MID HLS
020 EXAM

Collected by:

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Histology

1- All of the following cells can be seen in the cortex of the thymus except:

A. Macrophages

B. Dendritic cells

C. Reticular epithelial cells

D. Double positive T cells

E. Double negative T cells

Answer: B

2- C ell with the same size of erythrocyte and blue cytoplasm with large nucleus?

Answer: lymphocyte

3- Which one of the following is a correct pair?

A. Basophil / histaminasease
B. Eosinophil / heparin
C. Basophil / basic protein
D. Basophil / histamine

Answer: D

4- Correct sequence of blood cells producing sites:

A. yolk sac / liver / bone marrow
B. liver / yolk sac / bone marrow
C. yolk sac / liver / spleen

Answer: A

5- In parasitic infection which of the following increases:

A. Cells with a basophilic granular s-shaped nucleus
B. Cells with acidophilic granular bilobular nucleus
C. Cells without specific granules
D. Cells having multilobed nucleus

Answer: B

6- Which statement is wrong about granulopoiesis?

A. It takes around 2 weeks
B. Precursors have lobulated nucleus
C. Some of the Precursors have intended nucleus

D. All choices are true

Answer: B

7- Wrong statement:

A. Neutrophils circulate for hours in blood after maturation
B. Neutrophils circulate for days in blood after maturation

Answer: B

8- Which of the following statements regarding oncotic pressure is incorrect:

A. Also called colloidal osmotic pressure
B. Accounts for a major part of the total osmotic pressure
C. Regulates fluid movement between tissue and capillaries
D. Mainly caused by the plasma protein Albumin
E. A second function of the protein albumin is to transport products, such as fatty acids, hormones, drugs, etc..

Answer: B

9- Choose the wrong statements:

Answer: Lowest erythropoiesis occurs in the pelvis and vertebrae

10- Choose the wrong statement:

A. Granulocytes have irregular shape in blood & spherical shape in connective tissue
B. Granulocytes have spherical shape in blood & irregular shape in connective tissue

Answer: A

11- Which of the following isn't true about lymph nodes:

A. post capillary venules are located in the outer cortex
B. most of lymphocytes enter lymph nodes via blood vessels
C. The cords are separated by spaces called medullary sinuses

Answer: A

12- Activated B lymphocytes in spleen are located in:

Answer: Malpighian corpuscles

13. Choose the wrong statement:

Answer: Erythrocyte contains granules

14. What can be found inside the red bone marrow?

A. Hematopoietic stem cells along with numerous fat tissue
B. Hematopoietic stem cells + sinusoidal capillaries + reticular tissue
C. Hematopoietic stem cells + fenestrated capillaries + reticular tissue

Answer: B

15- True about all secondary lymph organs

A. contain lymph follicles
B. contain epithelial reticular cells as stroma
C. contain afferent vessels
D. contain capsule

Answer: A

16- T cells in spleen are mostly presented in

A. lymphoid follicles
B. splenic cords
C. splenic sinuses
D. PALS

Answer: D

17- The right arrangement of hemoglobin chains synthesis in human

A. it starts is liver then yolk sac and finally in bone marrow
B. it starts in yolk sac then liver and finally in bone marrow
C. yolk sac and liver synthesize hemoglobin for almost the same period in gestation liver and yolk sac then bone marrow after birth

Answer: B

18- Wrong about neutrophil

A. it has its own specific granules
B. it lives for several hours only and stores glycogen
C. it has polymorphic nucleus throughout its life
D. measuring neutrophils from blood represents all neutrophils in our body

Answer: D

19- Cell that contain bi lobed nucleus and large granules that obscure its nucleus

A. monocyte
B. eosinophil
C. basophil
D. neutrophil

Answer: C

20- Cell with c shaped single non-lobulated nucleus

A. mast cell
B. eosinophil
C. neutrophil

D. monocyte

Answer: D

21- Which of the following is covered by stratified squamous non-keratinized epithelium

A. palatine tonsils
B. appendix
C. payers patch

Answer: A

22- Choose the right statement about the thymus gland

A. it has afferent lymph vessels
B. Thymic epithelial cells form a blood thymic barrier in the medulla
C. thymic epithelial cells form the stroma of the gland

Answer: C

23- Lymphocytes in the circulation enter lymph nodes from

A. afferent vessels
B. marginal zone
C. postcapillary venule

Answer: C

24- wrong about reticulocytes

A. Contain DNA not RNA
B. increases in hemolytic anemia
C. can synthesize heme

Answer: A

25- Wrong about blood:

Answer: special type of CT that originates from endoderm

*It originates from mesoderm as other CT types

26- Which is wrong:

Answer: Nucleus is eccentric in promyelocyte

27- Lymphocytes, choose the CORRECT statement?

A. Are produced only in the bone marrow.
B. Are the most abundant type of leucocytes.
C. Are produced only in the lymphoid tissues.
D. Are granular leucocytes
E. Are produced in the bone marrow & in the lymphoid tissues.

Answer: E

28- Diffuse lymphatic tissue, choose the WRONG statement:

A. Peyer's patches are composed of Lymphatic nodules with a thin underlying connective tissue capsule.
B. M cells are intestinal epithelial cells overlying the diffuse lymphatic tissues.
C. The basement membrane overlying lymphatic nodules of Peyer's patches is highly porous.
D. Pharyngeal tonsils are covered by respiratory epithelium.
E. Palatine tonsils are partly encapsulated and covered by nonkeratinized stratified squamous epithelium.

Answer: A

29-The presence of which one of the following cells is of least value in distinguishing the spleen from the thymus?

A. Activated B cells.
B. Fibroblasts in capsule and trabeculae.
C. Endothelial cells with tight junctions and thick basement membranes.
D. Reticular epithelial cells.
E. Perisinusoidal macrophages.

Answer: C

30- Erythrocytes, Choose the WRONG statement:

A. Eosinophilia of erythrocytes is due to hemoglobin.
B. About one week is needed for the formation of erythrocytes from proerythroblasts.
C. Erythrocytes appear electron dense and homogenous under TEM.
D. Rouleaux formation is a reversible condition due to surface tension caused by erythrocytes biconcave surface in slow circulation.
E. Mature erythrocytes are still capable of producing a little amount of hemoglobin.

Answer: E

31- Which description is true of all primary lymphoid organs?

A. Contain crypts.
B. Contain epithelial-reticular cells.
C. Lack of connective tissue capsules.
D. Are sites for antigen exposure.
E. Are capable of antigen-independent lymphopoiesis.

Answer: E

32- The precursor cells of granulocytes are destroyed by radiotherapy. To reestablish the granulocytic lineage, which of the following cells should be transplanted?

A. Promyelocytes.

B. Metamyelocytes.
C. Promonocytes.
D. Band cells.
E. Myelocytes.

Answer: A

33- Examination of a normal peripheral blood smear reveals a cell more than twice the diameter of an erythrocyte with a C-shaped nucleus and a frosted glassy cytoplasm; Which of the following cell types is being described?

A. Basophil.
B. Eosinophil.
C. Lymphocyte.
D. Neutrophil.
E. Monocyte.

Answer: e

34-Regarding granulopoiesis, choose the WRONG statement:

A. Azurophilic granules first appear at the promyelocyte stage.
B. Secondary granules first appear at the myelocyte stage.
C. Metamyelocytes have kidney-shaped nuclei and cannot divide.
D. Both types of granules in granulopoiesis cells are synthesized by the free ribosomes.
E. Band cells are almost mature granulocytes but without segmented nuclei.

Answer: D

35- Thrombocytes, choose the WRONG statement:

A. Microtubules and microfilaments are found in the outer marginal bundle.
B. Have thick glycocalyx.
C. Originate from bone marrow cells with many dynamic cell projections.
D. Often form basophilic clumps in histological preparations.
E. Formation of germinal centers for B-cell proliferation in each node's cortex

Answer: E

39- Lymphatic organs, choose the WRONG statement:

A. Blood lymphocytes enter the spleen through marginal zone sinuses and enter the lymph nodes through postcapillary venules.
B. Aggregations of lymphocytes occupy the majority of splenic parenchyma.
C. The variation in color intensity of thymic lobules (cortex and medulla) is attributed to the density of thymocytes.
D. Cells with TCR proteins that bind to MHC-1 will express CD8 proteins at the end of thymic education.
E. PALS area in spleen and paracortex in lymph nodes are considered thymus dependent zones.

Answer: B

40- In the spleen, the plasma cells are found mainly in?

