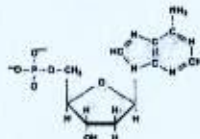


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**Please choose the most appropriate answer.** (3 points each)

- NASA announced in last year that they discovered a microorganism which can live with arsenic (As) as one of their macromolecule requirements. In this microorganism, what element is proposed to be replaced by As? (A) C (B) S (C) P (D) N (E) O
- The pK1, pK2 and pK3 of tyrosine are 2.20, 9.11 and 10.07, respectively. So, the isoelectric point of tyrosine is? (A) 2.20 (B) 5.65 (C) 9.11 (D) 9.59 (E) 10.07
- From above question, what will be ionic characterization of tyrosine at the aqueous solution with pH = 7.4? (A) Positively charged (B) Negatively charged (C) No net charge (D) All above are correct
- Each of the following subcellular structures contains DNA EXCEPT (A) the nucleus (B) ribosomes (C) chloroplasts (D) mitochondria
- Of the following, which are prokaryotes? (A) Poliovirus (B) *Escherichia coli* (C) *Saccharomyces cerevisiae* (D) *Arabidopsis*
- Which of the following statements about the lipid degradation is wrong? (A) Triacylglycerols are degraded to fatty acids and glycerol. (B) Triacylglycerols are hydrolyzed by hormone-stimulated lipases. (C) Fatty acid oxidation takes place in endoplasmic reticulum. (D) Fatty acids are activated by coenzyme A before oxidized.
- What is the correct name for the following molecule? (A) RNA nucleotide (B) RNA nucleoside (C) Deoxyadenosine (D) DNA nucleotide



**Short answer** (5 points each)

- Define peptide bond and disulfide bond.
- Briefly describe what are Holoenzyme and apoenzyme
- From the  $\beta$ -oxidation of the fatty acid myristate (14:0), how many molecules of acetyl-CoA are produced? What reduced coenzyme(s) is/are produced by  $\beta$ -oxidation of fatty acids (write correct form of reduced cofactor(s))?
- Define "southern blot" and "western blot".
- Briefly describe the different types of RNA made by the cell.
- Please describe the buffer action in biological system.

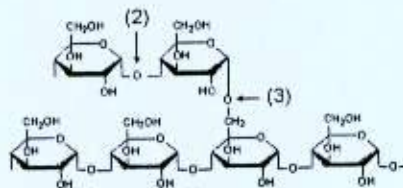
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**Matches**

14. Please pick the best choices to answer the following questions. (2 points each)

- (a) cellulose; (b) amylopectin; (c) amylose; (d) fructose; (e) glucose;  
 (f)  $\alpha$  (1→4) glycosidic bond; (g)  $\alpha$  (1→6) glycosidic bond; (h)  $\beta$  (1→4) glycosidic bond.

- (1). What is the following polymer?  
 (2). What kind of chemical bond is indicated by the arrow (2)?  
 (3). What kind of chemical bond is indicated by the arrow (3)?  
 (4). What kind of sugar is the monomer of this polysaccharide?



15. Match each amino acid in the left column with the appropriate side chain in the right column. (2 points each)

- |         |                         |
|---------|-------------------------|
| (a) Ser | (1) acidic              |
| (b) Trp | (2) basic               |
| (c) Lys | (3) sulfur-containing   |
| (d) Cys | (4) nonpolar aromatic   |
| (e) Glu | (5) hydroxyl-containing |

**Answer the following question.**

16. Briefly describe the structure and biological roles of cytoplasmic membrane (10 points)
17. Collagen is the most abundant protein in mammals. This protein contains the amino acid hydroxyproline, but there is no genetic codon for hydroxyproline. Please describe how cells have hydroxyproline in collagen. (10 points)
18. Please describe the light reaction of photosynthesis. (5 points) And give one example how herbicides kill weeds. (6 points)