



1. Inorganic substances represents..... of plasma:

- A. 55%
- B. 0.9%
- C. 9.1%
- D. 90%

2. Regarding plasma proteins all of the following are true except.....

- A. Total proteins in plasma are about 6-8 g/dl.
- B. Plasma proteins include conjugated proteins as glycoproteins and lipoproteins
- C. All plasma proteins are synthesized in the liver
- D. Albumin is the major human plasma protein

3. Albumin represents.....of total plasma proteins

- A. 40%
- B. 50%
- C. 55%
- D. 60%

4. All of the following are functions of albumin except.....

- A. Responsible for 70 to 80% of osmotic pressure
- B. Helps in the transport of several substances
- C. Assist in blood coagulation
- D. Is used in treatment of hemorrhagic shock and burns

5. Which of the following drugs bind to albumin?

- A. Sulphonamides,
- B. Aspirin,
- C. Penicillin
- D. All of the above

1. B	2. C	3. D	4. C	5. D
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6. Which of the following is a reliable indicator of acute inflammation?

- A. Albumin
- B. α 1-acid glycoprotein
- C. Transferrin
- D. β - Lipoproteins

7. Which of the following become deficient in emphysema?

- A. Albumin
- B. Orosomucoid
- C. α 1-antitrypsin
- D. Haptoglobin

8. The principal protease inhibitor of human plasma is.....

- A. Haptoglobin
- B. Transferrin
- C. C-reactive Protein
- D. α 1-antitrypsin

9. Which of the following minimizes urinary loss of Hb?

- A. Albumin
- B. Haptoglobin
- C. Fibrinogen
- D. β - Lipoproteins

10. Haptoglobin binds.....

- A. Free hemoglobin
- B. Carboxy-hemoglobin
- C. Meth-hemoglobin
- D. Oxy-hemoglobin

6. B	7. C	8. D	9. B	10. A
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**11. Hp-Hb complex is destroyed by:**

- A. Hepatocytes
- B. Neutrophils
- C. Lymphocytes
- D. Reticulo-endothelial cells.

12. Haptoglobin is.....

- A. α 1-globulins
- B. α 2-globulins
- C. β -globulins
- D. γ globulins

13. C-reactive Protein is.....

- A. α 1-globulins
- B. α 2-globulins
- C. β -globulins
- D. γ globulins

14. Transferrin

- A. Can bind to T-lymphocytes and can activate complement
- B. Takes part in coagulation of blood
- C. Transport iron between intestine and site of synthesis of Hb
- D. Inhibits trypsin, elastase, and other proteases

15. Regarding C-reactive Protein which of the following is true?

- A. It precipitates with group C polysaccharide of pneumococci, in the presence of Ca
- B. It can bind to T-lymphocytes and can activate complement
- C. It is used as a marker of tissue injury & inflammation
- D. All of the above

11.D

12.B

13.C

14.C

15.D

**16. Which of the following are immunoglobulins having antibody activity?**

- A. α 1-globulins
- B. α 2-globulins
- C. β -globulins
- D. γ globulins

17. Fibrinogen is clotting factor

- A. I
- B. II
- C. V
- D. VIII

18. Which of the following plasma proteins transport copper?

- A. Transcobalamin
- B. Transferrin
- C. Ceruloplasmin
- D. Albumin

19. Transcobalamin bind & transports.....?

- A. Steroid hormone
- B. Vitamin B12
- C. T3 & T4
- D. Extra-corporeal HB.

