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14 (CHM-3) 301

2018

B	A
<b>CHEMISTRY</b>	
Paper : CH 301	
<b>(Biochemistry)</b>	
Full Marks : 60	

Time : Three hours

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

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

- a) Outline the basic structural differences between prokaryotic and eukaryotic cells.
- b) Discuss the geometry of a peptide bond. With the help of a  $\beta$ -pleated sheet diagram, show how hydrogen bonds can be formed between the peptide chains.
- c) What are mitosis and meiosis ? Draw a pictorial diagram of a nerve cell showing its different constituents.

Contd.



2. Answer **any five** of the following questions :

5×2=10

- a) What is tRNA ? Discuss about the three different loops that exist in tRNA molecule with a pictorial diagram.
- b) What do you mean by triplet codon ? Why genetic codes are degenerate in nature ? Write the initiation and termination codons present in eukaryotic cell.
- c) Explain why fatty acids are considered as the most efficient form of stored energy compared to carbohydrates.
- d) Write down the chemical reactions involved consumption of ATP during glycolysis. Can D-Fructose be used instead of D-Glucose in glycolysis ? Explain using chemical reaction.
- e) Write down the chemical reaction involved during transformation of pyruvate to acetyl CoA. Why TCA cycle is also known as Citric Acid cycle ?

f) Draw a pictorial diagram of mitochondria showing all the constituents present in it. Why mitochondria is known as the "Power house" of eukaryotic cells ?

g) Discuss the role of actin and myosin in muscle contraction.

3. Answer **any three** of the following questions :

3×4=12

- a) Why does ATP have much higher standard free energy of hydrolysis ( $-30.5 \text{ kJmol}^{-1}$ ) than that of glucose-6-phosphate ( $-13.8 \text{ kJmol}^{-1}$ ) ?
- b) Discuss the chain initiation and chain elongation steps of protein synthesis.
- c) Discuss about the steps involved in Krebs Cycle.
- d) "Electron transport system and ATP synthesis are coupled processes". Explain the statement based on experimental evidence.
- e) Write down the chemical reactions involved in fatty acid degradation.



3. Draw the iron-sulfur clusters involved in oxidative phosphorylation. What is the role of ubiquinone in electron transport pathway?  $3 \times 4 = 12$
4. Answer **any three** of the following questions:  $3 \times 3 = 9$

- Draw the structures of the pyrimidine nucleobases present in nucleic acids. How do they differ in their presence in DNA and RNA?
- Show the H-bonding patterns for Watson-Crick type A-T and Hoogsteen type T-A-T base pairing.
- Compare the A-, B- and Z- form of double helical DNA in terms of their helical sense, base pairs per helical turn and base tilt normal to the helical axis. What is the most common type of DNA present in physiological condition?
- Discuss briefly the roles of the enzymes helicase, topoisomerase I and gyrases in DNA replication process.
- What are the fundamental differences between RNA and DNA polymerases? What is RNA splicing?

5. Answer **any three** of the following questions:  $3 \times 4 = 12$

- Give one example each of amino acids having aromatic, cationic and anionic R-groups showing their structures. What is isoelectric point of an amino acid?
- A tripeptide Ser-Gly-Tyr is subjected to Edman's degradation procedure using excess of phenylisothiocyanate under mild alkaline condition. Draw the structures of the phenylthiohydantoin products of the degradation reaction.
- Give one example each of functional mimics of the enzymes Ribonuclease A (RNase A) and ATPase.
- What are coenzymes? Give two examples of vitamins that work as coenzymes along with the reactions they catalyze.
- What are fats, oils and waxes? Give examples. Discuss briefly, what are phosphoglycerides and their roles in cellular membranes.



6. Answer **any three** of the following questions:  $3 \times 2 = 6$

a) What are the geometrical and conformational changes observed in haemoglobin upon binding of first dioxygen?

b) " $H^+$  acts as a heterotropic allosteric effector in haemoglobin dioxygen binding" — Elaborate it.

c) How is mother's dioxygen transferred to fetus?

d) Discuss the structure of ferritin.

e) Draw the Hill plot for non-cooperative dioxygen binding.

f) What is fractional saturation ( $\theta$ ) of dioxygen binding with haemoglobin? Why a non-cooperative strong dioxygen binder can not serve as a good dioxygen transporter?

7. Answer **any one** of the following questions:  $1 \times 3 = 3$

a) What are the four electron transport proteins? Discuss **any one** of them.

b) Show the sequence of electron transport among Fe center, FeMo-co center and P-cluster in nitrogenase. Write the overall equation of the nitrogen fixation reaction. What is the role of ATP in nitrogenase enzyme?

8. Answer **any one** of the following questions:  $1 \times 2 = 2$

a) What is the most widely accepted mechanism involved in curing Rheumatoid Arthritis by Gold containing drugs? Mention the role of triethyl phosphine ( $PEt_3$ ) ligand present in Auranofin.

b) Write a brief description on: **(any one)**

(i) Copper overload

(ii) Transferrin



9. Answer the following: 2

Match **A** and **B** —

<b>A</b>	<b>B</b>
EPR silent	Cytochrome
Heme-a	Oxidized 2Fe-2S protein
Methylcobalamin	Iron blomineral
Ferritin	Organometallic