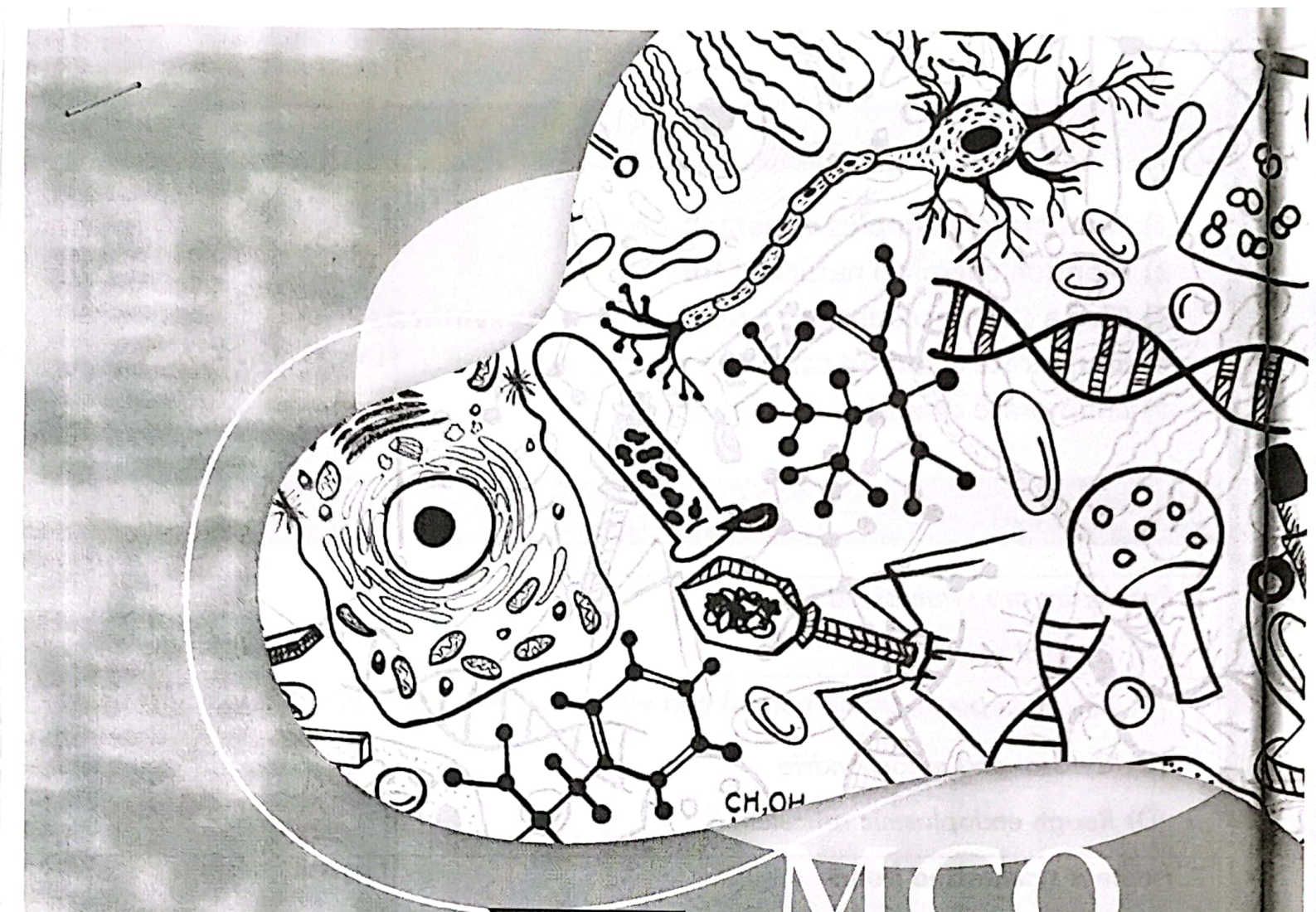
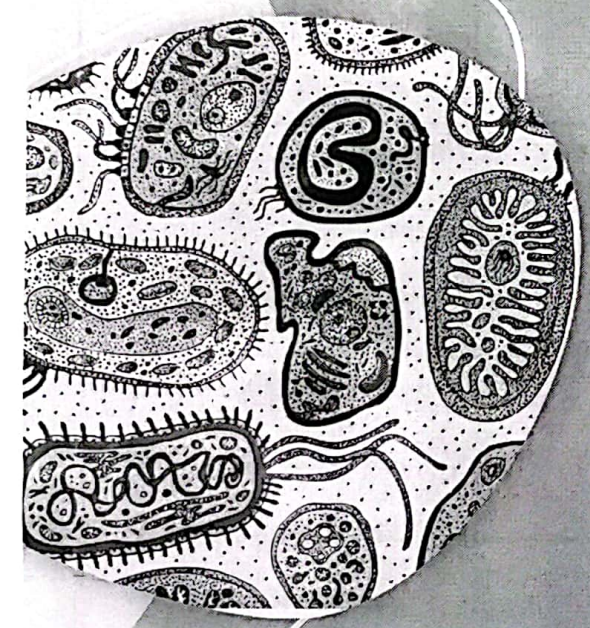
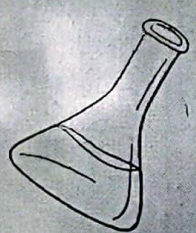


3
L.E

MCQ
HIS
Biochemistry
Lecture(1)

Level(1) Sem(2)





Dr.M.M

Written Bio 1

1) Enumerate examples of hemoprotein ?
2) Mention chemical nature of HB ?
3) Give a short account on regulation of heme synthesis ?
4) Enumerate acquired causes of porphyria ?
5) Enumerate clinical picture of porphyria ?

Written Bio 1

1. Porphyrins are synthesized in: *(A) Cytosol only* *(B) Mitochondria only* *(C) Cytosol and mitochondria* *(D) Rough endoplasmic reticulum*	**C**
2. Heme is synthesized from: *(A) Succinyl-CoA and glycine* *(B) Active acetate and glycine* *(C) Active succinate and alanine* *(D) Active acetate and alanine*	**A**
3. In the biosynthesis of the iron protoporphyrin, the product of the condensation between succinyl-CoA and glycine is: *(A) porphobilinogen* *(B) δ-Aminolevulinate* *(C) Hydroxymethylbilane* *(D) Uroporphyrinogen I*	**A**
4. Porphyrin synthesis is inhibited in: *(A) Mercury poisoning* *(B) Lead poisoning* *(C) Manganese poisoning d) Barium poisoning*	**B**

5. Which of the following is key rate limiting enzyme for heme synthesis? a) *Heme synthase* b) *Ferrochelatase* c) *ALA synthase* d) *ALA dehydratase*	**C**
6. Which of the following act as a co-enzyme for ALA synthase? a) *Vitamin B12* b) *PLP (B6)* c) *vitamin C* d) *Vitamin B1*	**B**
7. Which of the following is the 1st pyrrole ring formed during heme synthesis? a) *pyrrolidine* b) *proline* c) *porphobilinogen* d) *ALA*	**C**
8. *Which of the* **following is mitochondrial enzyme participates in heme synthesis?** a) *ALA dehydratase* b) *PBG synthase* c) *PBG deaminase* d) *ALA synthase*	**D**
9. Which of the following is a product of Uro-porphyrinogen decarboxylase? a) *protoporphyrin* b) *protophyrinogen* c) *coproporphyrinogen* d) *heme*	**C**

10. Which of the following is immediate precursor of heme? a) protoporphyrin b) protophyrinogen c) coproporphyrinogen d) Uroporphyrinogen	A
11. Which of the following is the most common cause of acquired porphyria? a) mercury poisoning b) exposure to sun light c) lead poisoning d) Arsenic poisoning	C
12. Which of the following is the main site of heme synthesis? a) liver b) skin c) bone marrow d) brain	C
13. Which of the following is not site of heme synthesis? a) Liver b) mature RBCs c) immature RBCs d) brain	B
14. Which of the following catalyze the 1st step in heme synthesis? a) ALA dehydratase b) ferrochelatase c) ALA synthase d) Heme synthase	C

15. ALA dehydratase catalyzes conversion of ALA into: a) Hydroxymethylbilane b) Uroporphyrinogen c) Coprophyrinogen d) Porphobilinogen e) Protoporphyrin	**D**
16. Lead inhibits: a) ALA dehydratase b) ALA synthase c) Ferro chelatase d) All of the above e) None of the above	**D**
17. The 4 pyrrole rings in porphyrin are united together by: a) Methyl group b) Methenyl group c) Methylene group d) Methanol e) None of the above	**C**
18. The rate-controlling step in hepatic porphyrin biosynthesis is: a) Synthesis of δ -ALA b) Synthesis of porphobilinogen c) Synthesis of uroporphyrinogen d) Synthesis of coproporphyrinogen e) None of the above	**A**

19. ALA dehydratase is responsible for enzymatic reaction that produces: a) δ -ALA b) porphobilinogen c) uroporphyrinogen d) coproporphyrinogen e) None of the above	B
20. By which process uroporphyrinogen passes to be converted to coproporphyrinogen: a) Oxidation b) Reduction c) Decarboxylation d) Deamination e) None of the above	C
21. All of the following stimulate haem synthesis except: a) Low O2 tension b) Steroids c) Iron d) Lead e) None of the above	D
22. One of the following is a symptom of porphyria: a) Abdominal pain b) Anxiety c) Photosensitivity d) Porphyrinuria e) All of the following	E

23. The porphyrin present in haem is: a) Uroporphyrin b) Protoporphyrin I c) Coproporphyrin d) Protoporphyrin 3 e) Porphobilinogen	**D**
24. During synthesis of porphyrins, synthesis of δ-amino levulinic acid occurs in: a) Mitochondria b) Cytosol c) Both in mitochondria and cytosol d) Ribosomes e) Lysosomes	**A**
25. The regulatory enzyme for haem synthesis is: a) ALA synthase b) Haem synthase c) Uroporphyrinogen decarboxylase d) Protoporphyrinogen oxidase e) Ferrochelatase	**A**
26. Which of the following is a hemoprotein? a) Albumin b) Tyrosinase c) Lipoproteins d) Glycoproteins e) Hemoglobin	**E**

27. The synthesis of heme involves both cytosole and mitochondrial reaction, which of the following enzymes catalyzed reaction occurs in cytosol? a) delta aminolevulinic acid synthase b) uroporphyrinogen synthase III c) protoporphyrinogen oxidase d) ferrochelatse	B
28. Which of the following is not heme protein: A) Tryptophan pyrrolase B) Cytochrome P450 C) Myoglobin D) Tyrosinase.	D
29. In hemoglobin biosynthetic pathway, lead is known to inhibit enzyme: A) delta-ALA synthase b) Uroporphyrinogen synthase C) ALA dehydratase D) Heme synthase	C
30. The precursor of protoporphyrin is: A) Alanine b) Proline C) Glycine d) Leucine	C
31. Pyridoxal phosphate is necessary for: A) ALA synthase b) Uroporphyrinogen synthase C) ALA dehydratase d) Ferrochelatase	A
32. Along with succinyl coA, which of the following amino acid serve as starting material in heme synthesis: a) glycine b) leucine c) alanine d) lysine	A

MCQ

1. Which of the following is a product of Uro-porphyrinogen decarboxylase ? a) Protoporphyrin b) Protophyrinogen c) Coproporphyrinogen d) Heme	C
2. ALA dehydratase is responsible for enzymatic reaction that produces: a) δ -ALA b) porphobilinogen c) uroporphyrinogen d) coproporphyrinogen	B
3. By which process uroporphyrinogen passes to be converted to coproporphyrinogen: a) Oxidation b) Reduction c) Decarboxylation d) Deamination	C
4. Which of the following is immediate precursor of heme ? a) Protoporphyrin b) Protophyrinogen c) Coproporphyrinogen d) Uroporphyrinogen	A