A. Splenic sinuses of the splenic red pulp.
B. Periarteriolar lymphoid sheaths of splenic white pulp.
C. Primary follicles of splenic white pulp.
D. Germinal centers of Malpingian corpuscles.
E. Cords of Billroth of the splenic red pulp.

Answer: E

41- The presence of which one of the following characteristics is of the least value in distinguishing lymph nodes from spleen?

A. High endothelial venules.
B. Afferent lymphatic vessels at capsule.
C. Lymphatic sinuses.
D. Stromal reticular tissue.
E. Cortical lymphatic follicles.

Answer: D

42- Blood formed elements, choose the wrong statement:

A. Erythrocytes lack class 1 MHC molecules.
B. Both basophil and mast cell are granulated but basophil nucleus is lobulated while the mast cell nucleus is round.
C. Human thrombocytes have, in contrast to erythrocytes, never been individual nucleated cells.
D. The Internum of eosinophilic granules contains major basic protein.
E. Most neutrophils in female peripheral blood normally show barr bodies.

Answer: E

43- Choose the wrong statement:

A. Platelets in contrast to RBCs show never individual nucleated cells in blood

B. Externum of eosinophils contains major basic protein

Answer: B

44- True about blood-thymus barrier

Answer: antigens that cross is cause immunological tolerance

45- Wrong about granulopoiesis

Answer: peripheral blood count of neutrophils is an absolute measure of their total count

46- Wrong about the spleen

Answer: like HEC of the lymph node, marginal sinuses only allow lymphocytes to go to the spleen

47-Wrong about WBCs

Answer: eosinophils are more phagocytic and bactericidal than neutrophils

48- Which of the following is the correct pathway when one lymph node sends a lymphocyte to educate another lymph node about antigenic stimulation?

A. Post-capillary venules →Thoracic duct →Systemic Circulation →Efferent lymphatic vessel
B. Afferent lymphatic vessel → Post-capillary venules → Efferent lymphatic vessel
C. Afferent lymphatic vessel → Thoracic duct → Systemic Circulation → Efferent lymphatic vessel
D. Afferent lymphatic vessel → Thoracic duct → Efferent lymphatic vessel
E. Efferent lymphatic vessel → Thoracic duct → Systemic Circulation → Post-capillary venules

Answer: E

49-Which of the following is NOT true of neutrophilia?

A. Neutrophilia is not always associated with an increased production of neutrophils
B. Apparent neutrophilia results in the migration of neutrophils from the marginating compartment to the circulating one.
C. Intense muscular exercise increases the number of neutrophils for many days.
D. Band cells and metamyelocytes can be seen sometimes in certain bacterial infections
E. Glucocorticoids increase the mitotic activity and result in increased production of neutrophils

Answer: C

50- Which of the following statements is NOT CORRECT?

A. Dendritic cells trap antigens on their surface and present them to T or B cells
B. Interdigitating dendritic cells are found in the thymus-dependent zones of the lymph nodes and spleen
C. Follicular dendritic cells can present an antigen not associated with MHC to a B cell
D. The first cells to be activated in a secondary immune response are memory B cells

Answer: B

51-Removal of the old and aged erythrocytes from the circulation:

A. Is due to the dilated endothelium and large pores in the lining of the sinusoids of the spleen
B. Takes place in the marginal zone sinuses
C. Occurs in the lymph node
D. Is the function of splenic cords
E. A + B

Answer: A

51- The wrong statement:

Answer: Macrophages secretes IL-2 that stimulates T-cells

It should be IL1

52- Which of the following cells their granules contain peroxidase and histaminase:

Answer: eosinophile.

Physiology

1-Most of the blood exists in?

A. arteries
B. veins
C. heart
D. lungs
E. capillaries

Answer: B

2- Wrong about eosinophil

A. like neutrophils, they migrate to the inflammation site
B. they don't play any role in wound healing
C. easily detected in blood samples
D. with basophils, they form 5% of blood cells

Answer: B

3- Fibrin stabilizing factor is:

A. factor V
B. factor VII
C. factor X
D. factor XIII
E. factor II

Answer: B

4-In severe chronic anemia all of the following are compensatory mechanisms, choose the wrong answer

A. PO2 increases in arterial part
B. 2,3-BPG increases
C. cardiac output at rest is increased
D. affinity of hemoglobin to oxygen is decreased

Answer: A

5- Blood sample with MCH=12g/dl , and blood cells count = 3.2m/microL , choose the right answer:

A. MCV can be measured
B. MCH can be measured
C. MCHC can be measured

D. this represents normal men values

note: this is the question as it is in the past papers, however, I think he meant (hb mass=12 not mch) so the asw will be mch

Answer: B

6- Wrong about blood Ph:

A. acidosis is below 7.35
B. alkalosis is above 7.45
C. blood Ph is different from water Ph as the neutral Ph is 7.4 rather than being 7
D. any change in Ph causes death

Answer: D

7- Regarding hemophilia A , a healthy man has married carrier women, choose the wrong statement regarding their children

A. half of males are diseased
B. half of females are carriers
C. half of females are healthy
D. All females are carriers

Answer: D

8- Which of the following isn't true

A. IDA and sideroblastic anemia are the most common forms of microcytic anemia
B. IDA is common clinical problem throughout the world
C. IDA affects 30% of the world's population
D. Indices calculated from the blood are defined

Answer: A

9-Choose the wrong statement regarding iron absorption

A. stomach acidity influence iron absorption
B. non heme iron is absorbed from the whole intestine
C. heme iron is preferential in meat products compared to non-heme iron

Answer: B

10-Which of the following combinations is not true

	Hemophilia a	Von.w.disease
A. Inheritance	x-linked	autosomal
B. Bleeding time	Normal	prolonged
C. VIII.c	low	low
D. VIII.ag	normal	low
E. Aggregation	normal	Normal

Answer: E

11- About hemoglobin, choose the true statement

A. hemoglobin saturation curve is dependent on PO2 and hemoglobin concentration
B. O2 content is dependent only on PO2 and independent on Hemoglobin concentration
C. hemoglobin saturation curve in independent on hemoglobin concentration

Answer: C

12-Wrong about hemophilia A:

A. it is sex linked
B. causes prolonged bleeding

Answer: B

13-Heparin blocks blood-coagulation by:

A. Inducing the activity of tissue factor pathway inhibitor
B. Activating plasminogen activation
C. Inhibiting the release of contents of platelet granules
D. Sequestering calcium ions
E. Promoting the interaction of anti-thrombin III to thrombin

Answer: e

14- One of the following is NOT true in regards to tissue factor:

A. It is found on the surface of subendothelial cells
B. It forms a complex with factor VII
C. It links the intrinsic and extrinsic pathways
D. Its activity requires calcium ions
E. It is critical in the activation of factors IX and X

Answer: e (according to the past papers)

15-Which one of the following is NOT a cause of vitamin B12 deficiency?

a. Jejunal resection
b. Gastrectomy.
c. Malabsorption.
d. Veganism.
e. Lack of gastric intrinsic factor.

Answer: A

16-One of the following about iron metabolism in the body is NOT true:

A. Iron is important for the formation of not only hemoglobin but also other essential elements in the body.
B. The total iron quantity in the body averages 4-5 gm.
C. There is heme iron and non-heme iron, non-heme iron is absorbed more efficiently than heme iron.
D. The amount of iron absorbed is normally about 3-6 % of the ingested amount. The average daily iron intake is about 20 -30 mg.

Answer: C

17-One of the following statements about the blood is NOT true:

A. The percentage (%) of the fetal hemoglobin in the adult RBC is normally about 1-2%.
B. The percentage (%) of the reticulocyte cells in the bone marrow and peripheral blood is equally distributed.
C. The bone marrow begins to produce blood cells not from the very early months of the fetal life.
D. The fetal hemoglobin is present in every RBC in the blood.
E. The reticulocyte cells are present in the bone marrow and peripheral blood.

Answer: B

18-One of the following about erythropoiesis is NOT true?

A. All the different forms of blood cells are produced at the same time in the fetus from the first month.
B. Even trace elements (copper, cobalt) play a role in normal erythropoiesis.
C. The main hormone that plays a role in erythropoiesis is erythropoietin.
D. Erythropoietin is produced by the kidneys and other organ(s).
E. In the adult the highest erythropoiesis occurs in the vertebrae and pelvis.

Answer: A

19- One of the following about hemoglobin is NOT true:

A. In one hemoglobin molecule there are four hemes and four globins subunits.
B. The term oxygenation is used for hemoglobin binding to oxygen not oxidation.
C. One hemoglobin molecule can bind four oxygen molecules.
D. Binding of four heme in the hemoglobin with oxygen doesn't occur at the same time, and the affinity of the fourth heme to oxygen is many times that of the first.
E. Globins can't bind oxygen but they bind CO, CO2 and hydrogen.

