

Q. P. Code : 04591

(2½ Hours)

( Total Marks : 75

- N.B.** 1. All questions are **compulsory**. Choice is **internal**.  
 2. **Figures** to the right indicate **full marks**.  
 3. Draw **figures** and **flowcharts** wherever **possible**.  
 4. Use of non-programmable **calculators** **permitted**.

1. (A) Select the **most appropriate** answer from the given options. Answer **any three**. **03**

i) A saturated C16 fatty acid will undergo maximum \_\_\_\_\_ turns of  $\beta$ -oxidation and yield \_\_\_\_ acetyl-CoA units.

- (a) 8,8 (b) 7,8 (c) 8,9

ii) Lipogenesis from acetyl-CoA occurs in the \_\_\_\_\_ of liver.

- (a) mitochondria  
 (b) endoplasmic reticulum  
 (c) cytosol

iii) Thiokinase is an alternative name for \_\_\_\_\_.

- (a) acyl-CoA synthetase  
 (b) carnitine palmitoyl transferase  
 (c) acyl-CoA dehydrogenase

iv) The two sulphhydryl groups of fatty acid synthase complex are contributed each by cysteine of ketoacyl synthase and \_\_\_\_\_.

- (a) cysteine of acyl carrier protein  
 (b) cysteine of hydratase  
 (c) phosphopantetheine of acyl carrier protein

v) \_\_\_\_\_ is not an intermediate during ketone body synthesis.

- (a) acetoacetyl CoA  
 (b)  $\beta$ -hydroxy- $\beta$ -methyl glutaryl-CoA  
 (c)  $\beta$ -hydroxy butyrate

vi) During  $\beta$  oxidation, \_\_\_\_\_ is not produced.

- (a) Acetate (b) NADH/H<sup>+</sup> (c) FADH<sub>2</sub>

(B) Answer **any one** of the following **02**

- i) What is ketosis?  
 ii) Write the reaction catalyzed by acetyl-CoA carboxylase.

(C) Answer **any one** of the following **04**

- i) Explain the role of carnitine in fatty acid metabolism.  
 ii) With detailed reactions, explain the conversion of acetoacetate to other two ketone bodies.

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(D) Answer **any one** of the following 06

- i) Write the reactions for conversion of 3-ketoacyl-CoA to acyl-CoA.
- ii) Explain mitochondrial  $\beta$  oxidation of palmitoyl CoA with detailed reactions.

2. (A) Select the **most appropriate** answer from the given options. Answer **any three**. 03

- i) \_\_\_\_\_ links the flavoproteins to cytochrome b.
  - (a) Ubiquinone
  - (b) Cytochrome c
  - (c) Dehydrogenase
- ii) If the free energy change, delta G is negative with a high magnitude, the reaction is \_\_\_\_\_.
  - (a) exergonic and irreversible
  - (b) endergonic and reversible
  - (c) endergonic and irreversible
- iii) \_\_\_\_\_ is a copper containing protein.
  - (a) Cytochrome b
  - (b) Flavoprotein
  - (c) Cytochrome oxidase
- iv) Complex I of ETC is also called as \_\_\_\_\_.
  - (a) Succinate dehydrogenase
  - (b) NADH : ubiquinone oxidoreductase
  - (c) cytochrome oxidase
- v) In plants, the photosystems are organized in \_\_\_\_\_ membrane.
  - (a) thylakoid
  - (b) mitochondrial
  - (c) nuclear
- vi) Photosystem II contains \_\_\_\_\_.
  - (a) P<sub>680</sub>
  - (b) P<sub>700</sub>
  - (c) P<sub>540</sub>

(B) Answer **any one** of the following 02

- i) Name the constituents of complex III of mitochondrial electron transport chain.
- ii) Define photophosphorylation.

(C) Answer **any one** of the following 04

- i) Explain the chemiosmotic theory for oxidative phosphorylation.
- ii) Explain noncyclic photophosphorylation.

(D) Answer **any one** of the following 06

- i) Schematically depict Calvin cycle and add a note on its significance.
- ii) The mitochondrial electron transport chain consists of electron carriers in the form of complexes. Depict the sequence of these electron carriers and show the site of ATP synthesis and sites of inhibition by antimycin and CN<sup>-</sup>.