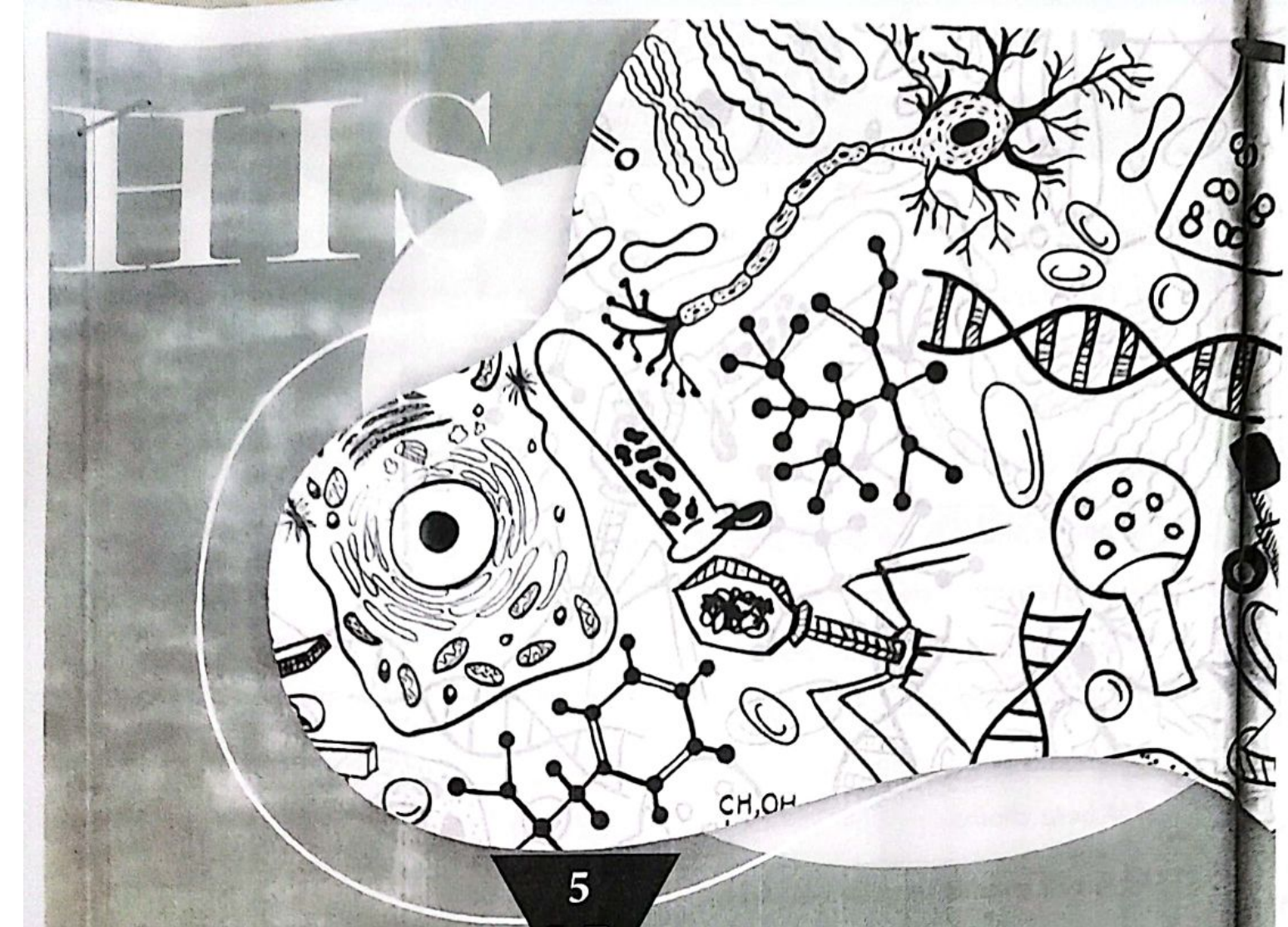
5. Which of the following is the 1st type of porphyrin formed during heme synthesis ? a) Protoporphyrin b) Protophyrinogen c) Coproporphyrinogen d) Uroporphyrinogen	**D**
6. One of the following is a symptom of porphyria: a) Abdominal pain b) Anxiety c) Porphyrinuria d) All of the following	**d**
7. The porphyrin present in haem is: a) Uroporphyrin b) Protoporphyrin I c) Coproporphyrin II d) Protoporphyrin IV	**D**
8. Which of the following is a manifestation of porphyria ? a) Dark green urine b) Black urine c) Porphyrinuria d) Pale urine	**C**
9. Which of the following is mitochondrial enzyme participates in heme synthesis ? a) ALA dehydratase b) PBG synthase c) PBG deaminase d) ALA synthase	**D**

10.Which of the following is the most common cause of acquired porphyria ? a) Mercury poisoning b) Exposure to sun light c) Lead poisoning d) Arsenic poisoning	C
11.Which of the following is the main site of heme synthesis ? a) Liver b) Skin c) Bone marrow d) Brain	C
12.Which of the following is not site of heme synthesis ? a) Liver b) Mature rbcs c) Immature rbcs d) Brain	B
13.Which of the following catalyze the 1st step in heme synthesis ? a) ALA dehydratase b) Ferrochelatase c) ALA synthase d) Heme synthase	C
14.Porphyrins are synthesized in a) Cytosol only b) Mitochondria only c) Cytosol and mitochondria d) Rough endoplasmic reticulum	C

15.Heme is synthesized from a) Succinyl-CoA and glycine b) Active acetate and glycine c) Active succinate and alanine d) Active acetate and alanine	**A**
16.All of the following stimulate haem synthesis except: a) Low O2 tension b) Steroids c) Iron d) Lead	**D**
17. During synthesis of porphyrins, synthesis of δ -amino levulinic acid occurs in: a) Mitochondria b) Cytosol c) Both in mitochondria and cytosol d) Ribosomes	**A**
18.Which of the following is key rate limiting enzyme for heme synthesis ? a) Heme synthase b) Ferrochelatase c) ALA synthase d) ALA dehydratase	**C**
19.During conversion of uroporphyrinogen to coproporphyrinogen , we cause decarboxylation of ? a) Acetate group b) Methyle group c) Propinyle group d) Vinyle group	**A**

20.ALA dehydratase catalyzes conversion of ALA into: a) Hydroxymethylbilane b) Uroporphyrinogen c) Coprophyrinogen d) Porphobilinogen	D
21. Lead inhibits: a) ALA dehydratase b) ALA synthase c) haem synthetase d) All of the above	D
22.The 4 pyrrole rings in porphyrin are united together by: a) Methyl group b) Methenyl group c) Methylene bridge d) Methanol	C
23.The rate-controlling step in hepatic porphyrin biosynthesis is: a) Synthesis of δ -ALA b) Synthesis of porphobilinogen c) Synthesis of uroporphyrinogen d) Synthesis of coproporphyrinogen	A
24.In the biosynthesis of the iron protoporphyrin, the product of the condensation between succinyl-CoA and glycine is a) porphobilinogen b) δ-Aminolevulinate c) Hydroxymethylbilane d) Uroporphyrinogen I	B

25.Porphyrin synthesis is inhibited in a) Mercury poisoning b) Lead poisoning c) Manganese poisoning d) Barium poisoning	**B**
26.Which of the following is a hemoprotein? a) Albumin b) Tyrosinase c) Lipoproteins d) Glycoproteins e) Hemoglobin	**E**
27.Haem synthesis occurs in: a) Cytosol and Golgi apparatus b) Mitochondria and Golgi apparatus c) Cytosol and lysosomes d) Cytosol and mitochondria	**D**



5
L.E

MCQ

Biochemistry

Lecture(2)

Level(1) Sem(2)

Dr.M.M

Bio HIS 2

1) Life span of RBCS is: a) 120 days b) 90 days c) 140 days d) 150 days	**A**
2) The polypeptides in the globin part of normal adult HB consists of: a) 2 alpha and 2 delta chains b) 2 alpha and 2 gamma chains c) 2 beta and 2 gamma chains d) 2 alpha and 2 beta chains e) 4 beta chains	**D**
3) Sickle cell anemia may be caused by: a) Deficiency in the amount or in the structure of spectrin b) Mutation 6th Codon of B globin gene where glutamic acid is replaced by valine c) Mutations In genes encoding red cell membrane proteins d) Absence of one or more of genes responsible for synthesis of or B globin chains e) None of the above	**B**
4) Bilirubin Is formed in: a) Brain b) Kidney c) Bones d) Spleen & bone marrow e) Intestine	**D**

6) Patients with sickle cell anemia due to: a) decrease of spectrin protein b) decrease of GPI_ Anchored protein c) absence of alpha and beta globulin d) GAG is replaced by GTG	**D**
7) Related to Carboxy-Hb Combination with CO: a) Affinity of Hb to CO is 210 times more than O2 b) Lethal action is due to inhibition of cytochrome oxidase of electron transport chain and thus stops cellular respiration c) Poisoning by CO is a common danger of modern life d) Carbon monoxide is particularly dangerous as It is colourless and odourless e) All of the Above	**E**
8) Hb-F: a) disappears after one year b) disappears after 2 year c) disappears after 5 year d) disappears after 6 year e) disappears after 10 year	**A**
9) Direct bilirubin is: a) free bilirubrin b) Albumin bound bilirubin c) conjugated bilirubin d) Biliverdin	**C**
10) Direct bilirubin is: a) Free bilirubin b) Albumin bound bilirubin c) Conjugated bilirubin d) Biliverdin	**C**

11) Which of the following is responsible for the color of urine? a) Urobilinogen b) Urobilin c) Stercobilinogen d) Stercobilin	**B**
12) Which of following is responsible for the color of the stool: a) Urobilinogen b) Urobilin c) stercobilinogen d) stercobilin	**D**
13) Urobilinogen is formed in: a) Liver. b) Kidney. c) Large intestine d) Urinary tract	**C**
14) Which of the following is a hemoprotein? a) Albumin b) Tyrosinase c) Lipoproteins d) Glycoproteins e) Hemoglobin	**E**
16) Bilirubin is transported in blood to the liver by: a) α Globulin b) Albumin c) Fibrinogen d) β globulin	**B**

17) Haemoglobin is: a) Conjugated protein b) Simple protein c) Drivatives protein d) All of the Above	**A**
18) Haem: a) It is a Fe-porphyrin compound b) the protein part of Hb c) is composed of four polypeptide chains d) None of the above	**A**
19) Hb-A1: (α2 β 2): a) Normal adult Hb consists of one α and two β chains . b) Normal adult Hb consists of two α and two β chains . c) Normal adult Hb consists of two α and one β chains . d) Normal adult Hb consists of two α only e) Normal adult Hb consists of two β chains only	**B**
21) Hb-A1C (Glycosylated Hb): a) Normally, it is present in conc.of 1-5% of total Hb. b) Normally, it is present in conc.of 3 -9% of total Hb. c) Normally, it is present in conc.of 3-5.7% of total Hb. d) Normally, it is present in conc.of 8 - 11 % of total Hb. e) Normally, it is present in conc.of 9 - 16 % of total Hb.	**C**
22) In Hb-A1C (Glycosylated Hb) patients with D.M: a) it may be increased to > 15% of total Hb b) Normally, it is present in conc.of 8 - 11 % of total Hb c) Normally, it is present in conc.of 3 -9% of total Hb d) it may be increased > 6.5% of total Hb	**D**

