Back to Basics: 
What Do You Want Your Entry Level Technologists to Know?

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Associate Professor, Clinical Laboratory Sciences Program; CUNY-York College
Lead Technologist, Process Improvement; Transfusion Services and Laboratory of Immunohematology and Genomics; New York Blood Center

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Objectives

- Identify essential cognitive and psychomotor skills for the entry level technologist.
- Describe three updates to recently published ASCLS entry level curriculum for MLS.
- Analyze and correlate laboratory results from various areas of the laboratory to recognize additional indicated tests to identify a clinical disease or condition.

ASCLS Entry Level Curriculum (ELC)

- Originally published in 2002
- Created to provide guidance as to the knowledge and skills a new graduate at the MLT or MLS level should possess upon entry into the workforce.
- Goals of 2016 Update
  - Use the recently updated (2014 version) ASCLS Body of Knowledge (BOK) and personal expertise in entry level practice to update the curriculum by removing dated topics and adding new items.
  - Ensure differentiation of the MLT and MLS curriculum based on the level of education required for each.
- Available as an electronic download after purchase from ASCLS
- Many configurations
  - MLT only
  - MLS only
  - MLS+MLT
  - Individual or institutional license
  - All labs or individual sections

Sections and Format of the ELC

- MLS Categories (MLS)
  - Administration/Management
  - Clinical Chemistry
  - Education
  - General Lab Practices
  - Hematology/Hemostasis
  - Immunology
  - Immunohematology
  - Microbiology
  - Molecular Diagnostics
  - Phlebotomy
  - Urinalysis/Body Fluids
- Each category includes
  - MLS or MLT Entry Level Competencies for that category
  - Additions
  - Deletions

ELC Format

- The MLS and MLT entry-level curricula are defined as the knowledge and skills expected of a new graduate upon successful completion of a formal educational program.
- Assumes no work experience other than that required as part of a clinical education affiliated with the program.
- The curriculum format is delineated by discipline area within the MLS and MLT levels.
  - Major topics in each discipline area include a sequence and coordination of concepts, principles and theories, and skills.
- Designed to
  - help develop the curriculum for a new program
  - assist the new instructor/professor with course development
  - update a current program or course
What's new?

- Molecular diagnostics is a new addition to the 2016 version of the ELC.
- Body fluids moved from the Chemistry section to create a new Urinalysis and Body Fluids section.
- Where there is overlap in some discipline areas, it is cross-referenced to another section within the ELC disciplines.
- For example, microscopic analysis in Hematology, Urinalysis & Body Fluids, and Microbiology are all cross-referenced to the more detailed microscope section in the General Practice document.
- Differentiation in MLT vs MLS curriculum was based on the background knowledge (pre-requisite and/or core courses). Different cognitive levels were reflected in the verbs used to elucidate the tasks or knowledge.

Some Chemistry Additions for MLS

- Math/Instrumentation
  - Perform basic calculations – normality
  - Define predictive statistics: True positive and negative, False positive and negative, Clinical sensitivity and specificity, Positive predictive value (PPV), Negative predictive value (NPV)
  - Calculate and utilize statistical data for method verification and comparison studies: Precision - Coefficient of variation (CV); F test ; Accuracy - T test, Linear regression- slope(m), - y intercept(b); Correlation coefficient(r)
  - Identify basic components of atomic absorption: Burner assembly, Gas regulators, Light source (hollow cathode lamp), Monochromator, Light detector, Signal conversion electronics, Read out systems
  - Identify basic concepts and principles of fluorescent polarization
  - Calibrate an osmometer following established laboratory procedure & perform test procedures on standards, controls, and unknowns
  - Identify basic concepts of mass spectrometry
- Electrolytes and Trace Elements: (NMR), mass spectroscopy
- Carbohydrates:
  - State the components of the disaccharides: Lactose, maltose, sucrose
  - State the composition and function of each of the following polysaccharides: starch, glycogen, proteoglycans (macromolecular carbohydrates), glycoproteins
  - Explain glucose pathways: eg Insulin and non-insulin routes of entry to cells; Glycolysis, Glycogenolysis
  - Explain diagnostic criteria for Type 1, 2 (impaired glucose tolerance and provisional diabetes mellitus), and GDM
- Proteins:
  - List the most common methods of analysis – nuclear magnetic resonance [NMR], mass spectroscopy
- Genetic disorders:
  - Explain tests used to evaluate the risk of fetal chromosomal abnormalities
    - Human chorionic gonadotropin (HCG)
    - Pregnancy-associated plasma protein-A (PAPP-A)
    - Iron excess

