

Specific Examination Objectives

Question Topic	Total	Average Difficulty
Anticoagulants	4	1.25
Blood Smear Preparation	9	1.33
Bone Marrow	16	1.13
Cell Counts	7	1.29
Hematopoiesis	2	1.00
Introduction	12	1.08
Lab Safety	4	1.25
Macrophage	1	1.00
Normal Values	1	1.00
Phlebotomy	3	1.67
Quality Assurance	11	2.09
RBC Membrane	2	1.00
RBC Production	5	1.20
RBCs	5	1.40
WBC Morphology	2	1.00
WBCs	12	1.42

Exam ID	Total Questions	Average Difficulty
CLS 312/432 Lecture #1	96	1.33

On this examination, the student will be expected to:

1. [Level 1/Hematology/Anticoagulants/226]
Identify the stopper color of a Vacutainer tube containing the anticoagulant heparin.
2. [Level 2/Hematology/Anticoagulants/227]
Explain the mechanism by which all of the anticoagulants, except heparin, exert their effects.
3. [Level 1/Hematology/Anticoagulants/228]
State the anticoagulant of choice for the study of peripheral blood cell morphology.
4. [Level 1/Hematology/Anticoagulants/231]
Identify the color of the stopper for a Vacutainer tube containing the anticoagulant EDTA.
5. [Level 3/Hematology/Blood Smear Preparation/271]
Explain how the color of a Wright Stained blood smear may be corrected if the cells are stained too pink/blue.
6. [Level 2/Hematology/Blood Smear Preparation/272]
Describe the purpose of the phosphate buffer in the Wright's staining procedure.
7. [Level 1/Hematology/Bone Marrow/282]
List the factors which play a role in the bone marrow 'release' mechanism.
8. [Level 1/Hematology/Bone Marrow/283]
Define 'hyperplasia'.
9. [Level 1/Hematology/Bone Marrow/284]
State the specific functions of a chemotaxin.
10. [Level 1/Hematology/Bone Marrow/286]
Identify which of the formed elements of blood is first produced by the developing embryo.

11. [Level 1/Hematology/Bone Marrow/295]
State the month of gestational age in which the bone marrow becomes the primary site of blood cell production.
12. [Level 1/Hematology/Bone Marrow/296]
Define 'PSC', and state which of the formed elements are derived from this precursor.
13. [Level 2/Hematology/Bone Marrow/297]
State the blood cell lines which are derived from the CFU-S.
14. [Level 1/Hematology/Bone Marrow/299]
State the normal RATIO of red marrow to yellow marrow in an adult.
15. [Level 2/Hematology/Bone Marrow/301]
Identify the location in healthy adults in which all erythropoiesis occurs.
16. [Level 1/Hematology/Bone Marrow/302]
Identify the type of blood cell which most resembles a stem cell MORPHOLOGICALLY.
17. [Level 1/Hematology/Bone Marrow/304]
State which of the major types of normal white blood cells is NOT produced in the bone marrow.
18. [Level 1/Hematology/Bone Marrow/308]
State the percentage of bony cavities in an adult which is normally filled with fatty tissue.
19. [Level 1/Hematology/Bone Marrow/309]
Identify the two major sites for obtaining bone marrow from an adult.
20. [Level 1/Hematology/Bone Marrow/310]
Define 'marrow cellularity'.
21. [Level 1/Hematology/Bone Marrow/311]
State which of the developing white blood cell precursors normally contain a visible nucleolus.
22. [Level 1/Hematology/Bone Marrow/313]
Identify the largest cell found in normal bone marrow.
23. [Level 2/Hematology/Cell Counts/435]
State the normal absolute count for monocytes in adult peripheral blood.
24. [Level 1/Hematology/Cell Counts/436]
Define 'leukocytosis'.
25. [Level 1/Hematology/Cell Counts/441]
State the normal ranges of relative percentages for each of the major types of white blood cells found in peripheral blood.
26. [Level 1/Hematology/Cell Counts/459]
Define 'absolute granulocytic leukocytosis'.
27. [Level 1/Hematology/Cell Counts/463]
Define 'relative lymphocytosis'.
28. [Level 2/Hematology/Cell Counts/478]
Given the mean, standard deviation, and acceptable range for a control, calculate the allowable limits for the control.
29. [Level 1/Hematology/Hematopoiesis/892]
State the percentage of normal peripheral blood normally comprised by the 'formed elements'.
30. [Level 1/Hematology/Hematopoiesis/907]
Identify the laboratory test which would be best for monitoring the rate of erythroid hematopoiesis.