23) All is true Methaemoglobin Except: a) chocolate colored b) It is a derivative in which Fe is in the ferric state . c) it is a true oxidation product of Hb . d) Bind O2 e) Can't bind O2	**D**
26) Sickle cell disease: a) Due to mutation in γ -globin gene b) Due to mutation in β - globin gene c) Due to mutation in ε - globin gene d) Due to mutation in α -globin gene e) Due to mutation in δ - globin gene	**B**
27) All is true about sickle cell disease except: a) Low O2 tension promotes RBCs sickling b) damage the cell membrane c) Increase the cell's elasticity d) decrease the cell's elasticity e) vessel occlusion and ischemia	**C**
28) Which HB has the highest affinity for oxygen? a) Oxy HB B) Carboxy HB c) Met HB D) Carbamino HB e) Myoglobin	**B**

29) Which of the following statements about myoglobin is true? A) Myoglobin is primarily found in plasma. B) Myoglobin is responsible for oxygen transport in the bloodstream. C) Myoglobin contains four heme groups per molecule. D) Myoglobin has a higher oxygen affinity compared to hemoglobin.	**D**
30) Which of the following statements about types of jaundice is correct? A) Hemolytic jaundice occurs due to liver damage or dysfunction. B) Obstructive jaundice is caused by excessive breakdown of red blood cells. C) Prehepatic jaundice is characterized by the obstruction of bile flow within the liver. D) Post-hepatic jaundice results from the blockage of bile ducts outside the liver.	**D**
31) Which of the following statements about myoglobin is true? A) Myoglobin is a protein found primarily in muscle cells. B) Myoglobin is responsible for the transport of oxygen in the bloodstream. C) Myoglobin is composed of four subunits. D) Myoglobin is an enzyme involved in the breakdown of glucose.	**A**
32) Type of bilirubin increased in plasma in haemolytic jaundice: a) Unconjugated (indirect) b) Conjugated (direct) c) Both d) None of the above	**A**

33) Type of bilirubin increased in plasma in obstructive jaundice: a) Unconjugated (indirect) b) conjugated (direct) c) Both d) None of the above	B
34) Type of bilirubin increased in plasma in hepatocellular jaundice: a) Unconjugated (indirect) b) conjugated (direct) c) Both types d) None of the above	C
35) All of the following are with diagnosis of obstructive jaundice except a) Elevated serum direct bilirubin b) presence of urine bilirubin c) increased urine urobilinogen d) Absence fecal urobilinogen	C
36) All of the following are with diagnosis of haemolytic jaundice EXCEPT" A) Elevated serum direct bilirubin B) Absence of urine bilirubin C) increased urine urobilinogen D) increased fecal urobilinogen	A
37) The amino acid substitution of Val for Glu in Hemoglobin S results in: aggregation of the protein because of …….. interactions between molecules: A) covalent B) disulphide c) hydrogen bonding D) hydrophobic E) Ionic	D

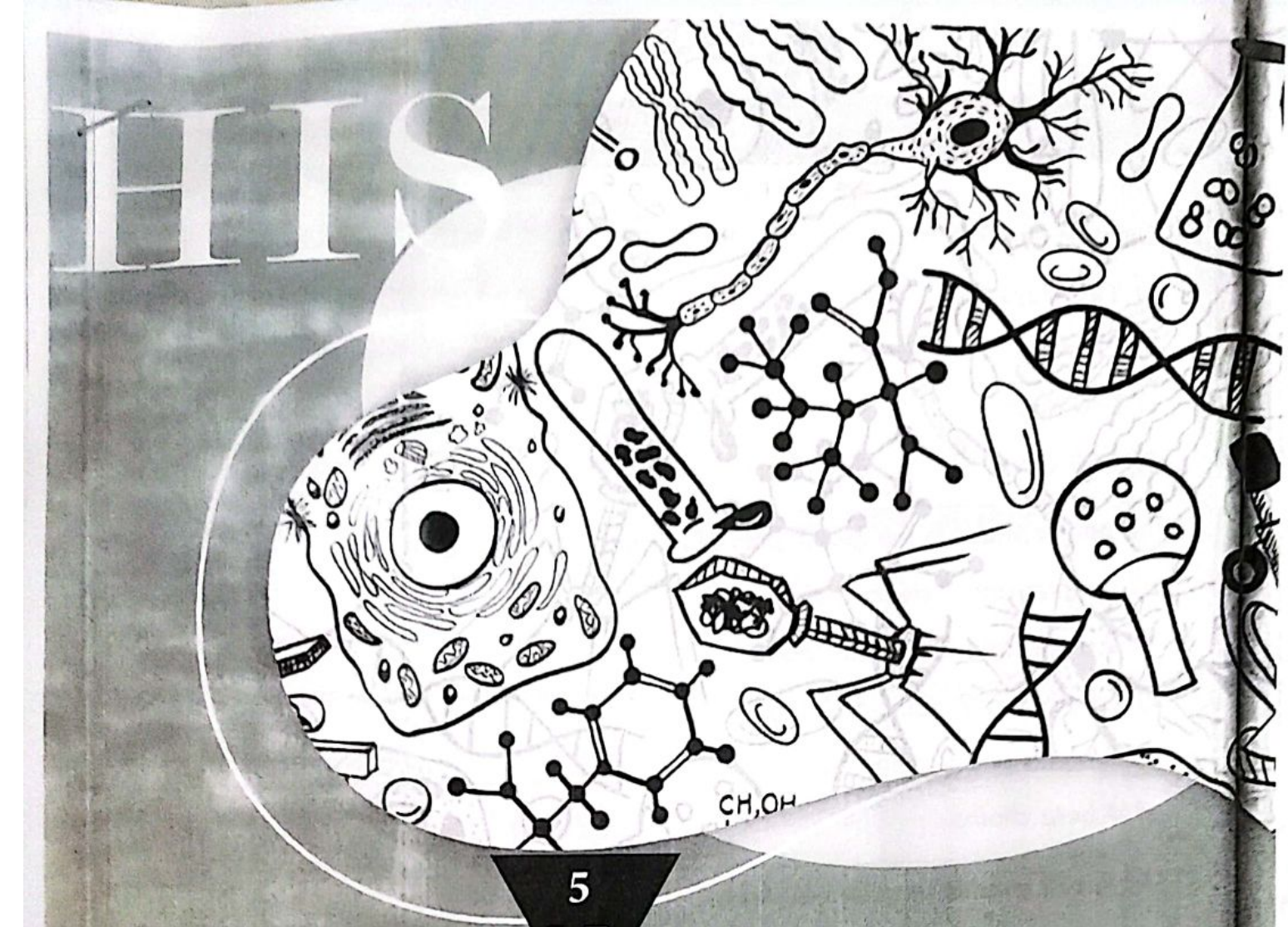
38) Cyanmethaemoglobin can be formed from: A) Oxy Hb B) Met Hb C) Carboxy Hb D) All of these	**B**
39) Abnormal chain of amino acids in sickle cell anaemia is: A) Alpha chain B) Beta chain C) Delta chain D) Gama chain	**B**
40) Normal level of total bilirubin in plasma is less than: A. 0.2 mg/dL. B. 1.2 mg/dL. C. 2.2 mg/dL. D. 10 mg/dL. E. None of the above.	**B**
41) Manifest jaundice occurs when plasma bilirubin level exceeds: A. 1.2 mg/dL. B. 2.5 mg/dL. C. 3 mg/dL. D. 5 mg/dL. E. 10 mg/dL.	**B**
42) Urobilinogen is formed: A. In the liver parenchymal cells. B. In the reticuloendothelial system. C. In the intestine by bacteria D. In the urine. E. By pancreatic enzymes.	**C**

43) Unconjugated bilirubin: *A. Is the component measured as "direct bilirubin"* *B. Is more soluble in aqueous solutions than conjugated bilirubin* *C. Is the predominant form of bilirubin found in bile* *D. Is measured "indirectly" by diazo reagents* *E. Is esterified by one or two UDP-glucuronic acids*	**D**
44) A jaundiced patient has elevated direct bilirubin with normal levels of indirect bilirubin. This patient is probably: *A. An infant with neonatal (physiological) jaundice* *B. Has glucuronyl transferase deficiency* *C. Thalassemic* *D. Suffering from an obstructed gall bladder* *E. Suffering from viral hepatitis*	**D**
45) The color of a healing bruise goes from reddish-purple to green and finally to yellow. This color sequence is due to the conversion of: *A. Heme to bile salts* *B. Serum bilirubin to liver biliverdin* *C. Localized heme to biliverdin to bilirubin* *D. Localized heme to urobilinogen to stercobilinogen* *E. Bilirubin to mono-conjugated bilirubin to di-conjugated bilirubin*	**C**
46) Carbon monoxide binds to heme: *A) with a higher affinity than oxygen.* *B) resulting in the oxidation of the Fe(II) to Fe(III)* *C) in a manner that displaces carbon dioxide, causing CO2 poisoning.* *D) from the side opposite oxygen, resulting in a brown colored heme.* *E) with a lower affinity than oxygen.*	**A**

47) Fecal stercobilinogen is increased in a) Hemolytic jaundice b) Hepatic jaundice c) Viral hepatitis d) Obstructive jaundice	**A**
48) Jaundice is caused due to: a) Excess of uric acid in the blood b) Excess of bilirubin in the blood c) Excess of haemoglobin in the blood d) Excess of potassium in the blood	**B**
49) Myoglobin and a single chain of hemoglobin have similar .... structures. A) primary B) secondary C) tertiary D) quaternary E) none of the above	**C**
50) In sickle-cell anemia, the negatively charged glutamic acid residue is replaced by the neutral amino acid A) tyrosine B) lysine C) valine D) adenosine E) glycine	**C**
51) The degradation of hemoglobin primarily occurs in which organ? a) Liver b) Kidneys c) Spleen d) Lungs	**C**

52) The breakdown of hemoglobin results in the production of bilirubin, which is: a) Excreted in urine b) Excreted in sweat c) Metabolized by the liver and excreted in bile d) Converted into glucose	**C**
53) In sickle cell disease, a mutation occurs in the hemoglobin gene, resulting in the production of abnormal hemoglobin. This mutation affects the: a) Alpha chains of hemoglobin b) Beta chains of hemoglobin c) Gamma chains of hemoglobin d) Delta chains of hemoglobin	**B**
54) A1c (HbA1c) is a form of hemoglobin that used as a marker for long-term glucose control in individuals with diabetes. The "A1c" portion refers to: a) A specific mutation in the hemoglobin gene b) The alpha chains of hemoglobin c) The beta chains of hemoglobin d) Glycated hemoglobin molecules	**D**
55) Hemoglobinopathies refer to: a) Genetic disorders affecting the structure or production of hemoglobin b) Autoimmune disorders affecting hemoglobin synthesis c) Nutritional deficiencies leading to abnormal hemoglobin levels d) Infectious diseases targeting hemoglobin molecules	**A**
56) Met HB: a) Cause stagnant hypoxia b) HB combine with CO c) The subject suffer from fever d) Result from oxidation of ferrous to ferric	**D**

57) Carbon monoxide (CO): *a) Loosely combines with hemoglobin.* *b) Shifts oxygen dissociation curve to the right.* *c) Interferes with 02 transport.* *d) Has a lesser affinity to hemoglobin than oxygen.* *e) Interferes with transport of CO2.*	**C**
58) What is true about symptoms of CO poisoning? *a. Sever cyanosis* *b. Shallow rapid breathing* *c. Increased heart rate* *d. Cherry red color*	**D**



5
L.E

MCQ

Biochemistry

Lecture(2)

Level(1) Sem(2)

Dr.M.M

Bio HIS 2

1) Life span of RBCS is: a) 120 days b) 90 days c) 140 days d) 150 days	**A**
2) The polypeptides in the globin part of normal adult HB consists of: a) 2 alpha and 2 delta chains b) 2 alpha and 2 gamma chains c) 2 beta and 2 gamma chains d) 2 alpha and 2 beta chains e) 4 beta chains	**D**
3) Sickle cell anemia may be caused by: a) Deficiency in the amount or in the structure of spectrin b) Mutation 6th Codon of B globin gene where glutamic acid is replaced by valine c) Mutations In genes encoding red cell membrane proteins d) Absence of one or more of genes responsible for synthesis of or B globin chains e) None of the above	**B**
4) Bilirubin Is formed in: a) Brain b) Kidney c) Bones d) Spleen & bone marrow e) Intestine	**D**

