

1. Hemoglobin is composed of:

- A. Two heme and two globin chains
- B. Four heme groups only
- C. Four subunits each containing heme and globin
- D. One heme and three globin chains
- E. Only globin protein

2. The iron present in hemoglobin is in which state?

- A. Ferric (Fe^{3+})
- B. Ferrous (Fe^{2+})
- C. Metallic iron
- D. Ferritin-bound iron
- E. Hemosiderin form

3. Adult hemoglobin (HbA) consists of:

- A. $\alpha_2\gamma_2$
- B. $\alpha_2\beta_2$
- C. β_4
- D. α_4
- E. $\alpha\beta\gamma\delta$

4. Fetal hemoglobin (HbF) differs from HbA in that it:

- A. Has lower affinity for oxygen
- B. Contains β chains instead of γ
- C. Has higher affinity for oxygen
- D. Cannot bind oxygen
- E. Contains no iron

5. Hemoglobin A1c is formed by:

- A. Binding of oxygen to Hb
- B. Binding of CO_2 to globin
- C. Reaction of Hb with glucose
- D. Oxidation of iron
- E. Binding of carbon monoxide

6. The affinity of hemoglobin to carbon monoxide compared to oxygen is approximately:

- A. Equal
- B. 10 times greater
- C. 50 times greater
- D. 200 times greater
- E. 500 times greater

7. Carbon dioxide binds to hemoglobin at:

- A. Iron of heme
- B. Porphyrin ring
- C. Amino acids of globin
- D. Only plasma proteins
- E. RBC membrane

8. Methemoglobin is unable to carry oxygen because:

- A. It lacks globin chains
- B. Iron is in ferric state
- C. Iron is absent
- D. It binds CO₂ strongly
- E. It is degraded rapidly

9. The enzyme responsible for converting methemoglobin back to hemoglobin is:

- A. Catalase
- B. Peroxidase
- C. Methemoglobin reductase
- D. Superoxide dismutase
- E. Carbonic anhydrase

10. Sickle cell anemia is caused by:

- A. Defect in α chains
- B. Defect in β chains
- C. Absence of heme
- D. Iron deficiency
- E. Excess globin production

11. All of the following are normal types of hemoglobin EXCEPT:

- A. HbA
- B. HbF
- C. HbA1c

- D. HbA (adult)
 - E. HbF (fetal)
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12. A patient with chronically elevated blood glucose will show increased levels of:

- A. HbF
 - B. HbCO
 - C. HbA1c
 - D. MetHb
 - E. HbS
-

13. All of the following conditions can cause hemolytic anemia EXCEPT:

- A. Incompatible blood transfusion
 - B. Snake venom
 - C. Chemotherapy
 - D. Malaria infection
 - E. Antibodies against RBCs
-

14. Aplastic anemia is primarily due to:

- A. Iron deficiency
 - B. Bone marrow depression
 - C. Increased RBC destruction
 - D. Acute blood loss
 - E. Vitamin B12 deficiency
-

15. Hemorrhagic anemia results from:

- A. Chronic infection
 - B. Acute blood loss
 - C. Iron malabsorption
 - D. Bone marrow failure
 - E. Genetic mutation
-

16. The most common cause of iron deficiency anemia is:

- A. Liver disease
 - B. Malabsorption
 - C. Dietary deficiency
 - D. Chronic infection
 - E. Bone marrow failure
-

17. Which of the following increases iron requirement physiologically?

- A. Old age
 - B. Infancy
 - C. Chronic disease
 - D. Liver failure
 - E. Hemorrhage
-

18. Megaloblastic anemia is caused by deficiency of:

- A. Iron only
 - B. Vitamin C
 - C. Vitamin B12 or folic acid
 - D. Calcium
 - E. Protein
-

19. Pernicious anemia is specifically due to:

- A. Iron loss
 - B. Lack of intrinsic factor
 - C. Excess RBC destruction
 - D. Blood loss
 - E. Infection
-

20. Polycythemia is defined as:

- A. Decreased RBC count
 - B. Increased WBC count
 - C. Increased RBC count
 - D. Decreased hemoglobin only
 - E. Increased plasma volume
-

 **Answers**

- 1. C
- 2. B
- 3. B
- 4. C
- 5. C
- 6. D
- 7. C
- 8. B
- 9. C
- 10. B
- 11. C
- 12. C
- 13. C

14. B
15. B
16. C
17. B
18. C
19. B
20. C

