

## CSIR NET 2017 JUNE

261. The energy-rich fuel molecules produced in the TCA cycle are:

- (a) 2 GTR 2 NADH and 1 FADH<sub>2</sub>
- (b) 1 GTR 2 NADH and 2 FADH<sub>2</sub>
- (c) 1 GTP, 3 NADH and 1 FADH<sub>2</sub>
- (d) 2 GTP and 3 NADH

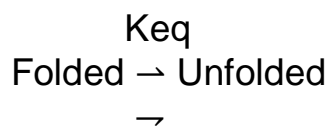
262. Denaturation of a highly helical protein having disulfide bridges and two phenylalanines can be monitored as a function of temperature by which one of the following techniques?

- (a) Recording circular dichroism spectra at various temperatures
- (b) Monitoring the absorbance at 214 nm at various temperatures
- (c) Estimating the -SH content during heat denaturation
- (d) Monitoring the ratio of absorbance at 214 nm and at 250 nm at various temperatures

263. Glycerol is added to protein solutions to stabilize the preparations by:

- (a) Increasing the viscosity of solution
- (b) Stabilizing the pH
- (c) Preferential hydration of proteins
- (d) Interacting and neutralizing the surface charges on the proteins

264. Protein stability is represented as:



Prior to development of sensitive calorimeters, thermodynamic parameters of processes were determined by following equation:

$$\ln \text{Keq} = \Delta H^0/R (1/T) + \Delta S^0/R$$

$\Delta H^0$  and  $\Delta S^0$  are standard changes of enthalpy and entropy, respectively. Which one of the following statements is correct for estimating  $\Delta G$ ,  $\Delta H$  and  $\Delta S$ ?

- (a) Determining the ratio of folded and unfolded protein at 37°C
- (b) Plotting  $K$ , as a function of  $\Delta H$
- (c) Plotting  $K$ , against  $\Delta S$
- (d) Plotting  $K_{re}$  against temperature

265. Rotenone is an inhibitor of the electron transport chain. The addition of rotenone to cells results in which of the following?

- (a) Generation of mitochondrial reactive oxygen species and block in ATP generation
- (b) Block in ATP generation but no generation of reactive oxygen species
- (c) Generation of reactive oxygen species but no block in ATP generation
- (d) Permeabilization of the inner membrane to compounds which are usually not able to traverse the membrane

266. Metachromatic leukodystrophy (MLD) is caused by a deficiency of arylsulfatase A and affects the CNS. MLD is:

- (a) A lysosomal storage disorder
- (b) A disease due to dysfunctional mitochondria
- (c) Caused by loss of the myelin sheath
- (d) Caused by a defect in proteins of the nuclear envelope

267. Which one of the following statements is NOT true?

- (a) Beta-oxidation of long chain fatty acids occurs in mitochondria
- (b) Fatty acid biosynthesis occurs in peroxisomes
- (c) Peroxisomes utilize  $H_2O_2$  to oxidize a variety of substrates
- (d) Peroxisomes import their repertoire of proteins using sorting signals

268. From the following statements:

- A. In proteins the amino acids that can undergo oxidation are Cys and Met
- B. A tetrasaccharide composed of alternate L and D isomers will not be optically active
- C. The  $\Delta G$ (Kcal/mol) values for Keq of 0.1, 0.01 and 0.001 are 1.36, 2.72 and 4.09, respectively. It can be concluded that the relationship between  $\Delta G$  and Keq is parabolic
- D. The oxidation state of Fe in hemoglobin is +2. In cytochrome C, the oxidation states of Fe can be +2 or +3
- E. In DNA, the sugar and bases are planar
- F. High-energy bonds hydrolyze with large negative  $\Delta G$

Choose the combination with ONLY ONE WRONG statement

- (a) A, E, F
- (b) B.C.D.
- (c) C.D.E.
- (d) A.B.C

269. Given below are statements related to protein structures

- A. The dihedral angles of an amino acid x in acetyl-X-N-Methylamide in the Ramachandran plot, occur in very small but equal areas in the left and right quadrants. It can be concluded that x is not one of the 0-coded amino acids
- B. The dihedral angles of a 20-residue peptide are represented in the Ramachandran plot. It is possible to conclude that the peptide does not have a proline
- C. Two have a proteins can have a similar fold even if they do not share significant similarity in their
- D. On denaturation of a protein by urea, the primary structure interactions that would be disrupted are ionic bonds and van der Waals interaction but not disulfide bonds

Choose the combination with ALL CORRECT answers.

- (a) A, B, C
- (b) A, C, D
- (c) B, C, D
- (d) A, B, D

270. Various modifications of nucleotides occur in nucleic acids. Which of the following combinations contains at least one modification that does NOT occur in nucleic acids?