20. The most common method for analysing plasma proteins is

- A. Gas chromatography
- B. High performance liquid chromatography
- C. Electrophoresis
- D. Immunohistochemistry

16.D

17.A

18.C

19.B

20.C



21. The plasma proteins can be separated into several fractions by

- A. Agarose electrophoresis
- B. Polyacrylamide electrophoresis
- C. Starch electrophoresis
- D. Cellulose acetate electrophoresis

22. Which of the following increase during acute inflammatory states?

- A. C-reactive protein
- B. Haptoglobin
- C. α 1 antitrypsin
- D. All of the above

23. All of the following are acute phase reactants except

- A. Haptoglobin (Hp)
- B. α 1 acid glycoprotein
- C. Transferrin
- D. Fibrinogen

24. All of the following are causes of hypoalbuminaemia except ?

- A. Protein losing enteropathy
- B. Infective endocarditis
- C. Severe burns
- D. Nephrotic syndrome

25. All of the following can lead to hypogammaglobulinemia except.....

- A. Liver cirrhosis
- B. Pregnancy
- C. Protein losing enteropathy
- D. Cytotoxic therapy

26. Most important sign of hypoproteinemia is.....

- A. Loss of muscle mass
- B. Fatigue
- C. Lower limb edema & face swelling
- D. Dry brittle hair

21. D

22. D

23. C

24. B

25. A

26. C



1. Regarding hemoglobin which of the following is correct:

- A. It is a lipoprotein
- B. It represents about one third of volume of the erythrocytes
- C. It is a yellow pigment
- D. Normal range in males is 12-16 g/dl

2. Hemoglobin is.....

- A. Monomer
- B. Dimer
- C. Trimer
- D. Tetramer

3. Each subunit of hemoglobin has

- A. One polypeptide chain and one heme group
- B. Two polypeptide chains and one heme group
- C. Two polypeptide chains and two heme groups
- D. One polypeptide chain and two heme groups

4. Heme is composed of a ring-like organic compound known as a

- A. Phenol
- B. Porphyrin
- C. Pyrimidine
- D. Proline

5. The iron present in the center of the heme molecule, coordinatesbonds?

- A. 3,
- B. 4,
- C. 5
- D. 6

1. B	2. D	3. A	4. B	5. D
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**6. In hemoglobin molecule the iron binds to.....?**

- A. Four nitrogen atoms of the porphyrin ring.
- B. Histidine residue of the globin chain.
- C. Oxygen molecule
- D. All of the above

7. Regarding iron in hemoglobin molecules all of the following is correct except.....?

- A. There are 4 iron atoms in each molecule of hemoglobin
- B. The iron must exist in the ferric state to bind oxygen
- C. Each hemoglobin molecule can bind 4 molecules of oxygen
- D. None of the above

8. Globin is rich in.....

- A. Histidine
- B. Leucine
- C. Tyrosine
- D. Tryptophan

9. Globin of hemoglobin is formed of polypeptide chains?

- A. 2
- B. 3
- C. 4
- D. 5

10. Regarding myoglobin which of the following is correct.....

- A. It is present in RBCs
- B. It is the oxygen storage protein
- C. It is a heterotetramer
- D. It can bind to four oxygen molecules

6. D

7. B

8. A

9. C

10. B

**11. Regarding hemoglobin which of the following is correct**

- A. It is present mainly in muscle cells
- B. It has a higher affinity for oxygen than myoglobin
- C. It can bind to only one oxygen molecule
- D. It is a quaternary structure

12. Which of the following is an abnormal hemoglobin.....

- A. Hb A
- B. Met Hb
- C. Hb A2
- D. Hb F

13. Hb A is composed of.....

- A. 2 alpha and 2 beta chains
- B. 2 alpha and 2 gamma chains
- C. 2 alpha and 2 delta chains
- D. $\alpha 2 \beta 2$ - glucose

14. The most common hemoglobin type in adults is.....

- A. Hb A
- B. Hb A1c
- C. Hb A2
- D. Hb F

15. Alpha chain of hemoglobin is made of.....amino acids?

- A. 140
- B. 141
- C. 143
- D. 146

11.D

12.B

13.A

14.A

15.B

**16. The primary hemoglobin produced by the fetus during pregnancy.?**

- A. Hb A
- B. Hb A1c
- C. Hb A2
- D. Hb F

17. Hb A:

- A. Formed of 2 α + 2 δ chains
- B. Formed of 2 α + 2 γ chains
- C. Represents 95-98% of Hb in adults.
- D. Represents the main Hb in fetus

