Total number of printed pages–8

14 (CHM–3) 301

2019

CHEMISTRY

Paper : CH-301

(Biochemistry)

Full Marks : 60

Time : Three hours

The figures in the margin indicate full marks for the questions.

1. Answer ***any three*** of the following questions : 2×3=6

   (a) What is chromosome ? How many pairs of chromosomes are present in human body ? What is the difference between autosome and allosome ?

   (b) What are fatty acids ? Discuss their role in eukaryotic cell.

   (c) What is a wobble base ? What is the role of m-RNA in protein synthesis ?

Contd.

(d) What do you understand by tertiary and quaternary structures of protein ? Discuss with examples.

2. Answer ***any three*** of the following questions : 4×3=12

(a) What are axon and dendrites ? Discuss the structure of a nerve cell showing various components present in it.

(b) Write down the steps involved in the Stage 1 of Glycolysis *i.e.* the formation of glyceraldehyde-3-P using chemical reaction.

(c) Discuss Boyer's three-state model for conformational coupling of ATP formation to translocation of hydrogen ion.

(d) Draw the structure of myosin and discuss its role on muscle contraction. What do you mean by A-band and I-band ?

3. Answer ***any two*** of the following questions : 4×2=8

(a) Discuss the various steps involved in protein biosynthesis.

(b) Write the chemical reactions involved in the biosynthesis of fatty acid.

(c) Discuss about the Complex I or NADH dehydrogenase present in electron transport pathway. Discuss the role of Flavin Mononucleotide (FMN) and FeS cluster in electron transport pathway using chemical reactions.

4. Answer ***any three*** of the following questions : 3×3=9

(a) Mention the forces that keep the two strands of DNA double helix together. Show a Hoogsteen type T·A·T base pairing for the formation of DNA triple helix.

(b) What do you understand by DNA melting ? Discuss the factors on which the melting temperature of a duplex DNA depends.

(c) What are the DNA hairpin and cruciform ? Show them pictorially.

(d) What is G-quadruplex ? Show the *H*-bonding pattern between guanine bases that leads to the formation of quadruplex DNA.

(e) Discuss the catalytic roles of DNA polymerases in DNA replication. What is the role of the enzyme helicase in the replication process ?

5. Answer ***any four*** of the following questions : 3×4=12

(a) What is selenocysteine ? Mention *two* proteins where selenocysteine is present. Give *one* example of an unnatural amino acid.

(b) Show the products formed when insulin is subjected to Sanger's method of peptide sequencing.

(c) Illustrate the factors that favour the formation of an α-helix in a primary amino acid sequence of a protein.

(d) "Vitamins are a major class of co-enzyme." Discuss with suitable examples.

(e) What are lipids ? Give the chemical structures, one each, of a vitamin, terpene and hormone that are lipids in nature.

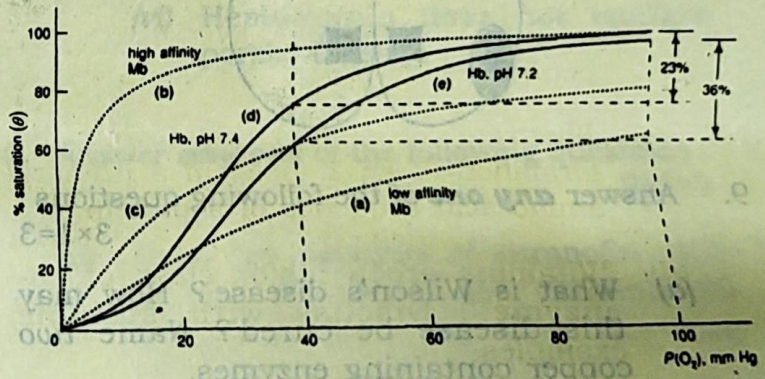
(f) What are prostaglandins ? Discuss their roles. Give examples of different classes of prostaglandins.

6. Answer ***any one*** of the following questions : 2×1=2

(a) How is iron transported and released by transferrin into the cell ?

(b) Draw the active site of transferrin.

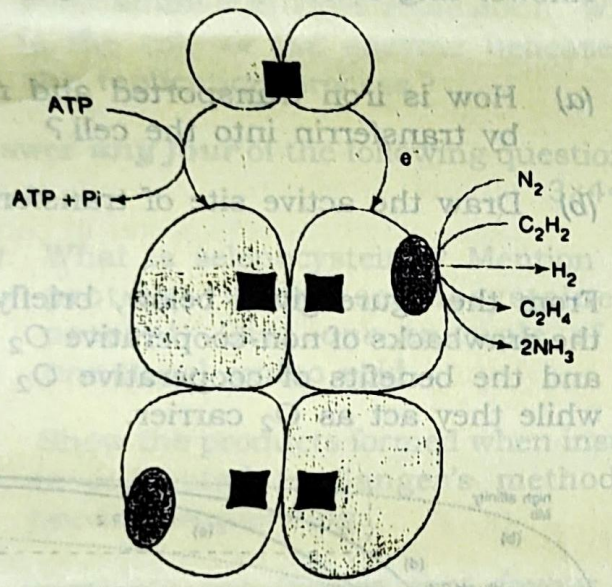
7. From the figure given below, briefly state the drawbacks of non-cooperative O_2 binder and the benefits of cooperative O_2 binder while they act as O_2 carrier. 3



8. Answer ***any one*** of the following questions : 3×1=3

(a) Write the 1, 2-shift reaction catalysed by vitamin B_{12} coenzyme.

(b) Label the metal clusters present in Mo-nitrogenase in the pictorial presentation given below :



9. Answer ***any one*** of the following questions : 3×1=3

(a) What is Wilson's disease? How may this disease be cured? Name *two* copper containing enzymes.

(b) Choose the correct statements from the following :

(i) There are three types of cytochromes in mitochondrial electron transport chain.

(ii) Blue copper protein has pyridine as one of its ligands.

(iii) Iron-sulfur electron transport protein is only found in plants.

(iv) Copper porphyrin complex acts as an electron transporter in complex IV of mitochondrial electron transport chain.

(v) Hemocyanin transports oxygen.

(vi) Hemocyanin does not contain porphyrin ring.

10. Answer ***any one*** of the following questions : 2×1=2

(a) Draw the structure of auranofin used in the treatment for rheumatoid arthritis. How is this prodrug transported to the target?

(b) Give *one* example of 3rd generation platinum anticancer drug. How are they more effective compared to cisplatin ?