

Course No: PHRM 2315
Course Title: Biochemistry-I
Date: 22/10/2017
No. of Questions: (6)
Time: 1 hours
Using Calculator (yes)

University of Palestine



First Mid. Exam
2017/2018
Total Grade:

Instructor Name: Dr. Iyad ALQOUQA
Student No.: _____
Student Name: _____
College Name: _____
Dep. / Specialist: _____
Using Dictionary (No)

Question One:

6 Marks

Choose the correct answer and encircle it.

1. Which of the following is considered as noncovalent bond?

- (a) Electrostatic interactions (b) Hydrogen bonds (c) van der Waals interactions (d) All of the above.
(e) None of the above.

2. The first law of thermodynamics states

- (a) Diversity is the result of gradual evolution.
(b) Total entropy of a system and its surroundings always increases for a spontaneous process.
(c) The total energy of a system and its surroundings is constant.
(d) Light is both particle and wave.
(e) None of the above.

3. The Second law of thermodynamics states

- (a) Total entropy of a system and its surroundings always increases for a spontaneous process.
(b) Temperatures will always decrease.
(c) Total energy of a system and its surroundings is constant.
(d) Diversity is the result of gradual evolution.
(e) None of the above.

4. List atoms commonly found in biological molecules that are often hydrogen-bond acceptors.

- (a) Carbon (b) Oxygen (c) Nitrogen (d) b and c (e) All of the above.

5. Enthalpy is defined as (a) A spontaneous reaction (b) The entropy of the system (c) The heat content of a system (d) All of the above (e) None of the above.

6. If a particular reaction has a negative ΔG , is it likely to occur?

- (a) Not unless energy is added to the system.
(b) Yes, if it is coupled to another reaction.
(c) Yes, it is spontaneous.
(d) No, it will never occur.
(e) Yes, if it takes place within a constrained area.

7. Two amino acids of the standard 20 contain sulphur atoms. They are:

- (a) cysteine and serine (b) cysteine and threonine (c) methionine and cysteine (d) methionine and serine (e) threonine and serine

8. The entropy S is:

- (a) the substrate in an enzyme catalyzed reaction (b) the heat transferred at constant pressure and volume.
(c) a measure of disorder in a system. (d) a measure of disorder change in a system
(e) equal to $\Delta G - T\Delta H$

9. In micelles:

- (a) polar ends form hydrophobic interactions with water.
(b) nonpolar ends form hydrophilic interactions with water.
(c) hydrocarbon tails form hydrophobic interactions with water.
(d) polar ends are hydrophobic and nonpolar ends are hydrophilic.
(e) hydrocarbon tails are excluded from the water into hydrophobic domains.

10. Identify the true statement:

- (a) The α -helix is the primary structure of a polypeptide.

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- (b) β -sheets define the tertiary structure of a protein.
- (c) Peptides can adopt many conformations because of rotation about single covalent bonds.
- (d) Unfolding or denaturation of a protein usually does not lead to a loss of biological activity.
- (e) Enzymes are very rigid proteins that cannot undergo conformation changes.

11. In amino acid analysis, trypsin performs which function?

- (a) It is used to hydrolyze a protein into individual amino acid components.
- (b) It acts as an ion exchange resin used to separate the individual amino acids.
- (c) It reacts with each amino acid producing different colour used to measure the amounts of each amino acid
- (d) It is used as a standard to calibrate ϵ in Beer's Law.
- (e) Trypsin is an enzyme used to cut a protein into smaller peptides.

12. Which statement is true for beta pleated-sheet secondary structures?

- (a) Amino acid side chains are found in the same plane as the beta sheet.
- (b) All proteins contain beta sheets.
- (c) Each amino acid forms H-bonds with the amino acid at relative position 4 down the chain.
- (d) Beta turns are necessary for antiparallel chains to interact through H-bonds.
- (e) Torsion angles psi and phi both equal -60° .

Question Two:

5 Marks

Put the sign (✓) against the right sentences and the sign (✗) against the wrong sentences and correct the wrong sentence whenever encountered.

1. () Immunoglobulin G (IgG), type of antibody, is one of the most abundant proteins in human serum belongs to the class of Glycoproteins.
2. () Ferritin is a blood cell protein that contains iron. This protein belongs to class Hemoprotein.
3. () Stereoisomers that are mirror images of each other are called Diastereomers.
4. () Buffer is a solution that resists change in pH following the addition of an acid or base and consist of weak acid and its conjugate base or weak base with its conjugate acid.
5. () AEGK is a tetrapeptide has one free amino group, one free α -carboxyl group, and one ionizable R groups.

Question Three:

5 Marks

1. 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)	5,000	3,000,000
3. Precipitation (pH)	4,000	1,000,000
4. Ion-exchange chromatography	200	800,000
5. Affinity chromatography	50	750,000
6. Size-exclusion chromatography	45	675,000

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- (a) From the information given in the table, calculate the specific activity of the enzyme after each purification procedure.

- (b) Which of the purification procedures used for this enzyme is most effective (i.e., gives the greatest relative increase in purity)?

- (c) Which of the purification procedures is least effective?

- (d) Is there any indication based on the results shown in the table that the enzyme after step 6 is now pure?

- (e) What else could be done to estimate the purity of the enzyme preparation?

Question Four:

6 Marks

Fill the following sentences with appropriate scientific term:

1. _____ are protein synthesizing machine.
2. _____ are unique site for oxidation of fatty acids.
3. _____ support the cells and facilitate movement of organelles.
4. _____ is site for lipid synthesis and drug metabolism.
5. _____ are sites for energy production in the form of ATP in mammals cells .
6. _____ are molecules with the same chemical bonds and same chemical formula but different configuration.
7. _____ explains the flow of genetic information, from DNA to RNA to make a functional product, a protein.
8. _____ molecules can be superimposed on its mirror image.
9. _____ are two intermediates involved in the biosynthesis of arginine and in the urea cycle but are not exist in proteins.
10. _____ are amphoteric molecules that contain both acidic and basic groups and will exist mostly as zwitterions in a certain range of pH.
11. _____ a procedure used to determine the isoelectric point (pI) of a protein.
12. _____ unfolding & disorganization of protein's structure without hydrolyzing peptide bonds

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Question Five:**2 Marks**

Justify and explain your answer for the following sentences:

1. Alanine, Glucose are soluble in water; while Palmitate and cholesterol are not

2. Purified protein has a higher specific activity than crude extract

Question Six:**6 Marks**

Calculate and Justify your answer

1. The amino acid histidine has three ionizable groups, with pK_a values of 1.8, 6.0, and 9.2. (a) Which pK_a corresponds to the histidine side chain? (b) In a solution at pH 5.4, what fraction of the histidine side chains will carry a positive charge.

2. Calculate the concentration of acetate in a 50-mM solution of acetic acid at pH 5.0. (pK_a 4.76).

3. Calculate the pH of a 1-L solution to which has been added 25 mL of 10 mM acetic acid and 25 mL of 30 mM sodium acetate.

End of Questions

Good Luck