18. Hb F

- A. Formed of 2 α + 2 γ chains
- B. Represents the main Hb in adults
- C. Has lesser affinity to O₂ than Hb A
- D. Represents 2-3% of Hb in adults

19. Hb A2.....

- A. Formed of 2 α + 2 δ chains
- B. Formed of 2 α + 2 β chains
- C. Represents 98% of Hb in adults.
- D. Represents the main Hb in fetus

20. At birth, approximately of the hemoglobin in cord blood is HbF

- A. 60%
- B. 70%
- C. 80%
- D. 90%

16.D

17.C

18.A

19.A

20.C

**21. Hb F reaches adult level withinafter birth?**

- A. 1-2 months
- B. 3-6 months
- C. 1-2 years
- D. 3-6 years

22. HbA1c is?

- A. Sulphated Hb
- B. Glycated Hb
- C. Phosphated Hb
- D. Carboxy Hb

23. Normal level of HbA1c in adults is?

- A. < 5.7 % of Hb
- B. < 6.5% of Hb
- C. > 6.5 % of Hb
- D. > 7 % of Hb

24. Regarding HbA1c all of the following is correct except.....?

- A. HbA1c level \geq 6.5% indicates that the patient is diabetic
- B. It reflects glycemic control over 2 months
- C. The extent of protein glycation depends on average glucose level and protein half-life
- D. It is an abnormal type of Hb

25. Regarding carboxy hemoglobin which of the following is correct.....?

- A. It has a cherry red color
- B. It is produced by binding of carbon dioxide to hemoglobin.
- C. Hemoglobin has a 210-fold greater affinity for oxygen than for CO
- D. Subjects intoxicated with CO show bluish lips and cheeks

21. C

22. B

23. C

24. D

25. A

**26. Which of the following causes inherited methemoglobinemia.?**

- A. Nitrophenols,
- B. Deficiency of cytochrome b5 methemoglobin reductase due to genetic mutations
- C. Aniline,
- D. Sulfonamides

27. Regarding methemoglobin all of the following is correct except.....:

- A. It is a type of Hb that has ferriheme instead of ferrous heme
- B. Sulfonamides can cause acquired methemoglobinemia
- C. It has a dark brown color
- D. Its increase in blood is clinically apparent by the presence of bluish cyanosis

28. Which of the following can cause Sulfhemoglobin

- A. Carbon monoxide
- B. Nitrophenols
- C. Phenylhydrazine
- D. Aniline

29. Sulfhemoglobin has acolor

- A. Green
- B. Dark brown
- C. Cherry red
- D. Black

30. Regarding thalassemia which of the following is correct.....

- A. It is an acquired hemolytic anemia
- B. It is characterized by abnormal Hb production
- C. In alpha thalassemia there is a decrease in alpha globin chain production
- D. In beta thalassemia there is production of Hb S

26. B

27. D

28. C

29. A

30. C

**31. Production of Hb S is due to.....?**

- A. Point mutation in the alpha globin gene
- B. Deletion of beta globin genes
- C. Substitution of glutamic acid to valine at the 6th position of the beta globin chain.
- D. Deletion of alpha globin genes

32. Which of the following is characterized by presence of Hb S.....:

- A. Megaloblastic anemia
- B. Hereditary spherocytosis
- C. Thalassemia
- D. Sickle cell anemia

33. Sickle cell anemia is characterized by.....

- A. Vaso-occlusion
- B. Hepatosplenomegaly
- C. Positive family history
- D. Bone marrow failure

