

Specific Examination Objectives

Question Topic	Total	Average Difficulty
Anemia	1	1.00
Anticoagulants	2	1.50
Blood Smear Examination	1	1.00
Hematopoiesis	1	2.00
Hemoglobin	25	1.36
Maturation	7	1.57
RBC Membrane	6	1.67
RBC Metabolism	1	1.00
RBC Morphology	1	1.00
RBC Production	6	1.33
RBCs	6	1.67
Reticulocytes	14	2.36
Special Stains	4	1.25

Exam ID	Total Questions	Average Difficulty
CLS 312/432 Lecture #2	75	1.60

On this examination, the student will be expected to:

1. [Level 1/Hematology/Anemia/47]
Identify the erythrocyte precursor which is a measure of the bone marrow's ability to replace red blood cells which have been destroyed.
2. [Level 1/Hematology/Anticoagulants/230]
State which of the anticoagulants does not act by binding calcium, and the mechanism of it's action.
3. [Level 2/Hematology/Anticoagulants/233]
Identify the contents of the following Vacutainer tubes: Blue Top, Red Top, Green Top, Purple Top.
4. [Level 2/Hematology/Hematopoiesis/891]
State the primary sources of hematopoiesis in prenatal and in postnatal life.
5. [Level 1/Hematology/Hemoglobin/908]
State the site in the body to which iron is preferentially delivered.
6. [Level 1/Hematology/Hemoglobin/909]
Identify the cofactor necessary for the production of delta-aminolevulinic acid.
7. [Level 1/Hematology/Hemoglobin/911]
Explain the hematologic significance of a change from ferrous iron to ferric iron, and vice versa.
8. [Level 1/Hematology/Hemoglobin/912]
Identify which of the Hemoglobins are normally found in adult blood.
9. [Level 1/Hematology/Hemoglobin/916]
State the significance of reduced glutathione.
10. [Level 2/Hematology/Hemoglobin/917]
Explain the difference between 'oxyhemoglobin' and 'oxidized hemoglobin'.
11. [Level 2/Hematology/Hemoglobin/918]
Explain the effects on the oxygen affinity of hemoglobin of a change in intracellular 2,3 DPG levels.

12. [Level 1/Hematology/Hemoglobin/922]
Explain why an examination of stool and urine specimens for urobilinogen **MUST** be carried out on a fresh specimen.
13. [Level 1/Hematology/Hemoglobin/923]
Define deoxyhemoglobin.
14. [Level 1/Hematology/Hemoglobin/932]
Identify the point of attachment and release of oxygen in the hemoglobin molecule.
15. [Level 2/Hematology/Hemoglobin/933]
Define methemoglobin.
16. [Level 1/Hematology/Hemoglobin/936]
State the importance of heme synthetase.
17. [Level 2/Hematology/Hemoglobin/938]
Explain the significance of a 'shift to the left' of the oxygen dissociation curve of hemoglobin.
18. [Level 2/Hematology/Hemoglobin/940]
Explain the effects of a change in pH on the oxygen affinity of hemoglobin.
19. [Level 2/Hematology/Hemoglobin/942]
Explain what intra-erythrocytic process could result in an immediate increase of oxygen delivery to tissues.
20. [Level 1/Hematology/Hemoglobin/943]
Define methemoglobin.
21. [Level 1/Hematology/Hemoglobin/944]
State the percentage of Hemoglobin F normally found in fetal blood, as well as in adult blood.
22. [Level 1/Hematology/Hemoglobin/945]
Identify the plasma protein responsible for the transport of iron.
23. [Level 1/Hematology/Hemoglobin/946]
State the specific cellular location in which early and late heme synthesis occurs.
24. [Level 1/Hematology/Hemoglobin/952]
Identify the hemoglobins which would not be able to be produced in an individual who is lacking the ability to make beta globin chains.
25. [Level 2/Hematology/Hemoglobin/954]
Explain the significance of delta-aminolevulinic acid.
26. [Level 1/Hematology/Hemoglobin/960]
State which of the globin chains are normally present **ONLY** during embryonic development.
27. [Level 2/Hematology/Hemoglobin/973]
Diagram the sequence in the synthesis of the heme molecule.
28. [Level 1/Hematology/Hemoglobin/975]
State the composition of normal hemoglobin A.
29. [Level 2/Hematology/Hemoglobin/976]
State the effect that a falsely elevated hemoglobin obtained on an automated cell counter would have on the RBC indices.
30. [Level 2/Hematology/Maturation/1786]
State which of the hematologic cells perform their functions entirely within the confines of the vascular system.

