



## CSIR-UGC-NET/JRF LIFE SCIENCES

### TEST : BIOCHEMISTRY

Time : 45 Minutes

Date : 07-04-2019

M.M. : 60

#### INSTRUCTION:

1. Part-C contains 15 objective type questions, each question carry 4 marks.
2. There is negative marking, @ 25% will be deducted for each wrong answer.
3. Attempt all the questions, use of calculator is not allowed.

### PART-C

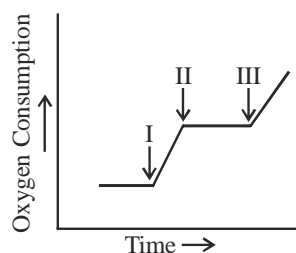
1. The following 4 different solutions are prepared by mixing the components of ETS. Which among them is expected to cause a net transfer of electrons to cytochrome C?
  - (a) Reduced ubiquinone and reduced cytochrome C
  - (b) Reduced ubiquinone, cytochrome b-C<sub>1</sub> complex and reduced cytochrome C
  - (c) Oxidised ubiquinone and oxidised cytochrome C
  - (d) Reduced ubiquinone, cytochrome b-C<sub>1</sub> complex and oxidised cytochrome C
2. A patient of glucose intolerance was put on high fructose and fat rich diet and observed for any symptoms of glucose intolerance, it was observed that
  - (a) Symptom appeared as the fats were preferred as metabolic substrate and metabolised to release high amount of Acetyl CoA which then enter into TCA → ETS → Oxidative phosphorylation, produce high concentration of ATP. Fructose through some intermediate enter into gluconeogenesis, producing glucose and symptoms appeared.
  - (b) No symptoms appeared as fructose was preferred as respiratory substrate and metabolised through Glycolysis → TCA → ETS → Oxidative phosphorylation and fats were stored in adipose tissues
  - (c) Symptoms appeared as humans cannot directly metabolize fructose and fructose first converted to glucose through isomerase and presence of high concentration of glucose produces symptoms. Fats get stored in adipose tissues
  - (d) Fructose toxicity will be observed as fructose cannot enter into the cells and high concentration of fructose in blood produces fructose toxicity
3. A biochemist discovers and purifies a new enzyme, generating the purification table below.

Procedure	Total Protein (mg)	Activity (Units)
1. Crude extract	20,000	4,000,000
2. Precipitation (salt)	5000	3,000,000
3. Precipitation (pH)	4000	1,000,000
4. Ion-exchange chromatography	200	8,00,000
5. Affinity chromatography	50	750,000
6. Size-exclusion chromatography	45	675,000

Which of the purification procedures used of this enzyme is most effective and least effective respectively.



- (a) Precipitation (pH) and Ion-exchange chromatography  
 (b) Affinity chromatography and size-exclusion chromatography  
 (c) Ion-exchange chromatography and precipitation (pH)  
 (d) Affinity chromatography and precipitation (pH)
4. A peptide with the primary sequence K–R–P–L–I–D–G–A is sequenced by Edman's procedure. If each Edman cycle is 96% efficient, what percentage of the amino acid liberated in the fourth cycle will be Leucine?  
 (a) 92%                      (b) 86%                      (c) 88%                      (d) 96%
5. A group of peptides that influence nerve transmission in certain parts of the brain has been isolated from normal brain tissues. Some researchers consider these peptides to be the brain's own pain killers and named them 'Opioid Leucine enkephalins'. On complete hydrolysis of these peptides by 6M HCl at 110°C followed by amino acid analysis indicated the presence of Gly, Leu, Phe and Tyr in a 2 : 1 : 1 : 1 molar ratio. Treatment of the peptide with Sanger's reagent yield Tyr and complete digestion of peptide with pepsin followed by chromatography yielded a dipeptide containing Phe and Leu and a tripeptide containing Tyr and Gly in a 1 : 2 ratio. The sequence of the peptide will be  
 (a) Phe – Gly – Gly – Tyr – Leu                      (b) Gly – Gly – Tyr – Phe – Leu  
 (c) Tyr – Gly – Gly – Leu – Phe                      (d) Tyr – Gly – Gly – Phe – Leu
6. Hair grows at a rate of 20 cm/yr. All this growth is concentrated at the base of hair fiber, where  $\alpha$ -keratin filaments are synthesized inside the epidermal cells and assembled into rope like structures. The fundamental structural element of  $\alpha$ -keratin is  $\alpha$ -helix with 5.4 Å of turn length and 3.6 amino acids per turn. Calculate the rate at which peptide bonds of  $\alpha$ -keratin must be synthesised (peptide bonds per second) to account for the observed yearly growth of hair.  
 (a) ~ 51 bonds per second                      (b) ~ 42 bonds per second  
 (c) ~ 49 bonds per second                      (d) ~ 38 bonds per second
7. Concentration of a purified enzyme is 10 mg/ml. 10  $\mu$ l of the enzyme solution in a total reaction volume of 1 ml catalyses the formation of 20 n moles of product in one minute under optimum condition. The specific activity of the enzyme is  
 (a) 0.4 unit/mg                      (b) 0.2 unit/mg                      (c) 0.3 unit/mg                      (d) 0.36 unit/mg
8. An unknown peptide was isolated from the leaf of a plant and purified. The peptide did not yield any sequence when subjected to Edman degradation. However, tryptic digest of the peptide produced a unique sequence. The mass of the intact peptide was found to be 18 Da less than that obtained from trypsin treated sample. The possible interpretation of the above experimental results could be that.  
 P) The N-terminus of the peptide was blocked by acetylation or methylation  
 Q) The peptide was cyclic and contained a lysine or arginine residue in its structure  
 R) Peptide was linear and contains Lysine or Arginine residue at its N-terminus  
 S) The peptide was cyclised by peptide bond formation between  $\alpha$ -amino group and  $\alpha$ -carboxyl group  
 Which of the above statements is true?  
 (a) P and S                      (b) P and Q                      (c) Q and R                      (d) Q and S
9. In a mitochondrial respiration experiment, a researcher observed the following profile of oxygen consumption upon addition of following compounds at times I, II and III.



Which of the following describes the profile approximately?

(a) I-b, II-d, III-e

(b) I-a, II-d, III-e

(c) I-a, II-e, III-c

(d) I-a, II-c, III-b

10. In a muscle, the extracellular and intracellular concentrations of  $\text{Na}^+$  are 150 mM and 12mM respectively and the membrane potential is  $-60\text{mV}$ , with the interior more negatively charged than the exterior. ( $R = 8.314 \text{ J mol}^{-1} \text{ K}^{-1}$ ,  $F = 96.45 \text{ kJ mol}^{-1} \text{ V}^{-1}$ ), at temperature is  $25^\circ\text{C}$ . The free energy change for the transport of 3  $\text{Na}^+$  out of the cell is
- (a)  $+1.5 \text{ kJ/mol}$       (b)  $+17.4 \text{ kJ/mol}$       (c)  $+18.9 \text{ kJ/mol}$       (d)  $+36.3 \text{ kJ/mol}$





# CAREER ENDEAVOUR

Best Institute for IIT-JAM, NET & GATE

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[ANSWERS]

**PART-C**

- |        |        |         |        |        |        |        |
|--------|--------|---------|--------|--------|--------|--------|
| 1. (d) | 2. (b) | 3. (c)  | 4. (c) | 5. (d) | 6. (b) | 7. (b) |
| 8. (d) | 9. (d) | 10. (d) |        |        |        |        |