34. Main site of RBCs degradation include.....

- A. Liver,
- B. Spleen
- C. Bone marrow
- D. All of the above

35. Which of the following is a green pigment.....

- A. Heme
- B. Biliverdin
- C. Bilirubin
- D. Acid hematin

31. C

32. D

33. A

34. D

35. B

**36. Bilirubin is carried byin blood?**

- A. Thyroxin
- B. Albumin
- C. Globulins
- D. Transcobalamin

37. Which of the following gives the stool its characteristic color.....:

- A. Urobilinogen
- B. Stercobilinogen
- C. Stercobilin
- D. Urobilin

38. Which of the following gives the urine its characteristic color

- A. Urobilinogen
- B. Stercobilinogen
- C. Stercobilin
- D. Urobilin

39. Conjugated bilirubin is deconjugated by colonic bacteria to

- A. Urobilinogen
- B. Stercobilinogen
- C. Stercobilin
- D. Urobilin

40.is a yellowish discoloration of the skin, sclera and mucous membranes

- A. Cyanosis
- B. Pallor
- C. Jaundice
- D. Acidemia

36. B

37. C

38. D

39. A

40. C

**41. Jaundice occurs due to.....?**

- A. Increase the blood bilirubin level
- B. Presence of carboxy hemoglobin in blood
- C. Increase the blood urobilinogen level
- D. Presence of met-hemoglobin in blood

42. Jaundice occur when total bilirubin level is.....:

- A. More than 1.2 mg/dl.
- B. More than 0.3 mg/dl
- C. More than 2 mg/dl
- D. More than 3 mg/dl

43. The most common cause of obstructive jaundice is.....

- A. Bile stones
- B. Cancer of pancreatic head
- C. Liver cirrhosis
- D. Sickle cell anemia

44. Which of the following is the mechanism of prehepatic jaundice

- A. Hepatocyte dysfunction
- B. Increase production of bilirubin exceeding the capacity of hepatocytes for uptake
- C. Obstruction in the passage of conjugated bilirubin from the liver to the intestine
- D. None of the above

45. In hepatocellular jaundice which of the following is increased

- A. Unconjugated bilirubin
- B. Direct bilirubin
- C. Both unconjugated & conjugated bilirubin
- D. None of the above

41.A

42.D

43.A

44.B

45.C



46. All of the following are causes of hemolytic jaundice except.....?

- A. Sickle cell anemia.
- B. Alcoholic liver disease.
- C. Spherocytosis.
- D. Incompatible blood transfusion

47. Adult hemoglobin (HbA) is a tetramer consisting of.....:

- A. $\alpha_2 \delta_2$
- B. $\alpha_2 \beta_2$
- C. $\alpha_2 \gamma_2$
- D. β_4

48. Which of the following is the oxygen binding site of the hemoglobin.....

- A. N-terminal of the beta subunit
- B. Carboxyl terminal of both alpha and beta subunits
- C. Ferric ion (Fe^{+3}) of the heme molecule
- D. Ferrous ion (Fe^{+2}) of the heme molecule

49. Carbon monoxide poisoning may lead to death in untreated individuals. The carbon monoxide.....

- A. Binds to the N-terminal chain and decreases the affinity of oxygen to a heme
- B. Competitively binds to oxygen binding site of hemoglobin at higher affinity
- C. Competitively Interfere with the binding of alpha and beta globin chains
- D. Reduce the iron in hemoglobin to a ferrous state

50. In sickle cell anemia, the basis of the malfunction of the hemoglobin molecule is

- A. Incorrect secondary structure
- B. Faulty binding of the heme groups
- C. Reduced affinity for oxygen
- D. Substitution of a single amino acid

46. B	47. B	48. D	49. B	50. D
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51. The enzyme responsible to change biliverdin into free bilirubin is.....?