Some Chemistry Additions for MLS (2)

- Electrolytes and Trace Elements:
  - Explain the role of atrial natriuretic peptide (ANP) in sodium regulation
  - Establish lab procedures for electrophoresis

Some Chemistry Additions for MLS (3)

- Disease Markers:
  - Explain the origin and the usefulness in the detection of and risk assessment for an MI
  - hs-CRP
  - Lipids
  - Homocysteine
- Non-protein nitrogen:
  - Discuss the advantage and disadvantages of cystatin for determination of renal clearance
  - Differentiate eGFR and GFR
  - Electrolytes and Trace Elements:
    - Explain the role of atrial natriuretic peptide (ANP) in sodium regulation
    - Define conversions between and among systems of measurement – metric to nonmetric, nonmetric to metric and SI, SI to nonmetric
  - Define predictive statistics: True positive and negative, False positive and negative, Clinical sensitivity and specificity, Positive predictive value (PPV), Negative predictive value (NPV)
  - Calculate and utilize statistical data for method verification and comparison studies: Precision - Coefficient of variation (CV); F test ; Accuracy - T test, Linear regression- slope(m), - y intercept(b); Correlation coefficient(r)
  - Identify basic components of atomic absorption: Burner assembly, Gas regulators, Light source (hollow cathode lamp), Monochromator, Light detector, Signal conversion electronics, Read out systems
  - Identify basic concepts and principles of fluorescent polarization
  - Calibrate an osmometer following established laboratory procedure & perform test procedures on standards, controls, and unknowns
  - Identify basic concepts of mass spectrometry

Some Chemistry (MLS) Deletions

- Math and Instrumentation
  - Perform basic calculations – specific gravity
  - Define units of systems of measurement – nonmetric
  - Define conversions between and among systems of measurement – metric to nonmetric, nonmetric to metric and SI, SI to nonmetric
  - Activate and calibrate spectrophotometer following established laboratory procedure
  - Establish lab procedures for electrophoresis
  - Define predictive statistics: True positive and negative, False positive and negative, Clinical sensitivity and specificity, Positive predictive value (PPV), Negative predictive value (NPV)
  - Calculate and utilize statistical data for method verification and comparison studies: Precision - Coefficient of variation (CV); F test ; Accuracy - T test, Linear regression- slope(m), - y intercept(b); Correlation coefficient(r)
  - Identify basic components of atomic absorption: Burner assembly, Gas regulators, Light source (hollow cathode lamp), Monochromator, Light detector, Signal conversion electronics, Read out systems
  - Identify basic concepts and principles of fluorescent polarization
  - Calibrate an osmometer following established laboratory procedure & perform test procedures on standards, controls, and unknowns
  - Identify basic concepts of mass spectrometry
- Electrolytes and Trace Elements:
  - Correlate UIBC with specific diseases or disorders or iron deficiency or iron excess
- Enzymes:
  - List the most common methods of analysis – nuclear magnetic resonance [NMR], mass spectroscopy

Some Chemistry Additions for MLS

- Math/Instrumentation
  - Perform basic calculations – normality
  - Define predictive statistics: True positive and negative, False positive and negative, Clinical sensitivity and specificity, Positive predictive value (PPV), Negative predictive value (NPV)
  - Calculate and utilize statistical data for method verification and comparison studies: Precision - Coefficient of variation (CV); F test ; Accuracy - T test, Linear regression- slope(m), - y intercept(b); Correlation coefficient(r)
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  - Identify basic concepts of mass spectrometry
- Electrolytes and Trace Elements: (NMR), mass spectroscopy
- Carbohydrates:
  - State the components of the disaccharides: Lactose, maltose, sucrose
  - State the composition and function of each of the following polysaccharides: starch, glycogen, proteoglycans (macromolecular carbohydrates), glycoproteins
  - Explain glucose pathways: eg Insulin and non-insulin routes of entry to cells; Glycolysis, Glycogenolysis
  - Explain diagnostic criteria for Type 1, 2 (impaired glucose tolerance and provisional diabetes mellitus), and GDM
- Proteins:
  - List the most common methods of analysis – nuclear magnetic resonance [NMR], mass spectroscopy
- Genetic disorders:
  - Explain tests used to evaluate the risk of fetal chromosomal abnormalities
    - Human chorionic gonadotropin (HCG)
    - Pregnancy-associated plasma protein-A (PAPP-A)
State the physical findings commonly present in hematologic disease
Incorporation of WHO system into Acute Leukemia objectives and
Identify abnormal lipid accumulations within
Greater than 20% (WHO)
Describe
Characterize
Distinguish nucleated erythrocyte precursors from other hematopoietic elements
List nutritional and regulatory factors with associated with erythropoiesis
Describe the purpose of the metabolic pathways used by erythrocytes

