Q.P. Code : 25027

(2½ Hours) **[Total Marks : 75**

N.B. : (1) **All** the question are **compulsory**. **Choice** is **internal**.
(2) **Figures** to the **right** indicate **Full Marks**.
(3) **All** questions carry **equal marks**.
(4) Draw **flowcharts / diagrams** wherever **necessary**.

1. (A) Choose the **MOST APPROPRIATE** answer (**Any Three**) : **3**

(i) _____ mammalian cell does not have aerobic pathway of glucose catabolism?
(a) Nerve cell (b) Sperm cell (c) Red cell

(ii) In anaerobic glycolysis does not stop at pyruvate but forms lactate, because _____.
(a) pyruvate is toxic in larger concentration
(b) pyruvate can form glucose back
(c) Because this allows the regeneration of NAD from $NADH_2$

(iii) CO_2 is not produced in the reaction catalysed by the enzyme _____.
(a) Pyruvate dehydrogenase
(b) Succinate dehydrogenase
(c) Isocitrate dehydrogenase

(iv) Which statement is not true of HMP shunt pathway?
(a) Substrate level phosphorylation present
(b) NADPH is produced
(c) Pentoses are produced

(v) Neoglucogenesis occurs predominantly from the following compounds except _____.
(a) Lactate (b) Fatty acids (c) Glycerol

(vi) _____ ATP molecules are produced on complete oxidation of acetyl CoA in the citric acid cycle.
(a) Fifteen (b) Nine (c) Twelve

(B) Define and explain **(any one)** : **2**
(i) Catabolism
(ii) Transketolase

TURN OVER

(C) Write short notes on **(any one)** : 4

(i) Multienzyme complex.

(ii) Anapleuratic reactions.

(D) Attemtp **(any one)** : 6

(i) Schematically represent Krebs cycle

(ii) Compare : Glycogenolysis and Glycogenesis

2. (A) Choose the **MOST APPROPRIATE** answer (**Any Three**) : 3

(i) _____ ETC carrier accepts only one electron.

(a) Cytochrome (b) NADH (c) FADH

(ii) During the dark reaction of photosynthesis _____.

(a) Water is split

(b) CO_2 is reduced to organic compounds

(c) Chlorophyll is activated

(iii) Chlorophyll-a differs from chlorophyll-b in having a _____.

(a) -CHO group (b) -COOH group (c) -CH3 group

(iv) Which one of the following statements best describes the enthalpy change of a reaction?

(a) The energy consumed when chemical bonds are broken during a chemical reaction.

(b) The difference between the energy released by bond formation and the energy consumed by bond cleavage during a chemical reaction.

(c) The increase in disorder of the system as a reaction proceeds.

(v) Glycerol phosphate accounts for generation of _____ ATP.

(a) 1 (b) 2 (c) 3

(vi) _____ inhibits complex I.

(a) Rotenone (b) Cyanide (c) Carbon monoxide

(B) Define and explain **(any one)** : 2

(i) Antenna molecules

(ii) DNP

(C) Answer the following **(any one)** : 4

(i) Describe the significance of Complex III to ETC.

(ii) Schematically explain cyclic photophosphorylation.

(D) Answer the following **(any one)** : 6

(i) With the help of a diagram, explain the structure of the ATP synthase complex and its contribution to the generation of a proton motive force.

(ii) Elaborate on C3 cycle with special emphasis on the role of rubisco. Explain the stoichemetry of the C3 cycle

3. (A) Choose the **MOST APPROPRIATE** answer (**any three**) : 3

(i) Ion exchange chromatography is based on _____.

(a) electrostatic attraction

(b) electrical mobility of ionic species

(c) adsorption chromatography

(ii) The right expression for the appearance of a solute in an effluent is (where V_e is the elution volume of a substance , V_0 void volume, kD distribution constant and Vi internal water volume).

(a) $V_e = V_0 - kDV_i$ (b) $V_e - V_0 = kDV_i$ (c) $V_e/V_0 = kDV_i$

(iii) A student sets up a paper chromatogram and places a spot of green food dye on the origin. After six minutes the solvent has moved 12 cm and a blue spot has advanced 9 cm. After fourteen minutes the solvent has advanced a further 4 cm. How many cm from the origin is the blue spot likely to be?