- A. Biliverdin anhydrase
- B. Biliverdin reductase
- C. Biliverdin inhibitor
- D. Heme oxygenase

52. Jaundice due to hereditary spherocytosis can be classified under.....:

- A. Thalassemia
- B. Hepatocellular jaundice
- C. Haemolytic jaundice
- D. Obstructive jaundice

51. B	52. C
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1. Regarding heme which of the following is correct:

- A. It is necessary for formation of myoglobin and cytochromes
- B. It is the most important porphyrin containing compound
- C. It is synthesized from porphyrins and iron.
- D. All of the above

2. The major tissues for heme synthesis are

- A. Bone marrow by developing erythrocytes
- B. Bone marrow by mature erythrocytes
- C. Liver
- D. A & C
- E. B & C

3. Regarding Porphyrins which of the following is correct

- A. They are cyclic compounds formed by the linkage of four pyrrole rings
- B. They can form complexes with metal ions that form coordinate bonds to the carbon atom of each pyrrole ring.
- C. Heme of hemoglobin is a zinc porphyrin
- D. All of the above

4. Chlorophyll is formed of Porphyrins and.....

- A. Iron
- B. Magnesium
- C. Zinc
- D. Copper

5. Porphyrins are cyclic compounds formed by the linkage of four pyrrole rings throughbridges?

- A. Methyl
- B. Methylene
- C. Methyne
- D. Carboxyl

1. D	2. D	3. A	4. B	5. C
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6. Heme biosynthesis occurs in most mammalian cells except?

- A. Mature erythrocytes
- B. Developing erythrocytes
- C. Hepatocytes
- D. Renal cells

7. Regarding heme biosynthesis which of the following is correct?

- A. It involves both cytosolic and mitochondrial reactions
- B. It occurs in most mammalian cells except mature erythrocytes
- C. Approximately 85% of heme synthesis occurs in erythroid precursor cells in bone marrow
- D. All of the above

8. Succinyl CoA andare the immediate substrates for formation of delta- amino-levulinate?

- A. Alanine
- B. Glycine
- C. Valine
- D. Leucine

9. Formation of delta-aminolevulinate is catalysed by.....?

- A. ALA dehydratase
- B. Uroporphyrinogen I synthase
- C. ALA synthase
- D. Uroporphyrinogen III synthase

10. ALA synthase requires

- A. Pyridoxal phosphate
- B. Thiamine pyrophosphate
- C. ATP
- D. Para-aminobenzoic acid

6. A	7. D	8. B	9. C	10.A
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**11. Synthesis of ALA occurs in:**

- A. Endoplasmic reticulum.
- B. Mitochondria
- C. Nucleus.
- D. Cytosol.

12. ALA synthase catalyses condensation of succinyl CoA with

- A. Alanine.
- B. Cysteine.
- C. Threonine.
- D. None of the above.

13. Condensation of succinyl-CoA and glycine depends on.....

- A. Vitamin B2
- B. Vitamin B3
- C. Vitamin B6
- D. Vitamin B12

14. ALA dehydratase catalyses conversion of ALA into.....

- A. Porphobilinogen
- B. Hydroxymethylbilane
- C. Uroporphyrinogen I
- D. Protoporphyrin

15. Lead inhibits....?

- A. ALA dehydratase.
- B. ALA synthase.
- C. Ferrochelatase.
- D. A and B.
- E. A and C.

11.B

12.D

13.C

14.A

15.E



16. One of the following intermediates is formed in the cytosol?

- A. ALA.
- B. Protoporphyrinogen III.
- C. Protoporphyrin III.
- D. Hydroxymethylbilane.

17. Which of the following is not a hemoprotein

- A. Myoglobin
- B. Tyrosinase
- C. Cytochromes
- D. Catalases

18. Protoporphyria is due to deficiency of.....

- A. ALA dehydratase.
- B. Uroporphyrinogen I synthase.
- C. Ferrochelatase
- D. Uroporphyrinogen III synthase.