Some Hematology (MLS) Additions
- State the physical findings commonly present in hematologic disease
- Describe the preparation of bone marrow smears and stains used and terms used to assess bone marrow structure and function
- Perform differential counts on normal specimens
- Distinguish between normal and abnormal hematopoietic elements found within the peripheral blood
- Correlate complete blood count findings with peripheral blood smear evaluation
- List and define components of commonly used stains and acceptable stain quality
- Describe the distinctive features used to characterize developing cells
- List the maturation sequence of developing erythrocytes
- Distinguish nucleated erythrocyte precursors from other hematopoietic elements
- List nutritional and regulatory factors with associated with erythropoiesis
- Describe the purpose of the metabolic pathways used by erythrocytes

Some Hematology (MLS) Additions (3)
- Identify morphologic changes in neutrophils that may accompany nonmalignant neutrophilic disorders
- State characteristic abnormalities and clinical features for the qualitative/functional disorders of neutrophils
- Identify abnormal lipid accumulations within monocytes and macrophages
- Hereditary membrane abnormalities (spherocytosis, elliptocytosis, ovalocytosis)
- RBC Enzyme abnormalities (G6PD and PK deficiencies)
- Extracorpuscular (immune and non-immune) mediated RBC defects
- Describe changes in the bone marrow and peripheral blood with polycythemia
- List the causes of hypochromic anemias
- Discuss tests methods commonly used to assess megaloblastic anemia
- Describe the clinical features and laboratory findings of red cell membrane defects
- Describe the utility of flow cytometry in assessing red cell membrane defects
- Describe the clinical and laboratory findings of hemoglobinopathies

Some Hematology Additions (4)
- Acute blood loss: Describe etiology of anemia/List clinical symptoms/Identify laboratory findings
- Describe the clinical features and laboratory findings associated with nonhematologic disorders
- Identify major systems used to classify neoplastic disorders of leukocytes
- Incorporation of WHO system into Acute Leukemia objectives and removal of FAB system from myelodysplasias
- Describe the principle of the platelet function assay
- Describe and perform procedures to evaluate erythrocytes and their physical properties using patient blood and quality control samples
- Perform and interpret calculations associated with reticulocyte assays
- Interpret results of erythrocyte sedimentation rates
- Recognize situations when results may be falsely high or low
- Calculate absolute and relative white blood cell values
- Greater than 20% (WHO)
- Primary myelofibrosis (PMF)
- Discuss the role of the vasculature in normal hemostasis

Additions-Immunology
- Autoimmune disease:
- Added additional diseases (e.g., celiac, autoimmune hepatitis)
- Additional antibody tests
- Role of HLA in autoimmune diseases
- Tumor markers:
  - listed key tumor marker tests
- No deletions in this section
Immunohematology: Additions and Deletions

- **Additions**
  - Throughout the document updated test methods (e.g., include molecular, bacterial testing for platelets)

- **Deletions**
  - Allogeneic Donation:
    - Removed section dealing with donors
    - Take donor history
    - Perform physical examination
    - Perform hemoglobin
    - Obtain informed consent
    - Perform phlebotomy use supplies for treating donor reactions

- Autologous donation:
  - Select donor
  - Adapt history questions
  - Collect blood

Sections such as developing and modifying procedures/guidelines (not entry level)

HLA: Changed “perform testing” to “observe testing”

