HEMATOLOGY

MTLE BOARD EXAM RECALLS

MTLE *MARCH* *2023* RECALLS

MTLE *AUGUST* *2023* RECALLS

MTLE *MARCH* *2024* RECALLS

MTLE *AUGUST* *2024* RECALLS

STUDY QUESTIONS

500 ITEMS

2022-2024

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1. Length of needle usually used in routine phlebotomy
a. 0.5- 1.0 inch
b. 1.0- 1.5 inches
c. 1.5- 2.0 inches
d. 2.0- 2.5 inches

2. In preparing a blood smear, the distance of the drop of blood from the label or end of the slide should be:
a. 1.0 cm
b. 2.0 cm
c. 3.0 cm
d. 4.0 cm

3. Stomatocytes: 15 per oil immersion field
a. 1+
b. 2+
c. 3+
d. 4+

4. 12 RBCs with basophilic stippling were seen on a blood smear. how do report thins finding?
a. positive
b. rare, few, moderate, many
c. 1+, 2+, 3+, 4+
d. average number/ OIO

5. Hypochromia grading: “Area of pallor is two-thirds of cell diamter”
a. 1+
b. 2+
c. 3+
d. 4+

6. Polychromasia grading: 1+
a. 1%
b. 3%
c. 5%
d. 10%

7. How many platelets per oil immersion field should be observed in order to evaluate normal platelet number in an appropriate area of a blood smear?
a. 4-10
b. 6-15
c. 8-20
d. 10-30

8. Third layer in the examination of spun hematocrit:
a. plasma
b. buffy coat
c. fatty layer
d. packed red cells

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9. Platelet estimate: 100,00- 149,000
a. low normal
b. slight decrease
c. normal
d. moderate decrease

10. If the RBC count of a patient is 5.0 x 10^12/L, what is the approximate hemoglobin value?
a. 12 g/dL
b. 14 g/dL
c. 15 g/dL
d. 20 g/dL

11. What is the primary cause of death in patients with sickle cell anemia?
a. aplastic crises
b. infectious crises
c. vaso- occlusive crises
d. bleeding

12. hematopoietic stem cell marker
a. CD10
b. CD34
c. CD35
d. CD56

13. Condition in whcih blood escapes into large areas of skin and mucous membranes, but not into deep tissues;
a. petechiae
b. purpura
c. ecchymosis
d. hematoma

14. Five- part differential:
a. granulocytes, lymphocytes, monocytes, platelets, erythrocytes
b. immature cells, inclusions, erythrocytes, leukocytes, platelets
c. platelets, band cells, granulocytes, lymphocytes, monocytes
d. neutrophils, lymphocytes, monocytes, eosinophils, basophils

15. MCHC: 28g/dL
a. outside reference range and considered normal
b. within reference range and considered normal
c. outside reference range and considered abnormal
d. within reference range and considered abnormal

16. Which of the erythrocyte indices is not used in the classification of anemia?
a. MCV
b. MCHC
c. MCH

17. normal value for template bleeding time:
a. 3-6 minutes
b. 6-10 minutes
c. 2-4 minutes

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18. A manual WBC count was performed on a hemacytometer, and 15,000 WBC/ uL were counted. When the differential count was performed, the medical technologist counter 20 NRBC per 100 total WBC. calculate the corrected WBC count.
a. 10,000 WBC/ uL
b. 11, 500 WBC/ uL
c. 12,000 WBC/ uL
d. 12, 500 WBC/ uL

19. Similarity of factors V and VIII:
a. vitamin-K dependent factors
b. Present in serum
c. Included in contact family of coagulation proteins
d. labile factors

20. If the white count is markedly elevated, in which it may be as high as 100 to 300 x 10^9/L, a _____ dilution is used.
a. 1:10
b. 1:100
c. 1:200
d. 1:250

21. How many WBCs can be counted in a differential when the WBC count is below 1.0 x 10^9/L?
a. 50
b. 100
c. 150
d. 200

22. A 200- cell count may be performed when the differential shows the following abnormal distribution except:
a. over 10% eosinophils
b. below 2% basophils
c. over 11% monocytes
d. more lymphocytes than neutrophils except in children

23. Stage in the megakaryocytic series where thrombocytes are visible
a. metamegakaryocyte
b. megakaryocyte
c. promegakaryocte
d. megakaryoblast

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1. Abnormal results in dysfibrinogenemia EXCEPT:
a) PT
b) APTT
c) TT
d) Fibrinogen level

2. If a blood specimen is spilled on a laboratory bench or floor area, the first step in cleanup should be? Turgeon
a) wear gloves and a lab coat
b) absorb blood with disposable towels
c) clean with freshly prepared 1% chlorine solution
d) wash with water

3. Review: Tubes
EDTA – lavender top – CBC
Heparin – green top – Osmotic fragility test, flow cytometry, blood gas studies, etc.
Citrate – light blue top – Coagulation studies

4. If a blood smear is too long, the problem can be resolved by Turgeon
a) decreasing the angle of the pusher slide
b) increasing the angle of the pusher slide
c) using a larger drop of blood
d) pushing the slide slower in smearing out the blood

5. The maturational sequence of the thrombocyte (platelet) is Turgeon
a) megakaryoblast—promegakaryocyte—megakaryocyte—metamegakaryocyte—thrombocyte
b) promegakaryocyte—megakaryocyte—metamegakaryocyte—thrombocyte
c) megakaryoblast—promegakaryocyte—megakaryocyte—thrombocyte
d) megakaryoblast—promegakaryocyte—metamegakaryocyte—thrombocyte

6. As a blood cell matures, the ratio of nucleus to cytoplasm (N:C) in most cases Turgeon
a) increases
b) decreases
c) remains the same

7. The normal range for reticulocytes in adults is Turgeon
a) 0% to 0.5%
b) 0.5% to 1.0%
c) 0.5% to 1.5%
d) 1.5% to 2.5%

8. Increased amounts of 2,3-DPG ____ the oxygen affinity of the hemoglobin molecule. Turgeon
a) increases
b) decreases
c) does not alter

9. Review: Size and Chromasia of red cell using rbc indices

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10. The average diameter of a normal erythrocyte is ___um. Turgeon
a) 5.2
b) 6.4
c) 7.2
d) 8.4

11. Review:
Macrocytic Larger than normal
Microcytic Smaller than normal
Anisocytosis Variation in erythrocyte size
Poikilocytosis Variation in erythrocyte shape

12. Review: Predominant erythrocyte types seen on a peripheral blood smear Associated with Abetalipoproteinemia:
a) Microcytes
b) Sickle cells
c) Macrocytes
d) Acanthocytes

13. Review: Grading of Erythrocyte Morphology

Numerical Scale	Description
0	Normal appearance or slight variation in erythrocytes
1+	Only a small population of erythrocytes displays a particular abnormality; the terms slightly increased or few would be comparable
2+	More than occasional numbers of abnormal erythrocytes can be seen in a microscopic field; an equivalent descriptive term is moderately increased
3+	Severe increase in abnormal erythrocytes in each microscopic field; an equivalent descriptive term is many
4+	The most severe state of erythrocytic abnormality, with the abnormality prevalent throughout each microscopic field; comparable terms are marked or marked increase

If you are grading changes in erythrocytic size or shape using a scale of 0 to 4+ and many erythrocytes deviate from normal per microscopic field, the typical score would be? Turgeon
a) 1+
b) 2+
c) 3+
d) 4+

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14. The greatest portion of operational body iron is normally contained in what compound? Turgeon

a) Hemoglobin
b) Ferritin
c) Cytochromes
d) Myoglobin

15. In megaloblastic anemia, the typical erythrocytic indices are Turgeon

a) MCV increased, MCH increased, and MCHC normal
b) MCV increased, MCH variable, and MCHC normal
c) MCV increased, MCH decreased, and MCHC normal
d) MCV normal, MCH increased, and MCHC normal

16. The stages of neutrophilic granulocyte development are Turgeon

a) promyelocyte, myeloblast, myelocyte, metamyelocyte, and band and segmented neutrophils
b) myeloblast, promyelocyte, myelocyte, metamyelocyte, and band and segmented neutrophils
c) myelocyte, myeloblast, promyelocyte, metamyelocyte, and band and segmented neutrophils
d) myeloblast, promyelocyte, metamyelocyte, myelocyte, and band and segmented neutrophils

17. On the basis of the following data, calculate the absolute value of the segmented neutrophils. Total leukocyte count = 12 × 109/L; percentage of segmented neutrophils on the differential count = 80%. The absolute segmented neutrophil value is Turgeon

a) 2.5 × 109/L
b) 4.5 × 109/L
c) 6.5 × 109/L
d) 9.6 × 109/L

18. Review: WBC Reference Values

WBC	× 10^3/μL (× 10^9/L)	3.6–10.6
NEUT	%	50–70
NEUT (ANC)	× 10^3/μL (× 10^9/L)	1.7–7.5
LYMPH	%	18–42
LYMPH	× 10^3/μL (× 10^9/L)	1.0–3.2
MONO	%	2–11
MONO	× 10^3/μL (× 10^9/L)	0.1–1.3
EO	%	1–3
EO	× 10^3/μL (× 10^9/L)	0–0.3
BASO	%	0–2
BASO	× 10^3/μL (× 10^9/L)	0–0.2

Rodaks

19. Niemann-Pick cells are of what cell type? Macrophage

MONOCYTE-MACROPHAGE DISORDERS

Gaucher Disease -This inherited disease is caused by a disturbance in cellular lipid metabolism. -The disorder represents a deficiency of b-glucocerebrosidase, the enzyme that normally splits glucose from its parent sphingolipid, glucosylceramide. -The typical Gaucher cell is large, with one to three eccentric nuclei and a characteristically wrinkled cytoplasm.

Niemann-Pick Disease -This disease is similar to Gaucher disease because it is also an inherited abnormality of lipid metabolism. -This disorder represents a deficiency of the enzyme that normally cleaves phosphoryl choline from its parent sphingolipid, sphingomyelin. Sphingomyelin accumulates in the tissue macrophages. -Pick cell, is similar in appearance to the Gaucher cell; however, the cytoplasm of the cell is foamy in appearance.

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20. In Gaucher Disease, as the result of b-glucocerebrosidase deficiency, what accumulates in (macrophages) histiocytes? glucocerebroside

21. Both myeloid and monocytic cells are present to the extent of at least 20% of the total leukocytes
a) M1
b) M5
c) M2
d) M4

22. The clot retraction test is Turgeon
a) a visible reaction to the activation of platelet actomyosin (thrombosthenin)
b) a reflection of the quantity and quality of platelets and other factors
c) a measurement of the ability of platelets to stick to glass
d) a measurement of the cloudiness of blood

23. The bleeding time test measures Turgeon
a) the ability of platelets to stick together
b) platelet adhesion and aggregation on locally injured vascular subendothelium
c) the quantity and quality of platelets
d) antibodies against platelets

24. If a pediatric preoperative patient has a family history of bleeding but has never had a bleeding episode herself, what test should be included in a coagulation profile in addition to the PT, aPTT, and platelet count? Turgeon
a) Lee-White clotting time
b) Clot retraction
c) Bleeding time
d) Fibrin split products

25. A patient with a severe decrease in factor X activity would demonstrate normal Turgeon
a) aPTT
b) PT 5
c) thrombin time
d) bleeding time

26. The function of thromboplastin in the prothrombin test is to provide ____ to the assay. Turgeon
a) kaolin
b) fibrinogen
c) phospholipoprotein
d) thrombin

27. If a child ingested rat poison, which of the following tests should be performed to test the effect of the poison on the child's coagulation mechanism? Turgeon
a) aPTT
b) PT
c) Fibrinogen assay
d) Thrombin time

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28. Which of the following parameters can be abnormal in classic von Willebrand disease type I? Turgeon

a) Bleeding time

b) PT

c) Platelet count

d) All of the above

29. What source of error will have greatest effect on PCV (hematocrit) Turgeon

a) Incorrect dilution of blood and diluent

b) Hemolysis of whole blood specimen

c) Excessive anticoagulant will produce shrinkage of cells

30. The reagent used in the traditional sickle cell screening test is Turgeon

a) sodium chloride

b) sodium citrate

c) sodium metabisulphite

d) sodium-potassium oxalate

31. The major application of flow-cell cytometry is Turgeon

a) determining cell size and granularity

b) sorting of cells and cellular identification using monoclonal antibodies

c) treating cancer cells and identifying specific virus types

d) counting leukocytes and platelets

32.Which parameters are calculated rather than directly measured? Turgeon

a) Hematocrit and erythrocyte distribution width

b) Erythrocyte count and leukocyte count

c) Leukocyte count and hematocrit

d) Platelet count and platelet volume

33.In an erythrocyte histogram, the erythrocytes that are larger than normal will be to the _____ of the normal distribution curve. Turgeon

a) right

b) left

c) in the middle

34. The RDW and MCV are both quantitative descriptors of erythrocyte size. If both are increased, the most probable erythrocytic abnormality would be Turgeon

a) iron deficiency anemia

b) acquired aplastic anemia

c) megaloblastic anemia

d) hemoglobinopathy

35. If the RBC distribution on a histogram demonstrates a homogeneous pattern and a small SD, the peripheral blood smear would probably exhibit Turgeon

extreme anisocytosis

very little anisocytosis

a single population of spherocytes

a single population of macrocytes

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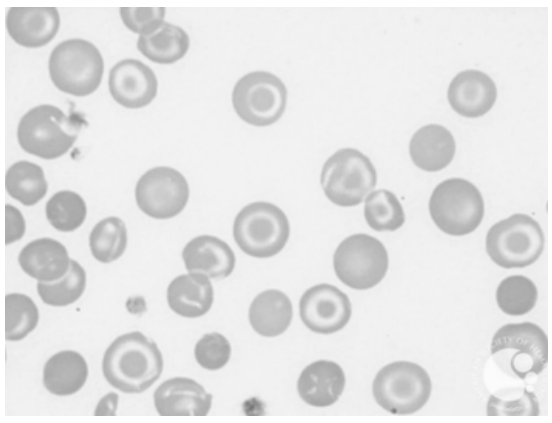
35.Review: Poikilocytes



Recall: Target cell

36. Review: Coagulation Factors + other names

Factor	Name	Alternate Terms
Coagulation Factors		
I	Fibrinogen	
II	Prothrombin	
V	Proaccelerin	Labile factor, Ac globulin
VII	Proconvertin	Stabile factor, SPCA
VIII	AHF	AHG, antihemophilic factor A
IX	PTC	Christmas factor, antihemophilic factor B
X	Stuart factor	Stuart-Prower factor
XI	Plasma thromboplastin antecedent	PTA, antihemophilic factor C
XII	Hageman factor	Glass or contact factor
XIII	Fibrin-stabilizing factor	FSF
Others	*Prekallikrein*	*Fletcher factor*
	HMW kininogen	HMW kininogen, Fitzgerald factor
	vWF	Factor VIII–related antigen
	Fibronectin	
	Antithrombin III	
	Heparin cofactor II	
	Protein C	
	Protein S	

37. Which test is MOST affected when there is excessive anticoagulant?

a) RBC count

b) Hemoglobin

c) HCT

d) ESR

38. PT is performed in what temperature?

a) 4 oC

b) 20oC

c) 37oC

d) 38oC

39. Microspherocytes are seen in which condition:

a) Thalassemia

b) Lead poisoning

c) Pernicious anemia

d) HDFN

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40. Review: Manual Cell Counts

Type of cell	Dilution	Objective	Area Counted
RBC	1:100	40x	0.2 mm^2
WBC	1:20	10x	4 mm^2
Platelet	1:100	40x	1 mm^2

41. Disease characterized with a poikilocyte with membrane folded over: Hb C disease

42. Azurophilic granules were produced in what stage?
a) Promyelocyte
b) Myelocyte (Secondary/Specific granules)
c) Metamyelocyte (Tertiary granules)
d) Band

43. Important reagent used for PT assay: thromboplastin

44. Which one of the following cells is a product of the CLP?
a) Megakaryocyte
b) T lymphocyte
c) Erythrocyte
d) Granulocyte

45. Physiologic programmed cell death is termed: Rodaks
a) Angiogenesis
b) Apoptosis
c) Aneurysm
d) Apohematics

46. Which organ is the site of sequestration of platelets? Rodaks
a) Liver
b) Thymus
c) Spleen
d) Bone marrow

47. Which one of the following morphologic changes occurs during normal blood cell maturation: Rodaks
a) Increase in cell diameter
b) Development of cytoplasm basophilia
c) Condensation of nuclear chromatin
d) Appearance of nucleoli

As cells mature, certain morphologic characteristics of maturation allow specific lineages to be recognized. General characteristics of maturation include decrease in cell diameter, decrease in nuclear diameter, loss of nucleoli, condensation of nuclear chromatin, and decreased basophilia in cytoplasm. Some morphologic changes are unique to specific lineages (e.g., loss of the nucleus in RBCs).

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48. Stain for reticulocyte count:
a) Methylene blue
b) Crystal violet

49. Which is an acquired platelet disorder?
a) Factor V deficiency
b) vWD
c) Bernard-Soulier syndrome
d) Uremia

50. Anticoagulant that can be used to avoid platelet satellitism: Sodium Citrate

The phenomenon of **"platelet satellitosis"** may occur when EDTA anticoagulant is used. This refers to the adherence of platelets around neutrophils, producing a ring or satellite effect. Using sodium citrate as the anticoagulant should correct this problem. Because of the dilution in the citrate evacuated tubes, it is necessary to multiply the obtained platelet count by 1.1 for accuracy.

51. Erythropoiesis occurs in distinct anatomical sites called **erythropoietic islands,** specialized niches in which erythroid precursors proliferate, differentiate, and enucleate. Each island consists of a macrophage surrounded by a cluster of erythroblasts.

52. Source of light used in vein illumination devices (like AccuVein): near infrared

53. In obese patients, veins may be neither readily visible nor easy to palpate. Sometimes the use of a blood pressure cuff can aid in locating a vein. The cuff should not be inflated any higher than **40 mm Hg** and should not be left on the arm for longer than 1 minute. The phlebotomist should not probe blindly in the patient's arm because nerve damage may result.

54. When should you remove the tourniquet? Not sure of the correct answer but below are resources which you can review. Hehe. You can memorize the terms used and decide what to answer if this question would be in next board exam again.

World Health Organization: Once sufficient blood has been collected, release the tourniquet **BEFORE withdrawing the needle**. Some guidelines suggest removing the tourniquet as soon as blood flow is established, and always before it has been in place for two minutes or more.

Hema Rodaks p. 25 Release and remove the tourniquet **as soon as blood flow is established** or after no longer than 1 minute.

LabCE
If the tourniquet is used during preliminary vein selection, it is best to release the tourniquet after assessing the vein and while you are assembling your supplies. Reapply the tourniquet just before starting the venipuncture; it should then be released soon after the needle has been inserted into the vein and the blood flows into the first tube.