Answer: E

20-With corresponding RBC morphology, one of the following is NOT true:

A. MCV= 69 M3 (fl), MCH= 23 pg, MCHC= 32% The RBCS are microcytic and hypochromic.
B. MCV= 90 M3 (fl), MCH= 30 pg, MCHC= 34% The RBCS are normocytic and normochromic.
C. MCV= 67 M3 (fl), MCH= 20 pg, MCHC= 30% The RBCS are microcytic and hypochromic.
D. MCV= 115 M3 (fl), MCH= 38 pg, MCHC= 33% The RBCS are macrocytic and normochromic.
E. MCV= 85 M3 (fl), MCH= 26 pg, MCHC= 29% The RBCS are normocytic and hypochromic.

Answer: A

21-One of the following statements about Hb-02 relationship is FALSE:

A. When plotted (%) saturation against Po2, the curve will always be the same whatever the Hb concentration is, if other factors remain the same.
B. The (%) saturations of Hb with 02 is dependent on Po2 as well as the Hb concentration.
C. The (%) saturation of Hb with O2 is dependent on Po2 and totally independent of Hb concentration.
D. The quantity of 02 carried in volume of blood is dependent on the Po2 as well as the Hb concentration.
E. If 02 content is plotted against Po2, the level of the curve will be dependent on the Hb concentration of the sample of the blood.

Answer: B

22-An increased in the P50 of the oxygen- hemoglobin dissociation curve occurs with

A. A decrease in hydrogen ions.
B. A decrease in the PCO2.
C. A decrease in diphosphoglycerate ions.
D. Exercise.

E. A decrease in temperature.

Answer: D

23-Which ONE of the following O2 Carriers elements has higher 02 affinity (its Hb-02 dissociation curve shifts to the left)?

A. Hemoglobin A (HBA).
B. Hemoglobin A2.
C. Have the same affinity.
D. hemoglobin.
E. Myoglobin.

Answer: E

24- One of these doesn't change between genders?

Answer: MCV

25- If hemophilic male gets married from hemophilic carrier female which one of the followings could NOT be the result of this marriage?

A. All the females aren't healthy.
B. 50% of the males they look healthy.
C. All the children they look healthy.
D. 50% of the females they look healthy.
E. % of the females are hemophilic.

Answer: C

26-Blood platelets assist in arresting bleeding by; Choose the INCORRECT answer:

A. Liberating high concentration of calcium.
B. Releasing factors promoting blood clotting.
C. Adhering together to form plugs when exposed to collagen.
D. Serotonin from platelets can release vascular plasminogen activators.
E. Releasing factors causing vasoconstriction.

Answer: D

27-One of the following about blood function is NOT completely true:

A. The patients of Covid-19 who have sufficient amount of vitamin D in the blood show lower suffering and symptoms of the corona virus infection.
B. the blood (body) pH.
C. Regulates the body temperature.
D. Provides blood clotting factors.

E. The main part of the immune system in the body are the white blood cells only.

Answer: E

28-Wrong about a 40-year-old woman with: 110 g/L Hb, 3x10^12/L RBCs and a mean cell diameter of 8.2 microns
Answer: Most likely is IDA

29-Wrong about eosinophils:

Answer: with basophils form 10% of WBCs

30-Wrong match about clotting:

Answer: factor XIII is for the intrinsic pathway

31-Least important clotting factor:

Answer: XII

32-Not activated by thrombin:

Answer: IX

Note: it activates>>> fibrinogen/factors:5,8,13/platelets/protein c

33-Wrong about von Wilibrand disease:
Answer: VIII:C is normal

34- Knowing Hb and cell count you can find:

Answer: MCH

35- Wrong about Iron:

Answer: is mostly absorbed in the jejunum

36- Wrong about B12:

Answer: its deficiency mostly affects WBCs

37- Which of the following about Hemophilia-A and Von-Willibrand inheritance is NOT TRUE:

A. Von-Willibrand is a hemorrhagic disease
B. Hemophilia-A is usually confined to males
C. Hemophilia-A is inherited as a sex-linked abnormality
D. Hemophilia-A passes on from mother to child
E. Von-Willibrand disease also appears in males only.

Answer: E

38- Which of the following statements about iron is NOT TRUE:

A. More than 65% in hemoglobin
B. The iron daily intake is usually equal to daily iron requirement
C. Women have less store of iron than man
D. Iron absorption mostly at upper part of jejunum
E. There is more iron absorption from meat and meat products than that from vegetables

Answer: B

39- HbF Wrong statement:

Answer: It has affinity for O2 similar to that of Myoglobin which in both more than the Hemoglobin affinity for O2.

40- which of the following is a rare cause of anemia:

A. vit B 12 deficiency
B. folate deficiency
C. iron absorption defect

Answer: A

41- 62 year old male, presented with microcytic hypochromic anemia, which of the following is the most common cause of the condition:

A. GI bleeding
B. Malabsorption
C. b12 deficiency

Answer: A

42- which one of these Hemoglobin isn't normally found in our body?

A. Hb H
B. Hba
C. Hba2
D. Hbf

Answer: A

43- which of the following combinations isn't true:

A. factor 3 … tissue thromboplastin ...extrinsic pathway
B. factor 10 ... steuart factor ...both
C. factor 13 ... fibrin stabilizing factor ... intrinsic
D. factor 12...hageman factor ...intrinsic

Answer: C

44- which of the following statements best describes why rbcs are efficient in carrying oxygen:

A. contain Hb
B. have no nucleus
C. biconcave in shape
D. have mitochondria needed to produce atp
E. O2 molecules are carried by Hb

Answer: **all except d**

45- which of the following regarding leukocytes is correct:

A. they move out of tissue in a process called emigration
B. neutrophils and macrophages are required in phagocytosis
C. inflammatory cells are attracted by bacterial molecules and inflamed tissue by process called chemotaxis
D. leukopenia is an increased in the number of leukocytes in the circulation

Answer: **all except d**

46- which is wrong:

Answer: thrombin, urokinase and streptokinase are plasminogen activators

47. Not strictly a function of the blood?

A. Maintains homeostasis
B. Transports hormones and vitamins
C. Plays a role in hemostasis
D. Carrying oxygen and CO2
E. Defense against microbes and toxins

Answer: A

48- Which of the following shifts HB saturation curve to the left?

A. 2.3 BPG ↑

B. CO2 ↑

C. 2.3 BPG ↓

D. Temperature ↑

Answer: C

49- Choose the wrong statement:

A. All iron is absorbed in the duodenum
B. Men have lower iron than women
C. women have lower hematocrit than men
D. mcv is the same in both men and women

Answer: B

50- Most of the blood exists in:

A. arteries
B. veins
C. heart
D. lungs
E. capillaries

answer: b

51- Which of the following is wrong about blood PH?

A. acidosis is below 7.35
B. alkalosis is above 7.45
C. blood Ph is different from water Ph as the neutral Ph is 7.4 rather than being 7
D. any change in PH causes death

answer: d

52- A 40-year old woman with 110 g/L Hb, 3x10^12/L RBCs and a mean cell diameter of 8.2 microns is not suspected to have:

A. IDA
B. B12 deficiency
C. Folate deficiency

answer: a

53- Which of the following is wrong about B12 deficiency?

A. it leads to megaloblastic anemia
B. it mostly affects WBCs
C. hemoglobin content is relatively high

answer: b

54- Which of the following is wrong about albumin?

A. it maintains exchange of fluids
B. it is the most abundant plasma protein

C. it transports CO2

answer: c

55-Which of the following is a rare cause of anemia?

A. iron deficiency
B. vitamin B12 deficiency
C. chronic inflammation

answer: b

56-Arrange the following according to activity in hematopoiesis-descending arrangement?

1. Vertebra **2. Sternum**

3. Femur **4. Tibia**

5. Ribs

A. 1,2,3,4,5
B. 1,2,5,3,4
C. 2,1,5,3,4
D. 2,3,5,4,3

answer: b

57- Which of the following is true about iron?