6) Patients with sickle cell anemia due to: a) decrease of spectrin protein b) decrease of GPI_ Anchored protein c) absence of alpha and beta globulin d) GAG is replaced by GTG	**D**
7) Related to Carboxy-Hb Combination with CO: a) Affinity of Hb to CO is 210 times more than O2 b) Lethal action is due to inhibition of cytochrome oxidase of electron transport chain and thus stops cellular respiration c) Poisoning by CO is a common danger of modern life d) Carbon monoxide is particularly dangerous as It is colourless and odourless e) All of the Above	**E**
8) Hb-F: a) disappears after one year b) disappears after 2 year c) disappears after 5 year d) disappears after 6 year e) disappears after 10 year	**A**
9) Direct bilirubin is: a) free bilirubrin b) Albumin bound bilirubin c) conjugated bilirubin d) Biliverdin	**C**
10) Direct bilirubin is: a) Free bilirubin b) Albumin bound bilirubin c) Conjugated bilirubin d) Biliverdin	**C**

11) Which of the following is responsible for the color of urine? a) Urobilinogen b) Urobilin c) Stercobilinogen d) Stercobilin	**B**
12) Which of following is responsible for the color of the stool: a) Urobilinogen b) Urobilin c) stercobilinogen d) stercobilin	**D**
13) Urobilinogen is formed in: a) Liver. b) Kidney. c) Large intestine d) Urinary tract	**C**
14) Which of the following is a hemoprotein? a) Albumin b) Tyrosinase c) Lipoproteins d) Glycoproteins e) Hemoglobin	**E**
16) Bilirubin is transported in blood to the liver by: a) α Globulin b) Albumin c) Fibrinogen d) β globulin	**B**

17) Haemoglobin is: a) Conjugated protein b) Simple protein c) Drivatives protein d) All of the Above	**A**
18) Haem: a) It is a Fe-porphyrin compound b) the protein part of Hb c) is composed of four polypeptide chains d) None of the above	**A**
19) Hb-A1: (α2 β 2): a) Normal adult Hb consists of one α and two β chains . b) Normal adult Hb consists of two α and two β chains . c) Normal adult Hb consists of two α and one β chains . d) Normal adult Hb consists of two α only e) Normal adult Hb consists of two β chains only	**B**
21) Hb-A1C (Glycosylated Hb): a) Normally, it is present in conc.of 1-5% of total Hb. b) Normally, it is present in conc.of 3 -9% of total Hb. c) Normally, it is present in conc.of 3-5.7% of total Hb. d) Normally, it is present in conc.of 8 - 11 % of total Hb. e) Normally, it is present in conc.of 9 - 16 % of total Hb.	**C**
22) In Hb-A1C (Glycosylated Hb) patients with D.M: a) it may be increased to > 15% of total Hb b) Normally, it is present in conc.of 8 - 11 % of total Hb c) Normally, it is present in conc.of 3 -9% of total Hb d) it may be increased > 6.5% of total Hb	**D**

23) All is true Methaemoglobin Except: a) chocolate colored b) It is a derivative in which Fe is in the ferric state . c) it is a true oxidation product of Hb . d) Bind O2 e) Can't bind O2	**D**
26) Sickle cell disease: a) Due to mutation in γ -globin gene b) Due to mutation in β - globin gene c) Due to mutation in ε - globin gene d) Due to mutation in α -globin gene e) Due to mutation in δ - globin gene	**B**
27) All is true about sickle cell disease except: a) Low O2 tension promotes RBCs sickling b) damage the cell membrane c) Increase the cell's elasticity d) decrease the cell's elasticity e) vessel occlusion and ischemia	**C**
28) Which HB has the highest affinity for oxygen? a) Oxy HB B) Carboxy HB c) Met HB D) Carbamino HB e) Myoglobin	**B**

29) Which of the following statements about myoglobin is true? A) Myoglobin is primarily found in plasma. B) Myoglobin is responsible for oxygen transport in the bloodstream. C) Myoglobin contains four heme groups per molecule. D) Myoglobin has a higher oxygen affinity compared to hemoglobin.	**D**
30) Which of the following statements about types of jaundice is correct? A) Hemolytic jaundice occurs due to liver damage or dysfunction. B) Obstructive jaundice is caused by excessive breakdown of red blood cells. C) Prehepatic jaundice is characterized by the obstruction of bile flow within the liver. D) Post-hepatic jaundice results from the blockage of bile ducts outside the liver.	**D**
31) Which of the following statements about myoglobin is true? A) Myoglobin is a protein found primarily in muscle cells. B) Myoglobin is responsible for the transport of oxygen in the bloodstream. C) Myoglobin is composed of four subunits. D) Myoglobin is an enzyme involved in the breakdown of glucose.	**A**
32) Type of bilirubin increased in plasma in haemolytic jaundice: a) Unconjugated (indirect) b) Conjugated (direct) c) Both d) None of the above	**A**

33) Type of bilirubin increased in plasma in obstructive jaundice: a) Unconjugated (indirect) b) conjugated (direct) c) Both d) None of the above	B
34) Type of bilirubin increased in plasma in hepatocellular jaundice: a) Unconjugated (indirect) b) conjugated (direct) c) Both types d) None of the above	C
35) All of the following are with diagnosis of obstructive jaundice except a) Elevated serum direct bilirubin b) presence of urine bilirubin c) increased urine urobilinogen d) Absence fecal urobilinogen	C
36) All of the following are with diagnosis of haemolytic jaundice EXCEPT" A) Elevated serum direct bilirubin B) Absence of urine bilirubin C) increased urine urobilinogen D) increased fecal urobilinogen	A
37) The amino acid substitution of Val for Glu in Hemoglobin S results in: aggregation of the protein because of …….. interactions between molecules: A) covalent B) disulphide c) hydrogen bonding D) hydrophobic E) Ionic	D

38) Cyanmethaemoglobin can be formed from: A) Oxy Hb B) Met Hb C) Carboxy Hb D) All of these	**B**
39) Abnormal chain of amino acids in sickle cell anaemia is: A) Alpha chain B) Beta chain C) Delta chain D) Gama chain	**B**
40) Normal level of total bilirubin in plasma is less than: A. 0.2 mg/dL. B. 1.2 mg/dL. C. 2.2 mg/dL. D. 10 mg/dL. E. None of the above.	**B**
41) Manifest jaundice occurs when plasma bilirubin level exceeds: A. 1.2 mg/dL. B. 2.5 mg/dL. C. 3 mg/dL. D. 5 mg/dL. E. 10 mg/dL.	**B**
42) Urobilinogen is formed: A. In the liver parenchymal cells. B. In the reticuloendothelial system. C. In the intestine by bacteria D. In the urine. E. By pancreatic enzymes.	**C**

43) Unconjugated bilirubin: *A. Is the component measured as "direct bilirubin"* *B. Is more soluble in aqueous solutions than conjugated bilirubin* *C. Is the predominant form of bilirubin found in bile* *D. Is measured "indirectly" by diazo reagents* *E. Is esterified by one or two UDP-glucuronic acids*	**D**
44) A jaundiced patient has elevated direct bilirubin with normal levels of indirect bilirubin. This patient is probably: *A. An infant with neonatal (physiological) jaundice* *B. Has glucuronyl transferase deficiency* *C. Thalassemic* *D. Suffering from an obstructed gall bladder* *E. Suffering from viral hepatitis*	**D**
45) The color of a healing bruise goes from reddish-purple to green and finally to yellow. This color sequence is due to the conversion of: *A. Heme to bile salts* *B. Serum bilirubin to liver biliverdin* *C. Localized heme to biliverdin to bilirubin* *D. Localized heme to urobilinogen to stercobilinogen* *E. Bilirubin to mono-conjugated bilirubin to di-conjugated bilirubin*	**C**
46) Carbon monoxide binds to heme: *A) with a higher affinity than oxygen.* *B) resulting in the oxidation of the Fe(II) to Fe(III)* *C) in a manner that displaces carbon dioxide, causing CO2 poisoning.* *D) from the side opposite oxygen, resulting in a brown colored heme.* *E) with a lower affinity than oxygen.*	**A**

47) Fecal stercobilinogen is increased in a) Hemolytic jaundice b) Hepatic jaundice c) Viral hepatitis d) Obstructive jaundice	**A**
48) Jaundice is caused due to: a) Excess of uric acid in the blood b) Excess of bilirubin in the blood c) Excess of haemoglobin in the blood d) Excess of potassium in the blood	**B**
49) Myoglobin and a single chain of hemoglobin have similar .... structures. A) primary B) secondary C) tertiary D) quaternary E) none of the above	**C**
50) In sickle-cell anemia, the negatively charged glutamic acid residue is replaced by the neutral amino acid A) tyrosine B) lysine C) valine D) adenosine E) glycine	**C**
51) The degradation of hemoglobin primarily occurs in which organ? a) Liver b) Kidneys c) Spleen d) Lungs	**C**

52) The breakdown of hemoglobin results in the production of bilirubin, which is: a) Excreted in urine b) Excreted in sweat c) Metabolized by the liver and excreted in bile d) Converted into glucose	**C**
53) In sickle cell disease, a mutation occurs in the hemoglobin gene, resulting in the production of abnormal hemoglobin. This mutation affects the: a) Alpha chains of hemoglobin b) Beta chains of hemoglobin c) Gamma chains of hemoglobin d) Delta chains of hemoglobin	**B**
54) A1c (HbA1c) is a form of hemoglobin that used as a marker for long-term glucose control in individuals with diabetes. The "A1c" portion refers to: a) A specific mutation in the hemoglobin gene b) The alpha chains of hemoglobin c) The beta chains of hemoglobin d) Glycated hemoglobin molecules	**D**
55) Hemoglobinopathies refer to: a) Genetic disorders affecting the structure or production of hemoglobin b) Autoimmune disorders affecting hemoglobin synthesis c) Nutritional deficiencies leading to abnormal hemoglobin levels d) Infectious diseases targeting hemoglobin molecules	**A**
56) Met HB: a) Cause stagnant hypoxia b) HB combine with CO c) The subject suffer from fever d) Result from oxidation of ferrous to ferric	**D**

57) Carbon monoxide (CO): *a) Loosely combines with hemoglobin.* *b) Shifts oxygen dissociation curve to the right.* *c) Interferes with 02 transport.* *d) Has a lesser affinity to hemoglobin than oxygen.* *e) Interferes with transport of CO2.*	**C**
58) What is true about symptoms of CO poisoning? *a. Sever cyanosis* *b. Shallow rapid breathing* *c. Increased heart rate* *d. Cherry red color*	**D**

Questions

Q 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
e) Histidine residue of the globin chain

Answer : d

Questions

Q Adult hemoglobin (HbA) is a tetrameter consisting of ___ .

a) $\alpha_2\delta_2$
b) $\alpha_2\beta_2$
c) $\alpha_2\gamma_2$
d) β_4
e) γ_4

Answer : b

Questions

Q Jaundice due to hereditary spherocytosis can be classified under ___ .

a) Sickle cell anemia
b) Thalassemia
c) Haemolytic jaundice
d) Hepatocellular jaundice
e) Obstructive jaundice

Answer : c

Case Scenario

A 70 year-old retired man presented to the Emergency Department following a house fire. The patient was exposed to significant smoke inhalation. He was drowsy, less responsive with a sever headache, nausea and fatigue. Blood sample was taken and carboxyhemoglobin levels were high.

- What is your provisional diagnosis?