55. ESR results in polycythemia vera: decreased ESR

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Category	Increased ESR	Decreased ESR
Blood proteins and lipids	Hypercholesterolemia Hyperfibrinogenemia Hypergammaglobulinemia Hypoalbuminemia	Hyperalbuminemia Hyperglycemia Hypofibrinogenemia Hypogammaglobulinemia Increased bile salts Increased phospholipids
Red blood cells	Anemia Macrocytosis	Acanthocytosis Anisocytosis (marked) Hemoglobin C Microcytosis Polycythemia Sickle cells Spherocytosis Thalassemia
White blood cells	Leukemia	Leukocytosis (marked)
Drugs	Dextran Heparin Penicillamine Procainamide Theophylline Vitamin A	Adrenocorticotropic hormone (corticotropin) Cortisone Ethambutol Quinine Salicylates
Clinical conditions	Acute heavy metal poisoning Acute bacterial infections Collagen vascular diseases Diabetes mellitus End-stage renal failure Gout Malignancy Menstruation Multiple myeloma Myocardial infarction Pregnancy Rheumatic fever Rheumatoid arthritis Syphilis Temporal arteritis	Cachexia Congestive heart failure Newborn status
Specimen handling	Refrigerated sample not returned to room temperature	Clotted blood sample Delay in testing
Technique	High room temperature Tilted ESR tube Vibration	Bubbles in ESR column Low room temperature Narrow ESR column diameter

56. Has normal PT, PTT, and Thrombin time: Factor XIII deficiency

57. Major organ that produces erythropoietin: Kidney / Liver

Growth Factor	Cellular Source	Progenitor Cell Target	Mature Cell Target
Erythropoietin	Peritubular cells of the kidney, Kupffer cells	CFU-E, late BFU-E, CFU-Meg	None
IL-3	Activated T lymphocytes	CFU-blast, CFU-GEMM, CFU-GM, CFU-G, CFU-M, CFU-Eo, CFU-Meg, CFU-Baso, BFU-E	Eosinophils, monocytes
G-CSF	Monocytes, fibroblasts, endothelial cells	CFU-G	Granulocytes
M-CSF	Monocytes, fibroblasts, endothelial cells	CFU-M	Monocytes
GM-CSF	T lymphocytes, monocytes, eosinophils, monocytes, fibroblasts, endothelial cells	CFU-blast, CFU-GEMM, CFU-GM, CFU-G, CFU-M, CFU-Eo, CFU-Meg, BFU-E	granulocytes

G-CSF, granulocyte colony-stimulating factor; M-CSF, macrophage colony-stimulating factor; GM-CSF, granulocyte-macrophage colony-stimulating factor; CFU-blast, colony-forming unit-blast; CFU-GEMM, colony-forming unit granulocyte, erythrocyte, monocyte, and megakaryocyte; CFU-GM, colony-forming unit-granulocyte and macrophage; CFU-EO, colony-forming unit-eosinophil; CFU-Meg, colony-forming unit-megakaryocyte; BFU-E, burst-forming unit-erythroid; CFU-G, colony-forming unit-granulocyte; CFU-M, colony-forming unit-macrophage; CFU-E, colony-forming unit-erythroid; CFU-Baso, colony-forming unit-basophil.

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58. Thrombopoiesis - production of platelets

59. D-dimer - is a specific fragment generated from two cross-linked fibrin molecules after a clot has formed

60. What abnormal laboratory finding is seen in Polycthemia vera?
a) Hypouricemia
b) Hypouricosuria
c) Increased Vitamin B12-binding capacity

- **Polycythemia vera can cause gout through higher-than-normal red blood cell turnover, resulting in higher uric acid production.**
- **Common Morphologic Changesin Polycythemia Vera**

Peripheral Blood	
Hemoglobin	Increased
Hematocrit	Increased
Red blood cell volume	Increased
Erythrocyte morphology	Normocytic/Normochromic
Total white blood cells	Increased
Granulocytes	Increased
Platelets	Increased
Leukocyte alkaline phosphatase	Normal or increased
Bone Marrow	
Normoblasts	Increased
Granulocytes	Increased
Megakaryocytes	Increased
Reticulin	Increased
Extramedullary Tissue	
Splenomegaly	Present
Sinusoidal	Present
Medullary	Present
Hepatomegaly	Present
Sinusoidal	Present

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1. Acceptable limits of a control value must fall.
a. Within +-1 standard deviation of the mean
b. Between 1 and 2 standard deviations of the mean
c. Within +-2 standard deviations of the mean
d. Within +-3 standard deviations of the mean

2. Which characteristics is inaccurate with respect to the anticoagulant K3 EDTA?
a. Removes ionized calcium (Ca2+) from fresh whole blood by the process of chelation
b. Is used for most routine coagulation studies
c. Is most commonly used anticoagulant in hematology
d. Is conventionally placed in lavender-stoppered evacuated tubes

3. If a blood smear stains too red on microscopic examination of a Wright-stained preparation, possible causes include that
a. The staining time was too long
b. The stain was too basic
c. The buffer was too acidic and the exposure time was too short
d. The buffer was too basic and the exposure time was too long

4. As a blood cell matures, the overall cell diameter in most cases
a. Increases
b. Decreases
c. Remains the same

5. What is the immature erythrocyte found in the bone marrow with the following characteristics: 12 to 17 mm in diameter, N:C of 4:1, nucleoli not usually apparent, and basophilic cytoplasm?
a. Rubrilast (pronormoblast)
b. Reticulocyte
c. Metarubricyte (orthochromatic normoblast)
d. Prorubricyte (basophilic normoblast)

6. If an alkaline (pH 8.6) electrophoresis is performed, hemoglobin E has the same mobility as hemoglobin
a. S
b. F
c. A
d. C

7. If you are grading changes in erythrocytic size or shape using scale of 0 to 4+ and many erythrocytes deviate from normal per microscopic field, the typical score would be
a. 1+
b. 2+
c. 3+
d. 4+

8. Paroxysmal nocturnal hemoglobinuria exhibits sensitivity f one population of red blood cells to
a. Warm antibodies
b. Cold antibodies
c. Complement
d. Either A or B

9. Which antibody test has replaced the LE cell preparation in the diagnosis of SLE?
a. Rheumatoid arthritis factor
b. ANA test
c. Complement fixation test
d. Antibody smith test

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10. An acute leukemia can be described as being
a. Of short duration with many mature leukocyte forms in the peripheral blood
b. Of short duration with many immature leukocyte forms in the peripheral blood
c. Of short duration with little alteration of leukocytes of the peripheral blood
d. Of long duration with many mature leukocyte forms in the peripheral blood

11. The abnormal protein frequently found in the urine of persons with multiple myeloma is
a. Albumin
b. Globulin
c. IgG
d. Bence Jones

12. The cellular ultrastructural component(s) unique to the platelet is (are)
a. Cytoplasmic membrane
b. Glycocalyx
c. Mitochondria
d. Microtubules

13. The abbreviation laser stands for
a. Light-associated simulated emission of radiation
b. Largely amplified by simulated emission of radiation
c. Light amplified by stimulated emission of radiation
d. Liquid amplified by stimulated emission of radiation

14. Which parameters are calculated rather than directly measured?
a. Hematocrit and erythrocyte distribution width
b. Erythrocyte count and leukocyte count
c. Leukocyte count and hematocrit
d. Platelet count and platelet volume

15. The delta check method of quality control
a. Uses the patient's own data to monitor population values
b. Uses batches of 20 samples to track MC, MCH, and MCHC values
c. Compares the patient's leukocyte and platelet counts with his or her previous results
d. Monitors the patient's values within two SDs of the mean

16. In the photo-optical method, the change in light transmission versus the ____ is used to determine the activity of coagulation factors or stages.
a. Amount of patient's plasma
b. Amount of test reagent
c. Time
d. Temperature

17. Neither the aPTT nor the PT detects a deficiency of
a. Platelet factor 3
b. Factor VII
c. Factor VIII
d. Factor IX

18. The function of thromboplastin in the prothrombin test is to provide ____ to the assay
a. Kaolin
b. Fibrinogen
c. Phospholipoprotein
d. Thrombin

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19. The intrinsic pathway of coagulation begins with the activation of ___ in the early stage
a. Factor II
b. Factor I
c. Factor XII
d. Factor V

20. The final common pathway of the intrinsic-extrinsic pathway is
a. Factor X activation
b. Factor II activation
c. Factor I activation
d. Factor XIII activation

21. What is the appropriate reagent for the reticulocyte count?
a. New methylene blue
b. Phyloxine B
c. Solution lyses erythrocytes and darkens the cells to be counted

22. What is the appropriate procedure and characteristic for the Westergren method
a. The diluting solution lyses erythrocytes with propylene glycol and contains sodium carbonate and water
b. The procedure measures the rate of erythrocyte settling
c. Ferrous ions are oxidized to the ferric state
d. The diluting solution is either 1% hydrochloric acid or 2% acetic acid

23. In an erythrocyte histogram, the erythrocytes that are larger than normal will be to the ___ of the normal distribution curve
a. Right
b. Left
c. In the middle

24. Two standard deviations (2SD) from the mean in normal distribution curve would include
a. 99% of all values
b. 95% of all values
c. 75% of all values
d. 68% of all values

25. The bevel of the needle should be held ___ in the performance of a venipuncture
a. Sideways
b. Upward
c. Downward
d. In any direction

26. A blue top tube is drawn for coagulation studies, the sample is a short draw result may be:
a. Falsely shortened
b. Hemophilia A
c. Unable to be obtained
d. Falsely prolonged

27. Pappenheimer bodies
a. DNA
b. RNA
c. Iron deposits
d. Precipitated hemoglobin

MTLE AUGUST 2023 RECALLS

God bless, future RMT!

28. Sickle cell disorders are:
a. Hereditary, intracorposcular RBC defects
b. Hereditary, extracorposcular RBC defects
c. Acquired, intracorposcular RBC defects
d. Acquired, extracorposcular RBC defects

29. Reticulocytosis usually indicates:
a. Response to inflammation
b. Neoplastic processes
c. Aplastic anemia
d. Red cell regeneration

30. Hereditary pyropikilocytosis (HP) is a red cell membrane defect characterized by:
a. Increased pencil-shaped cells
b. Increased oval macrocytes
c. Misshapen budding fragmented cells
d. Bite cells

31. What is the basic hematologic defect seen in patients with thalassemia major?
a. DNA synthetic defect
b. Hgb structure
c. Beta-chain synthesis
d. Hgb phosphorylation

32. Stressed platelets or reticulated platelets are:
Answer: larger than normal

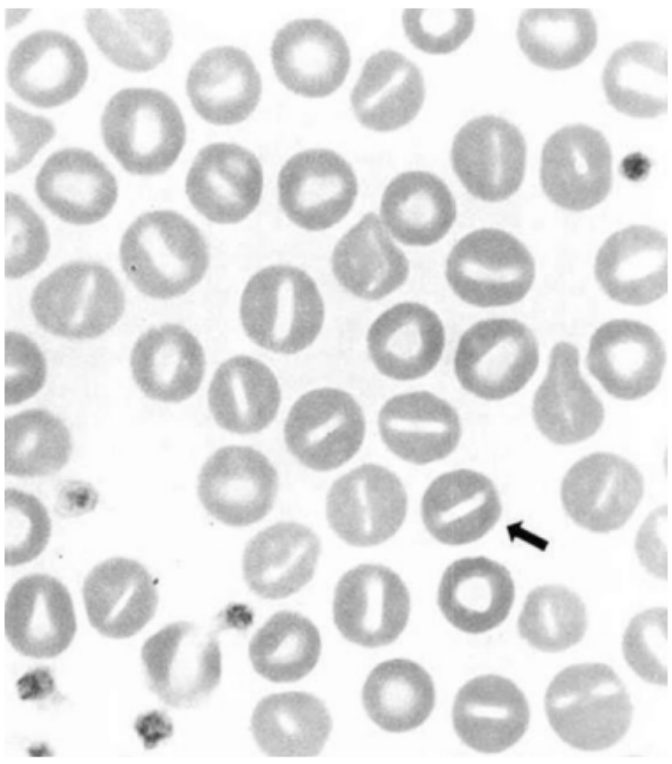
33. Formula of Absolute Lymphocyte Count = Total leukocyte count x % lymphocyte count divide by 100

34. Which growth factor is produced by the kidneys and is used to treat anemia associated with kidney disease?
Answer: EPO

35. What clotting factors (cofactors) are inhibited by protein S?
Answer: Factor Va and VIIIa

36. Platelet aggregation will occur with the end production of:
Answer: Thromboxane A2

37. Identify the abnormal RBC shown in the picture below
Answer: Stomatocyte



MTLE MARCH 2024 RECALLS

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1. Most common acquired platelet dysfunction:
A. HUS
B. DIC
C. Drug-induced
D. Heparin-induced

2. Which of the following activates fibrinolysis?
A. Plasmin
B. PAI-1
C. TAFI
D. Tissue plasminogen activator

3. Acute myelomonocytic leukemia
A. M3
B. M4

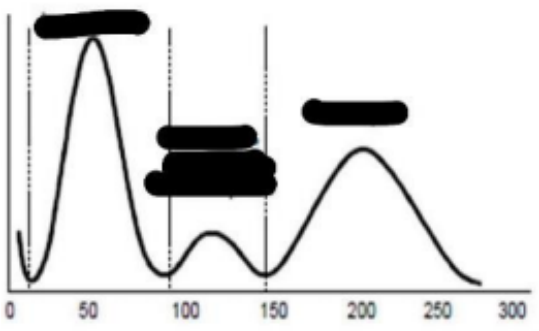
4. A reduction in thrombin generation in patients with Scott syndrome results from: (Rodaks)
A. Defective granule secretion
B. Altered platelet aggregation
C. Altered expression of phospholipids on the platelet membrane
D. Deficiency of vitamin K-dependent clotting factors

5. Fibrinogen/Fibrin fragments EXCEPT:
A. Fragment E
B. Fragment X
C. Fragment Z
D. Fragment D

6. C in VCS Hematology Coulter Technology means:
A. Connectivity
B. Conductivity
C. Current
D. Cells

7. Differentiation among RBCs, yeast, and oil droplets may be accomplished by all of the following except:
A. Observation of budding in yeast cells
B. Increased refractility of oil droplets
C. Lysis of yeast cells by acetic acid
D. Lysis of RBCs by acetic acid

8. Which of the following is represented by the first peak in this picture?
A. Lymphocyte
B. Neutrophils
C. Eosinophils
D. Monocytes



9. Venipuncture sites EXCEPT:
A. Palmar surface of the hand
B. Ankle?

10. What is the average diameter of RBCs? (Turgeon)
A. 6 um
B. 5 um
C. 7.2 um
D. 8.2 um

MTLE MARCH 2024 RECALLS

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11. Inflamed tissue; What contributes to show signs of inflammation:
A. Prostaglandin
B. Serotonin

12. Monocytes are often mistaken as:
A. Lymphocytes
B. WBCs
C. RTE
D. RBCs

13. A blood sample with high titer agglutinins was tested in room temperature with an electron particle scanner(?). What indices/count would be erroneous?
A. MCHC and WBC
B. MCV and HGB
C. MCHC and MCV
D. WBC and RBC

14. Which is a characteristic of anemia of renal disease?
A. Severe hypochromatosis with microcytosis
B. Normocytic, hypochromic
C. Presence of burr cells in the pbs
D. Normocytic, normochromic

15. Disadvantage of automated hematology analyzer, EXCEPT:
A. Less work for the technologist
B. multiple test in one parameter
C. clumped platelets are counted as one
D. comments on RBC morphology can’t be determined

16. Insufficient centrifuge how it affects hematocrit?
A. False increase
B. False decrease
C. Increase
D. Decrease

17. The mononuclear cells seen in WBC Histogram include:
A. Platelet
B. RBC
C. Blast
D. Leukocytes

18. Which of the following is the MAJOR post-analytical error?
A. Patient’s critical result
B. Sample transport
C. Sample quality
D. Patient’s specific diagnosis

19. In Protime effect if tube is NOT filled:
A. No effect
B. Normal
C. Shortened
D. Prolonged

20. What is the morphology of the echinocyte?
A. Small, round, rbc
B. Scooped out part of an rbc
C. Short, scallop or spike like
D. Fragmented RBCs

MTLE MARCH 2024 RECALLS

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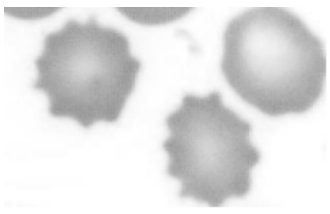
21. Part of flow cytometry EXCEPT:
A. Digital
B. Optical
C. Fluidics
D. Electronics

22. A hemoglobin molecule is composed of:
A. One heme molecule and four globin chains
B. Ferrous iron, protoporphyrin IX, and a globin chain
C. Protoporphyrin IX and four globin chains
D. Four heme molecules and four globin chains

23. Identify the abnormal RBC shown in the picture below.
A. Teardrop cell
B. Burr cell
C. Drepanocyte
D. Acanthocyte



24. What is the average liter of blood in humans:
A. 10L
B. 6L

25. Peripheral blood cells involved in hemostasis
A. Lymphocytes
B. Thrombocytes
C. Erythrocytes
D. Monocytes

26. Pelger-Huet anomaly
A. Hypersegmentation
B. Hyposegmentation
C. Bilobed segmentation

27. Meaning of R in Control flags
A. Red
B. Region
C. Reactive
D. Repeat

28. RU flag in automation is found in the following, except
A. Cold agglutination
B. RBC fragmentation
C. Rouleaux
D. Autoagglutination

29. Bite cells is associated with what disease?
A. G6PD deficiency
B. PK deficiency
C. Rh null
D. McLeod

30. PT and TT is Normal; APTT is Prolonged
A. IX
B. XIII
C. VII
D. Tissue factor

31. WBC Count computation

MTLE MARCH 2024 RECALLS

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32. The clot retraction test is:
a. a visible reaction to the activation of platelet actomyosin and other factors
b. a reflection of the quantity and quality of platelets and other factors
c. a measurement of the ability of platelets to stick to glass
d. a measurement of the cloudiness of blood

33. Which of the following clotting factors are considered vitamin K dependent?
a. III
b. IX
c. VIII
d. V

34. Acquired platelet dysfunction can be caused by:
a. aspirin
b. von Willebrand's disease
c. uremia
d. factor V deficiency

35. A correction is necessary for WBC counts when nucleated RBCs are seen on the peripheral smear because:
a. the WBC count would be falsely lower
b. the RBC count is too low
c. nucleated RBCs are counted as leukocytes
d. nucleated RBCs are confused with giant platelets

36. Which of the following morphological changes occurs during normal blood cell maturation?
a. increase in cell diameter
b. development of cytoplasm basophilia
c. condensation of nuclear chromatin
d. appearance of nucleoli

37. The average diameter of a normal erythrocyte is __ um
a. 5.2
b. 6.4
c. 7.2
d. 8.4

38. I f a small blood clot exists in an anticoagulant blood specimen, which blood cell parameter will be affected most?
a. leukocyte count
b. erythrocyte count
c. platelet count
d. microhematocrit count

39. What are the initial laboratory tests that are performed for the diagnosis of anemia?
a. CBC, iron studies, and reticulocyte count
b. CBC, reticulocyte count and peripheral blood film examination
c. Reticulocyte count, serum iron, vit B12 and folate assays
d. Bone marrow study, iron studies and peripheral blood examination

40. The Z-score is
a. how many standard deviations a particular number is from the right of left of the mean
b. the sum of squared differences from the mean
c. the square root of the variance from the mean
d. the expression of the position of each test result to the average

MTLE MARCH 2024 RECALLS

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41. Which of the following blood film finding indicates EDTA- induced pseudothrombocytopenia
a. the platelets are pushed to the feathered end
b. the platelets are adhering to WBCs
c. no platelets at all are seen on the film
d. the slide has a bluish discoloration when examined macroscopically

