



## ● Midterm Exam

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# Biochemistry

## Midterm Exam 2014/2015

1- A transmembrane protein is formed of:

- a- beta sheets with nonpolar amino acids.
- b- Beta sheets with polar amino acids.
- c- Alpha helices with polar amino acids.
- d- Alpha helices with nonpolar amino acids.
- e- None of the above.

Answer: e

2- All of the following statements are true about hemoglobin and myoglobin EXCEPT:

- a- Myoglobin has 5-coordinate heme and hemoglobin has 6-coordinate heme.
- b- Myoglobin is composed of one polypeptide chain and hemoglobin is composed of four.
- c- Myoglobin binds oxygen by a simply but hemoglobin bind oxygen cooperatively.
- d- In comparison with hemoglobin, Myoglobin is saturated with oxygen at a lower pressure.

Answer: a

3- Which of following events doesn't occur after the binding of oxygen to the heme group of hemoglobin?

- a-The proximal histidine is pulled upward with the polypeptide chain attached to it.
- b- The distal histidine becomes charged.
- c- The iron atom of the heme group becomes at the level of the plane.

Answer: b

4- One of the following statements describes loops:

- a- They are composed of 4 amino acids that have a hydrogen bond between the first and the fourth amino acids.
- b- They have irregular structures.
- c- Beta-turns is another name of them.

Answer: b

5- If you have these amino acids arranged in an alpha helix

Val-Leu-Thr-Phe-Leu-His-Asp-Lys-Ile-Val-Ala-Ser-Leu

What can you tell about the hydrogen binding of isoleucine?

- a- Isoleucine hydrogen bonds with Valine and lysine.
- b- Isoleucine hydrogen bonds with lysine.
- c- Isoleucine hydrogen bonds with Valine.
- d- Isoleucine hydrogen bonds with serine and histidine.
- e- Isoleucine hydrogen bonds with serine.

Answer: d

6- All of the following statements describe fibrous proteins EXCEPT:

- a- alpha keratin which is found in hair and nails is an example and it's composed of alpha helices.
- b- Collagen is an example and it's composed of alpha helices.
- c- They are composed of fibers which are tightly held and insoluble in water.
- d- All of them have important structural roles.
- e- All of the above

answer: e

7- All of these descriptions are true for collagen and elastin EXCEPT:

- a- Both have high number of glycine and proline.
- b- Both are glycosylated.
- c- Both have oxidized lysine residues that are involved in the formation of cross links.
- d- Both are found together in the same tissues.
- e- Both are composed of insoluble in water.

Answer: b

8- A protein with high cysteine content was mixed with an unknown solution. After mixing, you found the protein has been denatured. Which of following was the unknown solution?

- a- acetone
- b- Urea
- c- Guanidine hydrochloride
- d- Dithiothreitol
- e- C and D only.

Answer: e

9- Which of the following statements describes the leucine zipper (it was represented in a figure with its name not mentioned)?

- a- has no specific function.
- b- It is an immunoglobulin fold.
- c-
- d-
- e- None of the above.

Answer: e

10- Which of the following statements best describes the protein motif:

Answer: a portion of the protein that helps you predict the folding of the protein.

11- What determines the 3D structure of the protein?

Answer: The sequence of amino acids.

12- What's the function of chaperones?

Answer: They aid in the correct and timely folding of proteins.

13- Why are there only a few number of secondary structures?

Answer: Because the side chains are not involved in the formation of hydrogen bonds and thus different amino acid sequences will adopt these few secondary structures.

Amino acids... Dr Diala

1- What's correct about Gramicidin S?

- a- Has only D amino acids.
- b- Has a cyclic structure due to hydrogen bonding.
- c- Has the amino acid ornithine in its structure.
- d- Is a hexapeptide.

Answer: c

2- Which of the following characteristics do oxytocin and vasopressin have in common?

- 1- They both act as hormones.
- 2- They have cysteine residues that are responsible for the formation of their cycles.
- 3- Have 7 amino acids.
- 4- Oxytocin induces labor in pregnant women and vasopressin controls blood pressure.
- 5- They have amide groups at the N-terminus.
- 6- They are secreted from the anterior pituitary.

Answer: 1+2+4+5

3-All of the following statements are true about glutathione EXCEPT:

- a- its oxidized form is GSSG.
- b- It makes disulfide bridges within the same molecule.
- c- Is a tripeptide.
- d- It scavenges oxidizing agents.
- e- Reduced glutathione is in the form of GSH.

Answer → b

4- All of the following statements about phenylketonuria are true ACCEPT:

- a- The enzyme phenylalanine hydroxylase is deficient.
- b- There's an increase in the amount of tyrosine in the body.
- c- Phenylalanine is converted to phenylpyruvate, phenyllactate and phenylacetate.
- d- Phenylalanine is not converted into tyrosine.
- e- None of the above.