⟹ The patient is probably suffering from CO poisoning.

Questions

Q 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) Insufficient iron in the diet
e) Substitution of a single amino acid

Answer : e

Questions

Q 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
e) Increase the affinity of hemoglobin to oxygen

Answer : b

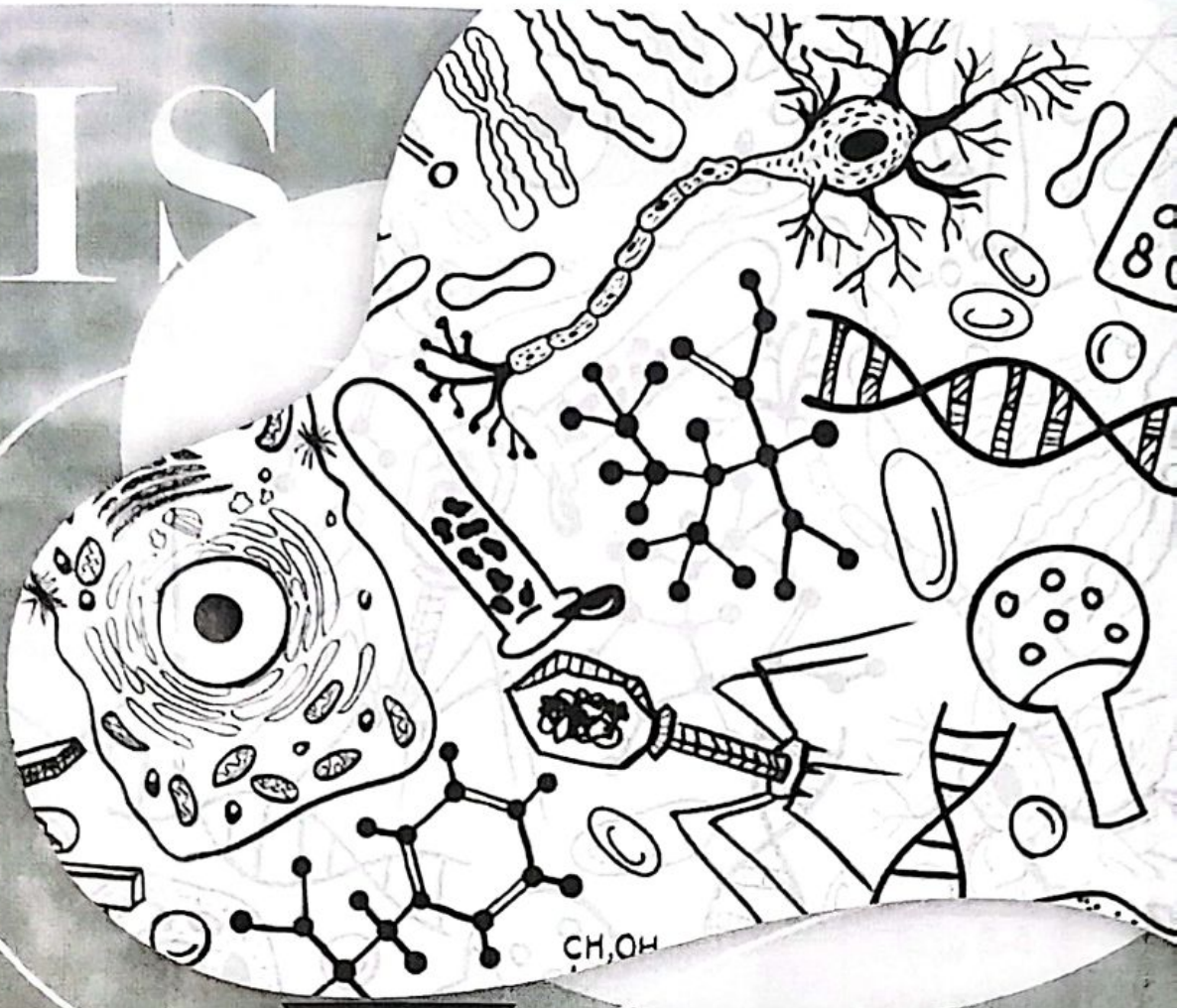
Questions

Q The enzyme responsible to change biliverdin into free bilirubin is ___ .

a) Biliverdin anhydrase
b) Biliverdin reductase
c) Biliverdin inhibitor
d) Heme oxygenase
e) Bilirubin oxygenase

Answer : b

HIS



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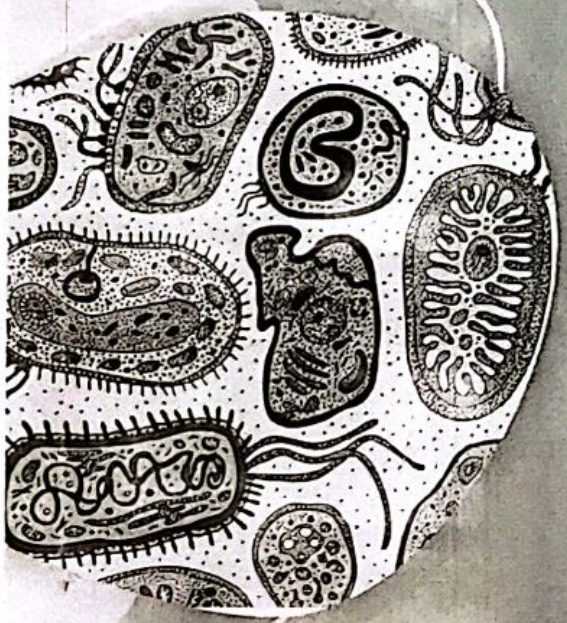


MCQ

Biochemistry

Lecture (3)

Level(1) Sem(

Dr.M.M

Bio and physio HIS 3

1. Bilirubin is transported in blood to the liver by: a) α Globulin b) Albumin c) Fibrinogen d) β globulin e) none of the above	B
2. Normal range of serum albumin: a) 2-3.6 g/dl b) 2-3 g/dl c) 3.5-5.5 g/dl d) 6-8 g/dl e) 7-7.5 g/dl	C
3. Which of the following proteins present in γ globulin fraction? a) Ceruloplasmin b) Haptoglobin c) Immunoglobulin d) C-reactive protein e) Transferrin	C
4. Old male presents with peripheral edema and ascites. The doctor suspects nephrotic syndrome he asked for serum electrophoresis, which of the following is suspected to decrease: a) α1 globulin b) α2 globulin c) β globulin d) α1 antitrypsin e) albumin	E

5. Albumin is synthesized in: *a) RBCs* *b) Liver* *c) Plasma cells* *d) Lymphoid tissues* *e) Kidneys*	**B**
6. Which of the following is the major plasma protein: *a) α1 globulin* *b) α2 globulin* *c) β globulin* *d) albumin* *e) fibrinogen*	**D**
7. Example of acute phase proteins: *a) transferrin* *b) ceruloplasmin* *c) albumin* *d) C-reactive protein* *e) Myoglobin*	**D**
8. γ globulins are synthesized in: *a) RBCS* *b) Liver* *c) Lymphoid tissues* *d) Kidneys* *e) Muscles*	**C**

9. Which of the following plasma proteins is a clotting factor? a) α1 globulin b) α2 globulin c) β globulin d) albumin e) fibrinogen	**E**
10. Hypoalbuminemia is caused by: a) Nephrotic syndrome. b) Burns. c) Hepatitis. Pregnancy. d) All of the above.	**D**
11. Deficiency of one of the following plasma proteins cause Emphysema : a) alpha globulin b) Albumin. c) B-globulin. d) Fibrinogen	**A**
12. The source of plasma proteins can be determined by: a) Electrophoresis. b) Plasmapheresis. c) The Dye-Dilution technique. d) None of the above	**A**
13. The plasma gamma globulins are synthesized mainly in : a) Liver. b) Heart c) Lungs. d) Reticuloendothelial System	**D**

14. Albumin is synthesized In : a) RBCS b) Liver c) Plasma cells d) Lymphoid tissues e) Kidneys	**B**
15. All the following are main functions of the plasma except: a) Transport of hormones. b) Transport of CO2. c) Transport of antibodies. d) Transport of O2.	**D**
16. All the following are functions of plasma proteins except : a) Control of the plasma volume. b) Control of erythropoiesis c) Transport of hormones. d) Carriage of carbon dioxide	**B**
17. C-reactive protein, a plasma protein that is elevated during inflammation and infections. C-reactive protein falls into the category : a) Transport proteins b) Clotting proteins c) Plasma enzymes d) Acute phase proteins	**D**
18. Which of the following plasma protein is not involved in iron homeostasis : a) Haptoglobin b) Transferrin c) Ferritin d) Ceruloplasmin	**D**

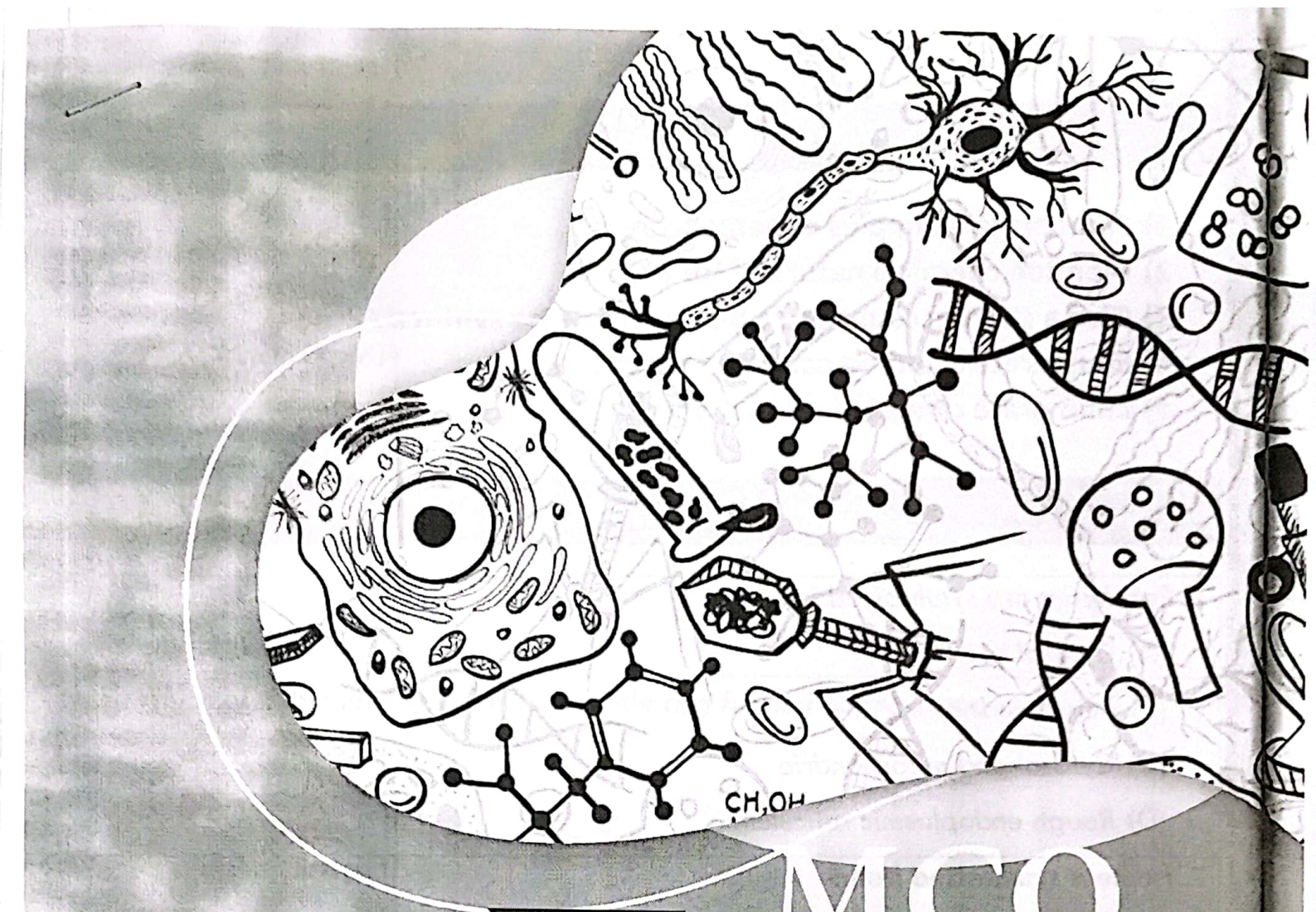
19. The average amount of plasma proteins in blood is: A. 3.5 gm % B. 5 gm% C. 7 gm % D. 9 gm %	C
20. A function of plasma proteins is: A. Erythropoiesis. B. Bone marrow regulation. C. Regulation of blood osmolarity. D. Oxygen transport.	C
21. The highest amount of plasma proteins is: A. Albumen B. Globulins C. Prothrombin. D. Fibrinogen.	A
22. The plasma proteins that are responsible for blood coagulation are: A. Albumin & globulins. B. Globulin & fibrinogen C. γ-globulin. D. Fibrinogen & prothrombin.	D
23. The defensive function microorganisms is produced by: A. γ Globulins. B. Albumin. C. Fibrinogen. D. Prothrombin.	A

