



Biomedical Engineering

Biochemistry  
Course Code : BME 291  
Level : 200  
Allowed Time : 2 hours  
First Semester 2016 /2017  
Final term exam  
50 marks



Faculty Of Engineering  
09-01-2017

كيمياء حيوية

## Biochemistry exam

### تعليمات

- الإجابة في الأماكن المخصصة فقط في نفس ورقة الامتحان وكل سؤال على حدة.
- ممنوع تكرار أية إجابة أو إعادتها في أماكن أخرى.
- ليست هناك أية فرصة لإضافة ورق زائد.
- الصفحة الأخيرة مسودة ولا يعتد بأي كتابة فيها كإجابة.
- يتكون الإمتحان من خمسة اسئلة ويقع في 7 صفحات بالمسودة وجميع الأسئلة إجبارية.
- ممنوع أية كتابات خارجة عن مضمون الإجابة حتى لا تعرض نفسك للمسائلة القانونية.

### Directions

- All questions are to be attempted in the same exam papers.
- Answers should be written in the provided spaces.
- Do not repeat any answer in other places.
- No additional Booklets could be provided.
- The last paper is a Draft Paper not to be corrected.
- The exam consists of 5 questions in 7 pages including a draft page.



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**Question (1): Complete the following sentences:**

(14 marks, 0,5 mark/each)

- 1- L-Glucose and D-glucose are considered enantiomers
- 2- Oxidation of aldehydic group of glucose leads to the production of gluconic acid  
while oxidation of both aldehydic and last hydroxy group of galactose leads to the production of mucic acid
- 3- An example of reducing disaccharide is maltose and lactose.
- 4- The types of linkages in amylopectin are 1,4 and 1,6 glycosidic linkages
- 5- Examples of amino acids with branched aliphatic side chain are valine, isoleucine, and leucine  
while an example of amino acid with aromatic side chain is phenylalanine, tyrosine and tryptophan
- 6- Examples of protein secondary structure are  $\alpha$ -helix,  $\beta$  pleated sheets and triple helix
- 7- An example of saturated fatty acid containing 18 C is stearic acid while unsaturated fatty acid containing 18C and 2 double bonds is linoleic acid
- 8- The simplest form of phospholipid is phosphatidic acid while the phospholipid containing 3 glycerol molecules is known as cardiolipin
- 9- The phospholipid bilayer in cell membrane is composed of hydrophobic (nonpolar) head and hydrophilic (polar) tail.
- 10- The model that mentions that phospholipids of cell membrane are not fixed is known as fluid mosaic model  
while the buffer that controls membrane fluidity is cholesterol
- 11- Transport of molecules across cell membrane against concentration gradient is known as active transport  
and examples of transport proteins are channels and carriers
- 12- Enzymes that catalyze the same reaction but differ in their structure are known as isoenzymes such as lactate dehydrogenase, creatine kinase
- 13- Fast acting neurotransmitters exert direct control of ion channels in cell membrane.
- 14- Inhibitory neurotransmitters induces a change on membrane of nerve cells which is known as hyperpolarization.
- 15- The type of sugar molecule in DNA is deoxyribose and DNA strand is read in the direction 5' to the 3' end



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**1- Question (2): Choose the correct answer for statements in column A from column B and write the answer letter in answer column: (15 marks, 1 mark/each)**

No	Column A	Answer letter		Column B
1	A compound in which the first aldehydic group of glucose is reduced into OH	G	A	Glucagon
2	The net charge of aspartic amino acid at neutral pH	F	B	positive
3	The storage form of carbohydrates in human	J	C	mRNA
4	Amino acid enters mainly in structure of collagen	I	D	leucine
5	The ketogenic amino acid	D	E	Skeletal muscles
6	A biologically active antioxidant	K	F	negative
7	Saturated fatty acid containing 24C	N	G	Sorbitol
8	Unsaturated fatty acid containing 20C	L	H	HDL
9	Good cholesterol	H	I	lysine
10	Muscle tissue characterized by continuous involuntary contraction	M	J	Glycogen
11	Irreversible inhibitor of enzyme	Q	K	Glutathione
12	The release of neurotransmitters from intracellular vesicles after neuron activation	R	L	Arachidonic acid
13	Adenine in DNA is paired with	P	M	Cardiac muscle
14	The type of RNA that reads the code and carries the amino acid to be incorporated into the developing protein	O	N	Lignoceric acid
15	The type of RNA that carries the genetic information from nuclear DNA to the cytosol	C	O	tRNA
<div style="border: 1px solid black; width: 50px; height: 50px; margin: 0 auto; display: flex; align-items: center; justify-content: center;"> <div style="border: 1px solid black; width: 40px; height: 40px; display: flex; align-items: center; justify-content: center;">15</div> </div>			P	thymine
			Q	Lead poisoning
			R	Exocytosis
			S	cytosine
			S	LDL
			T	Ribitol



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**Question (3): Give the name of each of the followings:**

**(12 marks, 1 mark/each)**

No.	Statement	Answer
1	An example of ketohexose.	Fructose
2	An optically inactive amino acid.	glycine
3	Unfolding the protein's secondary, tertiary or quaternary structure without affecting peptide bonds.	Denaturation
4	Sodium or potassium salts of fatty acid that has detergent action.	Soap
5	The chemical process required for margarine production	Hydrogenation
6	The basic unit of structure and function in the human body.	cell
7	The term describing solution concentration that causes lysis of red blood cells.	hypotonic
8	The process of activating trypsinogen in the presence of trypsin.	autocatalysis
9	The number of molecules of substrate converted to product per enzyme molecule per second.	turnover
10	The model that states that enzyme molecule changes shape as the substrate molecules gets close.	Induced-fit
11	The substrate concentration at which the reaction velocity is equal to $\frac{1}{2} V_{max}$	$K_m$
12	A molecule is similar to the substrate and competes with the substrate for the active site of the enzyme.	Competitive inhibitor



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**Question (4): Determine whether the following sentences are correct or wrong and correct the underlined words in case of wrong statements:** (5 marks, 1 mark/each)

1- Sucrose is composed of fructose and galactose.

Answer:

Wrong- fructose and glucose

2- Lysine is an example of basic amino acid

Answer: Correct

3- The N-terminal of cysteine-glycine-alanine-valine-methionine peptide is methionine.

Answer: wrong-cysteine

4- Lipid soluble compounds can cross cell membrane easily.

Answer:

Correct

5- Prosthetic groups are cofactors that bind weakly to proteins or enzymes.

Answer: wrong-tightly bind

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**Question (5): Answer all the following questions:**

**(4marks, 1 mark/each)**

**1- Enumerate only two factors that may disrupt  $\alpha$ -helix structure of protein.**

**1- Proline disrupts the  $\alpha$ -helix**

**2- Charged amino acids (e.g. glutamate, aspartate, histidine, lysine, and arginine)**

**3- Amino acids with bulky side chains**

**2- Enumerate only two factors that control rate of diffusion across cell membrane.**

**1. The steepness of the concentration gradient**

**2. Temperature.**

**3- The surface area**

**4- The type of molecule or ion diffusing.**

**3- Mention the reason that prevents further elevation of the temperature from increasing rate of reaction.**

Due to enzyme denaturation

**4- Enumerate only two roles of enzyme inhibitors.**

**1-1- Enzyme Inhibitors in Metabolic Control:**

**2- as drugs**

**3- As metabolic poisons**

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