19. The rate limiting step in hemoglobin synthesis is catalyzed by.....

- A. Heme synthase
- B. ALA synthase
- C. ALA hydratase
- D. Ferrochelatase

20. In hemoglobin biosynthetic pathway, lead is known to inhibit enzyme....

- A. Delta-ALA synthase
- B. Uroporphyrinogen synthase
- C. ALA dehydratase
- D. Heme synthase

16.D

17.B

18.C

19.B

20.C

**21. The key regulatory enzyme in heme biosynthesis is.....?**

- A. ALA synthase
- B. Uroporphyrinogen III synthase
- C. ALA dehydratase
- D. Heme synthase

22. ALA synthase is inhibited by.....?

- A. Iron
- B. Glucose
- C. Phenobarbital
- D. Rifampin

23. ALA synthase is stimulated by all of the following except.....?

- A. Iron
- B. Phenobarbital
- C. Excess heme formation
- D. Rifampin

24. The precursor of protoporphyrin is.....?

- A. Alanine
- B. Proline
- C. Leucine
- D. Glycine

25. Pyridoxal phosphate is necessary for

- A. ALA synthase
- B. Uroporphyrinogen synthase
- C. ALA dehydratase
- D. Ferrochelatase

21. A

22. B

23. C

24. D

25. A

**26. Porphobilinogen is formed by condensation of.....?**

- A. Two molecules of ALA
- B. Three molecules of ALA
- C. Four molecules of ALA
- D. Five molecules of ALA

27. Formation of porphobilinogen is catalysed by.....:

- A. ALA synthase
- B. ALA dehydratase
- C. Uroporphyrinogen III synthase
- D. Heme synthase

28. Hydroxymethylbilane is formed by condensation of.....

- A. Two molecules of ALA
- B. Two molecules of porphobilinogen
- C. Four molecules of porphobilinogen
- D. Four molecules of ALA

29. Formation of linear tetrapyrrole hydroxymethylbilane is catalysed by.....

- A. Uroporphyrinogen I synthase
- B. Uroporphyrinogen III synthase
- C. ALA dehydratase
- D. Ferrochelatase

30. Cyclization of hydroxymethylbilane is catalyzed

- A. Uroporphyrinogen I synthase
- B. Uroporphyrinogen III synthase
- C. ALA dehydratase
- D. Ferrochelatase

26.A

27.B

28.C

29.A

30.B

**31. Spontaneous cyclization of hydroxymethylbilane lead to formation of.....?**

- A. Uroporphyrinogen I
- B. Uroporphyrinogen II
- C. Uroporphyrinogen III
- D. None of the above

32. Uroporphyrinogen decarboxylase catalyse the formation of:

- A. Protoporphyrinogen
- B. Coproporphyrinogen III
- C. Uroporphyrinogen III.
- D. Protoporphyrin

33. Regarding formation of protoporphyrinogen III

- A. Occurs in the mitochondria
- B. Catalyzed by coproporphyrinogen oxidase
- C. It is next oxidized to protoporphyrin III
- D. All of the above

34. Which of the following generally do not occur in humans?

- A. Protoporphyrin III
- B. Uroporphyrinogen III
- C. Protoporphyrin I
- D. Uroporphyrinogen I

35. Which of the following incorporates ferrous iron into protoporphyrin III

- A. ALA synthase
- B. Uroporphyrinogen synthase
- C. ALA dehydratase
- D. Heme synthase

31.A

32.B

33.D

34.C

35.D

**36. The most common acquired form of porphyria is due to.....?**

- A. Lead poisoning
- B. Barbiturates poisoning
- C. Griseofulvin poisoning
- D. None of the above

37. Regarding porphyria which of the following is correct.....:

- A. It is a rare metabolic disorders of glucose biosynthesis
- B. It is always acquired
- C. It is due to deficiency of one or more of heme biosynthesis enzymes
- D. All of the above

38. Manifestations of Porphyria include.....

- A. Tachycardia
- B. Photosensitivity
- C. Chest pain
- D. All of the above

39. Porphyria can be treated by.....

- A. Avoiding drugs that induce production of cytochrome P450
- B. Ingestion of large amounts of carbohydrate
- C. Administration of hematin
- D. All of the above

40. Photosensitivity in Porphyria is treated by administration of.....

- A. Beta-carotenes
- B. Carnitine
- C. Zinc
- D. Vitamin B6

36.A

37.C

38.B

39.D

40.A