Answer: b

5- One of these groups (Derivative-Precursor-Function) is correctly matched:

- A- Histamine-His-vasoconstriction
- b- Gamma-carboxyglutamic acid - Gln - Coagulation
- c- GABA - Glu - relaxing inhibitory neurotransmitter
- d- Serotonin - Trp - sedative effects
- e- Thyroxine - Tyr - metabolism

Answer: c+d

6- Which of these name-structure amino acid combinations is mismatched:

The correct answer was (glutamic acid) ... The structure drawn was aspartic acid not glutamic acid.

7- One of the following is not true about the peptide bond:

- a- it's planar.
- b- It has partial double bond character
- c- it's represented by the letter A (( in the exam paper , there was a figure showing an amino acid sequence with its bonds represented by letters ... one of the peptide bonds was represented by the letter A ))
- d- it's weaker than a usual single bond
- e- None of the above

Answer: d

Acids and Bases ... Dr Naïf Karadsheh

1- If the pH of a solution decreased from 7.5 to 7. What change has occurred to the concentration of  $H_3O^+$ ?

- a- increased 3 times
- b- Increased 5 times
- c- Increased 500 times
- d- Increased  $10^5$  times
- e- Increased  $10^{(1/2)}$  times

Answer: a

2- In protein buffers, which factor has the highest buffering contribution?

Answer: Histidine content of the protein

3- Which of the following pairs can't make a buffer when mixed together?

Answer --> NaOH / NaCH<sub>3</sub>COO

4- Which of the following pairs can't make acid/conjugate base pair?

Answer --> CH<sub>3</sub>CH<sub>3</sub> / CH<sub>3</sub>CH<sub>2</sub>

5- Given pka of different acids, which one will have the strongest conjugate base when being dissociated with water?

- a- 3.5
- b- 2.9
- c- 4.76
- d- 7.2
- e- 12.4

Answer: e



6- What's the best description of water ion product?

a- the product of the concentration of positively and negatively charged ions resulting from the dissociation of water.

b- The product of the concentration of positively and negatively charged ions resulting from the dissociation of electrolyte solutions.

c- The product of the concentration of positively and negatively charged ions resulting from the dissociation of water and other electrolyte solutions.

d- None of the above.

Answer: c

7- How many molecules of water dissociate into OH<sup>-</sup> and H<sub>3</sub>O<sup>+</sup>?

a- one in 7

b- One in 10<sup>7</sup>

c- One in 10<sup>12</sup>

d- One in 10<sup>-7</sup>

Answer: b

8- One of the following statements is not true about Carbonic acid/Bicarbonate buffer:

a- The most common extracellular buffer.

b- Under physiological conditions the ratio of [HCO<sub>3</sub><sup>-</sup>]/ [H<sub>2</sub>CO<sub>3</sub>] = 20.

c- Its buffering range is less than the desirable pH and that's compensated by CO<sub>2</sub> mobility.

d- When adding a strong acid, it will react with HCO<sub>3</sub><sup>-</sup>.

e- When adding a strong base, it will react with CO<sub>3</sub><sup>2-</sup>.

Answer: e

9- All of the following will cause mild or severe acidosis except:

- a- the presence of ketone bodies in untreated diabetic patient
- b- The production of acids like lactic acid during metabolism
- c- Excessive breathing
- d- Repeated vomiting from the stomach containing HCL.

Answer: d

10- If you have X moles of KOH, how many moles of an acid must be added to have a buffer with equal concentrations of A<sup>-</sup> and HA?

- a- X
- b- X/2
- c- 2X
- d- 1.5 X
- e- None of the above

Answer: c

11- A 0.1 M base (B) has dissociated in water. Its pK<sub>b</sub> = 5, Calculate its pH.

Answer --> 11

12- Which of the following has ion-dipole interaction:

Answer --> Na<sup>+</sup> (H<sub>2</sub>O)

13- At neutral pH, the structure of glutamic acid is:

Answer --> the amino group is positively charged and the two carboxyl groups are negatively charged.

14- 100 mL of a buffer has a concentration of 0.2 M. The buffer is composed of a weak acid component and a conjugate base component and its pH=7.57. If 1 mL of 1 M HCl is added, what will be the new pH value? (Pka=7.57)

Answer --> 7.5

15- Below is the pKa of some weak acids. Which weak acid will be 91 % undissociated at pH=4.86?

a- Acetoacetic acid pka = 3.6

b- Lactic acid pKa=3.9

c- beta-hydroxyl butyric acid pka=4.8

d- propionic acid pka=4.9

e- Imidazolium pka=5.9

Answer: e

16- Which of the following acids or bases can make a buffer with its conjugate acid or its conjugate base?

a- HCl

b- KOH

c- H<sub>2</sub>SO<sub>4</sub>

d- None of the above

Answer: d

17- 100 mmol of a triprotic acid were titrated with KOH.  $P_{K_a}$  values = 3, 6, 9.

How many mmoles of KOH must be added to have  $pH=6$ ?

a- 100

b- 150

c- 200

d- 250

e- 300

Answer: b

18- If 10 mmoles of NaOH were dissolved in 1 L of water. What will be the  $pH$  of the solution?

a- 2

b- 1

c- 3

d- 12

e- 9

Answer: d

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