Additions - Microbiology

- **Prions**
- **Staphylococcus lugdunensis**
- **viridans** Strepogocci
- **Enterococcus faecalis**, **Enterococcus faecium**, **Vancomycin resistant Enterococcus (VRE)**
- **Group D Streptococcus in S. pyogenes (previously S. pyogenes)**
- **Alopecia**
- **Moraxella catarrhalis**
- **Vibrio alginolyticus**, **Vibrio parahemolyticus**, **Vibrio vulnificus**
- **Aggregatibacter aphrophilus** (previously known as Haemophilus aphrophilus/H. paraphrophilus)
- **Aggregatibacter actinomycetemcomitans** (previously known as Actinobacillus actinomycetemcomitans)
- **Capnocytophaga**
- **Steptobacillus moniliformis**
- **Eggerthella**
- **Orientia tsutsugamushi**
- **Anaplasma phagocytophilum**
- **Coxiella burnetii**
- **Spirillum spp**

Additions - Mycology/Parasitology

- **Mycology**
  - Rhodotorula spp
  - Saccharomyces spp
  - Penicillium marneffei
  - Acremonium spp
  - Chrysosporium spp
  - Septedonium spp
  - Rhizomucor spp
  - Cunninghamella spp
  - Syncephalastrum spp
  - Dracunculus medinensis

- **Parasitology**
  - Heterophyes heterophyes
  - Metagonimus yokogawai
  - Naegleria fowleri
  - Chromatix mesnili
  - Trichinella spiralis
  - Wuchereria bancrofti
  - Brugia malayi
  - Loa loa
  - Mansonella
  - Onchocerca volvulus

Additions - Mycobacteria/Viruses

- **Mycobacteria**
  - M. ulcerans
  - M. xenopi
  - M. kansasi
  - M. marinum
  - M. gordonae
  - M. scrofulaceum
  - M. chelonae
  - M. abscessus
  - M. leprae

- **Viruses**
  - SARS related coronavirus
  - Poliovirus
  - Coxsackievirus
  - Enterovirus
  - Rhinovirus
  - Echovirus
  - Hantavirus
  - Parvovirus B19
  - Flaviviruses: West Nile virus, St. Louis Encephalitis virus, Dengue virus, Yellow fever virus
  - MERS
  - Rift Valley Fever virus

Microbiology Deletions

- **CAMP**
  - Perform confirmatory identification tests (including rapid tests)
  - Hemolysis on Horse blood
  - Beta-glucuronidase (MUG)

Molecular Diagnostics: New Section!

- **Nucleic Acid Biochemistry**
  - Discuss/diagram RNA, DNA, and genome structure Level 1
  - Pairing of nitrogen bases Chargaff rules
  - Explain semi-conservative DNA replication Level 1
  - Central dogma

- **Genetics**
  - Define the various changes in chromosomal structure, such as inversion, duplication, deletion, translocation and isochromosome

- **Molecular methodologies**
  - Describe nucleic acid extraction/isolation/quantitation/purification techniques

- **Mutations and Polymorphisms**
  - Distinguish among DNA gene, chromosomal, and genome mutations

- **Laboratory Operations**
  - State variables of concern for pre-analytical and analytical phase
Phlebotomy additions

- Patient and laboratory safety
  - Discuss and evaluate safety equipment for use in phlebotomy and related services
- Infection control
  - Relate the types of isolation associated with specific inpatient/clinical treatment units
  - Develop and evaluate a system including protocols for ensuring proper infection control in phlebotomy and related services
- Specimens/Samples
  - Match the blood collection tube stopper colors with the additive routinely associated with each colored stopper (e.g., tubes with lavender)
- Equipment and Processing for phlebotomy and processing
  - Select and evaluate equipment and supplies used for phlebotomy and discuss proper use of each
  - Winged and non-winged blood collection sets
  - Triple Packaging System/Shredder devices
  - Dried Blood Spot and filter paper collections
- Specimen/Sample collection
  - Discuss precautions when collecting blood specimens/samples
  - Discuss technical complications associated with blood collection and methods of correction for each; include needle insertion and loss of vacuum in evacuated tubes
  - State/discuss patient factors and adverse complications that affect specimen collection