A. the absorption of non heme iron is restricted to the jejunum
B. iron is absorbed in ferric form more readily than ferrous form
C. the second storage for iron in the blood is ferritin

answer: c

58-All of the following are required in heme synthesis EXCEPT:

A. Glycine
B. Pyridoxal Phosphate
C. Succinyl CoA
D. Acetyl CoA
E. Ferrous iron

Answer: d

59-Which of the following statements most describe why RBC's are efficient in carrying oxygen:

1. contains hemoglobin

2. have no nucleus

3. have many mitochondria needed to produce ATP

4. biconcave shape

5. 4oxygen molecules are carried by hemoglobin

A. 1, 3,4
B. 2, 4, 5
C. 1, 2, 4, 5
D. 1, 2, 3, 5
E. 1, 2, 3, 4, 5

answer: c

60-Which of the following regarding iron absorption in NOT TRUE?

A. the daily iron intake is usually equal to daily iron requirement
B. women have less stored iron than men
C. more than 65 % of iron is present in hemoglobin
D. iron absorption is mainly in the upper part of the jejunum
E. there is more iron absorption from meat and meat products than from vegetables

answer: a

61-Which of the following is true about transferrin?

A. It binds only 2 molecules of iron
B. Used for transport and storage of iron in the blood
C. It binds to iron in its ferrous form

answer: a

62-Which of the following is not true?

A. IDA & sideroblastic anemia are the most common forms of microcytic anemia
B. indices calculated from blood cells are defined
C. IDA is common clinical problem throughout the world
D. estimated to affect 30% of the world's population

answer: a

(Note: Defined=Can be calculated)

63. A 23-year-old female with a red cell count of 3.2 x 10^6/microliter, hematocrit of 37%, and hemoglobin concentration of 120g/L.

According to the above parameters, which of the following statements is TRUE ?

A. the RBCS are normocytic, normochromic
B. the RBCS are microcytic, normochromic
C. the RBCS are microcytic, hypochromic
D. the RBCS are macrocytic, normochromic
E. the RBCS are macrocytic, hyperchromic

answer: d

64- In severe chronic anemia, all of the following are compensatory mechanisms except:

A. PO2 increases in arterial part
B. 2,3-BPG increases
C. cardiac output at rest is increased
D. affinity of hemoglobin to oxygen is decreased

answer: a

65- Choose the true statement about hemoglobin:

A. hemoglobin saturation curve is dependent on PO2 and hemoglobin concentration
B. O2 content is dependent only on PO2 and independent on Hemoglobin concentration
C. hemoglobin saturation curve is independent on hemoglobin concentration

answer: c

66- A blood sample was tested and the results indicated a red cell count of 3.8 x 10/L and hemoglobin concentration of 16g/deciliter. From the following data:

A. We can tell that the person is a female
B. We can directly calculate the mean corpuscular volume (MCV)
C. We can directly calculate the mean corpuscular hemoglobin (MCH)
D. We can directly calculate the mean corpuscular hemoglobin concentration (MCHC)
E. We can directly tell if the red blood cells are normocytic, microcytic or macrocytic

answer: c

67- Which of the following regarding % saturation of hemoglobin and oxygen content is NOT CORRECT?

A. The % saturation of hemoglobin is dependent on pO2, and completely independent on the concentration of hemoglobin
B. The oxygen content is dependent on the concentration of hemoglobin
C. The % saturation of hemoglobin is dependent on pO2, as well as on the concentration of hemoglobin
D. The oxygen content VS pO2, will change if the concentration of hemoglobin is changed
E. The % saturation of hemoglobin VS pO2 graph will remain the same despite changing the hemoglobin concentration

answer: c

68- Which of the following results in shift to the right in hemoglobin-oxygen saturation curve?

A. exercise
B. decrease in temperature
C. increase in PH
D. decrease in PCO2
E. decrease in 2,3-diphosphoglycerate

answer: a

69- Which of the following is wrong about HbF?

A. it could be found in fetus as well as in adults but in different concentrations
B. it has affinity for O2 similar to that of Myoglobin which is higher than the Hemoglobin affinity for O2
C. it can carry 8 Oxygen atoms

answer: b

70- Which of the following is wrong about WBCs?

A. in chronic meylogenous leukemia you see high blood count of myeloblasts
B. leuckemia results when leukocyte count increases and doesn't return back to normal
C. usually the more undifferentiated the WBCs, the more acute is the leukemia

answer: a

71- Which of the following is wrong about lymph?

A. It contains plasma proteins
B. It contains cells
C. lymph flow increases by muscle contractions (increases with muscular activity)
D. fluids filtered are usually less than reabsorbed

Answer: d

72- A tissue that has no lymphatic capillaries

A. GIT
B. Respiratory tract
C. CNS
D. UGT

Answer: c

73- A fall in sodium plasma concentration:

A. Decreases the freezing point of plasma

B. Increases intracellular fluid volume
C. Is not associated with thirst
D. Can't be caused by excessive (uncontrolled) secretion of ADH (anti- diuretic hormone)
E. Causes edema

Answer : b

74- Which of the following about Hemophilia A and Von-Willibrand inheritance is NOT TRUE?

A. Von-Willibrand is a hemorrhagic disease

B. Hemophilia A is usually confined to males

C. Hemophilia A is inherited as a sex-linked abnormality

D. Hemophilia A passes from mother to child

E. Von-Willibrand disease also appears in males only

Answer : e

75- Which of the following combinations is NOT TRUE?

	Factor	Factor Name	Pathway involved
a	3	Tissue Thromboplastin	Extrinsic Pathway
b	10	Stuart Factor	Both Pathways
c	1	Fibrinogen	Both Pathways
d	12	Hageman Factor	Intrinsic Pathway
e	13 Factor	Fibrin Stabilizing	Intrinsic Pathway

Answer: e

76- Most of the blood exists in:

A. arteries

B. veins

C. heart

D. lungs

E. capillaries

answer: b

77- Which of the following is wrong about blood PH?

A. acidosis is below 7.35

B. alkalosis is above 7.45

C. blood Ph is different from water Ph as the neutral Ph is 7.4 rather than being 7

D. any change in PH causes death

answer: d

78- A 40-year old woman with 110 g/L Hb, 3x10^12/L RBCs and a mean cell diameter of 8.2 microns is not suspected to have:

A. IDA

B. B12 deficiency

C. Folate deficiency

answer: a

79- Which of the following is wrong about B12 deficiency?

A. it leads to megaloblastic anemia

B. it mostly affects WBCs

C. hemoglobin content is relatively high

answer: b

80- Which of the following is wrong about albumin?

A. it maintains exchange of fluids

B. it is the most abundant plasma protein

C. it transports CO2

answer: c

Which of the following is a rare cause of anemia?

D. Iron deficiency

E. B. vitamin B12 deficiency

F. Chronic inflammation

answer: b

81- Arrange the following according to activity in hematopoiesis-descending arrangement?

1 .Vertebra

2 . Sternum

3 . Femur

4 . Tibia

5 . Ribs

A. 1,2,3,4,5

B. 1,2,5,3,4

C. 2,1,5,3,4

D. 2,3,5,4,3

answer: b

82- Which of the following is true about iron?

a. the absorption of non heme iron is restricted to the jejunum

b. iron is absorbed in ferric form more readily than ferrous form

c. the second storage for iron in the blood is ferritin

answer: c

83- All of the following are required in heme synthesis EXCEPT:

a. Glycine

b. Pyridoxal Phosphate

c. Succinyl CoA

d. Acetyl CoA

e. Ferrous iron

Answer: d

84- Which of the following statements most describe why RBC's are efficient in carryingoxygen:

1. contains hemoglobin

2. have no nucleus

3. have many mitochondria needed to produce ATP

4. biconcave shape

5. 4oxygen molecules are carried by hemoglobin

a. 1, 3,4

b. 2, 4, 5

c. 1, 2, 4, 5

d. 1, 2, 3, 5

e. 1, 2, 3, 4, 5

answer: c

85- Which of the following regarding iron absorption in NOT TRUE ?

a. the daily iron intake is usually equal to daily iron requirement

b. women have less stored iron than men

c. more than 65 % of iron is present in hemoglobin

d. iron absorption is mainly in the upper part of the jejunum

e. there is more iron absorption from meat and meat products than from vegetables

answer: a

86- Which of the following is true about transferrin?

A. It binds only 2 molecules of iron

B. Used for transport and storage of iron in the blood

C. It binds to iron in its ferrous form

answer: a

87- Which of the following is not true?

A. IDA & sideroblastic anemia are the most common forms of microcytic anemia

B. indices calculated from blood cells are defined

C. IDA is common clinical problem throughout the world

D. estimated to affect 30% of the world's population

answer: a (Note: Defined=Can be calculated)

89- A 23 year-old female with a red cell count of 3.2 x 10^6/microliter, hematocrit of 37%, and hemoglobin concentration of 120g/L. According to the above parameters, which of the following statements is TRUE?