24. Albumin, a plasma protein act to regulate: A. Defensive function. B. Blood coagulation. C. Oxygen carrying. D. Blood osmolarity.	**D**
25. Which act as excellent acid-base buffer: A. Hemoglobin. B. Prothrombin. C. Fibrinogen D. globulins	**A**
26. Plasma proteins which act as antibodies and attack foreign bodies are classified as: A. Albumin B. Alpha globulin C. Beta globulin D. Gamma globulin E. Fibrinogen	**D**
27. All the following about plasma albumin is true except: a) It makes the greatest contribution to plasma oncotic pressure. b) It is minimally filtered at renal glomeruli. c) It behaves as an anion at blood the blood pH. d) It carries CO, in the form of carbamino compound. e) It is involved in production of immunity.	**E**
28. Concerning the synthesis of plasma proteins: A. All types are formed by the liver only. B. Albumin, globulins and 50% of fibrinogen are formed by the liver. C. Gamma globulins are formed by liver & plasma cells in RES. D. Gamma globulins are released from activated T-lymphocytes.	**C**

29. The plasma protein with the highest concentration & lowest molecular weight is: A. Albumin. B. Beta globulin. C. Alpha globulin. D. Gamma globulin.	**A**
30. Plasma proteins: A. Are formed in liver only. B. Have a level of 10 gm/L C. Represent 85% of the buffering power of blood. D. Regulate blood volume and plasma viscosity.	**D**
31. The most important function of albumin is: A. Acting as an antibody. B. Contributing to the clotting process. C. Contributing to the effective osmotic pressure of plasma. D. Responsible for viscosity of blood.	**C**
32. The A/G ratio is important clinically in detecting: A. Liver disease. B. Cardiac disease. C. Nervous disease. D. Lung disease.	**A**
33. Regarding plasma proteins: A- Albumin is mainly synthesized by the reticulo-endothelial system. B- Fibrinogen is the primary determinant factor for capillary permeability. C- Albumin concentration is 4.5mg% D- Viscosity is mainly done by the level of fibrinogen.	**D**

34. Albumin/globulin ratio (A/G ratio): A- Normally equals 2-3. B- Is higher in liver diseases. C- Decreases in condition of kidney diseases. D- Increases in infections.	**C**
35. Concerning plasma proteins: A. They include clotting factors. B. Globulins are formed in the liver only. C. Fibrinogen has the highest concentration. D. Albumin has the largest molecular weight.	**A**
36. Albumin/Globulin ratio: A. Normally equals 1.2:1.7. B. Is higher in liver disease. C. Is increased in albuminuria. D. Increased in infections.	**A**
37. The plasma protein per 100 ml of blood in a normal adult male is about: a) 7.5 mg. b) 7.5 gm. c) 7.5 kg. d) 7.5 μg. e) none of the above.	**B**
38. The plasma protein formed outside the liver is: a) Albumin. b) α globulin. c) β globulin. d) γ globulin. e) Fibrinogen.	**D**

39. Concerning plasma proteins: a) *Most of the globulins are formed by plasma cells.* b) *Albumin is responsible for adhesive function.* c) *Fibrinogen is responsible for osmotic pressure of the plasma.* d) *Prothrombin is responsible for clotting.*	**D**
40. One of the following is false regarding organic constituent of plasma: a) *plasma protein* b) *lipid* c) *glucose and amino acids* d) *CO2 and O2*	**D**
41. 1ST and most important sign of hypoprotinemia is: a) *Swelling of face and edema* b) *loss of ms* c) *infection and dry hair* d) *fatigue*	**A**



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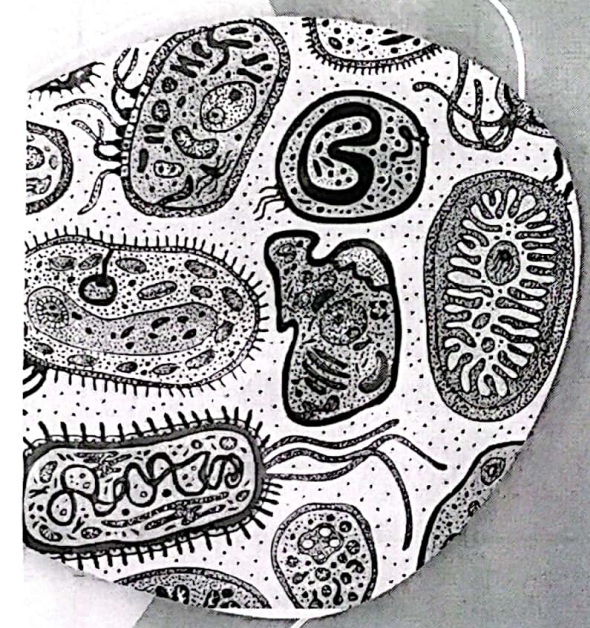
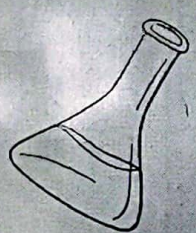
MCQ
HIS
Biochemistry
Lecture(1)

Level(1) Sem(2)





Dr.M.M

Written Bio 1

1) Enumerate examples of hemoprotein ?
2) Mention chemical nature of HB ?
3) Give a short account on regulation of heme synthesis ?
4) Enumerate acquired causes of porphyria ?
5) Enumerate clinical picture of porphyria ?

Written Bio 1

1. Porphyrins are synthesized in: *(A) Cytosol only* *(B) Mitochondria only* *(C) Cytosol and mitochondria* *(D) Rough endoplasmic reticulum*	**C**
2. Heme is synthesized from: *(A) Succinyl-CoA and glycine* *(B) Active acetate and glycine* *(C) Active succinate and alanine* *(D) Active acetate and alanine*	**A**
3. In the biosynthesis of the iron protoporphyrin, the product of the condensation between succinyl-CoA and glycine is: *(A) porphobilinogen* *(B) δ-Aminolevulinate* *(C) Hydroxymethylbilane* *(D) Uroporphyrinogen I*	**A**
4. Porphyrin synthesis is inhibited in: *(A) Mercury poisoning* *(B) Lead poisoning* *(C) Manganese poisoning d) Barium poisoning*	**B**

5. Which of the following is key rate limiting enzyme for heme synthesis? a) *Heme synthase* b) *Ferrochelatase* c) *ALA synthase* d) *ALA dehydratase*	**C**
6. Which of the following act as a co-enzyme for ALA synthase? a) *Vitamin B12* b) *PLP (B6)* c) *vitamin C* d) *Vitamin B1*	**B**
7. Which of the following is the 1st pyrrole ring formed during heme synthesis? a) *pyrrolidine* b) *proline* c) *porphobilinogen* d) *ALA*	**C**
8. *Which of the* **following is mitochondrial enzyme participates in heme synthesis?** a) *ALA dehydratase* b) *PBG synthase* c) *PBG deaminase* d) *ALA synthase*	**D**
9. Which of the following is a product of Uro-porphyrinogen decarboxylase? a) *protoporphyrin* b) *protophyrinogen* c) *coproporphyrinogen* d) *heme*	**C**

10. Which of the following is immediate precursor of heme? a) protoporphyrin b) protophyrinogen c) coproporphyrinogen d) Uroporphyrinogen	A
11. Which of the following is the most common cause of acquired porphyria? a) mercury poisoning b) exposure to sun light c) lead poisoning d) Arsenic poisoning	C
12. Which of the following is the main site of heme synthesis? a) liver b) skin c) bone marrow d) brain	C
13. Which of the following is not site of heme synthesis? a) Liver b) mature RBCs c) immature RBCs d) brain	B
14. Which of the following catalyze the 1st step in heme synthesis? a) ALA dehydratase b) ferrochelatase c) ALA synthase d) Heme synthase	C

15. ALA dehydratase catalyzes conversion of ALA into: a) Hydroxymethylbilane b) Uroporphyrinogen c) Coprophyrinogen d) Porphobilinogen e) Protoporphyrin	**D**
16. Lead inhibits: a) ALA dehydratase b) ALA synthase c) Ferro chelatase d) All of the above e) None of the above	**D**
17. The 4 pyrrole rings in porphyrin are united together by: a) Methyl group b) Methenyl group c) Methylene group d) Methanol e) None of the above	**C**
18. The rate-controlling step in hepatic porphyrin biosynthesis is: a) Synthesis of δ -ALA b) Synthesis of porphobilinogen c) Synthesis of uroporphyrinogen d) Synthesis of coproporphyrinogen e) None of the above	**A**

19. ALA dehydratase is responsible for enzymatic reaction that produces: a) δ -ALA b) porphobilinogen c) uroporphyrinogen d) coproporphyrinogen e) None of the above	B
20. By which process uroporphyrinogen passes to be converted to coproporphyrinogen: a) Oxidation b) Reduction c) Decarboxylation d) Deamination e) None of the above	C
21. All of the following stimulate haem synthesis except: a) Low O2 tension b) Steroids c) Iron d) Lead e) None of the above	D
22. One of the following is a symptom of porphyria: a) Abdominal pain b) Anxiety c) Photosensitivity d) Porphyrinuria e) All of the following	E

23. The porphyrin present in haem is: a) Uroporphyrin b) Protoporphyrin I c) Coproporphyrin d) Protoporphyrin 3 e) Porphobilinogen	**D**
24. During synthesis of porphyrins, synthesis of δ-amino levulinic acid occurs in: a) Mitochondria b) Cytosol c) Both in mitochondria and cytosol d) Ribosomes e) Lysosomes	**A**
25. The regulatory enzyme for haem synthesis is: a) ALA synthase b) Haem synthase c) Uroporphyrinogen decarboxylase d) Protoporphyrinogen oxidase e) Ferrochelatase	**A**
26. Which of the following is a hemoprotein? a) Albumin b) Tyrosinase c) Lipoproteins d) Glycoproteins e) Hemoglobin	**E**

27. The synthesis of heme involves both cytosole and mitochondrial reaction, which of the following enzymes catalyzed reaction occurs in cytosol? a) delta aminolevulinic acid synthase b) uroporphyrinogen synthase III c) protoporphyrinogen oxidase d) ferrochelatse	B
28. Which of the following is not heme protein: A) Tryptophan pyrrolase B) Cytochrome P450 C) Myoglobin D) Tyrosinase.	D
29. In hemoglobin biosynthetic pathway, lead is known to inhibit enzyme: A) delta-ALA synthase b) Uroporphyrinogen synthase C) ALA dehydratase D) Heme synthase	C
30. The precursor of protoporphyrin is: A) Alanine b) Proline C) Glycine d) Leucine	C
31. Pyridoxal phosphate is necessary for: A) ALA synthase b) Uroporphyrinogen synthase C) ALA dehydratase d) Ferrochelatase	A
32. Along with succinyl coA, which of the following amino acid serve as starting material in heme synthesis: a) glycine b) leucine c) alanine d) lysine	A