31. [Level 1/Hematology/Maturation/1798]
State main criteria used for differentiating the various stages of the erythrocyte series.
32. [Level 2/Hematology/Maturation/1800]
Explain how the myelocyte might be differentiated from the metamyelocyte.
33. [Level 1/Hematology/Maturation/1802]
Explain how the myeloblast might be differentiated from the promyelocyte.
34. [Level 2/Hematology/Maturation/1809]
Explain which morphologic criteria would provide the most reliable criteria for identification when examining and differentiating the various maturation stages of granulocytes.
35. [Level 1/Hematology/Maturation/1814]
State the name of the substance which causes the cytoplasmic basophilia in polychromatophilic erythrocytes.
36. [Level 2/Hematology/Maturation/1815]
Explain what is meant by a degenerative shift to the left.
37. [Level 2/Hematology/RBC Membrane/2280]
State which important biologic substance does not require active transport across a red blood cell membrane.
38. [Level 2/Hematology/RBC Membrane/2281]
What effect does polarity have on the ability of a substance to be transported across the red blood cell membrane.
39. [Level 1/Hematology/RBC Membrane/2283]
State the integral red cell membrane protein which serves as the point of attachment for the A, B, and O blood group antigens.
40. [Level 1/Hematology/RBC Membrane/2284]
Describe the forces which could act to produce the normal biconcave shape of the erythrocyte.
41. [Level 2/Hematology/RBC Membrane/2285]
Identify the predominant red blood cell cation.
42. [Level 2/Hematology/RBC Membrane/2286]
Describe the function of the Na⁺K⁺ pump.
43. [Level 1/Hematology/RBC Metabolism/2291]
State the function of the methemoglobin reductase pathway.
44. [Level 1/Hematology/RBC Morphology/2356]
Define hypochromia.
45. [Level 1/Hematology/RBC Production/2362]
State the location of the majority of the iron in a patient's body.
46. [Level 2/Hematology/RBC Production/2364]
State the significance of the measurement of TIBC. (Total Iron Binding Capacity)
47. [Level 1/Hematology/RBC Production/2365]
State which of the normal blood cells is not normally produced in the bone marrow of an adult.
48. [Level 1/Hematology/RBC Production/2367]
Identify the laboratory test used to monitor effective erythropoiesis.
49. [Level 1/Hematology/RBC Production/2370]
State the site of production of erythropoietin.

50. [Level 2/Hematology/RBC Production/2372]
Explain the effects on erythropoietin secretion that might be seen in a patient with a congenital heart defect.
51. [Level 2/Hematology/RBCs/2380]
Define bone marrow cellularity.
52. [Level 1/Hematology/RBCs/2417]
Define microcyte.
53. [Level 3/Hematology/RBCs/2429]
State the significance of a patient's urinary excretion of increased amount of delta-aminolevulinic acid.
54. [Level 1/Hematology/RBCs/2431]
State the amount of oxygen that may be bound by one gram of normal hemoglobin when fully saturated.
55. [Level 1/Hematology/RBCs/2439]
State the biologic significance of 2,3 DPG.
56. [Level 2/Hematology/RBCs/2446]
Explain the 'Times-3' rule, and its application in the clinical laboratory.
57. [Level 2/Hematology/Reticulocytes/2482]
Define polychromasia.
58. [Level 2/Hematology/Reticulocytes/2483]
State the laboratory procedure which would be the best follow-up to evaluate the effectiveness of iron therapy given to a patient.
59. [Level 3/Hematology/Reticulocytes/2485]
Given the appropriate laboratory data, calculate the corrected reticulocyte count for a patient.
60. [Level 3/Hematology/Reticulocytes/2486]
Given the appropriate laboratory data, calculate the Reticulocyte Production Index for a patient.
61. [Level 1/Hematology/Reticulocytes/2498]
State the normal blood values for reticulocytes in adults.
62. [Level 3/Hematology/Reticulocytes/2505]
Given appropriate laboratory data, calculate the corrected reticulocyte count for a patient.
63. [Level 3/Hematology/Reticulocytes/2506]
Given the appropriate laboratory data, calculate the Reticulocyte Production Index for a patient.
64. [Level 3/Hematology/Reticulocytes/2507]
Given the appropriate laboratory data, calculate the corrected reticulocyte count for a patient.
65. [Level 1/Hematology/Reticulocytes/2512]
Define Reticulocyte Production Index.
66. [Level 3/Hematology/Reticulocytes/2516]
Describe the significance of an increase in the Reticulocyte Production Index (RPI).
67. [Level 3/Hematology/Reticulocytes/2517]
Given the appropriate laboratory data, calculate the corrected reticulocyte count for a patient.
68. [Level 1/Hematology/Reticulocytes/2519]
Define sheath fluid, with respect to flow cytometry.
69. [Level 3/Hematology/Reticulocytes/2521]
Given the appropriate laboratory data, calculate the Reticulocyte Production Index for a patient.

70. [Level 2/Hematology/Reticulocytes/2527]
Explain why kidney failure would NOT lead to an increase in polychromasia.
71. [Level 2/Hematology/Special Stains/2647]
Describe the staining characteristics of a normal Wright stain.
72. [Level 1/Hematology/Special Stains/2651]
State the specific composition of the bluish filaments seen in reticulocytes.
73. [Level 1/Hematology/Special Stains/2663]
State the pH of the buffer used with typical Wright's Stain.
74. [Level 1/Hematology/Special Stains/2753]
Explain how a change in pH might affect the results of a Wright stained smear.
75. [Level 1/Immunology/Blood Smear Examination/2970]
Define normochromic.

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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