A. the RBCS are normocytic, normochromic

B. the RBCS are microcytic, normochromic

C. the RBCS are microcytic, hypochromic

D. the RBCS are macrocytic, normochromic

E. the RBCS are macrocytic, hyperchromic

answer: d

90-In severe chronic anemia, all of the following are compensatory mechanisms except:

A. PO2 increases in arterial part

B. 2,3-BPG increases

C. cardiac output at rest is increased

D. affinity of hemoglobin to oxygen is decreased

answer: a

91-Choose the true statement about hemoglobin:

A. Hemoglobin saturation curve is dependent on PO2 and hemoglobin concentration

B. O2 content is dependent only on PO2 and independent on Hemoglobin concentration

C. Hemoglobin saturation curve is independent on hemoglobin concentration

answer: c

92- blood sample was tested and the results indicated a red cell count of 3.8 x 10/L and hemoglobin concentration of 16g/deciliter. From the following data:

A. We can tell that the person is a female

B. We can directly calculate the mean corpuscular volume (MCV)

C. We can directly calculate the mean corpuscular hemoglobin (MCH)

D. We can directly calculate the mean corpuscular hemoglobin concentration (MCHC)

E. We can directly tell if the red blood cells are normocytic, microcytic or macrocytic

answer: c

93- Which of the following regarding % saturation of hemoglobin and oxygen content is NOT CORRECT?

The % saturation of hemoglobin is dependent on pO2, and completely independent on the concentration of hemoglobin

a. The oxygen content is dependent on the concentration of hemoglobin

b. The % saturation of hemoglobin is dependent on pO2, as well as on the concentration of hemoglobin

c. The oxygen content VS pO2, will change if the concentration of hemoglobin is changed

d. The % saturation of hemoglobin VS pO2 graph will remain the same despite changing the hemoglobin concentration

answer: c

94- Which of the following results in shift to the right in hemoglobin-oxygen saturation curve?

A. exercise

B. decrease in temperature

C. increase in PH

D. decrease in PCO2

E. decrease in 2,3- diphosphoglycerate

answer: a

95- Which of the following is wrong about HbF?

A. it could be found in fetus as well as in adults but in different concentrations

B. it has affinity for O2 similar to that of Myoglobin which is higher than the Hemoglobin affinity for O2

C. it can carry 8 Oxygen

answer: b

96- Which of the following is wrong about WBCs?

A. in chronic myelogenous leukemia you see high blood count of myeloblasts

B. leukemia results when leukocyte count increases and doesn't return back to normal

C. usually the more undifferentiated the WBCs, the more acute is the leukemia

answer: a

97- Which of the following is wrong about lymph?

a. It contains plasma proteins

b. It contains cells

c. lymph flow increases by muscle contractions (increases with muscular activity)

d. fluids filtered are usually less than reabsorbed

answer: d

98-A tissue that has no lymphatic capillaries

A. GIT

B. Respiratory tract

C. CNS

D. UGT

answer: c

99-A fall in sodium plasma concentration:

A. Decreases the freezing point of plasm

B. Increases intracellular fluid volume

C. Is not associated with thirst

D. Can't be caused by excessive (uncontrolled) secretion of ADH (anti- diuretic hormone)

E. Causes edema

Answer: b

100- Which of the following combinations is NOT TRUE?

	Factor	Factor Name	Pathway involved
a	3	Tissue Thromboplastin	Extrinsic Pathway
b	10	Stuart Factor	Both Pathways
c	1	Fibrinogen	Both Pathways
d	12	Hageman Factor	Intrinsic Pathway
e	13 Factor	Fibrin Stabilizing	Intrinsic Pathway

Answer: e

101- Which of the following regarding iron absorption in NOT TRUE?

A. The daily iron intake is usually equal to daily iron requirement

B. Women have less store of iron than men

C. More than 65 % of iron is present in hemoglobin

D. Iron absorption is mainly in the upper part of the jejunum

E. There is more iron absorption from meat and meat products than from vegetables

Answer: a

102 -A blood sample was tested and the results indicated a red cell count of 3.8 x 1012/L and Hemoglobin concentration of 16g/deciliter. From the following data:

A. We can tell the person is a female

B. We can calculate the mean corpuscular volume (MCV)

C. We can calculate the mean corpuscular hemoglobin (MCH)

D. We can calculate the mean corpuscular hemoglobin concentration (MCHC)

E. We can tell if the red blood cells are normocytic, microcytic or macrocytic.

Answer: c

103- All of the following regarding the bleeding caused by a small cut wound in the skin are true EXCEPT:

A. Can be stopped by a vascular spasm

B. It will stop within a period of 5 minutes

C. It will be prolonged if Von-Will brand factor is deficient

D. It will be prolonged in the case of thrombocytopenic purpura

Answer: c

105- All of the following are required in heme synthesis EXCEPT:

A. Glycine

B. Pyridoxaloshate

C. Succinyl CoA

D. Acetyl CoA

E. Ferrous iron

Answer: d

106- Which one of the following about the HCT is NOT true:

a. The value of HCT is usually 45%.

b. The HCT expresses the (%) of red blood cells in a volume of whole blood.

c. The values of HCT closely paralleled the values of hemoglobin & red cell count.

d. The space occupied by the packed red blood cells is termed the hematocrit.

e. The value of HCT does not vary with age & sex of the individual

answer: e

107- Which ONE of the following 02 Carriers elements has higher 02 affinity (its Hb-02 dissociation curve shifts to the left)?

A. Hemoglobin A (HBA).

B. Hemoglobin A2.

C. Have the same affinity.

D. Fetal hemoglobin.

E. Myoglobin.

Answer: e

108- An increased in the P50 of the oxygen- hemoglobin dissociation curve occurs With;

a. Decrease in hydrogen ions.

b. A decrease in the PCO2.

c. A decrease in diphosphoglycerate ions.

d. Exercise.

e. A decrease in temperature

answer: d

109- One of the following statements about Hb-02 relationship is FALSE:

A. When plotted (%) saturation against Po2, the curve will always be the same whatever the Hb concentration is, if other factors remain the same.

B. The (%) saturations of Hb with 02 is dependent on Po2 as well as the Hb concentration.

C. The (%) saturation of Hb with O2 is dependent on Po2 and totally independent of Hb concentration.

D. The quantity of 02 carried in volume of blood is dependent on the Po2 as well as the Hb concentration.

E. If 02 content is plotted against Po2, the level of the curve will be dependent on the Hb concentration of the sample of the blood.

Answer: b

110- One of the following about erythropoiesis is NOT true?

A. All the different forms of blood cells are produced at the same time in the fetus from the first month.
B. Even trace elements (copper, cobalt) play a role in normal erythropoiesis.
C. The main hormone that plays a role in erythropoiesis is erythropoietin.
D. Erythropoietin is produced by the kidneys and other organ(s).
E. In the adult the highest erythropoiesis occurs in the vertebrae and pelvis.

Answer: a

111 - One of the following statements about the blood is NOT true:

A. The percentage (%) of the fetal hemoglobin in the adult RBC is normally about 1-2%.
B. The percentage (%) of the reticulocyte cells in the bone marrow and Peripheral blood is equally distributed.
C. The bone marrow begins to produce blood cells not from the very early Months of the fetal life.
D. The fetal hemoglobin is present in every RBC in the blood.
E. The reticulocyte cells are present in the bone marrow and peripheral blood

Answer: b

113- One of the following about iron metabolism in the body is NOT true:

A. Iron is important for the formation of not only hemoglobin but also other essential elements in the body.
B. The total iron quantity in the body averages 4-5 gm.
C. There is heme iron and non-heme iron, non-heme iron is absorbed more efficiently than heme iron.
D. The amount of iron absorbed is normally about 3-6 % of the ingested amount.
E. The average daily iron intake is about 20 -30 mg.

answer: c

114- Choose the wrong statement regarding iron absorption:

a. stomach acidity influence iron absorption
b. non heme iron is absorbed from the whole intestine
c. heme iron is preferential in meat products compared to non heme iron

answer: b

115- A blood sample with MCH=12g/dl , and blood cells count = 3.2m/microL ,choose the right answer

A. MCV can be measured
B. MCH can be measured
C. MCHC can be measured
D. This represents normal men values

answer: b

116- Choose the wrong statement regarding iron absorption

A. stomach influence iron absorption

B. non heme iron is absorbed from the whole intestine

C. heme iron is preferential in meat products compared to non-heme iron

answer : b

117- One of the following about hemoglobin is NOT true:

A. In one hemoglobin molecule there are four hemes and four globins subunits.

B. The term oxygenation is used for hemoglobin binding to oxygen not oxidation.

C. One hemoglobin molecule can bind four oxygen molecules.

D. Binding of four heme in the hemoglobin with oxygen doesn't occur at the same time, and the affinity of the fourth heme to oxygen is many times that of the first.

