[This question paper contains 4 printed pages.]

(18) **Your Roll No.** 2022

Sr. No. of Question Paper : 1370 C

Unique Paper Code : 32491301

Name of the Paper : Metabolism of Carbohydrates & Lipids

Name of the Course : **B.Sc. (H) Biochemistry**

Semester : III

Duration : 3 Hours Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. There are **8** questions.
3. Attempt any **5** questions.
4. **All** questions carry equal marks.
5. Question no. **1** is compulsory.

1. (a) Comment on the following :

   (i) Sugar nucleotides are required for synthesis of glycogen.

P.T.O.

(ii) High NADPH/NADP ratio decreases the rate of hexose monophosphate shunt

(iii) Fatty acids cannot cross mitochondrial membrane to carry out beta oxidation in mitochondrial matrix

(iv) Fructose 2,6-bisphosphate is a potent activator of glycolysis

(v) Water soluble vitamins play a crucial role in the citric acid cycle.

(vi) Bile helps in digestion and absorption.

(b) Identify the defective enzyme in following :

(i) Niemans pick disease

(ii) Mc Ardles syndrome

(iii) Lactose Intolerance (12,3)

2. Differentiate between :

(a) Substrate level phosphorylation and oxidative phosphorylation

(b) Fatty acid synthesis and breakdown

(c) Malate Aspartate shuttle and Glycerol 3 phosphate shuttle (5,5,5)

3. Give the following conversions with enzymes involved in :

(a) Acetyl CoA to Mevalonate

(b) Galactose to glucose-6- phosphate

(c) Glucose to ribose 5 phosphate

(d) Glycerol-3-phosphate to phosphatidic acid

(4,4,4,3)

4. Answer the following :

(a) Animals cannot convert fatty acid into glucose but plants can. Explain by giving suitable reactions.

(b) C3 plants are different from C4 plants.

(c) Arsenate does not affect glycolysis but effects ATP synthesis.

(d) Glucose-6-phosphate is not given intravenously.

(e) HDL is a scavenger of cholesterol. (4,4,3,2,2)

5. Explain the following :

(a) Reciprocal regulation of gluconeogenesis and glycolysis with specific reference to Glucokinase, PFK I and PFK II.

(b) Oxidation of odd chain fatty acids leads to net synthesis of oxaloacetate.

(c) Carnitine plays important role in fatty acid oxidation.

(d) Liver glycogen contribute to blood glucose but not muscle glycogen. (6,3,3,3)

6. (a) Give the total number of ATP produced in the following :

(i) Complete oxidation of Palmitic acid.

(ii) Alpha ketoglutarate to malate.

(b) Give synthesis of triacylglycerol from glycerol. (7,5,3)

7. (a) Explain digestion and absorption of triacylglycerol.

(b) Describe the regulation of fatty acid oxidation by malonyl CoA.

(c) Give action of the following :

(i) Aspirin

(ii) Statins

(d) Give the regulation of Rubisco enzyme. (4,4,4,3)

8. Write short notes on :

(a) Amphibolic nature of TCA Cycle

(b) Starve Feed Cycle

(c) Omega oxidation

(d) Ketone bodies (4,4,4,3)

[This question paper contains 6 printed pages.]

(19) **Your Roll No.** 2022

Sr. No. of Question Paper : 1387 C

Unique Paper Code : 32491302

Name of the Paper : Membrane Biology and Bioenergetics

Name of the Course : **B.Sc. (H) Biochemistry**

Semester : III

Duration : 3 Hours Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. There are **8** questions.
3. Attempt any **5** questions.
4. **All** questions carry equal marks.
5. Question no. **1** is compulsory.

1. (a) Give explanation for the following **(any 6)**

   (i) Integral membrane proteins require detergents for their solubilisation.

(ii) Many thermodyanamically favorable reactions do not occur at room temperature.

(iii) Phosphotidylserine is found predominantly on the cytosolic side of the membrane.

(iv) PEP has high standard free energy change of hydrolysis.

(v) Cholesterol plays a dual role in maintaining membrane fluidity.

(vi) Oxygen is not evolved in cyclic photophosphorylation.

(vii) MDR pumps are referred as molecular vacuum cleaners.

(viii) Digitoxin is used in the treatment of congestive heart failure.

(b) Explain the role of the following :

(i) Bacteriorhodopsin in *Halobacteriun halobium*

(ii) Brown fat in newborn mammals

(iii) Tight junctions in membrane (9,6)

2. (a) Explain the key developments leading to the elucidation of the structure of biomembranes.

(b) What is the role of CFTR? How does CFTR differ from ABC transporters?

(c) Give the structural composition of F_0F_1ATP synthase. Explain the mechanism of ATP synthesis by rotational catalysis. (6,4,5)

3. (a) Explain Peter Mitchell's chemiosmotic theory. Give two experimental evidences in support of the chemiosmotic theory.

(b) Explain the use of Liposomes as drug delivery system.

(c) Define CMC. Explain different parameters that can be used to measure CMC. (6,4,5)

4. (a) What type of transporter is GLUT1? Elaborate upon the membrane topology and function of GLUT 1.