Urinalysis/Body fluids: Additions

- Urinalysis
  - Describe the process of glomerular filtration – including shield of negativity
  - State the clinical features of nephrotic syndrome and state diseases that are associated with this syndrome
  - Describe Specimen Collection technique - Timed collection
  - Specimen preparation - mix specimen
  - Distinguish between normal urine odor and that associated with old, unreserved urine
  - Dip and remove strips in urine appropriately and correctly, time and read, and interpret reactions
  - Apply criteria for results that require confirmatory testing and/or dilutions
  - Discuss the advantage and disadvantages of Cystatin C for determination of renal clearance
  - Recognize and identify factors that can influence eGFR results (age, muscle mass, pregnancy, ethnicity, race)
  - Discuss the chemical composition of most renal calculi
- Body Fluids
  - BAL (bronchoalveolar lavage) and Fecal occult blood

Urinalysis/Body fluids deletions

- Explain the function of the mesangium of the glomerulus
- Diagram renal blood circulation
- Identify characteristics of fasting urine specimen types
- Perform and record confirmatory tests - Sulfosalicylic acid for protein & Watson-Schwartz for unbilirubin/porphobilinogen, clinistest, acetest, ictotest
- For qualitative metabolic screening tests - Apply criteria for results that require confirmatory testing and/or dilutions
- Describe and utilize various microscopic techniques - Interference contrast microscopy
- Maintain daily and cumulative QC documentation
- Participate in continuing education programs; Enhance pertinent knowledge; Annually document competency (not needed for entry level)
- Renal calculi – locate chemical tests to determine chemical composition
- Quality Management in the Urinalysis Laboratory (covered in management section)

Administration/Management

- Includes
  - Federal regulations
  - Management theory/Operations management
  - Financial management/HR/Information systems
  - Safety: Personnel and Patient
- Additions
  - HIPPA, HITECH, ISO, CPT and HCPCS coding, Six sigma
  - New sections: General healthcare, professionalism, personnel safety, Technical Consultant (CLIA)
- Deletions
  - Removed old terms and updated (JCAHO to TJC)
  - Conduct and interview

General Lab Practice

- Lab safety
  - Chemicals; standards/controls
  - Quality control: reagents and equipment
  - Method selection/evaluation
- Additions
  - Microscope section
  - Define/use a document control system
- Deletions
  - Basic elements of a computer and software
  - Method evaluation-ROC curve

Got silos?
Case 1: A 10-year-old white male has symptoms of frequent bruising after sports activities and excessive bleeding following a tooth extraction. His family history is notable for heavy menstrual bleeding. Lab results include:
Hb/Ht 12/36
PLT 370x10^3/uL
PT 11 sec/PTT 80 sec/TT 13 sec
Abnormal bleeding time
Normal platelet aggregation with epinephrine, ADP and collagen
The clinical and laboratory findings are consistent with:
A. Hemophilia A
B. vWD
C. Glanzmann’s thrombasthenia
D. Bernard-Soulier Syndrome

Case 1: Which of the following platelet responses is most likely associated with classic vWD?
A. Decreased platelet aggregation to ristocetin, corrected upon addition of normal plasma
B. Normal platelet aggregation to ristocetin
C. Absent aggregation to epinephrine, ADP and collagen
D. Decreased amount of ADP in platelets

Case 1: The best treatment option for this patient is:
A. Recombinant factor VIII concentrate
B. FFP
C. Desmopressin or cryoprecipitate
D. Fresh whole blood

Case 2: A 58-year-old male is admitted to the E.D. following a motor vehicle accident. Initial lab results are:
CK-MB 14 ug/L; Total CK 170 IU/L
Serum Myoglobin 130 ug/L
Troponin I 1.6 ug/L
Three hours after admission the TnI is 3.0 ug/L
Which statement best describes the appropriate follow-up testing?
A. A repeat CK-MB and myoglobin should also be performed at 3 hours post admission
B. The elevated CK-MB results are consistent with skeletal muscle damage associated with a crush injury
C. Further testing 6-12 hours post admission is required to confirm AMI
D. The patient has suffered an AMI
Case 3: A 42 year old male is suffering from gastric ulcers. A tissue biopsy from the stomach is submitted for culture and histology. After 5 days, the cultures produced gram-negative bacilli on chocolate and Brucella agar with 5% sheep blood. The colonies tested positive for urease. The most likely organism is:

A. E. coli  
B. Streptococcus bovis  
C. H. pylori  
D. Enterobacter faecalis  

Case 3: Antigens of which blood group system are receptors for H. pylori?