E. Globins can't bind oxygen but they bind CO, CO2 and hydrogen

Answer : e

118- A 56-year-old female is discovered to have megaloblastic anemia. Her past medical history is significant for alcoholism. Which of the following would be the best treatment option for this patient?

A. Oral vitamin B12.

B. Parenteral vitamin B12.

C. Oral folate

Answer: c

119- All of the following are classifications of dietary deficiencies causing nutritional anemia except:

A. Vitamin B12 (cyanocobalamin).

B. Folic acid.

C. Vitamin D.

D. Iron.

Answer: C

Biochemistry

1) **2,3-bisphosphoglycerate binds weakly to fetal hemoglobin than adult hemoglobinbecause**:

a. The heme pocket is less hydrophobic.
b. Fetal hemoglobin has a serine instead of a histidine 143 residue. c. Fetal hemoglobin has a narrower core.
d. The lysine residue within the core of hemoglobin is replaced by a tyrosine.
e. The N-termini of the alpha chains of fetal hemoglobin are acetylated.

answer: b

2) The reason why liver is not affected by deficiency of pyruvate kinase is:

a. ATP and NADH are compensated by other metabolic pathways.
b. The enzyme is not regulated.
c. Reduced activity is compensated by increased expression.
d. Reduced activity is compensated by alternative expression of pyruvate kinase M1.
e. Reduced pyruvate level is compensated by increase uptake of pyruvate.

Answer: c

3) G6PD Mediterranean is characterized by:

a. Reduced stability of the enzyme.
b. Reduced expression, stability, and activity of the enzyme.
c. Reduced activity of the enzyme.
d. Reduced expression of the enzyme.
e. Reduced stability and activity of the enzyme.

Answer: C

4) This hemoglobin variant is both a quantitative and a qualitative hemoglobinopathy:

a. Hb Hammersmith.
b. Hb Kansas.
c. HbS.
d. HbE.
e. HbC.

Answer: d

5) Mutation of distal histidine into tyrosine results in:

a. Inability to bind to methemoglobin reductase.
b. Inability to release oxygen.
c. Oxidation of iron.
d. Attraction of carbon monoxide.
e. Stabilization of the R form of hemoglobin.

Answer: C

6) Which of the following is wrong about HbE?

a. It is caused by mutation that affects B chain
b. It is common in Africans
c. It results in defected proteins
d. A truncated (short) beta-chain is produced

answer: b

7) Hb Cowtown where His 146 is replaced by Leucine, choose the correct statement:

a. it stabilizes R state and increases affinity for oxygen
b. it stabilizes T state and increases affinity for oxygen
c. it stabilizes R state and decreases affinity for oxygen
d. it causes degradation of protein

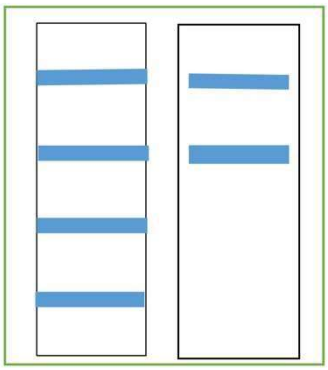
answer: a

8) Hb Bart means that you have:

a. 4 chains of gamma
b. 4 chains of beta
c. 3 chains of beta and 1 chain of alpha

answer: a

9) You have sample X and S in heme electrophoresis, what can you conclude about sampleS? (in X you have HbA, HbC, HbS, HbF, NOT ORDERED)



a. HbS homozygous
b. HbS heterozygous
c. HbSC
d. A neonate 4 weeks before birth

answer: d

10) Fetal pyruvate kinase influence to have hemoglobin withmore affinity is by:

a. producing more ATP
b. producing more 2,3-BPG
c. producing less 2,3-BPG

answer: c

11) G6PD deficiency class 2 (Mediterranean) produce an enzyme with

a. more activity
b. less stability
c. less activity
d. B+C

answer: c

12) Which of the following doesn't happen in RBC?

a. PPP
b. Heme Synthesis
c. glycolysis

answer: b

13) Which of the following is true?

a. most cells, unlike RBCs, have another pathway to synthesize NADPH
b. NADH is required for the activity of cytochrome b5 reductase
c. G6PD deficient Mediterranean variant shows severe enzyme deficiency of young cells
d. all of the above are true

answer : d

14) Which of the following doesn't cause hemoglobinopathy?

a. increasing the tendency of iron to stay in the ferrous form
b. decreasing numbers of hemoglobin
c. changing hemoglobin structure

answer: a

15) Which of the following is true about Hb?

a. β4 Hb has a more sigmoidal saturation curve and thus higher p50
b. Hb Bart is composed of 2γ 2α

answer: a

16) Which of the following is wrong about G6PD deficiency?

a. GSH is normally maintained in the reduced form by Glutathione reductase
b. G6PD gene is located on the X chromosome
c. G6PD deficiency is mainly caused by large deletions

answer: c

17) Which of the following regarding glutathione and G6PD deficiency is NOT CORRECT?

a. Glutathione is a tri-peptide that consists of (gly-cys-glu)
b. G6PD production of NADPH is required to maintain glutathione in a reduced state
c. G6PD A variant (class III) is associated with 80% enzyme activity in reticulocyte cells
d. In cells such as the liver, G6PD is not the only way for the production of NADPH
e. G6PD deficiency is associated with non-sense and frameshift mutations

answer: e

18) Which of the following is not true about thalassemia major?

a. HbA2 increases in B thalassemia
b. HbF increase in B thalassemia
c. Hb Bart's increase in a thalassemia
d. in a thalassemia major 3 or 4 copies are mutated but in B thalassemia major 2 copies are mutated

answer: d

19) An amino acid substitution in one of chains of hemoglobin could lead to hemoglobinopathy (hemoglobin with abnormal function) for any of the following reasonsEXCEPT:

a. An increase in the 2,3-BPG binding affinity
b. A change in the affinity of subunits contact
c. A change in the solubility properties of reduced hemoglobin
d. An increase in the hydrophilic property of heme-pocket
e. An increase tendency of the heme iron to exist in the reduced state

answer: e

20) Which of the following is true about HbS and HbA?

a. both have different migration speed in electrophoresis at PH 1-2
b. both have different migration speed in electrophoresis at PH 8-9

answer: b

21) Which of the following can't be present in beta thalassemia:

a. HbH
b. HbA
c. HbF

answer: a

22) Why 2,3 BPG is low in fetal tissues?

Ans: Accelerate conversion to subsequent products

24) Hb H is caused by:

Answer: deletion of 3 genes

25) A27 years old firefighter is brought to the emergency room after being exposed to smokeduring a training exercise. He looks ill and has labored breathing. He is clutching his head and exhibits an altered mental status. On examination, you note that he appears red, and his pulse oximetry reads 100%. You suspect carbon monoxide toxicity. What is true of the oxygen saturation curve during carbon monoxide toxicity?

a. The oxygen saturation curve is shifted to the left.

b. The oxygen saturation curve is shifted to the right.

c. The effect of carbon monoxide on hemoglobin is similar to that of having increased levels of 2,3 bisphosphoglycerate.

d. The effect of carbon monoxide on hemoglobin is similar to that of a low pH state.

e. The effect of carbon monoxide on hemoglobin is similar to that of an increased temperature state

Answer: A

26) Which one of the following statements concerning hemoglobin is correct?

a. HbA is the most abundant hemoglobin in normal adults.

b. Fetal blood has a lower affinity for oxygen than adult blood because HbF has an increased affinity for 2,3- bisphosphoglycerate.

c. The globin chain composition of HbF is α2δ2.

d. HbA1c differs from HbA by a single, genetically determined amino acid substitution.

e. HbA2 appears early in fetal life.

