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1. What is the fundamental unit of collagen?

- a) Tropocollagen
- b) Hydroxyproline
- c) Hydroxylysine
- d) Glycine

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Answer: a

Explanation: A typical collagen is long, stiff, inelastic and triple-stranded helical structure and is made up of tropocollagen. Tropocollagen consists of 3-coiled  $\alpha$  chains. While hydroxylysine, hydroxyproline, and glycine are the amino acid sequence of tropocollagen.

2. Name the vitamins which cause scurvy.

- a) Vitamin B
- b) Vitamin B3
- c) Vitamin C
- d) Vitamin K

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Answer: c

Explanation: Scurvy is a disease that affects the structure of collagen. It occurs due to impaired synthesis of collagen which results due to deficiencies of prolyl and lysyl hydroxylases.

3. Arrange the following sequence of collagen synthesis in the correct order.

- 1) The entrance of polypeptide into the rough endoplasmic reticulum
- 2) Packaged in to transport vesicle
- 3) Hydroxylation of lysyl and prolyl residues
- 4) Formation of tropocollagen
- 5) Covalent cross-linking of tropocollagen
- 6) Collection of fibrils

- a) 2, 3, 4, 1, 6, 5
- b) 4, 3, 2, 1, 5, 6
- c) 1, 2, 3, 4, 6, 5
- d) 1, 3, 4, 2, 5, 6

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Answer: d

Explanation: Biosynthesis of collagen starts with the entry of polypeptides which further involves the formation tropocollagen by hydroxylation of prolyl and lysyl residues. Once tropocollagen is formed, it is packed in to transport vesicle and undergo exocytosis. Fibrils are formed by the lateral covalent cross-linking of tropocollagens.

4. Name the protein which is responsible for extensibility and elasticity of connective tissues.

- a) Collagen
- b) Elastin
- c) Actin

d) Keratin

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Answer: b

Explanation: Elastin is the second major protein present in the extracellular matrix, due to its high hydrophobic nature it constitutes extensibility and elasticity to the connective tissues. It is also considered as the main component of elastic fibers found in a ligament.

5. Which of these type of curve shows the oxygen binding capacity of hemoglobin?

a) Hyperbolic curve

b) Sigmoidal curve

c) Exponential curve

d) Linear curve

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Answer: b

Explanation: A single molecule of hemoglobin binds up to four molecules of oxygen ( $\text{Hb} + 4\text{O}_2 = \text{Hb}(\text{O}_2)_4$ ). The sigmoidal curve shows the cooperativity in binding of oxygen and hemoglobin. This curve is a plot between the fractional saturation of hemoglobin versus the partial pressure of oxygen.

6. Oxygen affinity for hemoglobin is affected by Ph and this phenomenon is known as Bohr's effect.

a) True

b) False

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Answer: a

Explanation: PH has a strong effect on the oxygen affinity of hemoglobin. Lowering of Ph reduces the oxygen affinity of hemoglobin which shifts the sigmoidal curve to the right which and it shows that more partial pressure of oxygen is required for hemoglobin to bind the given amount of oxygen.

7. What is the function of myoglobin?

a) Oxygen storage

b) Oxygen carrier

c) Antioxidant

d) Oxidant

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Answer: a

Explanation: Myoglobin bind with one oxygen molecule and functions as an oxygen storage protein. Dissociation of myoglobin from oxygen is given by  $\text{MbO}_2 = \text{Mb} + \text{O}_2$ .

8. What is the name of protein which is found in nail, hair, and horns?

a) Myoglobin

b) Hemoglobin

c) Keratin

d) Collagen  
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Answer: c

Explanation: Keratin is the fibrous protein present in the eukaryotes. They have been further classified into  $\alpha$ -keratin and  $\beta$ -keratin, in which  $\alpha$ -keratin is tough and insoluble and constitute almost the entire dry weight of hair, wool, nail, claws, horn, hooves etc.

9. In which iron(Fe) state myoglobin binds to the oxygen?

- a)  $\text{Fe}^{2+}$
- b)  $\text{Fe}^{3+}$
- c) Fe
- d)  $\text{Fe}^{4+}$

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Answer: a

Explanation: Myoglobin only in the  $\text{Fe}^{2+}$  state can bind with oxygen as the iron atom has six co-ordination bonds, 4 in the flat and two in a perpendicular state to the porphyrin ring. The oxygen binding site is present on the other side of six coordination position.

10. What is the shape of the oxygen dissociation curve of myoglobin?

- a) Linear
- b) Hyperbola
- c) Sigmoid
- d) Parabola

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Answer: b

Explanation: Oxygen affinity in myoglobin is more than hemoglobin, as myoglobin binds oxygen more tightly than hemoglobin due to this hemoglobin shows sigmoidal curve while myoglobin shows hyperbolic.