A. Duffy  
B. Lewis  
C. Rh  
D. ABO  

Case 4: A 36 year old female reports symptoms of fatigue and shortness of breath. She has a history of chronic heavy menstrual bleeding. Lab tests reveal:

- WBC 6.4x10^9/L  
- H&H 9.1/27; smear reveals microcytic, hypochromic cells; mild anisopoikilocytosis  
- MCV 75 fL  
- PLT 250x10^9/L  

Based on these initial results, what is the most likely explanation for the anemia?

A. Thalassemia  
B. Lead poisoning  
C. Megaloblastic anemia  
D. Iron deficiency anemia  

Case 4: What additional test would be useful to confirm the diagnosis?

A. Hemoglobin electrophoresis  
B. Vitamin B12 and folate levels  
C. Serum iron, ferritin, TIBC  
D. Chromosome analysis  

Case 4: Iron deficiency anemia is associated with:

A. ↓ serum iron; ↑ MCV and serum ferritin  
B. ↓ serum ferritin; ↑ stainable bone marrow iron  
C. ↑ serum iron and serum ferritin; marked anisopoikilocytosis  
D. ↓ serum iron, ferritin and MCV; ↑ TIBC  

Case 5: A 72 year old immunocompromised female patient undergoing chemotherapy suffers a severe febrile transfusion reaction immediately following a red cell transfusion. The transfusion reaction investigation shows the DAT and antibody screen on the pre and post transfusion samples are both negative and the crossmatches were compatible. The culture of the blood bag shows gram-negative rods on MacConkey and blood agars. The organism is negative for lactose, citrate and indole; positive for sucrose and urease; motility is positive at 22°C, neg at 37°C. The most likely identification is:

A. E. coli  
B. Y. enterocolitica  
C. E. cloacae  
D. C. freundii
Case 6: A 68 year old male patient underwent orthopedic surgery 1 week ago and was transfused 2 units of red cells during surgery. Preop blood testing revealed A pos; antibody screen negative. The H&H dropped from 11/33 post-op to 8/24 in the absence of bleeding. What additional tests would help explain the drop in the H&H?

A. Direct bilirubin; DAT/IAT
B. Indirect bilirubin; DAT/IAT; haptoglobin
C. LDH; direct bilirubin; titration
D. Direct bilirubin; IAT; haptoglobin

Case 6: Additional tests reveal a positive DAT (poly and IgG1+, C3neg) antibody screen now 1+ positive by IAT only. Repeat testing of the pretransfusion sample confirms the antibody screen was negative. The indirect bilirubin is elevated, haptoglobin decreased. The most likely clinical scenario associated with these results is

A. Delayed hemolytic transfusion reaction
B. Acute hemolytic transfusion reaction
C. Warm autoimmune hemolytic anemia
D. Drug-induced hemolytic anemia

Case 6: The antibody most commonly implicated in delayed hemolytic transfusion reactions is:

A. Anti-D
B. Anti-K
C. Anti-Jkα
D. Anti-M

Case 7: A patient received 4 units of ABO-compatible FFP and developed a severe anaphylactic reaction. He has a history of respiratory and GI infections. Post-transfusion testing confirmed the ABO compatibility of the transfused units. What immunologic test could help determine the cause of the reaction?

A. Complement levels (C3 and C4)
B. Flow cytometry for T-cell counts
C. Measurement of immunoglobulin levels
D. NBT test for phagocytic function

Case 7: The patient is found to have low serum IgA level and all other immunoglobulins were with normal ranges. The patient requires a red cell transfusion. Which product would be the best choice?

A. Irradiated red cells
B. CMV negative red cells
C. Washed red cells
D. Leukoreduced red cells

Case 8: A 79 year old male is admitted with shortness of breath. If elevated, which laboratory test would support a diagnosis of congestive heart failure?

A. Homocysteine
B. Troponin
C. Albumin cobalt binding
D. B-type natriuretic peptide (BNP)
What skills does an entry level technologist need to succeed in your laboratory?

Additional Resources

- From ASCLS online store
  - http://members.ascls.org/store_category.asp?id=69
- Entry Level Curriculum
- Body of Knowledge

Questions?

Answer Key

- Case 1: B, A, C
- Case 2: D
- Case 3: C, B
- Case 4: D, C, D
- Case 5: B
- Case 6: B, A, C
- Case 7: C, C
- Case 8: D