Answer: A

27) Which one of the following statements concerning the binding of oxygen by hemoglobinis correct?

a. The Bohr effect results in a lower oxygen affinity at higher pH values.

b. Carbon dioxide increases the oxygen affinity of hemoglobin by binding to the C terminal groups of the polypeptide chains.

c. The oxygen affinity of hemoglobin increases as the saturation percentage increases.

d. The hemoglobin tetramer binds four molecules of 2,3- bisphosphoglycerate

e. Oxyhemoglobin and deoxyhemoglobin have the same affinity for protons

Answer: C

28) β-Lysine 82 in HbA is important for the binding of 2,3- bisphosphoglycerate. In Hb Helsinki, this amino acid has been replaced by methionine. Which of the following shouldbe true concerning Hb Helsinki?

a. It should be stabilized in the taut, rather than the relaxed, form

b. It should have increased oxygen affinity and, consequently, decreased oxygen delivery to tissues.

c. Its oxygen-dissociation curve should be shifted to the right relative to HbA.

d. It results in anemia

Answer: B

29) Your diabetic patient has a hemoglobin A1c (HbA1c) of 8.8. HbA1c differs fromunmodified hemoglobin by which one of the following.

a. Amino acid sequence

b. Serine acylation

c. Valine glycosylation

d. Intracellular location

e. Rate of degradation

Answer: C

31) A critical histidine side chain in an enzyme's active site displays a pKa value of 8.2. Which of the following best describes the effect of local environment in which this histidineresidue resides

a. A loss of quaternary structure of the hemoglobin molecule

b. An increase in oxygen binding to hemoglobin

c. A gain of ionic interactions, stabilizing the "T" form of hemoglobin

d. An increase in hydrophobic interactions between deoxyhemoglobin molecules

e. An alteration in hemoglobin secondary structure leading to loss of the "α" helix

Answer: C

31) A compensatory mechanism to allow adequate oxygen delivery to the tissues at highaltitudes, where oxygen concentrations are low, is which one of the following?

A. An increase in 2,3-BPG synthesis by the erythrocyte

B. A decrease in 2,3-BPG synthesis by the erythrocyte

C. An increase in hemoglobin synthesis by the erythrocyte

D. A decrease in hemoglobin synthesis by the erythrocyte

E. Decreasing the blood pH.

Answer: A

32) which of the following regarding % saturation of hemoglobin and oxygen content is NotCorrect

A. the %saturation of hemoglobin is dependent on PO2 and completely independent on hemoglobin concentration.

B. the oxygen content is dependent on the concentration of hemoglobin.

C. the% saturation of hemoglobin is dependent on PO2 as well as the concentration of hemoglobin.

D. the oxygen content VS PO2 will change when the concentration of hemoglobin changed.

E. The % saturation of hemoglobin VS PO2 graph will remain the same despite changing the hemoglobin concentration.

Answer: C

which of the following regarding heme structure and abnormalities is correct?

A. heme consists of a tetrapyrrole ring with 4 methy ,2 propionateand 2vinyl groups.

B. structural changes in the heme are the most common cause inabnormal hemoglobin.

C. heme iron is found in aqueous solution will be present in theferrous state

D. the distal histidine of heme is involved in the binding to ferrous iron.

Answer: A

33) All of the following regarding to 2,3BPG are correct except?

A. decrease the oxygen binding capacity of hemoglobin.

B. decrease some effects of sickle cell anemia.

C. Binds to the pocket situated between the two beta globin chains.

D. raises the P50 of hemoglobin.

E. all of the above are correct.

Answer: B

34)Which of the following is wrong about HbA1c

A. measurement of glucose bound to valine on Beta hemoglobin chains.
B. patient should be fasting
C. according to IFCC 100mmol/mol is acceptable.
D. B and C is correct.

Answer: D

35) Which of the following is wrong about allosteric regulation?

A. low Ph decreases the affinity of hemoglobin towards oxygen.
B. the major effect of CO2 is form of carbamate.
C. 2,3-BPG does its action by increasing electrostatic interactions.
D. Bohr effect works by electrostatic interaction between His with negatively charged amino acid on the same chain.

Answer: B

36) Which of the following statement is false?

A. BPG forms salt bridges with lysine, a histidine and in both beta chains.
B. BPG increases the energy needed to transform hemoglobin from T to R state.
C. Both Mb & Hb are affected by 2,3-BPG.
D. none of the above

Answer: C

37) All of the following favor the transformation from the T form to the R form ofhemoglobin except:

A. decreased PH.
B. decreased 2,3-BPG.
C. decreased temperature.
D. all of the above is correct.

Answer: A

38)Which of the following is true about R and T forms of Hb?

A. R releases protons.

B. R has less affinity for oxygen than T

Answer: A

39)Which of the following is wrong about the structure of heme?

A. iron is coplanar with the heme in deoxy form Hb

B. Iron can form six bonds

C. porphyrin consists of four rings (designated A-D) called pyrrole rings.

Answer: A

40) Which of the following regarding heme structure and abnormalities is CORRECT?

A. Heme consists of a tetrapyrrole ring, with 4 methyl, 2 vinyl and 2 propionate groups.

B. Structural changes in the heme are the most common cause of abnormal hemoglobin.

C. Heme iron if found in an aqueous solution will be present in the ferrous (Fe^{2+}) state

D. The distal histidine of heme is involved in the binding to ferrous iron

Answer: A

41) All of the following regarding 2,3 BPG are correct EXCEPT?

A. Decreases the oxygen-binding capacity of hemoglobin.
B. Decreases some of the effects of sickle cell anemia
C. Binds to the pocket situated between the two β globin chains.
D. Raises the P50 of hemoglobin
E. all the above are correct.

Answer: B

42) Regarding the binding of 2,3 BPG, it makes a cross-linking by which subunits?

A. B1, A1 subunits.
B. B1 , B2 subunits.
C. B1 , A2 subunits.
D. A1 , A2 subunits.

Answer: B

43) One of the following about hemoglobin is NOT true:

A. In one hemoglobin molecule there are four hemes and fourglobins subunits.
B. The term oxygenation is used for hemoglobin binding to oxygen not oxidation.
C. One hemoglobin molecule can bind four oxygen molecules.
D. Binding of four heme in the hemoglobin with oxygen doesn't occur at the same time, and the affinity of the fourth heme to oxygen is many timesthat of the first.
E. Globins can't bind oxygen but they bind CO, CO2 and hydrogen.

Answer: E

44) One of the following statements about Hb-02 relationship is FALSE:

A. When plotted (%) saturation against Po2, the curve will always be the samewhatever the Hb concentration is, if other factors remain the same.
B. The (%) saturations of Hb with 02 is dependent on Po2 as well as the Hbconcentration.
C. The (%) saturation of Hb with O2 is dependent on Po2 and totally independentof Hb concentration.
D. The quantity of 02 carried in volume of blood is dependent on the Po2 as well asthe Hb concentration.
E. If 02 content is plotted against Po2, the level of the curve will be dependent onthe Hb concentration of the sample of the blood.

Answer: B

45)An increase in the P50 of the oxygen- hemoglobin dissociation curve occurs with

A. A decrease in hydrogen ions.
B. A decrease in the PCO2.
C. A decrease in diphosphoglycerate ions.
D. Exercise.
E. A decrease in temperature.

Answer: D

46) Which ONE of the following O2 Carriers elements has higher O2 affinity (its Hb-O2 dissociation curve shifts to the left)?

A. Hemoglobin A (HBA).
B. Hemoglobin A2
C. Have the same affinity.
D. Fetal hemoglobin.
E. Myoglobin

Answer: E

47) The R form of hemoglobin is stabilized by:

A. Electrostatic interaction between Asp of beta chain with His within the same chain.
B. Electrostatic interaction between carboxylate of His146 with Lys of alpha chain.
C. Electrostatic interaction between His146 of beta chain with Asp of the alpha chain.
D. Hydrogen bond between Asn of beta chain with Asp within the same chain.
E. Hydrogen bond between Asn of beta chain with Asp of alpha chain

Answer: E

48) Prediabetes is characterized by having these lab results of glucose:

A. 155 mg/dL or 7%

B. 212 mg/dL or 11.8 mmol/L.

C. 120 mg/dL or 40mmol/mol.

D. 9% or11.8 mmol/L.

E. 8% glycosylated glucose or 64 mmol/mol.

Answer: A

49) A carbamate is formed between CO2 and?

A. Arg141 of the alpha chain.

B. His146 of the beta chain Iron of heme.

C. The N-terminus of the alpha chain.

D. The carboxylate end of the beta group.

Answer: C

50) Chloride ions move through the membrane of red blood cells in association withthe movement of:

A. Bicarbonate ion in the opposite direction.

B. Oxygen.

C. Protons in the same direction.

D. Bicarbonate ion in the same direction.

E. Protons in the opposite direction.

Answer: A

51) 2,3-bisphosphoglycerate binds weakly to fetal hemoglobin than adult hemoglobinbecause:

A. The heme pocket is less hydrophobic.

B. Fetal hemoglobin has a serine instead of a histidine 143 residue.

C. Fetal hemoglobin has a narrower core.

D. The lysine residue within the core of hemoglobin is replaced by tyrosine

E. The N-termini of the alpha chains of fetal hemoglobin are acetylated.

Answer: B

52)which of the following doesn't happen in gene expression regulation inhemoglobin?