Important Notes & MCQ on Biochemistry (HIS)

MCQ Notes Bio HIS 1

1) Examples **of hemoprotein** are HB , myoglobin and cytochromes
2) Porphyrin is formed from **4 pyrrole ring** connected together by methylene bridge
3) **Site of heme synthesis** in cytosol and mitochondria on bone marrow (mainly) and liver except mature RBCs
4) Glycine condense with succinyle COA (active succinate or active succinic acid) to form delta amino levulonic acid in mitochondria by the help of **delta ALA synthase** (key step or rate liminting step).
5) Delta ALA is converted into Porphobilinogen by the help of **ALA dehydratase**
6) Protoporphyrin in converted to heme of **hemoxygenase or ferrochelatase**
7) **Lead** inhibit ALA dehydratase mainly + ALA synthase + heme synthase
8) **Hypoxia , steroid and iron** stimulate ALA synthase (stimulate heme synthesis)
9) Metabolic disorder of heme synthesis is **porphyria**

MCQ Bio HIS 1

1. Porphyrins are synthesized in: (A) Cytosol only (B) Mitochondria only (C) Cytosol and mitochondria (D) Rough endoplasmic reticulum	C
2. Heme is synthesized from: (A) Succinyl-CoA and glycine (B) Active acetate and glycine (C) Active succinate and alanine (D) Active acetate and alanine	A
3. In the biosynthesis of the iron protoporphyrin, the product of the condensation between succinyl-CoA and glycine is: (A) porphobilinogen (B) δ-Aminolevulinate (C) Hydroxymethylbilane (D) Uroporphyrinogen I	B
4. Porphyrin synthesis is inhibited in: (A) Mercury poisoning (B) Lead poisoning (C) Manganese poisoning d) Barium poisoning	B
5. Which of the following is key rate limiting enzyme for heme synthesis? a) Heme synthase b) Ferrochelatase c) ALA synthase d) ALA dehydratase	C
6. Which of the following act as a co-enzyme for ALA synthase? a) Vitamin B12 b) PLP (B6) c) vitamin C d) Vitamin B1	B

7. Which of the following is the 1st pyrrole ring formed during heme synthesis? a) pyrrolidine b) proline c) porphobilinogen d) ALA	C
8. Which of the following is mitochondrial enzyme participates in heme synthesis? a) ALA dehydratase b) PBG synthase c) PBG deaminase d) ALA synthase	D
9. Which of the following is a product of Uro-porphyrinogen decarboxylase? a) protoporphyrin b) protophyrinogen c) coproporphyrinogen d) heme	C
10. Which of the following is immediate precursor of heme? a) protoporphyrin b) protophyrinogen c) coproporphyrinogen d) Uroporphyrinogen	A
11. Which of the following is the most common cause of acquired porphyria? a) mercury poisoning b) exposure to sun light c) lead poisoning d) Arsenic poisoning	C
12. Which of the following is the main site of heme synthesis? a) liver b) skin c) bone marrow d) brain	C
13. Which of the following is not site of heme synthesis? a) Liver b) mature RBCs c) immature RBCs d) brain	B

14. Which of the following catalyze the 1st step in heme synthesis? a) ALA dehydratase b) ferrochelatase c) ALA synthase d) Heme synthase	C
15. ALA dehydratase catalyzes conversion of ALA into: a) Hydroxymethylbilane b) Uroporphyrinogen c) Coprophyrinogen d) Porphobilinogen e) Protoporphyrin	D
16. The 4 pyrrole rings in porphyrin are united together by: a) Methyl group b) Methenyl group c) Methylene group d) Methanol e) None of the above	C
17. The rate-controlling step in hepatic porphyrin biosynthesis is: a) Synthesis of δ -ALA b) Synthesis of porphobilinogen c) Synthesis of uroporphyrinogen d) Synthesis of coproporphyrinogen e) None of the above	A
18. ALA dehydratase is responsible for enzymatic reaction that produces: a) δ -ALA b) porphobilinogen c) uroporphyrinogen d) coproporphyrinogen e) None of the above	B

19. By which process uroporphyrinogen passes to be converted to coproporphyrinogen: *a) Oxidation* *b) Reduction* *c) Decarboxylation* *d) Deamination* *e) None of the above*	**C**
20. During synthesis of porphyrins, synthesis of δ-amino levulinic acid occurs in: *a) Mitochondria* *b) Cytosol* *c) Both in mitochondria and cytosol* *d) Ribosomes* *e) Lysosomes*	**A**
21. The regulatory enzyme for haem synthesis is: *a) ALA synthase* *b) Haem synthase* *c) Uroporphyrinogen decarboxylase* *d) Protoporphyrinogen oxidase* *e) Ferrochelatase*	**A**

MCQ Notes Bio HIS 2

1) **HB** is tetramer because it is formed of four subunits
2) **HB** is conjugated protein.
3) Non protein part of HB = prosthetic group is **heme**
4) HB is formed of **4 heme + 1 globin**
5) Iron in the centre of HB has **six bond** , 4 with 4 N of 4 pyrrole ring , one with O2 , one with histidine of globin
6) Iron in HB is in **ferrous reduced** state
7) O2 bind to **ferrous iron**
8) **HB** is heterotetramer formed of 4 subunits (quaternary structure) **while myoglobin** is monomer formed of one subunit (tertiary structure)
9) **HB** can carry up to 4 O2 while **myoglobin** carry only one oxygen
10) Myoglobin has **higher affinity** to O2 than HB
11) **HBA1 or HBA** represent 98% of adult HB , formed of 2 alpa + 2 beta
12) **HB A2** formed of 2 alpha + 2 delta
13) **HB F** formed of 2 alpha + 2 gamma , with higher affinity to O2 , converted into HBA with 1-2 years after birth
14) **HB A1C = glycated HB** : normally < 5.7 % , if more than 6.5% indicate diabetes , reflect glycemic control over the last 2 monthes
15) **Carboxy HB = CO :**
    - compete with O2 on the same binding site on HB but with higher affinity 210 times more than O2
    - color chery red

16) **met-HB :**

- **formed by** oxidation of ferrous to ferric by the effect of oxidizing agent and deficieny of met-HB reductase
- color brownish cyanosis or dark brown

17) **sulf HB** is greenish caused by irrerversible oxidation of HB

18) **Sickle cell anemia caused** by single amino acid substitution in beta globin chain (valine instead of glutamic acid) leading to formation of HB S and precipitation of RBCS with thrombosis

19) **HB degradation** occurs after 120 day in RES (spleen , liver , bone marrow) leading to formation of Heme and globin

20) Biliverdin is converted into bilirubin by **biliverdin reductase**

21) Unconjugated bilirubin carried by **albumin**

22) **In colon :** bacteria flora act on conjugated bilirubin to convert into = urobilinogen

23) Color of stool by **stercobilin**

24) Color of urine by **urobilin**

25) **Jaundice is** yellowish discoloration of skin , sclera and mucos membrane

26) **Normal total bilirubin up** to 1.2 mg/dl , direct up to 0.3 mg/dl

27) Hyperbilirubinemia > 2.5-3 mg/dl >> **Jaundice**

28) **Hemolytic jaundice** caused by hemolytic anemia as sickle cell anemia and increases unconjugated (indirect , hemobilirubin) in blood

29) **Hepatic jaundice** increases both conjugated and unconjugated bilirubin in blood

30) **Obstructive or post-hepatic jaundice** increase conjugated (direct or cholebilirubin) in blood

MCQ Bio HIS 2

1. 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 e) Histidine residue of the globin chain	**D**
2. Adult hemoglobin (HbA) is a tetrameter consisting of ..... a) $\alpha 2\delta 2$ b) $\alpha 2\beta 2$ c) $\alpha 2\gamma 2$ d) $\beta 4$ e) $\gamma 4$	**B**
3. Jaundice due to hereditary spherocytosis can be classified under ..... a) Sickle cell anemia b) Thalassemia c) Haemolytic jaundice d) Hepatocellular jaundice e) Obstructive jaundice	**C**
4. 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) Insufficient iron in the diet e) Substitution of a single amino acid	**E**
5. The enzyme responsible to change biliverdin into free bilirubin is ..... a) Biliverdin anhydrase b) Biliverdin reductase c) Biliverdin inhibitor d) Heme oxygenase e) Bilirubin oxygenase	**B**

6. 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 here 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 e) Increase the affinity of hemoglobin to oxygen	**B**
7. Life span of RBCS is: a) 120 days b) 90 days c) 140 days d) 150 days	**A**
8. The polypeptides in the globin part of normal adult HB consists of: a) 2 alpha and 2 delta chains b) 2 alpha and 2 gamma chains c) 2 beta and 2 gamma chains d) 2 alpha and 2 beta chains e) 4 beta chains	**D**
9. Sickle cell anemia may be caused by: a) Deficiency in the amount or in the structure of spectrin b) Mutation 6th Codon of B globin gene where glutamic acid is replaced by valine c) Mutations In genes encoding red cell membrane proteins d) Absence of one or more of genes responsible for synthesis of or B globin chains e) None of the above	**B**
10. Bilirubin Is formed in: a) Brain b) Kidney c) Bones d) Spleen & bone marrow e) Intestine	**D**

11. Which of the following is responsible for the color of urine? a) Urobilinogen b) Urobilin c) Stercobilinogen d) Stercobilin	**B**
12. Which of following is responsible for the color of the stool: a) Urobilinogen b) Urobilin c) stercobilinogen d) stercobilin	**D**
13. Urobilinogen is formed in: a) Liver. b) Kidney. c) Large intestine d) Urinary tract	**C**
14. Which of the following is a hemoprotein? a) Albumin b) Tyrosinase c) Lipoproteins d) Glycoproteins e) Hemoglobin	**E**
15. Bilirubin is transported in blood to the liver by: a) α Globulin b) Albumin c) Fibrinogen d) β globulin	**B**
16. Haemoglobin is: a) Conjugated protein b) Simple protein c) Drivatives protein d) All of the Above	**A**

17. Haem: a) It is a Fe-porphyrin compound b) the protein part of Hb c) is composed of four polypeptide chains d) None of the above	**A**
18. In Hb-A1C (Glycosylated Hb) patients with D.M: a) it may be increased to > 15% of total Hb b) Normally, it is present in conc. of 8 - 11 % of total Hb c) Normally, it is present in conc. of 3 -9% of total Hb d) it may be increased > 6.5% of total Hb	**D**
19. Sickle cell disease: a) Due to mutation in γ -globin gene b) Due to mutation in β - globin gene c) Due to mutation in ε - globin gene d) Due to mutation in α -globin gene e) Due to mutation in δ - globin gene	**B**
20. Which of the following statements about myoglobin is true? A) Myoglobin is primarily found in plasma. B) Myoglobin is responsible for oxygen transport in the bloodstream. C) Myoglobin contains four heme groups per molecule. D) Myoglobin has a higher oxygen affinity compared to hemoglobin.	**D**
21. Which of the following statements about myoglobin is true? A) Myoglobin is a protein found primarily in muscle cells. B) Myoglobin is responsible for the transport of oxygen in the bloodstream. C) Myoglobin is composed of four subunits. D) Myoglobin is an enzyme involved in the breakdown of glucose.	**A**
22. Type of bilirubin increased in plasma in haemolytic jaundice: a) Unconjugated (indirect) b) Conjugated (direct) c) Both d) None of the above	**A**