- (a) N, N-dimethyl guanosine, pseudouridine, 2'O-methyluridine
- (b) 2-thiouridine, dihydrouridine, N-isopentenyladenine
- (c) 5-methyldeoxycytidine, 5-thiouridine, pseudouridine
- (d) Dihyrouridine, 4-thiouridine, 20-methyluridine

271. Given below are statements that may or may not be correct.

A. Fructose 2, 6-bisphosphate is an allosteric

B. The TCA cycle intermediates, succinate and inhibitor of phosphofructokinase-I oxaloacetate can both be derived from amino acids

C. A diet rich in cysteine can compensate for a methionine deficient diet in humans

D. dTTP for DNA synthesis can be obtained from UTP

E. In the fatty acid biosynthetic pathway, the carbon atom from  $\text{HCO}_3^-$  in the synthesis of malonyl-CoA is not incorporated into palmitic acid

Choose the option that represents the combination of all the CORRECT statements.

- (a) A, B, C and E
- (b) B, D and E
- (c) A, D and E

(d) Only B and C

272. A serine protease was tested for its activity on the following peptide substrates of different lengths and sequences. The obtained kinetic parameters of the protease are shown along with the peptide.

Peptide substrate	$K_{cat}$ ( $S^{-1}$ )	$K_m$ (mM)
↓ Ac-X-Ala-Co-NH <sub>2</sub>	0.01	100
↓ Ac-Y-X-Ala-Co-NH <sub>2</sub>	0.10	4.0
↓ Ac-Z-Y-X-Ala-Co-NH <sub>2</sub>	8.0	4.0
↓ Ac-Y-X-Val-Co-NH <sub>2</sub>	6.0	35.0

Arrow denotes site of cleavage.

Based on the above data, the following statements are made:

- A. Catalytic efficiency ( $K_{cat}/K_m$ ) increases with the size of the peptide
- B. Amino acid at the hydrolytic cleavage position of the peptide is critical for binding of the peptide with the protease
- C. Catalytic efficiency decreases from three amino acids peptide to four amino acids peptide

Which of the following combinations of the above statements is correct?

- (a) A and B
- (b) A and C
- (c) B and C
- (d) A, B and C

273. A membrane associated protein is composed of seven  $\alpha$ -helices, with each helix containing 19 hydrophobic residues. While treating the membrane with all kinds of proteases, a major portion of this protein remains intact, Treatment with high salt (till 1.5M NaCl) and buffer with pH

5.0 failed to dissociate this protein from the membrane. Predict the most appropriate nature and orientation of this protein in the membrane.

- (a) Peripheral glycoprotein
- (b) Integral protein with seven membrane spanning regions
- (c) Peripheral protein with both N and C-terminals remain exposed to outer surface of the cell membrane
- (d) Peripheral protein with both N and C-terminal remain exposed to cytosolic surface of the cell membrane

274. When the cholera toxin (protein of Mr 90,000 Da) gains access to the human intestinal tract. It binds tightly to specific receptors in the plasma membrane of the epithelial cells lining the small intestine, causing membrane bound adenylyl cyclase to undergo prolonged activation resulting in extensive loss of H<sub>2</sub>O and Na<sup>+</sup>. Pretreatment of the epithelial cells with various phospholipases and proteases failed to inhibit the binding of cholera toxin to its receptor and the fluid loss but treatment with exoglycosidase. Prior to bonding, significantly reduce these effects

Which of the following molecules could be the receptor for this toxin?

- (a) Phosphatidylcholine
- (b) Sodium-potassium ATPase
- (c) Ganglioside
- (d) Chloride-bicarbonate exchanger

275.  $\alpha$ -bungarotoxin binds to acetylcholine receptor (AChR) protein with high specificity and prevents the ion-channel opening. This interaction can be exploited to purify AChR from membrane using:

- (a) ion-exchange chromatography
- (b) Gel filtration chromatography
- (c) Affinity chromatography
- (d) Density gradient centrifugation

276. In Tay-Sachs disease, accumulation of glycolipids occurs especially in nerve cells. These cells are greatly enlarged with swollen lipid-filled endosomes and the children with this disease die at a very early stage. Such condition occurs due to a specific defect in:

- (a) Specific lysosomal enzyme that catalyzes a step in the breakdown of gangliosides
- (b) Sorting of an enzyme that adds a phosphate group at 6th position of mannose in all acid hydrolases
- (c) One of the Rab proteins involved in recycling of vesicles
- (d) V-SNARE molecules which cause abnormal vesicle tethering and docking and affect vesicle fusion with lysosomes

277. Point group symmetry operations such as inversion and mirror planes are not applicable to protein crystals. This is because:

- (a) Protein molecules assemble in highly ordered fashion
- (b) Protein molecules have handedness
- (c) Protein molecules form a lattice plane that do not diffract X-rays
- (d) Hydrogen atoms in proteins diffract weakly