A. LCR as an enhancer for multiple genes.

B. promoter for each gene.

C. chromatin looping.

D. adding organic groups on genes.

E. protein ubiquitination.

Answer: E

53) In blood transfusion, some components are "rejunivated" because ?

A. hemoglobin affinty towards oxygen decreased.

B. hemoglobin loses its ability to carry oxygen.

C. to repair the PH

D. the hemoglobin can't release oxygen because 2,3BPG is broken.

Answer: D

54)wrong about allosteric regulation :

A. low PH decrease the affinity of hemoglobin towards oxygen.

B. the major effect of CO2 is form carbamate.

C. 2,3BPG does its reaction by increasing electrostatic interactions.

D. the bohr effect is caused by electrostatic interactions between His and negatively charged amino acid in the same chain.

Answer: B

55)Which of the following isn't affected by CO2 on hemoglobin?

Answer: 2,3BPG

56)Which of the following shifts HB saturation curve to the left?

A. 2.3 BPG ↑

B. CO2 ↑

C. 2.3 BPG ↓

D. Temperature ↑

Answer: C

Books' questions

1. A compensatory mechanism to allow adequate oxygen delivery to the tissues at high altitudes, where oxygen concentrations are low, is which one of the following?

A. An increase in2.3-BPG synthesis by the red cell
B. A decrease in2.3-BPG synthesis by the red cell
C. An increase in hemoglobin synthesis by the red cell
D. A decrease in hemoglobin synthesis by the red cell
E. Decreasing the blood pH

The answer is A.Increased 2,3-BPG in the red cell will favor the deoxy conformation of hemoglobin and thus allow more oxygen to be released in the tissues. This is useful because the hemoglobin is 1s not as saturated at high altitudes as at low elevations because of the lower concentration of oxygen at high altitudes.
Answers C andD are incorrect because the red cells do not synthesize proteins.
Answer E is incorrect because reducing the blood pH will not aid in oxygen delivery; the Bohr effect works best when tissue pH is lower than blood pH in order to stabilize the deoxy form of hemoglobin. If the pH of both the blood and the tissue are the same, the Bohr effect will not be able to occur.

2. Drugs are being developed that will induce the transcription of certain globin genes, which are normally silent in patients affected with sickle cell disease. A good target gene forsuch therapy 1n this disease would be which one of the following?
A. The α1 gene
B. The α2 gene
C. The γ gene
D. The β gene
E. The ζ gene

The answer is C. Turning on a gene that would provide a functional alternative to the β gene would enable the defective β protein to be bypassed. Only the γ chain can do this, but it is normally only found in HbF. The δ chain is also a β replacement globin. but it was not listed as a potential answer. Answer D is incorrect because it is the β chain that is mutated, and it is already being expressed. Unlike the α gene, of which there are two copies per chromosome, there is only one copy of the β gene per chromosome. The other genes listed (answers A, B, and E) are α chain replacements, and expression of these genes will not alleviate the problem inherent in the β gene.

3. A family has two children, one with a mild case of thalassemia, and a second with a severe case of thalassemia that requires frequent blood transfusions as part of the treatmentplan. One parent is of Mediterranean descent, the other is of Asian descent. Neither parent

exhibits clinical signs of thalassemia. Both children express 20% of the expected level of β globin; the more severely affected child expresses normal levels of α globin, whereas the less severely affected child expresses only 50% of the normal levels of α globin. Why is thechild who has a deficiency in α globin expression less severely affected?

A. Thalassemia is caused by a mutation in the α gene, and the more severely affected child expresses more of it.
B. The less severely affected child must be synthesizing them ζ gene to make up for the deficiency in α chain synthesis
C. The more severely affected child also has HPFH.
D. The more severely affected child produces more inactive globin tetramers than the less severely affected child
E. Thalassemia is caused by an iron deficiency, and when the child is synthesizing normal levels of α globin, there is insufficient iron to populate all of the heme molecules synthesized.

The answer is D. Thalassemias result from an imbalance in the synthesis of α and β chains. Excessive synthesis of α chains results in their precipitation in developing red cells, which often kills the developing cell. The more severely affected child has an o@'6 ratio of 1:5, whereas the less severely affected child has a ratio of 1:2.5. When β chains are in excess, they form stable tetramers that bind but do not release oxygen. thus reducing the red cell's ability to deliver oxygen. Thus, this difference in chain ratio makes an important difference in the functioning of the red cell.

4. An individual displays an anemic condition and upon molecular analysis is shown to be acompound heterozygote for HbS/HbC. The symptoms exhibited by the patient are more severe than those exhibited by patients with sickle cell trait(HbA/HbS) owing primarily to which one of the following?

A. Increased concentration of HbC molecules in the patient's RBCs B. Increased volume of the patient's RBCs
C. Increased concentration of HDS 1n the patient's RBCs
D. Alterations in the patient's RBC morphology
E. Precipitation of HbS molecules within the patient's RBCs

The answer is C. HbC forms an insoluble tetramer that precipitates in RBCs. Because of this. the concentration of HbS is increased in the RBCs, leading to enhanced sickling as compared to someone who has a mixture of HbS and HbA molecules. The enhanced sickling is not directly the result of the precipitation of the HbC molecules, nor is it a result of an increased volume of RBCs (an increased volume would reduce the concentration of HbS, which would reduce sickling). The HbS molecules will form rods under low-oxygen conditions, but they do not precipitate in the cell as do the HbC molecules. Alterations in RBC morphology are a result of the sickling, not a cause of the sickling.

5. In preparation for a trip to an area of India where chloroquine-resistant malaria is endemic, a young man is given primaquine prophylactically. Soon thereafter, he develops a hemolytic condition due to a deficiency in glucose 6-phosphate dehydrogenase. A less-than-normal level of which of the following is a consequence of the enzyme deficiency and the underlying cause of thehemolysis?

A. Glucose 6-phosphate
B. Oxidized form of nicotinamide adenine dinucleotide
C. Reduced form of glutathione D. Ribose 5-phosphate

Correct answer = C. Glutathione (G-SH) is essential for red cel integrity and is maintained in this reduced (functional) form by nicotinamide adenine dinucleotide phosphate (NADPH)-dependent glutathione reductase. The NADPH is from the oxidative portion of the pentose phosphate pathway. Individuals with a deficiency of the regulated enzyme of this pathway, glucose 6-phosphate dehydrogenase (G6PD), have a decreased ability to generate NADPH and, therefore, a decreased ability to keep G-SH reduced. When treated with an oxidant drug such as primaquine, some patients with G6PD deficiency develop a hemolytic anemia. Primaquine does not affect glucose 6- phosphate levels. Nicotinamide adenine dinucleotide (NAD[H]) is neither produced by the pathway nor used as a coenzyme by G-SH reductase. A decrease in ribose 5-phosphate does not cause hemolysis.

6. In male patients who are hemizygous for X-linked glucose 6-phosphate dehydrogenase deficiency, pathophysiologic consequences are more apparent in red blood cells (RBC) thanin other cells such as in the liver.
Which one of the following provides the most reasonable explanation for this different response?

A. Excess glucose 6-phosphate in the liver, but not in RBC, can be channeled to glycogen, thereby averting cellular damage.
B. Liver cells, in contrast to RBC, have alternative mechanisms for supplying the reduced nicotinamide adenine dinucleotide phosphate required for maintaining cell integrity.
C. Because RBC do not have mitochondria, production of ATP required to maintain cell integrity depends exclusively on the shunting of glucose 6-phosphate to the pentose phosphate pathway.
D. In RBC, in contrast to liver cells, glucose 6-phosphatase activity decreases the level of glucose 6-phosphate, resulting in cell damage.

Correct answer = B. Cellular damage is directly related to decreased ability of the cel to regenerate reduced glutathione, for which large amounts of reduced nicotinamide adenine dinucleotide phosphate (NADPH) are needed, and RBC have no means other than the pentose phosphate pathway of generating NADPH. Itis decreased product (NADPH), not increased substrate (glucose 6-

phosphate), that is the problem. RBC do not have glucose 6-phosphatase. The pentose phosphate pathway does not generate ATP

اللهم إنّي أسألك فهم النّبيين، وحفظ المرسلين والملائكة المقرّبين