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3. (A) Select the **most appropriate** answer from the given options. Answer **any three**. **03**
- i. \_\_\_\_\_ is a peptide hormone.
    - (a) Glucocorticoid
    - (b) Oxytocin
    - (c) Insulin
  - ii. \_\_\_\_\_ is not secreted by pituitary.
    - (a) TSH
    - (b) Vasopressin
    - (c) Epinephrine
  - iii. Iodination of tyrosine residues of \_\_\_\_\_ forms triiodothyronine.
    - (a) TSH
    - (b) Thyroxine
    - (c) thyroglobulin
  - iv. Insulin has \_\_\_\_\_ intrachain and \_\_\_\_\_ interchain disulphide bridges.
    - (a) 1, 2
    - (b) 3, 1
    - (c) 2, 3
  - v. \_\_\_\_\_ is characterized by hyperthyroidism.
    - (a) Myxedema
    - (b) Cretinism
    - (c) Toxic goitre
  - vi. \_\_\_\_\_ increases blood glucose levels.
    - (a) Insulin
    - (b) Glucocorticoid
    - (c) Vasopressin
- (B) Answer **any one** of the following **02**
- i) Explain hormone receptor.
  - ii) Write in brief on antidiuretic hormone.
- (C) Answer **any one** of the following **04**
- i) Justify : Glucocorticoids play an important role in human body.
  - ii) Schematically only explain the action of epinephrine on glycogenolysis.
- (D) Answer **any one** of the following **06**
- i) Explain the synthesis and secretion of insulin. Add a note on the physiological effects of insulin deficiency.
  - ii) Classify hormones on the basis of chemistry. Give examples.
4. (A) Select the **most appropriate** answer from the given options. Answer **any three**. **03**
- i) Restriction endonucleases cut DNA \_\_\_\_\_.
    - (a) and RNA at specific sites
    - (b) at random sites
    - (c) at specific sites
  - ii) The process of uptake of DNA from the medium by a bacterial cell is called \_\_\_\_\_.
    - (a) transduction
    - (b) transfection
    - (c) transformation

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- iii) The technique used during isolation of a gene from an organism is \_\_\_\_\_.  
 (a) Southern blotting  
 (b) SDS –PAGE  
 (c) Western blotting
- iv. \_\_\_\_\_ is a structural database.  
 (a) BLAST (b) PDB (c) Swiss Prot
- v. The organism whose natural plasmid is engineered for transferring foreign DNA into plants is \_\_\_\_\_.  
 (a) *Bacillus thuringiensis*  
 (b) *Agrobacterium tumefaciens*  
 (c) Lepidoptera larva
- vi. DNA chip is used for studying \_\_\_\_\_.  
 (a) gene expression (b) DNA mutation (c) gene cloning

(B) Answer **any one** 02

- i) What is BLAST?  
 ii) Define genomics and proteomics

(C) Answer **any one** 04

- i) Explain the process of *in vitro* amplification of DNA.  
 ii) Write a note on sequence databases.

(D) Answer **any one** 06

- i) State the characteristic features of plasmid pBR322. With the help of a flowchart (only), depict the steps involved in cloning a mammalian gene with the help of plasmid pBR322.  
 ii) Justify: rDNA technology finds applications in producing therapeutic substances and in agriculture.

5. (A) Answer **any one** 03

- i) Justify: Ketone bodies are overproduced in Diabetes and during starvation.  
 ii) Give an account of the number of ATPs formed when a C18 fatty acid undergoes  $\beta$ -oxidation.

(B) Answer **any one** 03

- i) What is  $F_0F_1$  ATPase?  
 ii) Schematically depict cyclic photophosphorylation and add a note on its significance.

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- (C) Answer **any one** 03
- i) Explain the effect of thyroxine on metabolism.
  - ii) Write in brief on the physiological role of oxytocin.
- (D) Answer **any one** 03
- i) State any three applications of Bioinformatics.
  - ii) Write in brief on DNA library.
- (E) State true or false. Answer **any three** 03
- i) Steroid hormones act by binding to an intracellular receptor.
  - ii) CoQ serves as a mobile carrier of electrons and protons.
  - iii) CLUSTAL W is a sequence database.
  - iv) In Non-cyclic photophosphorylation, there is no formation of NADPH.
  - v) Fatty acid biosynthesis uses NADPH as reducing equivalent.
  - vi) Cos site in a cloning vector is obtained from a bacteriophage.