate knowledge of clinical protein analysis and correlate test results with disease states

Enzymology

- Demonstrate understanding of enzymology concepts:
  - Clinically-significant enzymes (CP, ALT, GGT, ALP, AST, CK, LD, amylase, lipase)
  - Isoenzymes (CK, ALP, LD)
  - Cardiac enzymes and related cardiac markers (troponin and myoglobin)
  - Pancreatic enzymes
  - Enzymes associated with the liver
- Demonstrate knowledge of the methodology for measuring enzyme activity
- Perform enzyme analyses
- Describe enzymes that are elevated in liver disease, correlate with liver disease, including types of jaundice
- Describe enzymes of the pancreas, correlate amylase and lipase with pancreatic disease

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disease; describe the classification of hyperlipidemias; know desirable limits for total cholesterol, LDL, and HDL

- Describe the digestion of fat
- Demonstrate understanding of lipid analyses

Water and el

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Special procedures

- Demonstrate knowledge of eosinophil count
- Demonstrate knowledge of body fluid analysis, counts, and related morphology (synovial fluid, CSF, serous fluid)
- Demonstrate knowledge of body fluid cytospin preparation and morphology
- Demonstrate knowledge of sickle cell screen
- Demonstrate knowledge of semen analyses
- Demonstrate knowledge of hemoglobinopathy evaluation, hemoglobin electrophoresis
- Demonstrate knowledge of molecular assays (malaria slide preparation and evaluation)

Automated instrumentation

- Demonstrate knowledge of CBC/Diff using automated hematology instrumentation; know cell counter principles (impedance, flow cytometry)
- Know which CBC parameters are measured directly
- Interpret patient data using WBC/RBC histogram or cytogram
- Perform QC and investigate QC failures
- Perform maintenance protocols
- Identify sources of error and perform corrective action for hematological tests
- Demonstrate knowledge of flow cytometry

[15] IV. Coagulation and Hemostasis (7.1% of exam)

General knowledge

- Define terminology associated with coagulation:

hemostasis	prothrombin time (PT)
coagulation	activated partial thromboplastin time (APTT)
factors	International Normalized Ratio (INR)
thrombin	fibrin degradation products (FDP)
fibrinogen	platelet function test
heparin	Coumadin® (warfarin)
sodium citrate	

- Collect and process coagulation specimens
- Adjust anticoagulant-to-blood ratio when indicated
- Describe the coagulation cascade and list coagulation factors (Roman numerals and common name)
- Understand principles of hemostasis (primary, secondary, and fibrinolysis)
- Understand intrinsic, extrinsic, common pathways, and associated factors
- Correlate hemostatic disorders with laboratory evaluation (coagulation, thrombocyte, and vasculature disorders)
- Perform molecular testing and understand molecular assays in coagulation

Coagulation procedures

- Perform prothrombin time, partial thromboplastin time (PTT or APTT), fibrinogen, and D-dimer

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tests

- Perform fibrin degradation and fibrin split product tests (FDP or FSP)
- Perform heparin assay
- Perform mixing studies, factor testing
- Perform platelet function testing

[8] V. Immunology and Serology (3.8% of exam)

General knowledge

- Define terminology related to immunology and serology

reagin	thermostable	anticomplementary
antigen	thermolabile	serum vs. plasma
antibody	physiologic	amboceptor or hemolysin
hemolysis	hypertonic	*Treponema pallidum*
VDRL	hypotonic	inactivation
PCT	cardiolipin	monoclonal
RPR	complement	

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- Demonstrate knowledge of anti-human immunodeficiency virus (HIV) tests
- Demonstrate knowledge of analyses related to cytomegalovirus, retrovirus, Epstein-Barr virus, HIV, rubella, hepatitis markers, ANA, alpha-fetoprotein (AFP), tumor markers, and other viral markers

[22] VI. Immunohematology (10.5% of exam)

General knowledge

- Define terminology related to immunohematology

antigen	anti-human globulin (direct and indirect)
antibody	compatibility testing (methods)
immunoglobulin	autoimmunity
genotype	Rh immune globulin
phenotype	agglutination
hemolysis	elution
sensitization	

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- Interpret compatibility testing (crossmatch) results, use of auto control, grading of reactions, interferences (cold agglutinins, Rouleaux)

Rh immune globulin

- Demonstrate knowledge of Rh immune globulin evaluation, know principles of Rh immune