42. Insufficient centrifugation will result in:
a. a false increase in hematocrit (Hct) value
b. a false decrease in hct value
c. no effect on hct value
d. all of these options, depending on the patient

43. What is the FAB classification of acute myelomonocytic leukemia?
a. M1
b. M4
c. M5
d. L1

44. All of the following is associated with PCR, except
a. primers
b. taq pool
c. dNTPs
d. EcoR1

45. What is a stain used to diagnose hairy cell leukemmia?
a. myeloperoxidase
b. sudan black B
c. tartrate- resistant acid phosphatase
d. periodic acid shiff

46. Which of the following conditions associated with normal urine color but produces red fluorescence when urine is examined with an ultraviolet lamp?
a. acute intermittent porphyria
b. lead poisoning
c. erythropoietic porphyria
d. porphyria cutanea tarda

47. The extrinsic pathway of coagulation is triggered by the entry of ___ into the circulation
a. membrane lipoprotein/ phospholipoprotein
b. tissue thromboplastin
c. Ca2+
d. Factor VII

48. What does “C” in a VCS counter stands for?
a. conductivity
b. contractility
c. consistency
d. coulter

49. A reduction in thrombin generation in patients with Scott syndrome results from:
a. defective granule secretion
b. altered platelet aggregation
c. altered expression of phospholipid on the platelet membrane
d. deficiency of vitamin K- dependent clotting factors

MTLE AUGUST 2024 RECALLS

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1. Which of the following procedures is the most basic and effective in preventing nosocomial infections?
A. Hand hygiene
B. Wearing laboratory coats
C. Isolating infectious patients
D. Isolating infectious specimens

2. Which of the following colors is commonly associated with hemoglobinuria?
a. Even brown
b. Even blue
c. Speckled green

3. What term describes the color variations of red blood cells (RBCs)?
A. Hypochromia
B. Hyperchromia
C. Polychromatophilia
D. Anisocytosis

4. What poikilocyte is seen in renal insufficiency?
Echinocytes/ Burr cell

5. What is the result of under centrifugation for HCT?
A. Increase
B. Decrease

6. What is the reference range for ESR in males younger than 50 years old?
0-15 mm/hr

7. What is the pH of citrate agar?
6.0 - 6.2

8. Typical range of platelets shed from a single megakaryocyte
a. 2,000-4,000
b. 20,000-40,000
c. 200,000-400,000

9. Schilling's Test - Detects pernicious anemia
10. Reticulated platelets are also known as: Stress platelets

11. Precursor of metamyelocyte
A. Neutrophil
B. Band
C. Myelocyte

12. Pk deficiency is:
A. Autosomal recessive
B. Autosomal dominant

13. Other name ng HMWK – Fitzgerald
14. Other name for Prothrombin: Factor II
15. Other name for Fibrinogen – Factor I
16. Normal in PT, aPTT, with bleeding, tested using 5M urea test: Factor XIII
17. Most common hereditary coagulation disorder: von Willebrand disease
18. It activates extrinsic pathway: Tissue factor
19. Describe Pelger-Huët Anomaly: Round cells with peanut-shaped nucleus
20. Control center of platelet activation: Dense tubular system

HEMATOLOGY EXAMINATION AND RATIO

1. Counting area for manual RBC count:
a. 0.2 mm2
b. 1 mm2
c. 4 mm2
d. 5 mm2

2. Dehydration:
a. Decreased hematocrit
b. Increased hematocrit
c. Variable hematocrit d. Hematocrit cannot be determined

3. When the correct area of a specimen from a patient with a normal RBC count is viewed, there are generally about _____ RBCs per 100x oil immersion field.
a. 10 to 15 RBCs per OIF
b. 20 to 25 RBCs per OIF
c. 100 to 150 RBCs per OIF
d. 200 to 250 RBCs per OIF

4. The ESR is _____ proportional to the red blood cell mass and _____proportional to plasma viscosity.
a. Direct, direct
b. Direct, inverse
c. Inverse, direct
d. Inverse, inverse

5. If 60 reticulocytes are counted in 1000 red blood cells, what is the reticulocyte count?
a. 0.06%
b. 0.6%
c. 6.0%
d. 60.0%

6. To improve accuracy of the reticulocyte count, have another laboratorian count the other film; counts should agree within:
a. 10%
b. 20%
c. 30%
d. 40%

7. All of the following causes a falsely low ESR, EXCEPT:
a. Column used is slanted
b. EDTA tube is clotted
c. EDTA tube is one-third full
d. EDTA specimen is 24-hour old

8. The reagent used in the traditional sickle cell screening test is:
a. Sodium chloride
b. Sodium citrate
c. Sodium metabisulfite
d. Sodium-potassium oxalate

9. Hemoglobin solubility test is a screening test for:
a. Hemoglobin A2
b. Hemoglobin F
c. Hemoglobin S
d. Unstable hemoglobin

10. If the sugar water test is positive, _____ procedure should be performed before a diagnosis of PNH is made.
a. Autohemolysis test
b. Hemoglobin electrophoresis
c. Osmotic fragility test
d. Sucrose hemolysis test

11. Anticoagulant for the sugar water and sucrose hemolysis test:
a. EDTA
b. Citrate
c. Heparin
d. Oxalate

12. What are the initial laboratory tests that are performed for the diagnosis of anemia?
a. CBC, iron studies, and reticulocyte count
b. CBC, reticulocyte count, and peripheral blood film examination
c. Reticulocyte count and serum iron, vitamin B12 and folate assays
d. Bone marrow study, iron studies, and peripheral blood film examination

13. All of the following are associated with increased OFT, EXCEPT:
a. Sickle cell anemia
b. Hereditary spherocytosis
c. HDN
d. Acquired hemolytic anemia

14. A Miller disk is an ocular device used to facilitate counting of:
a. Platelets
b. Reticulocytes
c. Sickle cells
d. Nucleated RBCs

15. The presence of excessive rouleaux formation on a blood smear is often accompanied by an increased:
a. Reticulocyte count
b. Sedimentation rate
c. Hematocrit
d. Erythrocyte count

16. Duplicate hematocrit results should agree within __ unit (%).
a. 1%
b. 2%
c. 5%
d. 15%

17. Insufficient centrifugation will result in:
a. A false increase in hematocrit (Hct) value
b. A false decrease in Hct value
c. No effect on Hct value
d. All of these options, depending on the patient

18. A correction is necessary for WBC counts when nucleated RBCs are seen on the peripheral smear because:
a. The WBC count would be falsely lower
b. The RBC count is too low
c. Nucleated RBCs are counted as leukocytes
d. Nucleated RBCs are confused with giant platelets

19. What combination of reagents is used to measure hemoglobin?
a. Hydrochloric acid and p dimethylaminobenzaldehyde
b. Potassium ferricyanide and potassium cyanide
c. Sodium bisulfite and sodium metabisulfit
d. Sodium citrate and hydrogen peroxide

20. All of the following are sources of error when measuring hemoglobin by the cyanmethemoglobin method EXCEPT:
a. Excessive anticoagulant
b. White blood cell count that exceeds linearity limits
c. Lipemic plasma
d. Scratched or dirty hemoglobin measuring cell

21. Lipemia can cause turbidity in the cyanmethemoglobin method and a falsely high hemoglobin result. It can be corrected by:
a. Reagent-sample solution can be centrifuged and the supernatant measured
b. Adding 0.01 mL of the patient's plasma to 5 mL of the cyanmethemoglobin reagent and using this solution as the reagent blank
c. Making a 1:2 dilution with distilled water (1 part diluted sample plus 1 part water) and multiplying the results from the standard curve by 2.
d. Cannot be corrected

22. Increased ESR:
1. Anemia
2. Macrocytosis
3. Sickle cells
4. Spherocytes
a. 1 and 2
b. 1 and 3
c. 1, 2 and 3
d. 1, 2, 3 and 4

23. Which of the following can be used with the MCV for initial classification of anemia?
a. RBC count
b. RDW
c. MPV
d. PDW

24. The Clinical and Laboratory Standards Institute (CLSI) recommends that bands and neutrophils be counted:
a. Separately and placed in two categories
b. Together and placed in a single category
c. Either of these
d. Neither of these

25. S or DNA replication
a. 1 hour
b. 4 hours
c. 8 hours
d. 10 hours

26. A patient has macrocytic anemia, the physician suspects pernicious anemia. Which tests would best rule in a definitive diagnosis of pernicious anemia?
a. Homocysteine
b. Intrinsic factor antibodies
c. Ova and parasite examination for
D. latum d. Bone marrow examination

27. G6PD deficiency episodes are related to which of the following?
a. Exposure to oxidant drugs
b. Defective globin chains
c. Antibodies to RBCs
d. Abnormal protein structures

28. Which antibody is associated with paroxysmal cold hemoglobinuria (PCH)?
a. Anti-I
b. Anti-i
c. Anti-M
d. Anti-P

29. Which antibiotic(s) is (are) most often implicated in the development of aplastic anemia?
a. Sulfonamides
b. Penicillin
c. Tetracycline
d. Chloramphenicol

30. Which anemia has red cell morphology similar to that seen in iron deficiency anemia?
a. Sickle cell anemia
b. Thalassemia
c. Pernicious anemia
d. Hereditary spherocytosis

31. Lack of vitamin B12 or folic acid hinders the erythroblast in manufacturing:
a. Heme
b. Globin
c. DNA
d. RNA

32. Megaloblastic anemia is characterized by all of the following, EXCEPT:
a. Decreased WBCs and retics
b. Hypersegmented neutrophils
c. Oval macrocytes
d. Increased platelets

33. Which type of anemia is usually present in a patient with acute leukemia?
a. Microcytic, hyperchromic
b. Microcytic, hypochromic
c. Normocytic, normochromic
d. Macrocytic, normochromic

34. Iron deficiency anemia may be distinguished from anemia of chronic infection by:
a. Serum iron level
b. Red cell morphology
c. Red cell indices
d. Total iron-binding capacity

35. Storage iron is usually best determined by:
a. Serum transferrin levels
b. Hgb values
c. Myoglobin values
d. Serum ferritin levels

36. The fish tapeworm Diphyllobothrium latum is associated with the development of:
a. Microcytic anemia
b. Macrocytic anemia
c. Hemolytic anemia
d. Hypoproliferative anemia

37. Paroxysmal nocturnal hemoglobinuria is characterized by flow cytometry results that are:
a. Negative for CD55 and CD59
b. Positive for CD55 and CD59
c. Negative for CD4 and CD8
d. Positive for all normal CD markers

38. Which of the following characteristics are common to hereditary spherocytosis, hereditary elliptocytosis, hereditary stomatocytosis, and paroxysmal nocturnal hemoglobinuria?
a. Autosomal dominant inheritance
b. Red cell membrane defects
c. Positive direct antiglobulin test
d. Measured platelet count

39. Anemia is due to the infiltration of abnormal cells into the bone marrow and subsequent destruction and replacement of normal hematopoietic cells:
a. Aplastic anemia
b. Pure red cell aplasia
c. Myelophthisic anemia
d. Anemia of chronic kidney disease

40. Deletion of three alpha globin genes:
a. Silent carrier state
b. Alpha thalassemia minor
c. Hemoglobin H disease
d. Bart's hydrops fetalis

41. Hemoglobinopathies associated with abnormal molecular structure:
a. Alpha thalassemia
b. Alpha and beta thalassemia
c. Sickle cell anemia and beta thalassemia
d. Sickle cell anemia, sickle cell trait and Hb C disease

42. In aplastic anemia, the bone marrow is:
a. Empty
b. Empty, hypoplastic
c. Empty, hyperplastic
d. Either hypoplastic or hyperplastic

43. In stage 3 IDA, the erythrocyte indices are typically:
a. MCV increased, MCH decreased, and MCHC decreased
b. MCV decreased, MCH decreased, and MCHC decreased
c. MCV decreased, MCH increased, and MCHC decreased
d. MCV decreased, MCH decreased, and MCHC normal

44. In cold-type AIHA:
a. IgM, usually anti-I is present
b. Rh antibodies are the most frequent cause
c. IgM usually occurs in newborn infants
d. Autoantibodies are present

45. What factors contribute to the sickling of erythrocytes in sickle cell disease crisis?
a. Increase in blood pH and increase in oxygen
b. Extremely hot weather
c. Extremely reduced oxygen and increased acidity in the blood
d. Sickling is spontaneous

46. Classification of anemia EXCEPT:
a. Blood loss
b. Impaired red cell production
c. Accelerated red cell destruction
d. Hemoglobin

47. Caused when lysine replaces glutamic acid at position 26 on the beta chains:
a. Hb S
b. Hb C
c. Hb E
d. Hb D

48. All of the following are associated with Folic acid deficiency EXCEPT:
a. CNS involvement
b. Methotrexate
c. Poor diet
d. Pregnancy

49. Diamond black fan anemia is characterized by the following EXCEPT:
a. Decreased RBC count
b. Normal RBC count
c. Normal PLT count
d. Normal WBC count

50. Triad of features characteristic of MAHA, EXCEPT:
a. Thrombocytopenia
b. Thrombocytosis
c. RBC polychromasia
d. RBC fragmentation

51. EDTA-induced pseudothrombocytopenia can be identified on blood smear by:
a. Finding platelets pushed to the feathered end
b. Finding platelets adhering to WBCs
c. Finding no platelets at all on the smear
d. Bluish discoloration to the macroscopic appearance of the slide

52. Which ratio of anticoagulant to blood is correct for coagulation procedures?
a. 1:4
b. 1:5
c. 1:9
d. 1:10

53. The bevel of the needle should be held _____ in the performance of a venipuncture.
a. Sideways
b. Upward
c. Downward
d. In any direction

54. Most common complication encountered in obtaining a blood specimen:
a. Ecchymosis (bruise)
b. Hematoma
c. Hemoconcentration
d. Anemia

55. Blood collection tubes are labeled:
a. As soon as the test order is received
b. Before the specimen is even collected
c. Immediately after specimen collection
d. After returning to the laboratory

56. A blood sample is needed from a patient with IV fluids running in both arms. Which of the following is an acceptable procedure?
a. Any obtainable vein is satisfactory.
b. Obtain sample from above the IV site.
c. Obtain sample from below the IV site with special restrictions.
d. Disconnect the IV line.

57. The recommended cleaner for removing oil from objectives is:
a. 70% alcohol or lens cleaner
b. Xylene
c. Water
d. Benzene

58. Blood drop size in the manual wedge technique:
a. 1 to 2 mm in diameter
b. 2 to 3 mm in diameter
c. 4 to 5 mm in diameter
d. 5 to 6 mm in diameter

59. In the preparing wedge smear from blood samples of polycythemic patients, the angle between the two slides should be:
a. 25
b. 30
c. 35
d. 45

60. When a blood film is viewed through the microscope, the RBCs appear redder than normal, the neutrophils are barely visible, and the eosinophils are bright orange. What is the most likely cause?
a. Slide was overstained
b. Stain was too alkaline
c. Buffer was too acidic
d. Slide was not rinsed adequately

61. A stained blood film is held up to the light and observed to be bluer than normal. What microscopic abnormality might be expected on this film?
a. Rouleaux
b. Spherocytosis
c. Reactive lymphocytosis
d. Toxic granulation

62. The normal sequence of blood cell development is:
a. Yolk sac—red bone marrow—liver and spleen
b. Yolk sac—thymus—liver and spleen—red bone marrow
c. Yolk sac—liver and spleen—red bone marrow
d. Liver and spleen—yolk sac—red bone marrow

63. The best source of active bone marrow from a 20- year-old would be:
a. Iliac crest
b. Femur
c. Distal radius
d. Tibia

64. Primary target cells of G-CSF, EXCEPT:
a. Fibroblasts
b. Leukemic myeloblasts
c. Neutrophil precursors
d. T and B cells

65. Bone marrow cellularity refers to the ratio of:
a. Red cell precursors to white cell precursors
b. Hematopoietic tissue to adipose tissue
c. Granulocytic cells to erythrocytic cells
d. Extravascular tissue to intravascular tissue

66. What is the recommended order of draw when the evacuated tube system is used?
a. Gel separator, nonadditive, coagulation, and blood culture
b. Additive, nonadditive, gel separator, and blood culture
c. Nonadditive, blood culture, coagulation, and other additives
d. Blood culture, coagulation, nonadditive, and gel separator or other additives

67. The most important step in phlebotomy is:
a. Cleansing the site
b. Identifying the patient
c. Selecting the proper needle length
d. Using the correct evacuated tube

68. Which of the following skin puncture areas is (are) acceptable for the collection of capillary blood from an infant?
a. Previous puncture site
b. Posterior curve of the heel
c. The arch
d. Medial or lateral plantar surface

69. Vein of choice for performing a venipuncture is the:
a. Basilic
b. Cephalic or accessory cephalic
c. Median or median cubital
d. One of the hand veins

70. Which characteristic is inaccurate with respect to the anticoagulant K3 EDTA?
a. Removes ionized calcium (Ca^{2+}) from fresh whole blood by the process of chelation
b. Is used for most routine coagulation studies
c. Is the most commonly used anticoagulant in hematology
d. Is conventionally placed in lavender stoppered evacuated tubes

71. Number of inversions of light blue top evacuated tube:
a. None
b. 3 to 4
c. 5 to 6
d. 8

72. Adjuvant for infectious disease therapy:
a. Interleukin 2
b. Interleukin 3
c. Interleukin 6
d. Interleukin 12

73. All of the following are examples of pre analytical errors, EXCEPT:
a. Specimen obtained from the wrong patient
b. Specimen collected in the wrong tube or container
c. Incorrect labeling of specimen
d. Failure to report critical values immediately

74. Heel punctures in infants should not be made more than __ mm deep because of the risk of bone injury and possible infection (osteomyelitis).
a. Not more than 1 mm deep
b. Not more than 2 mm deep
c. Not more than 3 mm deep
d. Not more than 5 mm deep

75. Counterproductive smear drying technique because the moisture causes RBCs to become echinocytic (crenated) or to develop water artifact (also called drying artifact):
a. Natural drying
b. Use of small fan
c. Blowing of breath
d. None of these

76. Which of the following best describes the function of the Rapoport Luebering pathway?
a. It produces ATP to help maintain RBC membrane deformability
b. It results in reduction of glutathione
c. It produces 2,3 diphosphoglycerate (2,3 DPG)
d. It produces cytochrome reductase

77. Which conditions will shift the oxyhemoglobin dissociation curve to the right?
a. Acidosis
b. Alkalosis
c. Multiple blood transfusions
d. Increased quantities of hemoglobin S or C

78. What is the last nucleated stage in development of erythrocyte?
a. Prorubricyte
b. Rubricyte
c. Metarubricyte
d. Reticulocyte

79. Which one of the following morphologic changes occurs during normal blood cell maturation?
a. Increase in cell diameter
b. Development of cytoplasmic basophilia
c. Condensation of nuclear chromatin
d. Appearance of nucleoli

80. Bite cells are usually seen in patients with:
a. Rh null disease
b. Chronic granulomatous disease
c. G6PD deficiency
d. Pyruvate kinase deficiency

81. Which of the following organs is responsible for the “pitting process” for RBCs?
a. Liver
b. Spleen
c. Kidney
d. Lymph nodes

82. A hemoglobin molecule is composed of:
a. 4 heme, 4 globin, 2 iron
b. 2 heme, 2 globin, 2 iron
c. 4 heme, 4 globin, 4 iron
d. 4 heme, 2 globin, 2 iron

