

**I : BIOCHEMISTRY****Q. 1 – Q. 7 carry one mark each.**

- Q.1 Pernicious anemia is due to
- (A) blockage of vitamin B<sub>12</sub> absorption. (B) blockage of vitamin A absorption.  
(C) deficiency of vitamin C. (D) deficiency of vitamin B<sub>2</sub>.
- Q.2 Which of these can be an antigen but cannot induce immune responses ?
- (A) Hemocyanin (B) Influenza virus  
(C) Azobenzene arsonate (D) *Corynebacteria*
- Q.3 In mammals, the second messenger Nitric Oxide (NO) is produced from
- (A) Ammonium nitrate (B) Arginine  
(C) Urea (D) Nitrous acid
- Q.4 Generally, the rate-limiting step of major metabolic pathways is a reaction
- (A) in which the availability of the substrate is limited.  
(B) catalyzed by an allosteric enzyme.  
(C) catalyzed by an enzyme with very low K<sub>m</sub>.  
(D) whose products are not readily consumed by the subsequent step of the pathway.
- Q.5 Human DNA ( $3 \times 10^6$  Kb) is replicated in 5 hrs at a rate of 1 Kb/min. The number of origins of replication utilized are
- (A) 1 (B) 3  
(C) 300 (D) 10,000
- Q.6 Phospholipases A1 and A2,
- (A) play no role in phospholipids synthesis.  
(B) hydrolyze phosphatidic acid to diglycerate.  
(C) remove fatty acid from sn-1 and sn-2 of phospholipids.  
(D) are involved in biosynthesis of phosphatidyl ethanolamine.
- Q.7 Equal volumes of two buffers of pH 4 and pH 6 of identical ionic strengths are mixed. The resultant pH is
- (A) close to 4. (B) close to 5.  
(C) close to 6. (D) exactly 5.

**Q. 8 to Q.21 carry two marks each.**

- Q.8 An insert (I) of 1 Kb is ligated to a plasmid (P) of 4 Kb in a molar ratio of 4:1 respectively in a final DNA concentration of  $10\mu\text{g/ml}$ . The amounts of insert (I) and plasmid (P) required in  $\mu\text{g}$  are
- (A) I = 8 and P = 2 (B) I = 2 and P = 8  
(C) I = 5 and P = 5 (D) I = 1 and P = 4
- Q.9 The formation of ATP from ADP and  $\text{P}_i$  is not a spontaneous reaction. A reason for this is
- (A) ATP readily ionizes.  
(B) electrostatic repulsion in ATP is lower than that in ADP.  
(C) ATP is better hydrated than the total hydration levels of ADP and  $\text{P}_i$ .  
(D) resonance stabilization of P-O bonds in  $\text{P}_i$  is higher than that in ATP.
- Q.10 A beam of light passes through 1 cm of a colored solution. Eighty percent of the incident light is transmitted. If the incident light passes through 2 cm of the same solution, the percentage of transmitted light is
- (A) 60 (B) 64 (C) 70 (D) 40
- Q.11 Lactose uptake in *E. coli* is an example of
- (A) Passive transport (B) Primary active transport  
(C) Secondary active transport (D) Simple diffusion
- Q.12 During receptor-mediated endocytosis of LDL bound to its receptor
- (A) both receptor and ligand are degraded.  
(B) the receptor is degraded and the ligand is recycled.  
(C) both are recycled.  
(D) the ligand is degraded and the receptor is recycled.
- Q.13 Choose the correct pairs from the following:
- |                                   |   |
|-----------------------------------|---|
| a. Isocitrate lyase               | i. Conversion of amino acids into glucose |
| b. PEP carboxykinase              | ii. Biotin                                |
| c. Pyruvate dehydrogenase complex | iii. Synthesis of glucose from acetate    |
| d. Phosphofructokinase            | iv. Lipoic acid                           |
| e. Pyruvate carboxylase           | v. An allosteric enzyme                   |
- (A) a-i, b-ii, c-iv, d-v, e-iii (B) a-iii, b-i, c-iv, d-v, e-ii  
(C) a-iii, b-i, c-iv, d-ii, e-v (D) a-ii, b-v, c-i, d-iv, e-iii
- Q.14 The advantage of hemoglobin having a high histidine content is
- (A) histidine binds to oxygen.  
(B) histidine carries oxygen to the tissues.  
(C) histidine imparts buffering capacity to hemoglobin.  
(D) 'R' group of histidine has low pKa.
- Q.15 IgG has four chains. Purified monoclonal IgG was subjected to electrophoresis. The number of bands visible by
- a) Reducing SDS-PAGE b) Isoelectric focusing c) Native PAGE
- are
- (A) a-2; b-1; c-1 (B) a-1; b-1; c-2 (C) a-2; b-4; c-2 (D) a-4; b-2; c-4

- Q.16 When *E.coli* is grown in glucose and lactose, the *lac* operon is not expressed. This is because glucose interferes with
- (A) removal of repressor.
  - (B) binding of activator.
  - (C) removal of repressor and binding of activator.
  - (D) removal of activator.
- Q.17 What property of biomembranes is responsible for their self-sealing nature ?
- (A) Hydrophilicity of the phospholipid head group
  - (B) Presence of proteins in biomembranes
  - (C) Presence of cholesterol in biomembranes
  - (D) Hydrophobicity of the fatty acid side chains of phospholipids
- Q.18 A mixture of amino acids consisting of glycine, lysine, arginine, histidine, aspartic acid and glutamic acid was placed in the centre of a paper strip, moistened with buffer of pH 6 and electric current applied. The migration of amino acids was as follows:
- (A) Glycine, lysine and histidine moved towards the anode. Aspartic acid and glutamic acid moved towards the cathode while arginine remained near the origin.
  - (B) Aspartic acid and glutamic acid remained near the origin and lysine, histidine and glycine moved towards the anode while arginine moved towards the cathode.
  - (C) Glycine remained near the origin. Lysine, arginine and histidine moved towards the cathode while aspartic acid and glutamic acid moved towards the anode.
  - (D) All amino acids remained near the origin.
- Q.19 Cells expressing Epidermal Growth Factor (EGF) receptors were treated (T) or untreated (U) with EGF. The cells were lysed and immunoprecipitated with EGF receptor-specific antibodies. The immunoprecipitate was analyzed by Western blotting with antibodies specific to
- i) phosphotyrosine ii) phosphothreonine iii) tyrosine kinases iv) threonine kinases.
- Which of these antibodies would detect a band under T and U conditions ?
- (A) T – i & iii; U – iii
  - (B) T – ii & iv; U – iv
  - (C) T – i & ii; U – i
  - (D) T – i & iii; U – ii
- Q.20 Which of the following would be considered the longest feedback loop ?
- (A) Reproductive steroid hormones ----- aminergic neurons
  - (B) Reproductive steroid hormones ----- hypothalamic neurons
  - (C) Reproductive steroid hormones ----- pituitary gonadotrophs
  - (D) Gonadotropin releasing hormone -----hypothalamic neurons
- Q.21 In *myasthenia gravis*, a neuromuscular disorder, the acetylcholine receptor becomes dysfunctional because
- (A) the receptor is mutated.
  - (B) antibodies to the receptor inhibit ligand binding.
  - (C) of deficiency in acetylcholine transferase.
  - (D) of excess of acetylcholine esterase.

**END OF SECTION - I**