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Blood banking practices

- Perform therapeutic phlebotomy
- Understand purpose for therapeutic phlebotomy
- Know and understand regulation parameters for computer crossmatch
- Know and understand special requirements of blood products (e.g., CMV-negative, baby units)
- Know and evaluate blood donor collection requirements and deferrals

[31] VIII. Microbiology (14.8%)

Bacteriology

General knowledge

- Define terminology associated with bacteriology

bacteria	osmosis	capsule
autotrophic	semipermeable	ambient
heterotopic	cytoplasm	nucleus
pathogenic	cell wall/membrane	spore
flagella	microaerophilic	aerobic
phagocytosis	facultative aerobic	anaerobic
bacteriophage	facultative anaerobic	Pili
mesophilic	thermophilic	

- Describe and identify shapes and arrangements of bacteria
- Demonstrate knowledge of staining procedures (acid-fast stains, fluorescent stains, Gram's stain, Giemsa and Wright's stain, India ink stain)
- Interpret/identify structures through microbiological slide preparations
- Demonstrate knowledge of quality control procedures

Media quality control, techniques, and cultures

- Demonstrate knowledge of additives used in media preparation (inhibitors, salts and buffers, indicators, pH, enrichments)
- Prepare bacterial smears and stains (including Gram's, fast stains, and other stains)
- Justify uses of bacterial culture methods: selective and differential media, enrichment procedures, anaerobic media and techniques, using host cells, candle jars
- Prepare specimens and know rejection criteria
- Culture clinical specimens: blood, urine, stool (feces), sputum, throat, spinal fluid, upper respiratory, wound, abscess, other body fluids/tissue specimens, urethral/cervical/gynecological, catheter tip (intravenous), intrauterine devices (IUD)
- Interpret morphological characteristics
- Isolate, identify, and differentiate microorganisms
- Demonstrate knowledge of proper processing and planting of specimens
- Prepare and interpret gram stain
- Recognize normal flora from cultures
- Recognize pathogens from cultures

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- Identify criteria for proper collection and rejection of specimens for the clinical microbiological laboratory
- Concentrate and culture sputum for acid-fast bacilli
- Test for multi-drug resistant tuberculosis (MDR-TB)
- Perform quality control on media based on standards of the Clinical and Laboratory Standards Institute (CLSI)

Bacterial identification

- Demonstrate knowledge of various methods of bacterial identification
- Examine stained smears
- Examine smears for acid-fast bacilli
- Demonstrate knowledge of various systems of bacterial identification (API, automated systems, biochemical and carbohydrate systems)
- Perform bacterial identification using biochemical and carbohydrate systems
- Perform differentiating tests

oxidase	beta lactam disk (cefinase disk)	indole
catalase	optochin disk (P disk)	Camp test
coagulase	bile esculin (enterococcal slant)	TSB with NACL
bile solubility	bacitracin disk (A disk)	

Mannitol salt test for differentiating Staphylococcus species

- Isolate, identify, and differentiate gram-positive cocci
- Isolate, identify, and differentiate gram-positive bacilli
- Isolate, identify, and differentiate gram-negative cocci and coccobacilli
- Isolate and identify gram-negative Enterobacteriaceae and differentiate genera and species
- Isolate, identify, and differentiate gram-negative bacilli: Brucella, Bordetella, HACEK family (upper respiratory): Haemophilus, Actinomycetemcomitans, *Cardiobacterium hominis*, *Eikenella corrodans*, *Kingella kingae;* Pseudomonas; Campylobacter; Anaerobic bacteria (fusobacterium, bacteroides group, actinomyces, *Clostridium difficile*)
- Demonstrate understanding of MRSA and its importance in nosocomial infection; differentiate nosocomial from community-acquired MRSA
- Understand the emergence, significance, and impact of multi-drug resistant organisms (MDRO)
- Understand the significance of vancomycin-resistant Enterococcus
- Know and perform quality control and maintenance of instrumentation for microbiologic diagnostic procedures

Special tests

- Demonstrate knowledge of streptococcal testing: rapid enzyme immunoassay test (or other antigen detection kits) from throat swabs; cultures for beta hemolysis screening, bacterial identification
- Demonstrate knowledge of *Clostridium difficile* toxin test
- Demonstrate knowledge of Campylobacter urease test and antigen/antibody test
- Demonstrate knowledge of *Helicobacter pylori* screening; shiga toxin test
- Demonstrate knowledge of antimicrobial susceptibility testing (Kirby-Bauer, MIC, and

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automated systems)

x

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[10] IX. Urinalysis and Body Fluids (4.8% of exam)

General knowledge

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