83. Schistocytes, ovalocytes, and acanthocytes are examples of abnormal changes in RBC:
a. Volume
b. Shape
c. Inclusions
d. Hemoglobin concentration

84. A morphological description of echinocytes is:
a. short, scalloped, or spike-like projections that are regularly distributed around the cell
b. fragments of erythrocytes
c. the scooped-out part of an erythrocyte that remains after a blister cell ruptures
d. compact round shape

85. Which of the following is decreased in cases of intravascular hemolytic anemia?
a. Bilirubin
b. Urine hemosiderin
c. Haptoglobin
d. Serum hemoglobin

86. The maturational sequence(s) of the erythrocyte is (are):
a. Rubriblast—prorubricyte—metarubricyte— rubricyte—reticulocyte—mature erythrocyte
b. Rubriblast—prorubricyte—rubricyte — metarubricyte—reticulocyte—mature erythrocyte
c. Pronormoblast—basophilic normoblast— polychromatophilic normoblast— orthochromic normoblast—reticulocyte— mature erythrocyte
d. Both B and C

87. With a normal diet, an erythrocyte remains in the reticulocyte stage in the circulating blood for:
a. 1 day
b. 2.5 days
c. 3 days
d. 120 days

88. In a Wright-stained peripheral blood film, the reticulocyte will have a blue appearance. This is referred to as:
a. Megaloblastic maturation
b. Bluemia
c. Polychromatophilia
d. Erythroblastosis

89. The final steps in heme synthesis, including the formation of protoporphyrin take place in:
a. Cell's nucleus
b. Cell's cytoplasm
c. Spleen
d. Mitochondria

90. In an alkaline pH (pH of 8.6) electrophoresis is performed, hemoglobin E has the same mobility as hemoglobin:
a. S
b. F
c. A
d. C

91. The type of hemoglobin that is detectable with the Kleihauer-Betke test is:
a. A
b. A2
c. F
d. S

92. Basophilic stippling represents:
a. DNA
b. Precipitated denatured hemoglobin
c. Granules of ribosomes and RNA
d. Aggregates of iron, mitochondria and ribosomes

93. The most versatile type of stem cell, can develop into any human cell type, including development from embryo into fetus:
a. Multipotential stem cell
b. Pluripotential stem cell
c. Totipotential stem cell
d. Semipotential stem cell

94. What is the normal distribution of hemoglobin in healthy adults?
a. 80% to 90% Hb A, 5% to 10% Hb A2, 1% to 5% Hb F
b. 80% to 90% Hb A2, 5% to 10% Hb A, 1% to 5% Hb F
c. Greater than 95% Hb A, less than 3.5% Hb A2, 1% to 2% Hb F
d. Greater than 90% Hb A, 5% Hb F, less than 5% Hb A2

95. Which of the following is considered a normal hemoglobin?
a. Carboxyhemoglobin
b. Methemoglobin
c. Sulfhemoglobin
d. Deoxyhemoglobin

96. Which of the following hemoglobins migrates to the same position as Hgb A2 at pH 8.6?
a. Hgb H
b. Hgb F
c. Hgb C
d. Hgb S

97. What staining method is used most frequently to stain and manually count reticulocytes?
a. Immunofluorescence
b. Supravital staining
c. Romanowsky staining
d. Cytochemical staining

98. As a blood cell matures, the ratio of nucleus to cytoplasm (N:C) in most cases:
a. Increases
b. Decreases
c. Remains the same
d. Variable

99. Apoptosis:
1. Cell size enlarged due to swelling
2. Cell size reduced due to shrinkage
3. Nucleus condensation and fragmentation
4. Nucleus exhibits random breaks and lysis (karyolysis)

a. 1 and 3
b. 1 and 4
c. 2 and 3
d. 2 and 4

100. The positive predictive value predicts the probability that an individual with a positive assay result ____ the disease or condition.
a. Has (have)
b. Could have
c. May have
d. Will have

101. Falsely elevated automated platelet counts may result from:
a. Platelet satellitism
b. Platelet agglutinins
c. Exceptionally large platelets
d. Erythrocyte inclusion bodies

102. RL flag EXCEPT:
a. Platelet clumps
b. RBC fragments
c. Giant platelets
d. Cold agglutinins

103. Leukemia, especially with chemotherapy
a. Decreased WBCs, increased platelets
b. Increased WBCs, decreased platelets
c. Decreased WBCs, decreased platelets
d. Increased WBCs, increased platelets

104. All of the following are causes of spurious decrease in MCHC, EXCEPT:
a. Autoagglutination
b. High WBCs
c. Spuriously low hemoglobin
d. Spuriously high hematocrit

105. Side angle scatter in a laser-based cell counting system is used to measure:
a. Cell size
b. Cytoplasmic granularity
c. Cell number
d. Immunologic (antigenic) identification

106. In an erythrocyte histogram, the erythrocytes that are larger than normal will be to the _____ of the normal distribution curve.
a. Right
b. Left
c. Middle
d. Below

107. If the RBC distribution on a histogram demonstrates a homogeneous pattern and a small SD, the peripheral blood smear would probably exhibit:
a. Extreme anisocytosis
b. Very little anisocytosis
c. A single population of spherocytes
d. A single population of macrocytes

108. Effect of platelet clumps to automated cell counting:
a. Decreased platelets and WBCs
b. Increased platelets and WBCs
c. Decreased platelets, increased WBCs
d. Increased platelets, decreased WBCs

109. The Coulter principle for counting of cells is based upon the fact that:
a. Isotonic solutions conduct electricity better than cells do
b. Conductivity varies proportionally to the number of cells
c. Cells conduct electricity better than saline does
d. Isotonic solutions cannot conduct electricity

110. Cold agglutinins:
a. Decreased RBCs, increased MCV and MCHC, grainy appearance
b. Increased RBCs, decreased MCV and MCHC, grainy appearance
c. Increased RBCs, increased MCV and MCHC, grainy appearance
d. Decreased RBCs, decreased MCV and MCHC, grainy appearance

111. Lipemia and icterus:
a. Decreased hemoglobin and MCH
b. Increased hemoglobin and MCH
c. Normal hemoglobin and MCH
d. Decreased hemoglobin and increased MCH

112. Dilution for RBC count in AUTOMATED cell counters:
a. 1:100
b. 1:200
c. 1: 50,000
d. 1: 500

113. Forward, low angle light scatter:
a. 0 degree angle
b. 2 to 3 degree angle
c. 5 to 15 degree angle
d. 90 degree angle

114. In automated cell counters, these parameters are directly measured:
a. WBC and RBC
b. WBC, RBC, and hemoglobin
c. WBC and hemoglobin
d. RBC only

115. Based on the degree of scatter and the amount of light reaching the sensor depend on the volume of the cell:
a. Impedance principle of cell counting
b. Optical principle of cell counting
c. Reflectance photometry
d. Fibrometer

116. In the impedance principle of cell counting, the electrical resistance between the _____ electrodes, or impedance in the current, occurs
as the cells pass through the sensing aperture, causing voltage pulses that are measurable.
a. Two (2) electrodes
b. Three (3) electrodes
c. Four (4) electrodes
d. Ten (10) electrodes

117. Cells that exhibit a positive stain with acid phosphatase and are not inhibited with tartaric acid are characteristically seen in:
a. Infectious mononucleosis
b. Infectious lymphocytosis
c. Hairy cell leukemia
d. T-cell acute lymphoblastic leukemia

118. Which of the following appearances describes the types of cells seen in Sezary syndrome?
a. Plasma cells containing immunoglobulin deposits
b. Large circulating micromegakaryocytes
c. Lymphocytes with convoluted, cerebriform nuclei
d. Prolymphocytes with prominent azurophilic granules

119. In myelofibrosis, the characteristic abnormal red cell morphology is:
a. Target cells
b. Schistocytes
c. Teardrop cells
d. Ovalocytes

120. The erythrocytosis seen in relative polycythemia occurs because of:
a. Decreased arterial oxygen saturation
b. Decreased plasma volume of circulating blood
c. Increased erythropoietin levels
d. Increased erythropoiesis in the bone marrow

121. Which of the following gene mutations correlates with the t(9;22) that is present in Philadelphia chromosome positive chronic myelogenous leukemia?
a. MYC/IGH
b. BCR/ABL
c. PML/RARA
d. JAK2

1122. In myeloid cells, the stain that selectively identifies phospholipids in the membranes of both primary and secondary granules is:
a. PAS
b. Myeloperoxidase
c. Sudan black B
d. Tdt

123. In the French-American-Bristish (FAB) classification, myelomonocytic leukemia would be:
a. M1 and M2
b. M3
c. M4
d. M5

124. Solid tumor counterpart of acute lymphoblastic leukemia:
a. Lymphoma, undifferentiated
b. Lymphoma, poorly-differentiated
c. Lymphoma, well-differentiated
d. Myeloma

125. Auer rods may be seen in all of the following EXCEPT:
a. Acute myeloid leukemia
b. Acute promyelocytic leukemia
c. Acute lymphoblastic leukemia
d. Acute myelomonocytic leukemia

126. The FAB classification of ALL seen most commonly in children is:
a. L1
b. L2
c. L3
d. Burkitt's type

127. Sodium fluoride may be added to naphthyl ASD (NASDA) esterase reaction. The fluoride is added to inhibit a positive reaction with:
a. Megakaryocytes
b. Monocytes
c. Erythrocytes
d. Granulocytes

128. The morphological characteristic(s) associated with the Chédiak–Higashi syndrome is (are):
a. Pale blue cytoplasmic inclusions
b. Giant lysosomal granules
c. Small, dark-staining granules and condensed nuclei
d. Nuclear hyposegmentation

129. A Gaucher cell is best described as a macrophage with:
a. "Wrinkled" cytoplasm due accumulation of glucocerebroside
b. "Foamy" cytoplasm filled to an with unmetabolized sphingomyelin
c. Pronounced vacuolization and deposits of cholesterol
d. Abundant cytoplasm containing storage iron and cellular remnants

130. The familial disorder featuring pseudo-Dohle bodies, thrombocytopenia, and large platelets is called:
a. May-Hegglin anomaly
b. Chediak-Higashi syndrome
c. Pelger-Huet anomaly
d. Alder-Reilly anomaly

131. The principal leukocyte type involved in phagocytosis
a. Monocyte
b. Neutrophil
c. Eosinophil
d. Basophil

132. The nitroblue tetrazolium reduction test is used to assist in the diagnosis of:
a. Leukocyte adhesion disorders (LADs)
b. Chronic granulomatous disease (CGD)
c. May-Hegglin anomaly
d. Pelger-Huet anomaly

133. Which of the following is associated with Alder Reilly inclusions?
a. Membrane defect of lysosomes
b. Dohle bodies and giant platelets
c. Two-lobed neutrophils
d. Mucopolysaccharidosis

134. Tertiary granules of the neutrophils are formed during the:
a. Promyelocyte stage
b. Myelocyte and metamyelocyte stage
c. Metamyelocyte and band stage
d. Band and segmented neutrophil stage

135. Chondroitin sulfates such as heparan:
a. Neutrophil secondary granules
b. Eosinophil secondary granules
c. Basophil secondary granules
d. Lymphocyte secondary granules

136. In the blast stage of development of leukocytes, the cytoplasm of the cell is:
a. Dark blue and lacks vacuoles
b. Light blue and lacks granules
c. Light blue and has specific granules
d. Gray with many dark-blue granules

137. A characteristic of a segmented neutrophil is:
a. Large orange granules
b. An elongated and curved nucleus
c. Light sky-blue cytoplasm
d. Greatest number of WBCs in the peripheral blood of an adult

138. An increase in metamyelocytes, myelocytes and promyelocytes can be referred to as:
a. Leukocytopenia
b. Shift to the right
c. Shift to the left
d. Pelger-Huet anomaly

139. The cell maturation sequence of the segmented neutrophil is:
a. Promyelocyte → myeloblast → myelocyte → metamyelocyte → band or stab → segmented neutrophil (PMN)
b. Myeloblast → promyelocyte → myel oocyte → metamyelocyte → band or stab → segmented neutrophil (PMN)
c. Monoblast → promyelocyte → myelocyte → metamyelocyte → band or stab → segmented neutrophil (PMN)
d. Promyelocyte → myelocyte → metamyelocyte → band or stab → segmented neutrophil (PMN)

140. Which of the following can differentiate metamyelocytes from other stages of granulocyte maturation?
a. Presence of specific granules
b. Indentation of nucleus
c. Absence of nucleoli
d. Color of cytoplasm

141. Basophils have an average circulation time of about:
a. 7 to 10 hours
b. 8.5 hours
c. 12 hours
d. 2.5 days

142. Mast cells have an appearance similar to that of the blood:
a. Monocyte
b. Neutrophil
c. Eosinophil
d. Basophil

143. Granulocytic precursor with an indented or kidney-shaped nucleus:
a. Promyelocyte
b. Myelocyte
c. Metamyelocyte
d. Band

144. Densely packed chromatin:
a. Myelocyte
b. Metamyelocyte
c. Band
d. Segmented neutrophil

145. Which of the following cells exhibit IgE receptors on their surface membranes?
a. Basophils
b. Eosinophils
c. Band neutrophils
d. Monocytes

146. Most reliable way to differentiate a mature from an immature granulocyte:
a. Size of the cell
b. Color of the cytoplasm
c. Size of the nucleus
d. Chromatin pattern

147. Indented or twisted nucleus, lacy chromatin and gray-blue cytoplasm:
a. Segmented neutrophil
b. Band neutrophil
c. Monocyte
d. Lymphocyte

148. The most mature cell that can undergo mitosis is the:
a. Promyelocyte
b. Myelocyte
c. Metamyelocyte
d. Band

149. Once the metamyelocyte stage has been reached, cells have undergone ____ cell divisions and the proliferative phase comes to an end.
a. 1 or 2 cell divisions
b. 2 or 3 cell divisions
c. 4 or 5 cell divisions
d. 6 or 7 cell divisions

150. Reliable way to differentiate platelet precursors:
a. Size of the cell
b. Cytoplasmic appearance
c. Nucleus
d. Chromatin pattern

151. Which of the following is characteristic of cellular changes as megakaryoblasts mature into megakaryocytes within the bone marrow?
a. Progressive decrease in overall cell size
b. Increasing basophilia of cytoplasm
c. Nuclear division without cytoplasmic division
d. Fusion of the nuclear lobes

152. The outermost zone of platelet is called:
a. Peripheral zone
b. Sol-gel zone
c. Alpha zone
d. Organelle zone

153. The lifespan of a platelet is about:
a. 2 to 3 hours
b. 1 to 3 days
c. 8 to 11 days
d. 60 to 80 days

154. Approximately ___ of the total number of platelets circulate in the systemic circulation?
a. One-fourth
b. One-third
c. One-half
d. Two-thirds

155. If an average of 10 platelets are seen per oil immersion field, what is the estimated platelet count?
a. 50 x 10 9th/L
b. 100 x 10 9th/L
c. 200 x 10 9th/L
d. 300 x 10 9th/L

156. Moderately condensed chromatin:
a. MK-I
b. MK-II
c. MK-III
d. MK-IV

157. Normal platelet adhesion depends upon:
a. Fibrinogen
b. Glycoprotein Ib
c. Glycoprotein IIb, IIIa complex
d. Calcium

158. Reticulated platelets can be enumerated in peripheral blood to detect:
a. Impaired production in disease states
b. Abnormal organelles associated with diseases such as leukemia
c. Increased platelet production in response to need
d. Inadequate rates of membrane cholesterol exchange with the plasma

159. The first hemostatic response to injury of a blood vessel is:
a. Platelet adhesion
b. Platelet aggregation
c. Vasoconstriction
d. Extrinsic coagulation

160. The enzyme inhibited by aspirin is:
a. Thromboxane synthetase
b. Cyclooxygenase
c. Lactate dehydrogenase
d. Phospholipase

161. Which coagulation factor is present in the highest concentration in plasma?
a. Factor II
b. Factor XII
c. Factor I
d. Factor VII

162. Which of the following participates only in the extrinsic pathway?
a. Factor VII
b. Factor IX
c. Factor X
d. Factor II

163. The activated partial thromboplastin time is not affected by deficiency of:
a. Factor VIII
b. Factor IX
c. Factor XI
d. Factor VII

164. Which of the following is vitamin K dependent?
a. Factor XII
b. Fibrinogen
c. Antithrombin III
d. Factor VII

165. In which of the following lists the steps of hemostatic response in the correct order?
a. Fibrinolysis → injury → secondary hemostasis → primary hemostasis
b. Injury → primary hemostasis → secondary hemostasis → fibrinolysis
c. Injury → secondary hemostasis → primary hemostasis → fibrinolysis d. Injury → fibrinolysis → primary hemostasis → secondary hemostasis

166. Primary inhibitor of the fibrinolytic system?
a. Protein C
b. Protein S
c. Alpha2 antiplasmin
d. Alpha2 macroglobulin

167. In the Ivy method of bleeding time, the blood pressure cuff is inflated to:
a. 20 mm. Hg
b. 30 mm. Hg
c. 40 mm. Hg
d. 45 mm. Hg

168. Which results would be expected for the PT and APTT in a patient with polycythemia?
a. Both prolonged
b. Both shortened
c. Normal PT, prolonged APTT
d. Both normal

169. Which of the following laboratory findings is associated with Factor XIII deficiency?
a. Prolonged activated partial thromboplastin time
b. Clot solubility in a 5 molar urea solution
c. Prolonged thrombin time
d. Prolonged prothrombin time

170. A prolonged Stypven (Russell viper venom) time is associated with deficiency of the following factors EXCEPT:
a. Factor I
b. Factor II
c. Factor X
d. Factor VII

171. The laboratory test for monitoring heparin therapy is:
a. PT
b. PTT
c. Bleeding time
d. Thrombin time

172. All of the following tests are affected by heparin therapy EXCEPT:
a. Thrombin time
b. Whole blood clotting time
c. APTT
d. Reptilase time

173. An abnormal thrombin time is associated with:
a. Factor X deficiency
b. Excess plasminogen
c. Fibrinogen deficiency
d. Protein C deficiency

174. MPV values should be based on specimens that are between _____ and ___ hours old.
a. 1 and 4 hours old
b. 4 and 6 hours old
c. 6 and 8 hours old
d. 16 and 18 hours old

175. The D-dimer test is a specific test for:
a. Plasminogen activation
b. Plasmin degradation of fibrinogen
c. Plasmin degradation of fibrin
d. Factor XIII

176. A positive protamine sulfate is suggestive of:
a. vWD
b. Primary fibrinolysis
c. DIC
d. Glanzmann's thrombasthenia

177. The Bethesda assay is used for which determination?
a. Lupus anticoagulant titer
b. Factor VIII inhibitor titer
c. Factor V Leiden titer
d. Protein S deficiency

178. Which of the following is considered to be an advantage of the MECHANICAL end-point detection methodology?
a. It is not affected by lipemia in the test sample
b. It has the ability to provide a graph of clot formation
c. It can incorporate multiple wavelengths into a single testing sequence
d. It can measure proteins that do not have fibrin formation as the end-point

179. The clot retraction test is:
a. Visible reaction to the activation of platelet actomyosin (thrombosthenin)
b. Reflection of the quantity and quality of platelets and other factors
c. Measurement of the ability of platelets to stick to glass
d. Measurement of the cloudiness of blood

180. A plasma sample submitted to the lab for PT testing has been stored for 25 hours at 4°C. The PT result is shortened. What is the most probable cause?
a. Factor VII deficiency
b. Activation of factor VII due to exposure to cold temperature
c. Lupus inhibitor
d. Factor X inhibitor