(b) Explain the structure and function of water channels?

(c) Give the mode of action of the following :

(i) Amytal

(ii) DNP

(iii) Oligomycin

(iv) Azide (5,4,6)

5. (a) What are membrane rafts. Why are they called detergent resistant domains? Give the physiological significance of these rafts.

(b) What do you understand by Homeoviscous adaptation.

(c) What is the significance of cyclic photophosphorylation in plants. (6,4,5)

6. (a) Elaborate upon different types of membrane proteins. Give examples of membrane proteins with alpha helix and beta barrel structures.

(b) Differentiate between P-Type and V-Type ATPases.

(c) What are reactive oxyen species? Enumerate the ROS scavenging mechanisms in mitochondria. (6,4,5)

7. (a) Give a diagramatic representation of RBC membrane skeleton. Label the major RBC membrane proteins.

(b) How do you determine the topology of a membrane protein? Give two methods.

(c) Depict the Z-scheme of photosynthesis in plants with the help of diagram. (5,6,4)

8. (a) Calculate the actual free energy change of ATP hydrolysis in the human erythrocytes in which the ATP, ADP and Pi concentrations are 2.25,0.25 and 1.65mM respectively.

Assume that pH is 7.0 and the temperature is 37 degree Celsius.

(R = 8.315 J/mol. K; Standard free energy change of ATP hydrolysis = –30.5KJ/mol)

(b) Elaborate upon photophosphorylation in purple bacteria and green sulphur bacteria.

(c) Explain the role of following in the study of membrane dynamics:

(i) FRAP

(ii) TNBS

(iii) SPT

(4, 5, 6)

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(20) **Your Roll No.** 2022

Sr. No. of Question Paper : 1416 **C**

Unique Paper Code : 32491303

Name of the Paper : Hormone: Biochemistry and Function

Name of the Course : **B.Sc. (Hons.) Biochemistry**

Semester : III

Duration : 3 Hours Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. There are **8** questions.
3. Attempt any **5** questions.
4. **All** questions carry equal marks.
5. Question no. **1** is compulsory.

1. (a) Explain the following statements :

   (i) Signal transduction pathways result in amplification of signal.

P.T.O.

(ii) Steroid hormones regulate gene expression by binding to intracellular receptors.

(iii) TSH levels are high in Hashimoto's disease.

(iv) Ghrelin is often known as hunger hormone.

(v) Corpus luteum is a transitory endocrine gland.

(b) Explain the following terms :

(i) Paracrine hormone

(ii) Goitrogens

(iii) Inhibin

(iv) POMC peptide

(v) Menarche (10,5)

2. (a) NO (nitric oxide) does not have a specific cellular receptor. How, then, does it act as a signaling molecule?

(b) How do DAG and IP3 originate? Give the mechanism of one action that each of them mediate.

(c) Cholera toxin and Forskolin cause increased production of cAMP. Give the mechanism of action of each. (4,5,6)

3. (a) Schematically give the signal transduction events that follow when Insulin binds to its receptor.

(b) Give mechanism of short term and long term regulation of hormone receptors.

(c) Diagrammatically explain the biosynthesis steps involved in Thyroid hormone synthesis. (5,5,5)

4. (a) Taking an example each explain the positive and negative feedback regulation mechanism of hormones.

(b) The hypothalamus communicates differently with the anterior pituitary and the posterior pituitary. Explain with the help of a diagram.

(c) Elaborate on the direct and indirect actions of Growth hormone. Name the diseases associated with GH excess. (5,5,5)

5. Give the role of the following :

(a) Renin-Angiotensin system in maintaining electrolyte balance

(b) Insulin in glucose homeostasis.

(c) Vitamin D in Ca^{2+} homeostasis. (5,5,5)

6. (a) What are fight-or-flight responses? How are they triggered?

(b) Summarize the role of Gastrin, Cholecystokinin and Secretin following a meal.

(c) What are oral contraceptives? Discuss their mechanism of action? (5,6,4)

7. (a) What changes happen in males during puberty?

(b) Every month, the uterus prepares itself to receive a fertilized egg. Give the role of estrogen and progesterone in bringing about changes in the uterine lining to nourish the embryo. Also give details of the menstruation process if the egg is not fertilized.

(c) Show how interplay of hormones bring about development of lactating mammary gland.

(4,6,5)

8. (a) Patients suffering from Hypothyroidism often suffer from cold intolerance. Explain Why?

(b) Thirty year old man underwent surgery for cystic pituitary adenoma. Three weeks post operation he developed increasing thirst and was drinking 4-5 L of fluid in 24 h. He was waking up four to five times at night to pass urine. What further tests would you recommend to confirm diagnosis of Diabetes Insipidus?

(c) Common signs and symptoms of Cushing syndrome include weight gain and fatty tissue deposits, particularly around the midsection and in the face. What causes Cushing syndrome and give the basis of the symptoms observed. Also state the biochemical parameters observed in Cushing syndrome.

(d) What stimulates the release of PDGF? Discuss its biological role. (3,4,5,3)