31. [Level 1/Hematology/Introduction/1335]
Define 'diapedesis'.
32. [Level 1/Hematology/Introduction/1337]
Define 'granulocytopenia'.
33. [Level 1/Hematology/Introduction/1338]
Identify and state the function of the major type of intracellular organelles.
34. [Level 1/Hematology/Introduction/1340]
State the reference ranges for the ABSOLUTE counts of each of the major types of leukocytes found in normal peripheral blood.
35. [Level 1/Hematology/Introduction/1342]
State the function of cellular mitochondria.
36. [Level 1/Hematology/Introduction/1343]
Define 'phagolysosome'.
37. [Level 2/Hematology/Introduction/1344]
State the major differences between the CFU-S and the CFU-C progenitor stem cells.
38. [Level 1/Hematology/Introduction/1347]
Define 'agranulocytosis'.
39. [Level 1/Hematology/Introduction/1348]
State the general characteristics which apply to a blood cell which is becoming increasingly mature.
40. [Level 1/Hematology/Introduction/1349]
Identify the only reference 'STANDARD' which is available for use in the hematology laboratory.
41. [Level 1/Hematology/Introduction/1352]
State the major functions of the proteins making up the cellular membrane.
42. [Level 1/Hematology/Introduction/1353]
State the normal ranges of relative percentages for each of the major types of white blood cells found in peripheral blood.
43. [Level 1/Hematology/Lab Safety/1437]
Define 'universal precautions'.
44. [Level 1/Hematology/Lab Safety/1438]
State the major safety requirements of Universal Precautions.
45. [Level 1/Hematology/Lab Safety/1440]
Identify specific activities which, for safety reasons, are prohibited in the clinical laboratory.
46. [Level 2/Hematology/Lab Safety/1445]
State the major safety requirements of Universal Precautions.
47. [Level 1/Hematology/Macrophage/1781]
Identify the metabolic pathway utilized as the major energy source in macrophages.
48. [Level 1/Hematology/Normal Values/2092]
State the normal ranges of relative percentages for each of the major types of white blood cells found in peripheral blood.
49. [Level 2/Hematology/Phlebotomy/2115]
State the sources of error in doing a venipuncture which could, and probably would, cause hemolysis of the sample collected.
50. [Level 2/Hematology/Phlebotomy/2116]
State the order of draw when doing a phlebotomy by venipuncture, and explain the rationale.

51. [Level 1/Hematology/Phlebotomy/2117]
List the major sources of error when doing a capillary puncture.
52. [Level 1/Hematology/Quality Assurance/2252]
Define 'accuracy'.
53. [Level 1/Hematology/Quality Assurance/2253]
Define 'control'.
54. [Level 3/Hematology/Quality Assurance/2254]
Calculate the standard deviation for a set of results, given the variance.
55. [Level 1/Hematology/Quality Assurance/2258]
Define '68 percent confidence limits'.
56. [Level 1/Hematology/Quality Assurance/2260]
Define '95 percent confidence limits'.
57. [Level 3/Hematology/Quality Assurance/2263]
Given appropriate laboratory data, calculate the z-score for a set of values.
58. [Level 3/Hematology/Quality Assurance/2265]
Given appropriate laboratory data, calculate the median for a set of values.
59. [Level 1/Hematology/Quality Assurance/2266]
Given appropriate laboratory data, define and be able to calculate a coefficient of variation.
60. [Level 3/Hematology/Quality Assurance/2270]
Given appropriate laboratory data, calculate the mean for a set of values.
61. [Level 3/Hematology/Quality Assurance/2272]
Given appropriate laboratory data, be able to properly interpret a shift, trend, or dispersion with regard to quality control (Levy-Jennings) plotting.
62. [Level 3/Hematology/Quality Assurance/2275]
Evaluate the significance of a Gaussian distribution curve that has a narrow base.
63. [Level 1/Hematology/RBC Membrane/2287]
State the reasons that a lipid bilayer cell wall would only be semi-permeable in an aqueous (water-based) solution.
64. [Level 1/Hematology/RBC Membrane/2290]
State the major function of spectrin.
65. [Level 1/Hematology/RBC Production/2360]
Define and state the functions of erythropoietin.
66. [Level 1/Hematology/RBC Production/2363]
Explain how megakaryocytes give rise to circulating platelets.
67. [Level 2/Hematology/RBC Production/2373]
State the condition which exerts the most influence over the control of erythropoietin production, and thus the regulation of red blood cell production.
68. [Level 1/Hematology/RBC Production/2378]
Explain how a reticulocyte count can be used as an indicator of effective red blood cell production.
69. [Level 1/Hematology/RBC Production/2379]
Define 'erythropoietin'.
70. [Level 2/Hematology/RBCs/2385]
Describe the physical features and characteristics of the normal, mature red blood cell.