181. Primary platelet aggregation disorders:
a. Bernard-Soulier syndrome
b. Glanzmann's thrombasthenia
c. Essential athrombia
d. Glanzmann's thrombasthenia and Essential athrombia

182. Acquired platelet dysfunction can be caused by:
a. Aspirin
b. Von Willebrand's disease
c. Uremia
d. Factor V deficiency

183. Which of the following coagulation test results is normal in patients with classic vWD?
a. Bleeding time
b. APTT
c. Platelet count
d. Factor VIII:C and vWF

184. In essential thrombocythemia, the platelets are:
a. Increased in number and functionally abnormal
b. Normal in number and functionally abnormal
c. Decreased in number and functional
d. Decreased in number and functionally abnormal

185. Which of the following is characteristic of Bernard-Soulier syndrome?
a. Giant platelets
b. Normal bleeding time
c. Abnormal aggregation with ADP
d. Increased platelet count

186. The preferred blood product for a bleeding patient with von Willebrand's disease is transfusion with:
a. Factor II, VII, IX, X concentrates
b. Platelet Concentrates
c. Fresh Frozen Plasma and Platelets
d. Cryoprecipitated AHF

187. Storage pool deficiencies are defects of:
a. Platelet adhesion
b. Platelet aggregation
c. Platelet granules
d. Platelet production

188. Hereditary hemorrhagic telangiectasia is a disorder of:
a. Platelets
b. Clotting proteins
c. Fibrinolysis
d. Connective tissue

189. In disseminated intravascular coagulation (DIC) and immune thrombocytopenic purpura (ITP):
a. There is decreased production of platelets
b. There is increased destruction of platelets
c. There is a defect of platelet membrane
d. There is defect of platelet release reaction

190. Which of the following is associated with multiple factor deficiencies?
a. An inherited disorder of coagulation
b. Severe liver disease
c. Dysfibrinogenemia
d. Lupus anticoagulant

191. Normal PT and APTT results in a patient with a poor wound healing may be associated with:
a. Factor VII deficiency
b. Factor VIII deficiency
c. Factor XII deficiency
d. Factor XIII deficiency

192. Which results are associated with hemophilia A?
a. Prolonged APTT, normal PT
b. Prolonged PT and APTT
c. Prolonged PT, normal APTT
d. Normal PT and APTT

193. Which of the following factor deficiencies is associated with either no bleeding or only a minor bleeding tendency, even after trauma or surgery? a. Factor X
b. Factor XII
c. Factor XIII
d. Factor V

194. A patient on therapeutic warfarin will most likely have a(an):
a. Normal PT/INR, increased APTT, prolonged bleeding time, low platelet count
b. Increased PT/INR, increased APTT, normal bleeding time, normal platelet count
c. Normal PT/INR, normal APTT, normal bleeding time, normal platelet count
d. Increased PT/INR, normal APTT, prolonged bleeding time, low platelet count

195. Reversal of heparin overdose can be achieved by administration of:
a. Vitamin K
b. Anti-thrombin
c. Protamine sulfate
d. Warfarin

196. The abnormal APTT seen in pathological circulating anticoagulant is:
a. Corrected with aged serum
b. Corrected with adsorbed plasma
c. Corrected with normal plasma
d. Not corrected with any of the above

197. Fibrinogen increases approximately _____mg/dL per DECADE in the elderly (65 to 79 years).
a. 1 mg/dL per decade
b. 5 mg/dL per decade
c. 10 mg/dL per decade
d. 15 mg/dL per decade

198. The target INR for PULMONARY EMBOLISM (PE) treatment:
a. 1
b. 2
c. 3
d. 4

199. In end-stage liver disease, the fibrinogen level may fall to less than ___mg/dL, which is a mark of liver failure.
a. Less than 100 mg/dL
b. Less than 200 mg/dL
c. Less than 300 mg/dL
d. Less than 400 mg/dL

200. Delta checks identify:
a. Random error
b. Shift
c. Trend
d. Gross error

201. The RDW and MCVare both quantitative descriptors of erythrocyte size. If both are increased, the most probable erythrocytic abnormality would be:
a. Iron deficiency anemia
b. Acquired aplastic anemia
c. Megaloblastic anemia
d. Hemoglobinopathy

202. Which of the following is considered to be an advantage of the mechanical end-point detection methodology?
a. It has the ability to provide a graph of clot formation
b. It can incorporate multiple wavelengths into a single testing sequence
c. It is not affected by lipemia in the test sample
d. It can measure proteins that do not have fibrin formation as the end-point

203. The bleeding time test measures:
a. Ability of platelets to stick together
b. Platelet adhesion and aggregation of locally injured vascular subendothelium
c. Quantity and quality of platelets
d. Antibodies against platelets

204. The final common pathway of the intrinsic-extrinsic pathway is:
a. Factor X activation
b. Factor II activation
c. Factor I activation
d. Factor XII activation

205. Which is the first stage of erythrocytic maturation in which the cytoplasm is pink due to the formation of hemoglobin?
a. Reticulocyte
b. Pronormoblast
c. Basophilic normoblast
d. Polychromatic normoblast

206. Which characteristic is inaccurate with respect to the anticoagulant K3 EDTA?
a. Removes ionized calcium (Ca^{2+}) from fresh whole blood by the process of chelation
b. Is used for most routine coagulation studies
c. Is the most commonly used anticoagulant in hematology
d. Is conventionally placed in lavender-stoppered evacuated tubes

207. What does “S” in VCS Hematology Coulter Technology stands for?
a. Standard
b. Scatter
c. System
d. Slide

208. All of the following are acceptable sites for blood collection, EXCEPT:
a. Palmar surface of the hand
b. Dorsal surface of the hand
c. Lateral sides of ankle
d. Ventral wrist

Venipuncture sites

1. Antecubital fossa region (Median cubital vein > Cephalic vein > Basilic vein)
2. Veins on the wrist and Dorsal aspect of hands
3. Veins in the ankle

209. Relative polycythemia exists when:

a. Increased erythropoietin is produced
b. Total blood volume is expanded
c. Plasma volume is increased
d. Plasma volume is decreased

Polycythemia or patients with >55% HCT will cause FASELY PROLONGED results for clot-based coagulation tests due to excess CITRATE

210. Which of the following can be found in a patient with classic megaloblastic anemia?

a. Ovalocytes and hypersegmented neutrophils
b. Hypochromic macrocytes and variant lymphocytes
c. Howell-Jolly bodies and Pappenheimer bodies
d. Lymphocytosis

Presence of hypersegmented neutrophils are due to MATURATION LAG OF NUCLEUS

211. Smudge cells are associated with:

a. Niemann Pick disease and Burkitt's lymphoma
b. CLL
c. Leukosarcoma
d. Natural artifact

212. Myeloid and monocytic acute leukemias are classified as FAB:

a. M1
b. M4
c. M5
d. L1

FAB CLASSIFICATION OF THE AML

M0: Acute myeloid leukemia, minimally differentiated
M1: Acute myeloid leukemia without maturation
M2: Acute myeloid leukemia with maturation
M3: Acute promyelocytic leukemia
M4: Acute myelomonocytic leukemia
M4eo: Acute myelomonocytic leukemia with eosinophilia
M5a: Acute monocytic leukemia, poorly differentiated
M5b: Acute monocytic leukemia, well differentiated
M6: Acute erythroleukemia
M7: Acute megakaryocytic leukemia

213. Which of the following is/are characteristic of protein C?

a. It is not vitamin K-dependent
b. It is formed in response to thrombin generation
c. It inactivates factors Va and VIIIa
d. Both B and C

214. The restriction of data analysis to one cell population is accomplished by:

a. Amplification
b. Gating
c. Compensatory monitoring
d. Data limitation

216. Which clinical or specimen condition will produce an increased Westergren ESR method test result?
a. Splenectomy
b. Rouleaux formation
c. Polycythemia
d. Hemolytic anemia crisis

217. The normal sequence of blood cell development is:
a. Yolk sac—red bone marrow—liver and spleen
b. Yolk sac—thymus—liver and spleen—red bone marrow
c. Yolk sac—liver and spleen—red bone marrow
d. Liver and spleen—yolk sac—red bone marrow

218. True of endoreduplication, EXCEPT:
a. Duplicates DNA without cell division
b. Results in cells with ploidy values of 4n, 8n, 16n and 32n
c. Is unique to the megakaryocytic type of blood cell
d. Duplicates DNA with cell division

219. What happens if a coagulation specimen collection tube is underfilled?
a. The specimen clots and is useless
b. The specimen is hemolyzed and is useless
c. Clot-based test results are falsely prolonged
d. Chromogenic test results are falsely decreased

220. This component is essential for normal platelet aggregation:
a. Calcium
b. Glycoprotein Ib
c. VWF
d. Glycoprotein IIb-IIIa complex

221. Neither the APTT nor the PT detects a deficiency of:
a. Platelet factor 3
b. Factor VII
c. Factor VIII
d. Factor IX

PLATELET AGGREGATION
Fibrinogen binds to GP IIb/ IIIa receptors on adjacent platelets and joins them together in the presence of ionized calcium

222. RBCs are too pale and or red, WBCs are barely visible. All are probable causes, EXCEPT:
a. Stain or buffer too acidic
b. Underbuffering
c. Over-rinsing
d. Heparinized blood sample

HEPARINIZED BLOOD SAMPLE
RBCs- GRAY
WBCs- TOO DARK
Eosinophil granules- GRAY, NOT ORANGE

223. An increase in metamyelocytes, myelocytes and promyelocytes can be referred to as:
a. Leukocytopenia
b. Shift to the right
c. Shift to the left
d. Pelger-Huet anomaly

224. Thrombin:
a. II
b. IIa
c. VIII
d. IV

225. A 7.0-mL EDTA tube is received in the laboratory containing only 2.0 mL of blood. If the laboratory is using manual techniques, which of the following tests will most likely be erroneous?
a. RBCcount
b. Hemoglobin
c. Hct
d. WBCcount

FALSELY DECREASE
Short draw / Overanticoagulation / Underfilled tube effect on Hct. (volume of packed cells)

226. A positive protamine sulfate test is suggestive of:
a. DIC
b. vWD
c. Glanzmann's thrombasthenia
d. Primary fibrinolysis

227. In an erythrocyte histogram, the erythrocytes that are larger than normal will be to the ____ of the normal distribution curve.
a. Right
b. Left
c. Middle
d. Variable

228. Which of the following is characteristic of Dohle body inclusions?
a. Gigantic peroxidase positive deposits
b. Precipitated mucopolysaccharides
c. Dark blue cytoplasmic inclusions
d. Single or multiple pale-blue staining inclusions

DOHLE BODIES
ConfusedwithMay-hegglin(Dohlebody-likeinclusions)

229. What single feature of normal RBCs is most responsible for limiting their life span?
a. Loss of the nucleus
b. Increased flexibility of the cell membrane
c. Reduction of hemoglobin iron
d. Loss of mitochondria

230. Fibrinogen is converted to thrombin monomers by:
a. Prothrombin
b. Thrombin
c. Calcium ions
d. Factor XIIIa

231. Heparin inhibits clotting by:
a. Preventing the activation of prothrombin
b. Chelation of calcium
c. Causing the liver synthesis of nonfunctional factors
d. Enhancing the function of antithrombin

The heparin-antithrombin complex rapidly inhibits thrombin and other serine proteases.
EDTA AND SODIUM CITRATE: Anticoagulants that inhibit coagulation by chelation of calcium.

232. If a small blood clot exists in an anticoagulated blood specimen, which blood cell parameter will be affected the most?
a. Leukocyte count
b. Erythrocyte count
c. Platelet count
d. Microhematocrit

FALSELY DECREASE
If a small clot exists in a blood specimen, the platelet count will be _____

233. Reticulocytes can be detected using ___ stain.
a. Newmethylene blue
b. Thiazole orange
c. Propidium iodide
d. Both A and B

234. What is the average diameter of RBCs?
a. 5.2 um
b. 6.4 um
c. 7.2 um
d. 8.4 um

RED BLOOD CELLS
appear salmon pink and measure 7 to 8 um in diameter with a zone of pallor that occupies 1/3 of their center

235. What is the usual shape of platelets in citrated blood?
a. Cylindrical and beaded
b. Biconvex and discoid
c. Spherical or round with pseudopods
d. Round

236. The reference range of platelets in the systemic circulation is:
a. 50to 120 x 10^9/L 0
b. 100 to 200 x 10^9/L
c. 150 to 350 x 10^9/L
d. 150 to 400 x 10^9/L

237. Acute leukemia can be described as being:
a. Short duration with many mature leukocyte forms in the peripheral blood
b. Short duration with many immature leukocyte forms in the peripheral blood
c. Short duration with little alteration of the leukocytes of the peripheral blood
d. Long duration with many mature leukocyte forms in the peripheral blood

238. Hypoxia stimulates RBC production by:
a. Inducing more pluripotent stem cells into the erythroid lineage
b. Stimulating EPO production by the kidney
c. Increasing the number of RBC mitoses
d. Stimulating the production of fibronectin by macrophages of the bone marrow

ACTIONS OF EPO
1. Early release of reticulocytes
2. Inhibition of apoptosis
3. Reduced marrow transit time

239. All of the following factors may influence the erythrocyte sedimentation rate (ESR), EXCEPT:
a. Blood drawn into a sodium citrate tube
b. Anisocytosis
c. Plasma proteins
d. Poikilocytosis

240. RU flag, EXCEPT:
a. Nucleated RBCs
b. RBC fragments
c. RBC agglutination
d. Cold agglutinins

241. Faggot cells are predominantly seen in which type of leukemia?
a. M1
b. M2
c. M3
d. M4

Faggot cells
Bundles of auerrods

242. Which of the following inclusions is only visible with supravital staining?
a. Basophilic stippling
b. Cabot rings
c. Heinz Bodies
d. Pappenheimer bodies

243. What is the area counted for manual platelet count?
a. 0.2 mm^2
b. 1mm^2
c. 1.5 mm^2
d. 4mm^2

WBC: 4 mm^2
RBC: 0.2 mm^2

244. Normal adult hemoglobin has:
a. Two alpha and two delta chains
b. Three alpha and one beta chains
c. Two alpha and two beta chains
d. Two beta and two epsilon chains

245. If 10 platelets are seen per OIO, what is the approximate platelet count?
a. $50x10^9/L$
b. $100 x10^9/L$
c. $150 x10^9/L$
d. $200 x10^9/L$

PLATELET ESTIMATE
AveragenumberofplateletsperfieldX20,000

246. What are the fibrinogen levels in Hemophilia A, B, and C, respectively?
a. Increased, increased, increased
b. Normal, normal, normal
c. Decreased, decreased, decreased
d. Increased, decreased, increased

Hemophilia A, B, and C are specific clotting factor deficiencies and are not associated with the increase or decrease of fibrinogen.

247. The least mature specific progenitor:
a. MK-I
b. BFU-Meg
c. LD-CFU-Meg
d. MK-III

248. What growth factor is produced in the kidneys and is used to treat anemia associated with kidney disease?
a. EPO
b. TPO
c. G-CSF
d. KIT ligand

249. What is the error caused by aggregates of platelets surrounding neutrophils seen on PBS?
A. Increased platelet count and WBC count
B. Decreased platelet count and increased WBC count
C. Increased platelet count and decreased WBC count
D. Decreased platelet count and WBC count

The platelets will gather or aggregate around the white blood cells. Large clumps will be counted as WBCs and not platelets.

250. What additive should be used when glucose and urea are both requested together for laboratory testing?
A. Potassium oxalate
B. EDTA
C. Sodium fluoride
D. Lithium iodoacetate

Use lithium iodoacetate when both are requested together instead of NaF because NaF inhibits urease. EDTA is used for complete blood count in hematology section while sodium citrate is used when coagulation tests are requested

251. This pathway is important in the oxygen-carrying capability of erythrocytes, it permits the accumulation of 2,3-DPG which is essential for maintaining normal oxygen tension at a level necessary for oxygen transport.
A. Methemoglobin Reductase Pathway
B. Hexose Monophosphate Shunt
C. Luebering-Rapoport Pathway
D. Embden-Meyerhof Pathway

Embden-Meyerhof Pathway- This glycolytic pathway is the major source of the essential cellular energy. Maintains cellular energy by generating ATP.
Methemoglobin Reductase Pathway - This pathway depends on the Embden-Meyerhof pathway for the reduced pyridine nucleotides that keep hemoglobin in a reduced state. Its function pathway is lo prevent the oxidation of heme iron.
Hexose Monophosphate Shunt - This energy system couples oxidative catabolism of glucose with reduction of NADP to NADPH (the reduced form of NADP), which is subsequently required to reduce glutathione.

252. Form/s of hemoglobin that is/are incapable of transporting oxygen:
I. Deoxyhemoglobin
II. Oxyhemoglobin
III. Carboxyhemoglobin
IV. Methemoglobin
V. Sulfhemoglobin

A.I and II
B. I and V
C. III and IV
D. III , IV and V

Dyshemoglobins include me/hemoglobin, su/fhemoglobin, and carboxyhemoglobin. Dyshemoglobins form and may accumulate to toxic levels, after exposure to certain drugs or environmental chemicals. The offending agent modifies the structure of the hemoglobin molecule, preventing it from binding oxygen.

253. Third layer found in spun hematocrit:
A. Plasma
B. PCV
C. Fatty Layer
D. Buffy Coat

Layers in spun hematocrit:
1 sf Layer - Fatty layer
2nd Layer- Plasma
3rd Layer - Buffy Coat
4th Layer- Packed Cell Volume

254. This is the primary cause of death in patients with sickle cell disease.
A. Marching anemia
B. Infectious Crisis
C. Splenic Sequestration
D. Congestive Heart Failure

Sickle cell disease is characterized by the production of HbS, anemia, and acute and chronic tissue damage secondary to the blockage of blood fl ow produced by abnormally shaped red blood cells. Infectious crises are the most frequent cause of death in patients with sickle cell disease especially in children younger than 5 years old

255. Which among the following is considered to be the marker for hematopoietic stem cells?
A. CD19
B. CD34
C. CD21
D. CD10

CD10 - Marker for pre-B CALLA
CD19 - Pan marker (All stages of B-ce/1)
CD21 - Receptor for Epstein-Barr Virus

256. 1g of hemoglobin is capable of carrying how much oxygen?
A. 0.34
B. 1.34ml
C. 34ml
D. 2.34ml

During oxygenation, each of the four heme iron atoms in a hemoglobin molecule can reversibly bind one oxygen molecule. Approximately 1.34 mL of oxygen is bound by each gram of hemoglobin.

257. Which among the following is associated and is responsible for normal platelet aggregation?
A. Phospholipase
B. Calcium
C. Gplb
D. Gpllb-llla

When platelets are activated, a change in the GP /lb/llla receptor allows binding of fibrinogen, as well as VWF and fibronectin. Fibrinogen binds to GP /lb/llla receptors on adjacent platelets and joins them together in the presence of ionized calcium. Gplb is responsible for normal platelet adhesion.