23. Type of bilirubin increased in plasma in obstructive jaundice: *a) Unconjugated (indirect)* *b) conjugated (direct)* *c) Both* *d) None of the above*	***B***
24. Type of bilirubin increased in plasma in hepatocellular jaundice: *a) Unconjugated (indirect)* *b) conjugated (direct)* *c) Both types* *d) None of the above*	***C***
25. The amino acid substitution of Val for Glu in Hemoglobin S results in: aggregation of the protein because of …….. interactions between molecules: *A) covalent* *B) disulphide* *c) hydrogen bonding* *D) hydrophobic* *E) Ionic*	***D***
26. Cyanmethaemoglobin can be formed from: *A) Oxy Hb* *B) Met Hb* *C) Carboxy Hb* *D) All of these*	***B***
27. Normal level of total bilirubin in plasma is less than: *A. 0.2 mg/dL.* *B. 1.2 mg/dL.* *C. 2.2 mg/dL.* *D. 10 mg/dL.* *E. None of the above.*	***B***
28. Manifest jaundice occurs when plasma bilirubin level exceeds: *A. 1.2 mg/dL.* *B. 2.5 mg/dL.* *C. 3 mg/dL.* *D. 5 mg/dL.* *E. 10 mg/dL.*	***B***

29. Urobilinogen is formed: A. In the liver parenchymal cells. B. In the reticuloendothelial system. C. In the intestine by bacteria D. In the urine. E. By pancreatic enzymes.	C
30. The color of a healing bruise goes from reddish-purple to green and finally to yellow. This color sequence is due to the conversion of: A. Heme to bile salts B. Serum bilirubin to liver biliverdin C. Localized heme to biliverdin to bilirubin D. Localized heme to urobilinogen to stercobilinogen E. Bilirubin to mono-conjugated bilirubin to di-conjugated bilirubin	C
31. Carbon monoxide binds to heme: A) with a higher affinity than oxygen. B) resulting in the oxidation of the Fe(II) to Fe(III) C) in a manner that displaces carbon dioxide, causing CO2 poisoning. D) from the side opposite oxygen, resulting in a brown colored heme. E) with a lower affinity than oxygen.	A
32. Myoglobin and a single chain of hemoglobin have similar .... structures. A) primary B) secondary C) tertiary D) quaternary E) none of the above	C
33. In sickle-cell anemia, the negatively charged glutamic acid residue is replaced by the neutral amino acid A) tyrosine B) lysine C) valine D) adenosine E) glycine	C

34. The degradation of hemoglobin primarily occurs in which organ? a) Liver b) Kidneys c) Spleen d) Lungs	**C**
35. A1c (HbA1c) is a form of hemoglobin that used as a marker for long-term glucose control in individuals with diabetes. The "A1c" portion refers to: a) A specific mutation in the hemoglobin gene b) The alpha chains of hemoglobin c) The beta chains of hemoglobin d) Glycated hemoglobin molecules	**D**
36. Met HB: a) Cause stagnant hypoxia b) HB combine with CO c) The subject suffer from fever d) Result from oxidation of ferrous to ferric	**D**
37. What is true about symptoms of CO poisoning? a. Sever cyanosis b. Shallow rapid breathing c. Increased heart rate d. Cherry red color	**D**

MCQ Notes Bio HIS 3

1) Plasma protein conc is **7-7.5 gm/dl**

2) Plasma proteins are **simple and conjugated proteins**

3) **Plasma proteins** are formed in liver except gamma globulin formed in plasma cell in lymphoid tissue

4) **Albumin :**

- Major plasma protein , 60% , 3.5-5.5 gm/dl
- Responsible of 70-80% of osmotic pressure
- Carry unconjugated bilirubin , FA and drugs
- Treat hemorhagic shock and burn

5) **Alpha 1 antitrypsin** is deficient in emphysema

6) **Haptoglobin** bind to free extracorpuscular HB to prevent its loss in urine

7) **CRP** is indicator of inflammation and tissue damage

8) **Gamma globulin** is antibody = immunoglobulin

9) **Fibrinogen and prothrombin** are clotting factors

10) Separation of plasma proteins occur by **cellulose acetate electrophoresis**

11) Proteins that increases in inflammation are **acute phase reactant**

12) **Albumin globulin ratio :**

- Normally 1.2 – 1.6
- Decreased in liver dse , renal dse and infection
- Increased in congenital aggamma gloubinemia

13) Colloid smotic or oncotic pressure is **19 mmhg** caused mainly by **albumin** due to gighest conc and samllest molecular weight

14) Plasma protein is responsible for **15%** of buffering capacity of blood

15) **Blood viscoisity** caused by RBCs + fibrinogen due to its elongated shape

16) **Plasma protein** close pores and decrease capillary permeability

17) Transferrin carry iron , ceruloplasmin carry copper

18) Carrier function is reservoir , prevent substance loss in urine , make lipid miscible in water

19) Plasma protein carry CO2 in the form of carbamino compounds

20) Ratio of tissue protein to plasma protein is 33: 1 (state of reversible equilibrium)

21) Albumin decreases in liver dse and nephrotic syndrome

22) Edema and swelling is the most important sign of hypoproteinemia

MCQ Bio HIS 3

1. Bilirubin is transported in blood to the liver by: a) α Globulin b) Albumin c) Fibrinogen d) β globulin e) none of the above	**B**
2. Normal range of serum albumin: a) 2-3.6 g/dl b) 2-3 g/dl c) 3.5-5.5 g/dl d) 6-8 g/dl e) 7-7.5 g/dl	**C**
3. Which of the following proteins present in γ globulin fraction? a) Ceruloplasmin b) Haptoglobin c) Immunoglobulin d) C-reactive protein e) Transferrin	**C**
4. Old male presents with peripheral edema and ascites. The doctor suspects nephrotic syndrome he asked for serum electrophoresis, which of the following is suspected to decrease: a) α1 globulin b) α2 globulin c) β globulin d) α1 antitrypsin e) albumin	**E**
5. Albumin is synthesized in: a) RBCs b) Liver c) Plasma cells d) Lymphoid tissues e) Kidneys	**B**

6. Which of the following is the major plasma protein: a) α1 globulin b) α2 globulin c) β globulin d) albumin e) fibrinogen	**D**
7. Example of acute phase proteins: a) transferrin b) ceruloplasmin c) albumin d) C-reactive protein e) Myoglobin	**D**
8. γ globulins are synthesized in: a) RBCS b) Liver c) Lymphoid tissues d) Kidneys e) Muscles	**C**
9. Which of the following plasma proteins is a clotting factor? a) α1 globulin b) α2 globulin c) β globulin d) albumin e) fibrinogen	**E**
10. Deficiency of one of the following plasma proteins cause Emphysema : a) alpha globulin b) Albumin. c) B-globulin. d) Fibrinogen	**A**
11. The source of plasma proteins can be determined by: a) Electrophoresis. b) Plasmapheresis. c) The Dye-Dilution technique. d) None of the above	**A**

12. All the following are main functions of the plasma except: a) Transport of hormones. b) Transport of CO2. c) Transport of antibodies. d) Transport of O2.	**D**
13. All the following are functions of plasma proteins except : a) Control of the plasma volume. b) Control of erythropoiesis c) Transport of hormones. d) Carriage of carbon dioxide	**B**
14. C-reactive protein, a plasma protein that is elevated during inflammation and infections. C-reactive protein falls into the category : a) Transport proteins b) Clotting proteins c) Plasma enzymes d) Acute phase proteins	**D**
15. Which of the following plasma protein is not involved in iron homeostasis : a) Haptoglobin b) Transferrin c) Ferritin d) Ceruloplasmin	**D**
16. The average amount of plasma proteins in blood is: A. 3.5 gm % B. 5 gm% C. 7 gm % D. 9 gm %	**C**
17. A function of plasma proteins is: A. Erythropoiesis. B. Bone marrow regulation. C. Regulation of blood osmolarity. D. Oxygen transport.	**C**

18. The highest amount of plasma proteins is: A. Albumen B. Globulins C. Prothrombin. D. Fibrinogen.	**A**
19. The plasma proteins that are responsible for blood coagulation are: A. Albumin & globulins. B. Globulin & fibrinogen C. γ-globulin. D. Fibrinogen & prothrombin.	**D**
20. The defensive function microorganisms is produced by: A. γ Globulins. B. Albumin. C. Fibrinogen. D. Prothrombin.	**A**
21. Albumin, a plasma protein act to regulate: A. Defensive function. B. Blood coagulation. C. Oxygen carrying. D. Blood osmolarity.	**D**
22. Which act as excellent acid-base buffer: A. Hemoglobin. B. Prothrombin. C. Fibrinogen D. globulins	**A**
23. Plasma proteins which act as antibodies and attack foreign bodies are classified as: A. Albumin B. Alpha globulin C. Beta globulin D. Gamma globulin E. Fibrinogen	**D**

24. All the following about plasma albumin is true except: a) It makes the greatest contribution to plasma oncotic pressure. b) It is minimally filtered at renal glomeruli. c) It behaves as an anion at blood the blood pH. d) It carries CO, in the form of carbamino compound. c) It is involved in production of immunity.	**E**
25. Concerning the synthesis of plasma proteins: A. All types are formed by the liver only. B. Albumin, globulins and 50% of fibrinogen are formed by the liver. C. Gamma globulins are formed by liver & plasma cells in RES. D. Gamma globulins are released from activated T-lymphocytes.	**C**
26. The plasma protein with the highest concentration & lowest molecular weight is: A. Albumin. B. Beta globulin. C. Alpha globulin. D. Gamma globulin.	**A**
27. Plasma proteins: A. Are formed in liver only. B. Have a level of 10 gm/L C. Represent 85% of the buffering power of blood. D. Regulate blood volume and plasma viscosity.	**D**
28. The most important function of albumin is: A. Acting as an antibody. B. Contributing to the clotting process. C. Contributing to the effective osmotic pressure of plasma. D. Responsible for viscosity of blood.	**C**
29. The A/G ratio is important clinically in detecting: A. Liver disease. B. Cardiac disease. C. Nervous disease. D. Lung disease.	**A**

30. Regarding plasma proteins: A- Albumin is mainly synthesized by the reticulo-endothelial system. B- Fibrinogen is the primary determinant factor for capillary permeability. C- Albumin concentration is 4.5mg% D- Viscosity is mainly done by the level of fibrinogen.	**D**
31. Albumin/globulin ratio (A/G ratio): A- Normally equals 2-3. B- Is higher in liver diseases. C- Decreases in condition of kidney diseases. D- Increases in infections.	**C**
32. Concerning plasma proteins: A. They include clotting factors. B. Globulins are formed in the liver only. C. Fibrinogen has the highest concentration. D. Albumin has the largest molecular weight.	**A**
33. Albumin/Globulin ratio: A. Normally equals 1.2:1.7. B. Is higher in liver disease. C. Is increased in albuminuria. D. Increased in infections.	**A**
34. The plasma protein per 100 ml of blood in a normal adult male is about: a) 7.5 mg. b) 7.5 gm. c) 7.5 kg. d) 7.5 μg. e) none of the above.	**B**
35. The plasma protein formed outside the liver is: a) Albumin. b) α globulin. c) β globulin. d) γ globulin. e) Fibrinogen.	**D**

36. Concerning plasma proteins: a) Most of the globulins are formed by plasma cells. b) Albumin is responsible for adhesive function. c) Fibrinogen is responsible for osmotic pressure of the plasma. d) Prothrombin is responsible for clotting.	**D**
37. One of the following is false regarding organic constituent of plasma: a) plasma protein b) lipid c) glucose and amino acids d) CO2 and O2	**D**
38. 1ST and most important sign of hypoprotinemia is: a) Swelling of face and edema b) loss of ms c) infection and dry hair d) fatigue	**A**