71. [Level 2/Hematology/RBCs/2390]
State the major sources of error in performing Wright's staining of a peripheral blood smear, and the effects of each of those errors.
72. [Level 1/Hematology/RBCs/2416]
State the properties of blood formed elements with regard to their staining characteristics with Wright stain.
73. [Level 1/Hematology/RBCs/2436]
Identify the blood formed element which performs its functions entirely within the confines of the vasculature, i.e. it does not undergo diapedesis.
74. [Level 1/Hematology/RBCs/2448]
Identify the major constituent of a cell's nucleus.
75. [Level 1/Hematology/WBC Morphology/2796]
State the normal absolute count ranges for each of the major types of white blood cells found in peripheral blood.
76. [Level 1/Hematology/WBC Morphology/2797]
State the major function of the polymorphonuclear neutrophil.
77. [Level 1/Hematology/Cell Counts/2803]
Contrast what is meant by 'relative' vs. 'absolute' counts with regard to the white blood cell differential count.
78. [Level 1/Hematology/WBCs/2817]
State the conditions which usually result in a 'shift to the left'.
79. [Level 2/Hematology/WBCs/2825]
Explain what is meant by a 'degenerative shift to the left'.
80. [Level 1/Hematology/WBCs/2829]
Explain what is meant by a 'left shift'.
81. [Level 1/Hematology/WBCs/2833]
State the major functions of a lymphocyte.
82. [Level 1/Hematology/WBCs/2840]
State the normal ranges of relative percentages for each of the major types of white blood cells found in peripheral blood.
83. [Level 1/Hematology/WBCs/2844]
State the major functions of lymphocytes.
84. [Level 2/Hematology/WBCs/2849]
Define 'absolute lymphocytosis'.
85. [Level 1/Hematology/WBCs/2854]
State the number of plasma cells normally seen in peripheral blood.
86. [Level 3/Hematology/WBCs/2855]
Given appropriate laboratory data, determine whether a patient is suffering from a 'degenerative' or a 'regenerative' shift to the left, and evaluate the probable outcome for the patient.
87. [Level 2/Hematology/WBCs/2859]
Explain what effects a change in buffer pH would have on the staining of a peripheral blood smear with Wright's stain.
88. [Level 1/Hematology/WBCs/2863]
Identify the largest leukocyte normally seen in peripheral blood or bone marrow.

89. [Level 1/Hematology/WBCs/2867]
Identify and state the function of each of the components of Wright stain.
90. [Level 1/Hematology/Blood Smear Preparation/2978]
State the physical characteristics of a properly prepared peripheral blood smear.
91. [Level 1/Hematology/Blood Smear Preparation/2980]
State the major sources of error in performing Wright's staining of a peripheral blood smear, and the effects of each of those errors.
92. [Level 1/Hematology/Blood Smear Preparation/2981]
State the starting angle at which the spreader slide should be held when performing a manual smear of peripheral blood.
93. [Level 1/Hematology/Blood Smear Preparation/2982]
State the properties of blood formed elements with regard to their staining characteristics with Wright stain.
94. [Level 1/Hematology/Blood Smear Preparation/2983]
Explain the procedure by which the length of the smear may be increased, when making a manual smear of peripheral blood.
95. [Level 1/Hematology/Blood Smear Preparation/2984]
State the pH range which must be maintained when performing a Wright stain.
96. [Level 1/Hematology/Blood Smear Preparation/2985]
Identify the two specific stains which comprise Wright's hematology stain.

Levels given in brackets at the beginning of the question objective indicate the level of difficulty for the actual question on this examination, NOT the level of difficulty for the stated objective. Levels of difficulty were developed using Bloom, et.al. Taxonomy of Educational Objectives. Also shown in the brackets are the Category of the question, the Topic of the question, and the number of the question in the database.

Explanation of Categories in the Cognitive Domain: (with Outcome-Illustrating Verbs)

Level 1: Recall

Knowledge of terminology; specific facts; ways and means of dealing with specifics (conventions, trends and sequences, classifications and categories, criteria, methodology); universals and abstractions in a field (principles and generalizations, theories and structures). Knowledge is (here) defined as the remembering (recalling) of appropriate, previously learned information.

* defines; describes; enumerates; identifies; labels; lists; matches; names; reads; records; reproduces; selects; states; views.

Level 2: Comprehension

Grasping (understanding) the meaning of informational materials.

* classifies; cites; converts; describes; discusses; estimates; explains; generalizes; gives examples; makes sense out of; paraphrases; restates (in own words); summarizes; traces; understands.

Level 3: Application

The use of previously learned information in new and concrete situations to solve problems that have single or best answers.

* acts; administers; articulates; assesses; charts; collects; computes; constructs; contributes; controls; determines; develops; discovers; establishes; extends; implements; includes; informs; instructs; operationalizes; participates; predicts; prepares; preserves; produces; projects; provides; relates; reports; shows; solves; teaches; transfers; uses; utilizes.

Taxonomy of educational objectives : the classification of educational goals ; / by a committee of college and university examiners ; Benjamin S. Bloom, editor [and others] IMPRINT New York : D. McKay Co., Inc., c1956-1964 (1971-72 printing) DESCRIPT. 2 v. in 1 : ill. ; 22 cm. NOTE Vol.2 by D.R. Krathwohl and others.

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