258. The presence of schistocytes on the peripheral blood film is a characteristic feature of microangiopathic hemolytic anemia. Increased number of schistocytes could make accurate RBC and platelet count impossible.
A. First statement is correct
B. Second statement is correct
C. Both statements are correct
D. Both statements are incorrect

Cell fragments may be counted as platelets in specimens from chemotherapy-treated patients with increased WBC fragility. Likewise, schistocytes or small RBCs may interfere with the platelet count making the results inaccurate

259. This is the only WBC that is capable of mitosis in the circulation.
A. Neutrophil
B. Monocyte
C. Lymphocyte
D. Basophil

Lymphocytes are different from the other leukocytes in several ways, one of these is that lymphocytes are not end cells. They are resting cells, and when stimulated, they undergo mitosis to produce both memory and effector cells.

260. A specimen from a hematopoietically active area of the skeleton is needed. Among the given choices which is the best or the most preferred area for obtaining active bone marrow by aspiration in an adult?

A. Posterior iliac crest
B. Tibia
C. Anterior iliac crest
D. Vertebra

Appropriate sites in an adult include the posterior iliac crest (preferred site), anterior iliac crest, and sternum. The tibia may be used in infants younger than 18 months of age

261. These erythrocyte inclusions appear as ring-shaped, figure-eight, or loop-shaped structures. Occasionally, the inclusions may be formed of either double or multiple rings.
A. Basophilic Stipplings
B. Cabot Rings
c. Heinz Bodies
d. Crystals

Cabot rings stain red or reddish purple color and have no internal structure. They may represent remnants of microtubules from the mitotic spindle. Can be seen in lead poisoning and pernicious anemia

262. Which among the following acts as a buffer in staining peripheral blood films?
A. Saline solution
B. Azure Blue
C. Blood
D. Eosin

The best staining results are obtained on fresh slides because the blood itself acts as a buffer in the staining process.

263. This is the standard calibration method for hematology instrumentation.
A. Water
B. Whole blood
C. Saline
D. Heparinized Plasma

Whole-blood calibration using fresh whole-blood specimens requires the use of reference methods, materials, and procedures to determine "true" values. The International Committee for Standardization in Hematology has established guidelines for selecting a reference blood cell counter for this purpose, but the cyanmethemoglobin method remains the only standard available in hematology for calibration and quality control. Whole-blood calibration, which historically has been considered the preferred method for calibration of multi-channel hematology analyzers, has been almost completely replaced by the use of commercial calibrators assayed using reference methods.

264. Hemoglobinopathies can be classified as:
A. Abnormal hemoglobin globulin structure
B. Defect of hemoglobin globulin synthesis
C. Combination of defects of both structure and synthesis
D. All of the above

HEMATOLOGY EXAMINATION AND RATIO

Abnormal hemoglobins including hemoglobinopathies and thalassemias can be classified into three major categories:
1. Abnormal molecular structure of one or more of the polypeptide chains of globulin in the hemoglobin molecule, for example, sickle cell anemia.
2. A defect in the rate of synthesis of one or more particular polypeptide chains of globulin in the hemoglobin molecule, for example, the thalassemias.
3. Disorders that are a combination of abnormal molecular structure with a synthesis defect.

265. Cobie's test results show elevated leukocyte count. The slide is examined microscopically and 100 segmented neutrophils was stained for leukocyte alkaline phosphatase and were rated as follows: 10 cells - 0; 30 cells - 1 +; 28 cells - 2+; 32 cells - 3+; 16 cells - 4+. Based from the given data, it is evident that she most likely has:
A. Leukemoid Reaction
B. Paroxysmal Nocturnal Hemoglobinuria
C. Chronic Myelogenous Leukemia
D. Normal condition

The leukocyte alkaline phosphatase (LAP) procedure is used to differentiate between CML and a leukemoid reaction. The possible range is Oto 400, although the normal range is from 20 to 100. Increased scores are associated with leukemoid reactions, severe bacterial infections, and polycythemia vera. Decreased scores can be found in viral infections and CML.

266. This the reference method for hemoglobin assay.
A. Copper Sulfate Method
B. Van Slyke Method
C. Gravimetric Method
D. Cyanmethemoglobin Method

The cyanmethemoglobin method is the reference method for hemoglobin assay. A /ysing agent present in the cyanmethemoglobin reagent frees hemoglobin from RBCs. Free hemoglobin combines with potassium ferricyanide contained in the cyanmethemoglobin reagent, which converts the hemoglobin iron from the ferrous to the ferric state to form methemoglobin. Methemoglobin combines with potassium cyanide to form the stable pigment cyanmethemoglobin. The cyanmethemoglobin color intensity, which is proportional to hemoglobin concentration, is measured at 540 nm spectrophotometrica/ly and compared with a standard.

267. Increased amount of trapped plasma can be seen in sickle cell anemia and thallasemia. This trapped plasma causes spun hematocrit results to be how many percent higher than electronic cell counter?
A. 2-3%
B. 3-6%
C. 1-3%
D. 4-6%

The trapping of the plasma causes the microhematocrit to be 1% to 3% (0.01 to 0.03 UL) higher than the value obtained using automated instruments that calculate or directly measure the hematocrit and are unaffected by the trapped plasma

268. What is the primary inhibitor of fibrinolysis?
A. Prostacyclin
B. a2-Antiplasmin
C. Tissue Plasminogen Activator (TPA)
D. Thrombin-Activatable Fibrinolysis Inhibitor

a2-Antiplasmin (AP) is synthesized in the liver and is the primary inhibitor of free plasmin. TAFI is a plasma procarboxypeptidase synthesized in the liver that becomes activated by the thrombin thrombomodulin complex. TPA hydrolyzes fibrin-bound plasminogen and initiates fibrinolysis. Prostacyclin inhibits platelet activation.

269. All coagulation factors are synthesized by the liver, EXCEPT:
A. FIX
B. F X
C. Prekallikrein
D. Vwf

All coagulation factors except vWF are made in the liver.

270. Detectable level of hemoglobin synthesis occurs in this stage.
A. Rubriblast
B. Prorubricyte
C. Rubricyte
D. Metarubricyte

Detectable hemoglobin synthesis occurs during the Basophilic Normoblast (Prorubricyte) stage but the many cytoplasmic organelles, including ribosomes and a substantial amount of messenger ribonucleic acid (RNA; chiefly for hemoglobin production), completely mask the minute amount of hemoglobin pigmentation.

Pronormoblast (Rubriblast) -
The pronormoblast begins to accumulate the components necessary for hemoglobin production. The proteins and enzymes necessary for iron uptake and protoporphyrin synthesis are produced. Globin production begins.

Polychromatic (Polychromatophilic) Normoblast (Rubricyte) - Hemoglobin synthesis increases, and the accumulation begins to be visible in the color of the cytoplasm.

Orthochromic Normoblast (Metarubricyte) - Hemoglobin production continues on the remaining ribosomes using messenger RNA produced earlier. Late in this stage, the nucleus is ejected from the cell.

271. RSC destruction that occurs when macrophages ingest and destroy RBCs is termed as:
A. Extracellular hemolysis
B. Macrophage-mediated
Intra-organ hemolysis
Extrahematopoietic

When an RBC is ingested by a macrophage, it is lysed within a phagolysosome, and the contents are processed entirely within the macrophage. The contents of the RBC are not detected in plasma because it is lysed inside the macrophage, and the contents are degraded there-hence the designation MACROPHAGE MEDIA TED (extravascular) hemolysis

Vascular disorder that occurs more commonly in elderly men than in women and is due to a lack of collagen support for small blood vessels and loss of subcutaneous fat and elastic fibers.

272. Support for small blood vessels and loss of subcutaneous fat and elastic fibers.
A. Allergic purpura
B. Henoch-Schonlein Purpura
C. Senile Purpura
D. Amyloidosis

Allergic purpura has been associated with certain foods and drugs, cold, insect bites, and vaccinations. The term Henoch- Schonlein purpura is applied when the condition is accompanied by transient arthralgia, nephritis, abdominal pain, and purpuric skin lesions, which are frequently confused with the hemorrhagic rash of immune thrombocytopenic purpura. Henoch-Schonlein purpura is primarily a disease of children.

Amyloidosis - the deposition of abnormal quantities of amyloid in tissues, may be primary or secondary and localized or systemic. Purpura, hemorrhage, and thrombosis may be a part of the clinical presentation of patients with amyloidosis. Thrombosis and hemorrhage have been ascribed to amyloid deposition in the vascular wall and surrounding tissues.

273. A tourniquet is used to provide a barrier against venous blood flow to help locate a vein and should be applied ____ above the venipuncture site.
A. 1-2 inches
B. 3-4 inches
C. 2-3 inches
D. 0.5-1inch

The tourniquet should be applied 3 to 4 inches above the venipuncture site and left on for no longer than 1 minute before the venipuncture is performed.

274. Acanthocytes are found in association with:
A. Abetalipoproteinemia
B. G6PD deficiency
C. Rh deficiency syndrome
D. Vitamin 812 deficiency

Acanthocytes are not present on peripheral blood films of healthy individuals but can be found in hereditary neuroacanthocytosis (including abetalipoproteinemia), and acquired conditions such as spur cell anemia in severe liver disease, myelodysplasia, malnutrition, and hypothyroidism

275. Osmotic Fragility is a test to measure the ability of the red cell to take up fluid without lysing. What is the primary factor affecting the test?
A. Size of the red cell
B. Shape of the red cell
C. Temperature
D. Size of the tube

In the osmotic fragility test, whole blood is added to varying concentrations of sodium chloride solution and allowed to incubate at room temperature. The amount of hemolysis is then determined by examining the supernatant fluid either visually or with a spectrophotometer.

The main factor in this procedure is the shape of the erythrocyte, which is dependent on the volume, surface area, and functional state of the erythrocytic membrane.

276. Which of the following results are consistent with Hereditary Spherocytosis?
A. Increased osmotic fragility, increased MCHC
B. Decreased osmotic fragility, increased MCHC
Increased osmotic fragility, decreased MCHC
Decreased osmotic fragility, normal MCHC

Hereditary spherocytosis (HS) is caused by mutations that disrupt the vertical membrane protein interactions, which results in loss of membrane, decrease in surface area-to-volume ratio, and formation of spherocytes that are destroyed in the spleen. Patients with HS have anemia, splenomegaly, jaundice, an increased MCHC, a negative DAT result. The osmotic fragility test usually shows increased in blood specimens in which the RBCs having decreased surface area-to-volume ratios.

277. Mutations in NADPH oxidase genes leads to failure of neutrophil respiratory burst following phagocytosis of organism.
A. Lipid storage diseases
B. Myeloperoxidase (MPO) deficiency
C. Leukocyte adhesion disorders
D. Chronic granulomatous disease

Lipid storage diseases are inherited disorders in which lipid catabolism is defective. Myeloperoxidase (MPO) deficiency is characterized by a deficiency in myeloperoxidase in the primary granules of neutrophils and lysosomes of monocyte.

Myeloperoxidase normally stimulates production of hypochlorite and hypochlorous acid, which are oxidant agents that attack phagocytized microbes.

Leukocyte adhesion disorders (LADs) are rare autosomal recessive inherited disorders that result in the inability of neutrophils and monocytes to adhere to endothelial cells and to transmigrate from the blood to the tissues

278. Morphologic abnormality characterized by granulocytes with large, darkly staining metachromatic cytoplasmic granules composed primarily of partially digested mucopolysaccharides.
A. Pelger-Huet anomaly
B. Neutrophil hypersegmentation
C. Alder-Reilly anomaly
D. Chediak-Higashi disease

Pelger-Huet anomaly - Decreased nuclear segmentation in neutrophils: sometimes also affects other WBCs.
Neutrophil hypersegmentation - Less than 5 nuclear lobes in neutrophils

Chediak-Higashi disease - Giant lysosomal granules in granulocytes, monocytes, and lymphocytes.

279. Which among the following is true about 2,3-SPG?
A. The least abundant of RSC organophosphates
B. Enhances 02 release from hemoglobin
C. Source of RSC glucose
D. Source of RSC ATP

The 2,3-BPG regulates oxygen delivery to tissues by competing with oxygen for the oxygen-binding site of hemoglobin. When 2,3-BPG binds heme, oxygen is released, which enhances delivery of oxygen to the tissues.

280. It is at this stage where the specific neutrophil granules begin to appear.
A. Promyelocyte
B. Myelocyte
C. Juvenile Cell
D. Metamyelocyte

Myelocyte - this is the last stage capable of cell division and considered to be the stage where granulation occurs.

Promyelocyte - characterized by 2 or more less distinct nucleoli. Metamyelocyte or Juvenile Cell - characterized by pinkish blue cytoplasm filled with numerous small granules.

281. This leukemia is associated with DIC:
A. FAB M2
B. Acute promyelocytic leukemia
C. FAB M3
D. B and C

FAB M3 or Acute Promyelocytic Leukemia is associated with high incidence of DIC.

282. Also known as the Fletcher Factor.
A. Factor XIII
B. Factor IIII
C. HMWK
D. PK

Factor XIII - Fibrin Stabilizing Factor
Factor III - Tissue Factor
HMWK - Fitzgerald Factor

283. What is the first coagulation factor affected by Coumarin?
A. Factor X
B. Factor IX
C. Factor VII
D. Factor II

Factor VII activity decreases to 50% of normal 6 hours after Coumadin therapy is begun, prolonging the factor VI/a-sensitive prothrombin time to near the therapeutic INR of 2 to 3. The half-lives of factors II (prothrombin), IX, and X are longer than that of VII; factor II activity requires at least 3 days to decline by 50%

284. If a blood specimen is spilled on a laboratory bench or floor area, the first step in cleanup should be
a. Wear gloves and a lab coat
b. Absorb blood with disposable towels
c. Clean with freshly prepared 1% chlorine solution
d. Wash with water

285. Acceptable limits of a control value must fall
a. Within ± 1 SD of the mean
b. Between 1 and 2 SD of the mean
c. Within ± 2 SD of the mean
d. Within ± 3 SD of the mean

286. A trend change in QC data is:
a. A progressive change all in one direction away from the mean for at least 3 days
b. An abrupt shift in the control values
c. Scattered variations from the mean
d. A progressive change in various directions away from the mean for at least 1 week

287. Which of the following statements is true of a Gaussian curve?
a. It represents the standard deviation
b. It represents the coefficient of variation
c. It represents variance of a population
d. It represents a normal bell-shaped distribution

288. Which characteristic is inaccurate with respect to the anticoagulant K3EDTA?
a. Removes ionized calcium (Ca^{2+}) from fresh whole blood by the process of chelation
b. Is used for most routine coagulation studies
c. Is the most commonly used anticoagulant in hematology
d. Is conventionally placed in lavender-stoppered evacuated tubes

289. A blood sample is needed from a patient with IV fluids running in both arms. Which of the following is an acceptable procedure?
a. Any obtainable vein is satisfactory
b. Obtain sample from above the IV site
c. Obtain sample from below the IV site with special restrictions
d. Disconnect the IV line

290. The bevel of the needle should be held ____ in the performance of a venipuncture.
a. Sideways
b. Upward
c. Downward
d. In any direction

291. . Which of the following skin puncture areas is/are acceptable for the collection of capillary blood from an infant?
a. Previous puncture site
b. Posterior curve of the heel
c. The arch
d. Medial or lateral plantar surface

292. If a blood smear is too long, the problem can be resolved by:
a. Decreasing the angle of the pusher slide
b. Increasing the angle of the pusher slide
c. Using a larger drop of blood
d. Pushing the slide slower in smearing out the blood

293. If a blood smear stains too red on microscopic examination of a Wright-stained preparation, possible causes include that
a. The staining time was too long
b. The stain was too basic
c. The buffer was too acidic and the exposure time was too short
d. The buffer was too basic and the exposure time was too long

294. During cell division, the S phase, the stage at which DNA is replicated, takes approximately ____ hours.
a. 10
b. 8
c. 4
d. 1

295. As a blood cell matures, the overall cell diameter in most cases
a. Increases
b. Decreases
c. Remains the same
d. Increases then decreases

296. The normal sequence of blood cell development is
a. Yolk sac · red bone marrow · liver and spleen
b. Yolk sac · thymus · liver and spleen · red bone marrow
c. Yolk sac · liver and spleen · red bone marrow
d. Liver and spleen · yolk sac · red bone marrow

297. The maturational sequence of the thrombocyte is:
a. Megakaryoblast · promegakaryocyte · megakaryocyte · metamegakaryocyte · thrombocyte
b. Promegakaryocyte · megakaryocyte · metamegakaryocyte · thrombocyte
c. Megakaryoblast · promegakaryocyte · megakaryocyte · thrombocyte
d. Megakaryoblast · promegakaryocyte · metamegakaryocyte · thrombocyte

298. The chromatin pattern, in most cells, as the cell matures
a. Becomes more clumped
b. Becomes less clumped
c. Remains the same
d. Becomes more clumped then less clumped

299. Stimulation of erythropoietin is caused by:
a. Tissue hypoxia
b. Hypervolemia
c. Inflammation
d. Infection

300. What is the immature erythrocyte found in the bone marrow with the following characteristics: 12-17 · m in diameter, N:C of 4:1, nucleoli not usually apparent, and basophilic cytoplasm?
a. Rubriblast
b. Reticulocyte
c. Metarubricyte
d. Prorubricyte

301. In a Wright-stained peripheral blood film, the reticulocyte will have a blue appearance. This is referred to as:
a. Megaloblastic maturation
b. Bluemia
c. Polychromatophilia
d. Erythroblastosis

302. On a Wright-stained peripheral blood smear, stress or shift reticulocytes are
a. Smaller than normal reticulocytes
b. About the same size as normal reticulocytes
c. Larger than normal reticulocytes
d. Noticeable because of a decreased blue tint

HEMATOLOGY EXAMINATION AND RATIO

303. The normal range for reticulocytes in adults is
a. 0% to 0.5%
b. 0.5% to 1.0%
c. 0.5% to 1.5%
d. 1.5% to 2.5%

304. If a male patient has a reticulocyte count of 5.0% and a packed cell volume of 0.45 L/L, what is his corrected reticulocyte count?
a. 2.5%
b. 4.5%
c. 5.0%
d. 10.0%

304. If a male patient has a reticulocyte count of 6.0% and a packed cell volume of 45%, what is his RPI?
a. 1.5
b. 3.0
c. 4.5
d. 6.0

305. Normal adult hemoglobin has
a. Two alpha and two delta chains
b. Three alpha and one beta chains
c. Two alpha and two beta chains
d. Two beta and two epsilon chains

306. Increased amounts of 2,3-DPG _____ the oxygen affinity of the hemoglobin molecule.
a. Increases
b. Decreases
c. Does not change
d. Increases then decreases

307. The protein responsible for the transport of iron in hemoglobin synthesis is:
a. Globin
b. Transferrin
c. Oxyhemoglobin
d. Ferritin

308. Relative polycythemia exists when
a. Increased erythropoietin is produced
b. The total blood volume is expanded
c. The plasma volume is increased
d. The plasma volume is decreased

309. Which of the following is/are characteristic(s) of megaloblastic maturation?
a. Cells of some leukocytic cell lines are smaller than normal
b. Nuclear maturation lags behind cytoplasmic maturation
c. Cytoplasmic maturation lags behind nuclear maturation
d. Erythrocytes are smaller than normal

310. If an alkaline (pH 8.6) electrophoresis is performed, hemoglobin E has the same mobility as hemoglobin
a. S
b. F
c. A
d. C

311. The most common erythrocytic enzyme deficiency involving the Embden-Meyerhof glycolytic pathway is a deficiency of:
a. ATPase
b. Pyruvate kinase
c. Glucose-6-phosphate dehydrogenase
d. Lactic dehydrogenase