(a) 15 cms (b) 18 cms (c) 12 cms

(iv) _____ is the most suitable gas to use as a carrier gas in a gas chromatogram.

(a) Helium (b) Oxygen (c) Carbon dioxide

(v) In chromatography, the mobile phase can be _____.

(a) Solid or liquid (b) Liquid or gas (c) Gas only

(vi) _____ types of chromatography involves the process, where mobile phase moves through the stationary phase by the influence of gravity or capillary action.

(a) Column Chromatography
(b) High Pressure Liquid Chromatography
(c) Planar Chromatography

(B) Define and explain **(any one)** : **2**

(i) Gradient elution
(ii) Retention time

(C) Write short note on **(any one)** : **4**

(i) Column chromatography
(ii) Principle and applications of gel permeation chromatography

(D) Answer the following **(any one)** : **6**

(i) A mixture of glucose, xylulose and lactose has to be resolved into separate components. Suggest a technique and explain its principle as well as the procedure for the same.

(ii) Components with isoelectric pH as 2.4, 5.9 and 9.8, need to be separated from a plant extract. (a) Give the principle of chromatographic technique suitable for this separation. (b) Discuss the technique in detail starting with the stationary phase, mobile phase and the order of elution.

4. (A) Choose the **MOST APPROPRIATE** answer (**any three**) : **3**

(i) Which one of the following cofactors is correctly matched with the vitamins it is derived from?

(a) NADH-vitamin B_2 (b) TPP-vitamin B_1 (c) $FADH_2$-Vitamin B_3

(ii) _____ form of Vitamin A is required for vision?

(a) All cis retinal (b) All trans retinal (c) 11 cis-retinal

(iii) Vitamin E prevents _____.

(a) secretion of enzymes
(b) keratinisation of epidermal cells
(c) absorption of harmful enzymes.

(iv) Ascorbic acid acts as a _____.
- (a) oxidizing agent
- (b) reducing agent
- (c) both reducing and oxidizing agent

(v) The equilibrium constant of ionisation reaction of pure water is _____.
(a) 1.8×10^{-14} M (b) 1.8×10^{-16} M (c) 1.8×10^{-7} M

(vi) At zwitterionic form, an amino acid will act as a _____.
- (a) proton donor
- (b) proton acceptor
- (c) both proton donor and acceptor

(B) Define and explain **(any one)** : **2**
- (i) Titration curve
- (ii) Niacin

(C) Answer the following **(any one)** : **4**
- (i) How is the blood calcium level maintained in the body? Emphasize on the role of PTH.
- (ii) Derive the Henderson Hasselbalch equation. Prepare a buffer solution that has a pH of 5.27. If there are 10mmols of acetic acid, how many mmols of sodium-acetate will be needed? (pK_a of acetate buffer is 4.76).

(D) Answer the following **(any one)** : **6**
- (i) Define buffering capacity. With ionisation forms and pKa values, explain the titration curve of a basic amino acid.
- (ii) Discuss in detail the role of transducin in the Wald's Visual cycle.

5. (A) Attempt **any one** of the following : **3**
- (i) Schematically represent the oxidative phase of HMP.
- (ii) Give the significance and characteristics of the glyoxalate cycle.

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(B) Answer the following **(any one)** : **3**

(i) Give the redox potential of : (a) NADH (b) O_2 (c) Coenzyme Q.

(ii) Compare and contrast : Oxidative and photo-phosphorylation.

(C) Answer the following **(any one)** : **3**

(i) Give the principle and applications of gas chromatography.

(ii) For chromatography, state the role of : (a) Dextran blue, (b) Silica gel.

(D) Answer the following **(any one)** : **3**

(i) Mention : (a) deficiency disease, (b) physiological role, (c) chemical form of Vitamin B_1.

(ii) Briefly explain the working and principle of a pH meter.

(E) State True or False (**any three**) : **3**

(i) Hexokinase has lower Km than glucokinase.

(ii) PDH complex has lipoic acid as a cofactor.

(iii) Cytochrome c has higher redox potential to that of hydrogen.

(iv) Above the pI, an amino acid is positively charged.

(v) Water soluable vitamin deficiencies generally do not occur.

(vi) The synonym of Glyoxalate cycle is HMP pathway