312. The Luebering-Rapoport pathway
a. Permits the accumulation of 2,3-DPG
b. Promotes glycolysis
c. Produces cellular energy
d. Produces acidosis

313. The average diameter of a normal erythrocyte is ____
a. 5.2
b. 6.4
c. 7.2
d. 8.4

314. Which of the following is the term for erythrocytes resembling a stack of coins on thin sections of a peripheral blood smear?
a. Anisocytosis
b. Poikilocytosis
c. Agglutination
d. Rouleaux formation

315. If you are grading changes in erythrocytic size or shape using a scale of 0 to 4+ and many erythrocytes deviate from normal per microscopic field, the typical score would be:
a. 1+
b. 2+
c. 3+
d. 4+

316. The erythrocyte morphology associated with anemia in an otherwise healthy individual caused by acute blood loss is usually
a. Microcytic
b. Megaloblastic
c. Normochromic
d. Hypochromic

317. The peripheral blood smear demonstrates _____ red blood cells in IDA.
a. Microcytic, hypochromic
b. Macrocytic, hypochromic
c. Macrocytic, spherocytic
d. Either A or B

318. In megaloblastic anemia, the typical erythrocytic indices are:
a. MCV increased, MCH increased, and MCHC normal
b. MCV increased, MCH variable, and MCHC normal
c. MCV increased, MCH decreased, and MCHC normal
d. MCV normal, MCH increased, and MCHC normal

319. In IDA, the
a. Serum iron is severely decreased and the TIBC is increased
b. Serum iron is decreased and the TIBC is normal
c. Serum iron is normal and the TIBC is normal
d. Serum iron is increased and the TIBC is normal

320. The greatest portion of operational body iron is normally contained in what compound?
a. Hemoglobin
b. Ferritin
c. Cytochromes
d. Myoglobin

321. Hemolytic disruption of the erythrocyte involves
a. An alteration in the erythrocyte membrane
b. A defect of the hemoglobin molecule
c. An antibody coating the erythrocyte
d. Physical trauma

322. Heinz bodies are associated with the congenital hemolytic anemia
a. G6PD deficiency
b. Abetalipoproteinemia
c. Hereditary spherocytosis
d. Hemolytic anemias

323. The erythrocyte alteration characteristically associated with hemolytic anemias is:
a. Hypochromia
b. Macrocytosis
c. Spherocytosis
d. Burr cells

324. Paroxysmal nocturnal hemoglobinuria exhibits sensitivity of one population of red blood cells to:
a. Warm antibodies
b. Cold antibodies
c. Complement
d. Either A or B

325. Patients with suspected PCH can be confirmed by performing which of the following tests?
a. DAT
b. Donath-Landsteiner test
c. Osmotic fragility test
d. G6PD activity assay

326. In sickle cell disease, the abnormality is related to:
a. The rate of synthesis of hemoglobin
b. An abnormal molecular structure of hemoglobin
c. An acquired defect
d. A membrane dysfunction

327. In **α**-type thalassemia, with three inactive **α** genes, which of the following is characteristic?
a. Hb A2
b. Hb A
c. Hb H
d. Hb F and A2

328. The stages of neutrophilic granulocyte development are:
a. Promyelocyte, myeloblast, myelocyte, metamyelocyte, and band and segmented neutrophils
b. Myeloblast, promyelocyte, myelocyte, metamyelocyte, and band and segmented neutrophils
c. Myelocyte, myeloblast, promyelocyte, metamyelocyte, and band and segmented neutrophils
d. Myeloblast, promyelocyte, metamyelocyte, myelocyte, and band and segmented neutrophils

329. Marginating granulocytes in the peripheral blood can be found:
a. In the circulating pool
b. In the tissues
c. Adhering to the vascular endothelium
d. All of the above

330. The half-life of circulating granulocytes in normal blood is estimated to be:
a. 2.5 to 5 hours
b. 7 to 10 hours
c. 24 hours
d. 2 days

331. The earliest granulocytic maturational stage in which secondary or specific granules appear is:
a. Myeloblast
b. Monoblast
c. Promyelocyte
d. Myelocyte

332. A leukocyte with the morphological characteristics of being the largest normal mature leukocyte in the peripheral blood and having a convoluted or twisted nucleus is the:
a. Myelocyte
b. Metamyelocyte
c. Promonocyte
d. Monocyte

333. On the basis of the following data, calculate the absolute value of the segmented neutrophils. Total leukocyte count = 12 x 109/L; percentage of segmented neutrophils on the differential count = 80%. The absolute segmented neutrophil value is:
a. 2.5 x 109/L
b. 4.5 x 109/L
c. 6.5 x 109/L
d. 9.6 x 109/L

334. An increase in metamyelocytes, myelocytes, and promyelocytes can be referred to as:
a. Leukocytopenia
b. A shift to the right
c. A shift to the left
d. Pelger-Huet anomaly

335. Faggot cells are predominantly seen in which type of leukemia?
a. M1
b. M2
c. M3
d. M4

336. The most characteristic morphological feature of variant lymphocytes include
a. Increased overall size, possibly 1-3 nucleoli, and abundant cytoplasm
b. Increased overall size, round nucleus, and increased granulation in the cytoplasm
c. Segmented nucleus, light-blue cytoplasm, and no nucleoli
d. Enlarged nucleus, 6-8 nucleoli, and dark-blue cytoplasm

337. An abnormal plasma cell with red-staining cytoplasm is a
a. Russell body
b. Mott cell
c. Grape cell
d. Flame cell

338. Which antibody test has replaced the LE cell preparation in the diagnosis of SLE?
a. Rheumatoid arthritis factor
b. ANA test
c. Complement fixation test
d. Antibody Smith test

339. An acute leukemia can be described as being
a. Of short duration with many mature leukocyte forms in the peripheral blood
b. Of short duration with many immature leukocyte forms in the peripheral blood
c. Of short duration with little alteration of the leukocytes of the peripheral blood
d. Of long duration with many mature leukocyte forms in the peripheral blood

340. Characteristics of FAB M1 include:
a. Leukocytosis with maturation of the myeloid cell line in the peripheral blood
b. Leukocytosis with maturation of the lymphocytic cell line in the peripheral blood
c. Leukocytosis without maturation of the myeloid cell line in the peripheral blood
d. Leukocytosis with many mature leukocytes in the peripheral blood

341. The Sudan black B cytochemical stain differentiates:
a. Acute myeloid from ALL
b. Acute monocytic from AML
c. Myeloid leukemia from a leukemoid reaction
d. Acute myeloid from acute myelomonocytic leukemia

342. Naphthol AS-D chloroacetate differentiates:
a. Granulocytic from the monocytic cell line
b. Promyelocytes from myelocytes
c. Monoblasts from myeloblasts
d. Metamyelocytes from myelocytes

343. CLL is classically a
a. T-cell disorder
b. B-cell disorder
c. Null cell disorder
d. Disorder of the young

344. The abnormal protein frequently found in the urine of persons with multiple myeloma is:
a. Albumin
b. Globulin
c. IgG
d. Bence Jones

345. The ALP cytochemical staining reaction is used to differentiate between
a. CLL and AML
b. ALL and AML
c. CML and severe bacterial infections
d. Leukemoid reactions and severe bacterial infections

346. The Philadelphia chromosome is typically associated with
a. AML
b. Leukemoid reactions
c. ALL
d. CML

347. The primary treatment for PV is:
a. Therapeutic phlebotomy
b. Myelosuppressive agents
c. Radioactive phosphorus
d. Low-dose busulfan

348. The level of EPO in the urine is _____ in patients with PV compared with other kinds of polycythemia.
a. Increased
b. The same
c. Variable
d. Decreased

349. The initiating stimulus to blood coagulation following injury to a blood vessel is:
a. Contact activation with collagen
b. Vasoconstriction
c. Stenosis
d. Release of serotonin

350. The cellular ultrastructural component(s) unique to the platelet is/are:
a. Cytoplasmic membrane
b. Glycocalyx
c. Mitochondria
d. Microtubules

351. Choose the incorrect statement regarding storage granules related to hemostasis in the mature platelet.
a. Alpha-granules contain platelet factor 4, beta-thromboglobulin, and platelet-derived growth factor
b. Alpha-granules contain platelet fibrinogen and von Willebrand factor
c. Dense bodies contain serotonin and ADP
d. Lysosomes contain actomyosin, myosin, and filamin

352. At all times, approximately ____ of the total number of platelets are in the systemic circulation.
a. One-fourth
b. One-third
c. One-half
d. Two-thirds

353. The reference range of platelets in the systemic circulation is:
a. 50-150 x 109/L
b. 100-200 x 109/L
c. 150-350 x 109/L
d. 150-450 x 109/L

354. If 10 platelets are seen per OIO, what is the approximate platelet count?
a. 50 x 109/L
b. 100 x 109/L
c. 150 x 109/L
d. 200 x 109/L

355. Aspirin ingestion has the following hemostatic effect in a normal person:
a. Prolongs the bleeding time
b. Prolongs the clotting time
c. Inhibits factor VIII
d. Has no effect

356. The bleeding time test measures
a. The ability of platelets to stick together
b. Platelet adhesion and aggregation on locally injured vascular subendothelium
c. The quantity and quality of platelets
d. Antibodies against platelets

357. This component is essential for normal platelet aggregation:
a. Calcium
b. Glycoprotein Ib
c. VWF
d. Glycoprotein IIb-IIIa complex

358. The clot retraction test is:
a. A visible reaction to the activation of platelet actomyosin (thrombosthenin)
b. A reflection of the quantity and quality of platelets and other factors
c. A measurement of the ability of platelets to stick to glass
d. A measurement of the cloudiness of blood

359. The extrinsic pathway of coagulation is triggered by the entry of _____ into the circulation.
a. Membrane lipoproteins (phospholipoproteins)
b. Tissue thromboplastin
c. Ca2+
d. Factor VII

360. Prothrombin to thrombin conversion is accelerated by:
a. A complex of activated factors IX and VII
b. Factor V and ionized calcium
c. A complex of phospholipids and factor VII
d. A complex of activated factors X and V

361. The phase contrast microscope is employed in which platelet count method?
a. Rees-Ecker
b. Brecker-Cronkite
c. Indirect
d. Coulter

362. If a pediatric preoperative patient has a family history of bleeding but has never had a bleeding episode herself, what test should be included in a coagulation profile in addition to the PT, aPTT, and platelet count?
a. Lee-White clotting time
b. Clot retraction
c. Bleeding time
d. FSPs

363. A patient with a severe decrease in factor X activity would demonstrate normal
a. aPTT
b. PT
c. Thrombin time
d. Bleeding time

364. Neither the aPTT nor the PT detects a deficiency of:
a. PF3
b. Factor VII
c. Factor VIII
d. Factor IX

365. Liver disease is characterized by all of the following, except:
a. Prolonged PT
b. Acanthocytosis
c. Decreased factor VIII
d. Decreased fibrinogen

366. If a child ingested rat poison, which of the following tests should be performed to test the effect of the poison on the child's coagulation mechanism?
a. aPTT
b. PT
c. Fibrinogen assay
d. Thrombin time

367. A patient has a prolonged aPTT and a normal PT. The aPTT is not corrected by factor VIII-deficient plasma but is corrected by factor IX-deficient plasma. In which factor does the patient appear to be deficient?
a. Factor II
b. Factor V
c. Factor VIII
d. Factor IX

368. Hemorrhagic disease of newborns is often due to hypoprothrombinemia. This condition may be prevented by giving expectant mothers adequate doses of:
a. Vitamin A
b. Vitamin C
c. Vitamin D
d. Vitamin K

369. Which of the following is/are characteristic of protein C?
a. It is not vitamin K-dependent
b. It is formed in response to thrombin generation
c. It inactivates factors Va and VIIIa
d. Both B and C

370. Laboratory results in acute DIC reflect abnormalities in which of the following coagulation components?
a. Platelet function
b. Excessive clotting and fibrinolysis
c. Accelerated thrombin formation
d. Fibrin formation

371. 5M urea or 1% monochloroacetic acid are reagents used in tests for which plasma factor deficiency?
a. VIII
b. IX
c. XII
d. XIII

372. A condition characterized by the presence of large platelets with Dohle-like bodies in leukocytes.
a. Wiskott-Aldrich
b. May-Hegglin
c. Bernard-Soulier
d. Alport syndrome

373. A positive protamine sulfate test is suggestive of:
a. DIC
b. vWD
c. Glanzmann's thrombasthenia
d. Primary fibrinolysis

374. A platelet count of 100,000-150,000/ · L is reported as:
a. Normal
b. Low Normal
c. Slightly decreased
d. Moderately decreased

375. What is the appropriate procedure and characteristic for the Westergren method?
a. The diluting solution lyses RBCs with propylene glycol and contains sodium carbonate and water
b. The procedure measures the rate of erythrocyte settling.
c. Ferrous ions are oxidized to the ferric state.
d. The diluting solution is either 1% HCl or 2% acetic acid.

376. What source of error will have the greatest effect on PCV?
a. Incorrect dilution of blood and diluent
b. Hemolysis of whole blood specimen
c. Excessive anticoagulant will produce shrinkage of cells
d. Incorrect gauge used in specimen collection

377. A normal blood smear should have no more than approximately ____ (maximum) number of platelets per OIF in an area where the erythrocytes are just touching each other.
a. 10
b. 15
c. 20
d. 25

378. Leukocytes that demonstrate a positive reaction in the tartrate acid-resistant acid phosphatase cytochemical stain are the lymphocytes seen in:
a. Infectious lymphocytosis
b. Malignant lymphoma
c. ALL (non-T type)
d. Hairy cell leukemia

379. A decreased LAP score is seen in:
a. PV
b. CML
c. Leukemoid reactions
d. AML

380. In the LAP procedure, blood smears should be stained
a. Within 8 hours of specimen collection
b. Within 48 hours of specimen collection
c. Within 72 hours of specimen collection
d. Within 5 days of specimen collection

381. The reagent used in the traditional sickle cell screening test is
a. Sodium chloride
b. Sodium citrate
c. Sodium metabisulphite
d. Sodium-potassium oxalate

382. The abbreviation laser stands for:
a. Light-associated simulated emission of radiation
b. Largely amplified by simulated emission of radiation
c. Light amplified by stimulated emission of radiation
d. Liquid amplified by stimulated emission of radiation

383. A photon is
a. A diffuse form of energy
b. A piece of equipment in a laser assembly
c. The basic unit of all radiation
d. Equivalent to an atom

384. The term parameter means
a. A subset of a population
b. The mean value of a sample
c. Two SDs on either side of the mean value
d. Any numerical value that describes an entire population

385. Which parameters are calculated rather than directly measured?
a. Hematocrit and erythrocyte distribution width
b. Erythrocyte count and leukocyte count
c. Leukocyte count and hematocrit
d. Platelet count and platelet volume

386. The delta check method of quality control
a. Uses the patient's own data to monitor population values
b. Uses batches of 20 samples to track MCV, MCH, and MCHC values
c. Compares the patient's leukocyte and platelet counts with his or her previous results
d. Monitors the patient's values within two SDs of the mean

387. In an erythrocyte histogram, the erythrocytes that are larger than normal will be to the _____ of the normal distribution curve.
a. Right
b. Left
c. In the middle

389. If the RBC distribution on a histogram demonstrates a homogeneous pattern and a small SD, the peripheral blood smear would probably exhibit
a. Extreme anisocytosis
b. Very little anisocytosis
c. A single population of spherocytes
d. A single population of macrocytes

390. A combined scatter histogram measure
a. Overall size versus nuclear size
b. Cytoplasm-to-nucleus ratio
c. Cell size and granularity
d. Cell shape and cytoplasmic color

391. The MPV is
a. Analogous to the MCHC
b. A direct measure of the platelet count
c. A measurement of the average volume of platelets
d. A comparison of the patient's value to the normal value

392. Major systems in a flow cytometer include all of the following except
a. Fluidics
b. Optics
c. Computerized electronics
d. Gating

393. Which cell surface membrane marker is used for enumeration of HPC enumeration?
a. CD4
b. CD8
c. CD34
d. CD45

394. A Wintrobe tube is graduated between
a. 0-18 mm
b. 0-50 mm
c. 0-100 mm
d. 0-200 mm

395. Which of the following types of hemoglobin is the fastest to migrate on cellulose acetate hemoglobin electrophoresis?
a. A1
b. Bart
c. I
d. H

396. The newer clinical instruments for measuring blood clotting are based on:
a. Clot elasticity
b. Fibrin adhesion
c. Conduction of impedance of an electrical current by fibrin
d. Changes in optical density

397. The fibrometer relies on the principle of
a. Clot elasticity
b. Fibrin adhesion
c. Conduction or impedance of an electrical current by fibrin
d. Changes in optical density

398. How is the endpoint in platelet aggregation test using aggregometer detected?
a. Change in optical density
b. Turbidity
c. Clot formation via clotting time
d. Clot formation via specific gravity

399. In the photo-optical method, the change in light transmission versus the ____ is used to determine the activity of coagulation factors or stages.
a. Amount of patient's plasma
b. Amount of test reagent
c. Time
d. Temperature

400. The RDW and MCV are both quantitative descriptors of erythrocyte size. If both are increased, the most probable erythrocytic abnormality would be:
a. IDA
b. Acquired aplastic anemia
c. Megaloblastic anemia
d. Hemoglobinopathy

401. Causes of positive errors in particle-counting instruments, except:
a. Aperture plugs
b. Bubbles in the sample
c. Extraneous electrical pulses
d. Excessive lysing of RBCs

402. The size threshold range used by electrical impedance methods to count particles as platelets is:
a. 0-10 fL
b. 2-20 fL
c. 15-40 fL
d. 35-90 fL

403. In the Coulter counter electrical impedance instrument, the R1 flag in flagging indicates:
a. Increased granulocyte count
b. Overlap of cell populations at the lymphocyte-mononuclear boundary
c. Presence of nucleated RBCs, giant platelets, or sickle cells
d. Overlap of cells at the mononuclear-granulocyte boundary

404. Which anemia is characterized by a lack of intrinsic factor that prevents B12 absorption?
A. Tropical sprue
B. Transcobalamin deficiency
C. Blind loop syndrome
D. Pernicious anemia

- PERNICIOUS develops slowly and insidiously in patients when autoimmune antibodies to intrinsic factor or to parietal cells destroy their parietal cells so that they are lef without intrinsic factor.
- Tropical sprue and Blind loop syndrome – have been associated with Vit. 12 deficiency among elderly adults

405. Which of the following are most characteristic of the red cell indices associated with megaloblastic anemias?
A. MCV 99 fl, MCH 28 pg, MCHC 31%
B. MCV 62 fL, MCH 27 pg, MCHC 30%
C. MCV 125 fL, MCH 36 pg, MCHC 34%
D. MCV 78 fL, MCH 23 pg, MCHC 30%

Reference Values:
MCV 80 to 100 fL
MCH 26 to 34 pg
MCHC 32 to 36 g/dL

406. In a 1:200 dilution of a patient's sample, 336 cells were counted in an area of 0.2 mm2. What is the RBC count?
A. 1.68 x 1012/L
B. 3.36 x 1012/L
C. 4.47 x 1012/L
D. 6.668 x 1012/L

407. A manual WBC count was performed. A total of 25 cells were counted in all 9-mm2 squares of a Neubauer-ruled hemacytometer.
A 1:10 dilution was used. What is the WBC count?
A. 0.28 x 109/L
B. 278 x 109/L
C. 27.8 x 109/L
D. 0.4 x 109/L

408. The ability of an assay to distinguish the targeted analyte from interfering substances within the specimen matrix is called:
A. Analytical specificity
B. Analytical sensitivity
C. Clinical specificity
D. Clinical sensitivity

409. The BEST source of active bone marrow from a 20 year old would be:
A. Iliac Crest
B. Femur
C. Distal Radius
D. Tibia

410. What growth factor is produced in the kidneys and is used to treat anemia associated with kidney disease?
A. EPO
B. TPO
C. G-CSF
D. KIT ligand

411. Which of the following is an erythroid progenitor?
A. Pronormoblast
B. Reticulocyte
C. CFU-E
D. Orthochromic normoblast

412. What single feature of normal RBCs is most responsible for limiting their life span?
A. Loss of the nucleus
B. Increased flexibility of the cell membrane
C. Reduction of hemoglobin iron
D. Loss of mitochondria

413. All the following items should be discarded in a puncture-resistant container, EXCEPT:
A. Transfer pipette
B. Needles
C. Broken Glass
D. None of the choices

Anything that could cause puncture similar to a needle should be discarded in a puncture-resistant container.

414. If a blood specimen is spilled on a laboratory bench or floor area, the first step in cleanup should be
A. wear gloves and a lab coat
B. absorb blood with disposable towels
C. clean with freshly prepared 1% chlorine solution
D. wash with water

415. The recommended cleaner for removing oil from objectives is:
a. Lens cleaner or Xylene
b. 70%alcohol or Lens cleaner
c. Xylene or 70% alcohol
d. NOTA

416. The test reagent in PT contains which of the following substance(s)?
1. Calcium ions
2. Kaolin
3. Tissue thromboplastin
4. Celite

a. 1, 2 and 3 are correct
b. 1and3are correct
c. 2and4are correct
d. Only 4 is correct

417. Platelets interacting with and binding with other platelets is referred to as:
a. Adhesion
b. Aggregation
c. Release
d. Retraction

418. The defect in Paroxysmal Nocturnal Hemoglobinuria is a/an ____ associated defect of the RBC membrane.
a. Structural protein
b. Hemoglobin
c. Antibody
d. Enzyme

419. The primary pathophysiologic mechanism of anemia associated with chronic kidney disease is:
a. Inadequate production of erythropoietin
b. Excessive hemolysis
c. Hematopoietic stem cell mutation
d. Toxic destruction of stem cells

420. Detects lymphocytic cells and certain abnormal erythrocytic cells by staining of cytoplasmic glycogen:
a. MPO
b. SBB
c. PAS
d. Tdt

421. As a blood cell matures, the overall cell diameter in most cases:
a. Increases
b. Decreases
c. Remains the same
d. Variable

422. If a blood smear is too long, the problem can be resolved by:
a. Decreasing the angle of the pusher slide
b. Increasing the angle of the pusher slide
c. Using a larger drop of blood
d. Pushing the slide slower in smearing out the blood

423. Reticulated platelets can be enumerated in peripheral blood to detect:
a. Impaired production in disease states
b. Abnormal organelles associated with diseases such as leukemia
c. Increased platelet production in response to need
d. Inadequate rates of membrane cholesterol exchange with the plasma

424. Which of the following blood film findings indicates EDTA-induced pseudothrombocytopenia?
a. The platelets are pushed to the feathered end.
b. The platelets are adhering to WBCs.
c. No platelets at all are seen on the film.
d. The slide has a bluish discoloration when examined macroscopically

425. An unconscious inpatient does not have an ID band. The name on an envelope on the patient's nightstand matches with the requisition. What should you do?
a. Ask the nurse to verify the patient's ID and collect the specimen.
b. Complete the required procedure and then file an incident report.
c. Do not start any procedure until the nurse attaches an ID bracelet.
d. Make a computer entry to alert other phlebotomists of the issue

426. According to the WHO classification, except in leukemias with specific genetic anomalies, the minimal percentage of blasts necessary for a diagnosis of acute leukemia is:
a. 10%
b. 20%
c. 30%
d. 50%

427. The cytochemical stain that can demonstrate iron, hemosiderin and ferritin is:
a. Newmethylene blue
b. Romanowsky
c. Prussian blue
d. Wright-Giemsa

428. Insufficient centrifugation will result in:
a. A false increase in hematocrit (Hct) value
b. A false decrease in Hct value
c. No effect on Hct value
d. All of these options, depending on the patient

429. The venipuncture needle should be inserted into the arm with the bevel facing:
a. Down and an angle of insertion between 15 and 30 degrees
b. Up and an angle of insertion less than 30 degrees
c. Down and an angle of insertion greater than 45 degrees
d. Up and an angle of insertion between 30 and 45 degrees

430. The MPV is:
a. Analogous to the MCHC
b. A direct measure of the platelet count
c. A measurement of the average volume of platelets
d. A comparison of the patient's value to the normal value

431. Which of the following is NOT a characteristic of platelets?
a. Size of 2 to 4 µm
b. The presence of a nucleus
c. A discoid shape as an inactive cell
d. Cytoplasm is light blue with fine red-purple granules

432. The fibrometer relies on the principle of:
a. Clot elasticity
b. Fibrin adhesion
c. Conduction or impedance of an electrical current by fibrin
d. Changes in optical density

433. Which test result would be normal in a patient with dysfibrinogenemia? a. Thrombin time
b. APTT
c. PT
d. Immunologic fibrinogen level

434. The extrinsic pathway of coagulation is triggered by the entry of ___ into the circulation.
a. Membrane lipoproteins
b. Tissue thromboplastin
c. Calcium
d. Factor VII

435. Orthogonal Light Scatter is used to measure:
a. Cell nuclear volume
b. Internal complexity of the cell
c. Cellular granularity
d. Nuclear density

436. In cold-type AIHA:
a. IgM, usually anti-I is present
b. Rhantibodies are the most frequent cause
c. IgM usually occurs in newborn infants
d. Autoantibodies are present

437. Vitamin K dependent coagulation factor:
a. II
b. V
c. VIII
d. XIII

438. Effect of increasedamountsof2,3 DPG to oxygen affinity of the hemoglobin molecule.
a. Increases
b. Decreases
c. Donotalter
d. Variable

439. A hemoglobin molecule is composed of:
a. 4heme, 4 globin, 2 iron
b. 4heme, 2 globin, 2 iron
c. 2heme, 2 globin, 2 iron
d. 4heme, 4 globin, 4 iron

440. A combined scatter histogram measure:
a. Overall size versus nuclear size
b. Cytoplasm-to-nucleus ratio
c. Cell size and granularity
d. Cell shape and cytoplasmic color

HEMATOLOGY EXAMINATION AND RATIO

441. RBC with membrane folded over:
a. Aplastic anemia
b. Iron deficiency anemia
c. Hemoglobin C, hemoglobin SC disease
d. Sickle cell anemia, thalassemia

442. When encountering a patient with a fistula, the phlebotomist should:
a. Apply the tourniquet below the fistula
b. Use the other arm
c. Collect the blood from the fistula
d. Attach a syringe to the T-tube connector

443. A peripheral blood smear can be prepared from:
a. EDTA-anticoagulated blood within 1 hour of collection
b. Free-flowing capillary blood
c. Citrated whole blood
d. Both A and B

444. Lymphocyte development in the thymus and bursal equivalent are:
a. Antigen-independent
b. Antigen-dependent
c. Antibody-independent
d. Antibody-dependent

445. What is the best way to clean up blood that has dripped on the arm of a phlebotomy chair?
a. Absorb it with a gauze pad and clean the area with disinfectant.
b. Rub it with a damp cloth and wash the area with soap and water.
c. Wait for it to dry and then scrape it into a biohazard container.
d. Wipe it with an alcohol pad using an outward circular motion

446. All are fibrin degradation products, EXCEPT:
a. Fragment E
b. Fragment X
c. Fragment Z
d. Fragment D

447. All the megakaryocyte progenitor stages resemble ____ and cannot be distinguished by Wright-stained microscopy.
a. Lymphocyte
b. Monocyte
c. Neutrophil
d. Eosinophil

448. Acceptable limits of a control value must fall:
a. Within ±1 standard deviation of the mean
b. Between 1 and 2 standard deviations of the mean
c. Within ±2 standard deviations of the mean
d. Within ±3 standard deviations of the mean

449. A laboratory assay that can be used to differentiate a leukemoid reaction from chronic myelogenous leukemia is:
a. Leukocyte alkaline phosphatase (LAP) stain
b. Erythrocyte sedimentation rate (ESR)
c. Assessment of the shift to the left
d. Absolute neutrophil count

450. The major application of flow cytometry is:
a. Determining cell size and granularity
b. Sorting of cells and cellular identification using monoclonal antibodies
c. Treating cancer cells and identifying specific virus types
d. Counting leukocytes and platelets

451. The transfer of iron from the enterocyte into the plasma is regulated by:
a. Transferrin
b. ferroprotein
c. Hephaestin
d. hepcidin

452. A preanalytical error can be introduced by:
a. Drawing a coagulation tube before an EDTA tube
b. Mixing an EDTA tube 8-10 times
c. Vigorously shaking of blood tube to prevent clotting
d. Transporting the specimen in a biohazard bag

453. The type of hemoglobin that is detectable with the Kleihauer-Betke test is: a. A
b. A2
c. F
d. S

454. What is the first type of cell produced by the developing embryo?
a. Erythrocyte
b. Granulocyte
c. Lymphocyte
d. Thrombocyte

455. Which parameters are calculated rather than directly measured?
a. Hematocrit and erythrocyte distribution width
b. Erythrocyte count and leukocyte count
c. Leukocyte count and hematocrit
d. Platelet count and platelet volume

456. In measuring platelet aggregation, platelet-rich plasma can be treated with ___ to aggregate platelets.
a. Saline
b. Collagen
c. Epinephrine
d. Both B and C

457. The Philadelphia chromosome is formed by a translocation between:
a. Chromosome 22 and chromosome 9
b. Chromosome 21 and chromosome 9
c. Chromosome 21 and chromosome 6
d. Chromosome 22 and chromosome 6

458. When comparing von Willebrand's disease and Glanzmann's thrombasthenia, Glanzmann's thrombasthenia will demonstrate:
a. Absent ADP
b. Normal clot retraction
c. Abnormal ristocetin aggregation
d. Abnormal release of ADP

459. Which of the following hematologic tests may not be part of the usual complete blood count?
a. Hematocrit
b. Hemoglobin
c. Platelet estimate
d. Reticulocyte count

460. Basophilic stippling represents:
a. DNA
b. Precipitated denatured hemoglobin
c. Granules of ribosomes and RNA
d. Aggregates of iron, mitochondria and ribosomes

461. In obese patients, veins may be neither readily visible nor easy to palpate. Sometimes the use of a blood pressure cuff can aid in locating a vein. The cuff should:
a. Inflated higher than 40 mm Hg and should be left on the arm for longer than 1 minute
b. Inflated higher than 40 mmHg and should not be left on the arm for longer than 1 minute
c. Not be inflated any higher than 40 mm Hg and should be left on the arm for longer than 1 minute
d. Not be inflated any higher than 40 mm Hg and should not be left on the arm for longer than 1 minute

462. What pathway anaerobically generates energy in the form of ATP?
A. 2,3-BPG pathway
B. Embden-Meyerhof pathway
C. Hexose monophosphate pathway
D. Rapoport-Luebering pathway

463. Which of the following is an example of a transmembrane or integral membrane protein?
A. Actin
B. Ankyrin
C. Glycophorin A
D. Spectrin

464. What membrane-associated protein in enterocytes transports iron from the intestinal lumen into the enterocyte?
A. DMT1
B. Ferroportin
C. Transferrin
D. Hephaestin

465. A hemoglobin molecule is composed of:
A. One heme molecule and four globin chains
B. Ferrous iron, protoporphyrin IX, and a globin chain
C. Protoporphyrin IX and four globin chains
D. Four heme molecules and four globin chains

466. What is the normal distribuCon of hemoglobins in healthy adults?
A. 80% to 90% HbA, 5% to 10% HbA2, 1% to 5% HbF
B. 80% to 90% HbA2, 5% to 10% HbA, 1% to 5% HbF
C. >95% HbA, <3.5% HbA2, 1% to 2% HbF
D. 90% HbA, 5% Hb F, 5% Hb A2

467. The transfer of iron from the enterocyte into the plasma is regulated by:
A. Transferrin
B. Ferroportin
C. Hephaestin
D. Hepcidin

468. Which of the following would NOT interfere with the result when hemoglobin determination is performed by the cyanmethemoglobin method?
A. Increased lipids
B. Elevated WBC count
C. Lyse-resistant RBCs
D. Fetal hemoglobin

HEMATOLOGY EXAMINATION AND RATIO

469. A patient has a hemoglobin level of 8.0 g/dL According to the rule of three, what is the expected range for the hematocrit?
A. 21% to 24%
B. 23.7% to 24.3%
C. 24% to 27%
D. 21% to 27%

470. Which of the following would be associated with an elevated ESR value?
A. Microcytosis
B. Polycythemia
C. Decreased globulins
D. Inflammation

471. A stained blood film is held up to the light and observed to be bluer than normal. What microscopic abnormality might be expected on this film?
A. Rouleaux
B. Spherocytosis
C. Reactive lymphocytosis
D. Toxic granulation

472. What is the largest hematopoieCc cell found in a normal bone marrow aspirate?
A. Osteoblast
B. Monocyte
C. Pronormoblast
D. Megakaryocyte

473. What are the clinical laboratory tests that are performed for the diagnosis of anemia?
A. CBC, iron studies, and reticulocyte count
B. CBC, reticulocyte count, and peripheral blood film examination
C. Reticulocyte count and serum iron, vitamin B12, and folate assays
D. Bone marrow study, iron studies, and peripheral blood film examination

474. An increase in which one of the following suggests a shortened life span of RBCs and hemolytic anemia?
a. Hemoglobin concentration
b. Hematocrit
c. Reticulocyte count
d. Red cell distribution width

475. A sign of hemolysis that is typically associated with both fragmentation and macrophage-mediated hemolysis is:
A. Hemoglobinuria
B. Hemosiderinuria
C. Hemoglobinemia
D. Elevated urinary urobilinogen level

476. Which one of the following sets of results is consistent with HS?
A. Decreased osmotic fragility, negative DAT result
B. Decreased osmotic fragility, positive DAT result
C. Increased osmotic fragility, negative DAT result
D. Increased osmotic fragility, positive DAT result

477. In autoimmune hemolytic anemia, a positive DAT is evidence that an:
A. IgM antibody is in the patient's serum
B. IgG antibody is in the patient's serum
C. IgM antibody is sensitizing the patient's red blood cells
D. IgG antibody is sensitizing the patient's red blood cells

478. Hb Bart is composed of:
A. Two alpha and two beta chains
B. Two epsilon and two gamma chains
C. Four beta chains
D. Four gamma chains

479. What factors contribute to the sickling of erythrocytes in sickle cell disease crisis?
A. Increase in blood pH and increase in oxygen.
B. Extremely hot weather.
C. Extremely reduced oxygen and increased acidity in the blood.
D. Sickling is spontaneous.

480. The RDW and MCV are both quantitative descriptors of erythrocyte size. If both are increased, erythrocyte abnormality would be:
A. IDA
B. Acquired Aplastic Anemia
C. Megaloblastic Anemia
D. Hemoglobinopathy

481. Endomitosis starts at which specific progenitor?
a. MK-I
b. BFU-Meg
c. LD-CFU-Meg
d. MK-III

482. The congenital deficiency of Factor IX:
a. Hemophilia B
b. Christmas disease
c. Sex-linked recessive trait
d. All of the above

483. What is the deficiency in factor XI called?
a. Hemophilia C
b. Hemophilia B
c. Rosenthal syndrome
d. Both A and C

484. When viewing platelet morphology on a blood smear, the presence of giant platelets is noted. This may indicate:
a. Bernard-Soulier syndrome
b. Von Willebrand disease
c. Glanzmann thrombasthenia
d. Ehler-Danlos disease

485. Hemophilia B is a sex-linked recessive disorder that presents with a decrease in factor:
a. VIII
b. IX
c. X
d. XI

486. The activation of plasminogen to plasmin resulting in the degradation of fibrin occurs by:
a. PAI-1
b. Alpha-2 antiplasmin
c. tPA
d. alpha-2 macroglobulin

487. Swelling of tumor in the tissue of a body cavity that contains clotted blood.
a. Ecchymosis
b. Hematoma
c. Purpura
d. Petechiae

488. Form of purpura in which blood escapes into large areas of skin and mucous membranes, but not into deep tissues. They are usually irregular in shape.
a. Ecchymosis
b. Hematoma
c. Purpura
d. Petechiae

489. Hyperextended or hypermobile joints and hyperplastic skin:
a. Kasabach-Meritt syndrome
b. Ehlers Danlos syndrome
c. Marfan syndrome
d. Osler-Weber-Rendu syndrome

490. What are the fibrinogen levels in Hemophilia A, B, and C, respectively?
a. Increased, increased, increased
b. Normal, normal, normal
c. Decreased, decreased, decreased
d. Increased, decreased, increased

491. All are terms that refer to Fitzgerald factor, except:
a. Contact activation cofactor
b. William's factor
c. Laki-Lorand factor
d. None of the above

492. Which is the primary inhibitor of plasmin?
a. Thrombospondin
b. Alpha-2 antiplasmin
c. Alpha-2 macroglobulin
d. PAI-1

493. A specimen supposedly tested for coagulation has been stored in a 4C refrigerator. Which of the following factors will be prematurely activated?
a. I and II
b. III and V
c. VII and IX
d. VII and XI

494. D-dimer test is positive in DIC as soon as ___ after onset.
a. 4 minutes
b. 4 hours
c. 8 hours
d. 8 minutes

495. What is the platelet if the platelet is reported as "slightly decreased"?
a. 200,000 to 400,000
b. 150,000 to 199,000
c. 100,000 to 149,000
d. 50,000 to 99,000

496. Based from your answer in number 70, how does the presence of this chromosome abnormality affect the prognosis?
A. The prognosis is better when the marker is present
B. The prognosis is better when the marker is not present.
C. The chromosome is not considered a prognostic indicator.
D. The presence of the chromosome indicates a disease progression to essential thrombocythemia

HEMATOLOGY EXAMINATION AND RATIO

497. A 50-year-old white woman had seen her physician and reported having no energy and feeling tired all the time.She also reported experiencing mild pain in the abdominal region. The physician ordered a routine CBC. The results of the blood count were as follows: Hgb 6.2 gldl Hct 22% RBC 1.7 x 1012IL WBC 4.0 x 109IL Her RBC indices were as follows: MCV 129.4 fl MCH 36.5 pg MCHC 38 gldl Given the data, what category of anemia is suggested by the hematological findings?
A. Microcytic type-anemia
B. Normocytic type-anemia
C. Macrocytic type-anemia
D. Insufficient data; cannot be determined

498. Principal inhibitor of coagulation.
A. Antithrombin III
B. A2-antiplasmin
C. A 1-antitrypsin
D. A2-macroglobulin

499. What is the primary cell source of the cytokine erythropoietin?
A. Endothelial Cel Is
B. Placenta
C. Peritubular interstitial cell
D. Hepatocytes

500. In the in vitro coagulation scheme, factor V is primarily involved in?
A. Intrinsic Pathway
B. Common Pathway
C. Fibrinolysis
D. NOTA