

Al Azhar University – Gaza
Biology Department
1st semester 22/23
19.11.2022

Biology / Medicine
Midterm Exam
Instructor: Prof. Dr. M Sirdah
Time : one Hour

Part I: (40 points)- State which of the following statements is true (✓) and which is false(X).

1. X Binding of phosphate to (C-5') atom of pentose is the most prevalent form in biological systems and the one found in DNA but not RNA.
2. X mutarotation is the process of the direct interconversion of α and β anomers of the monosaccharide in aqueous solution



15.	X	The enzyme lysozyme is notably present in tears and kills bacteria by hydrolyzing the <u>peptide bonds</u> of the crosslinked short peptides of the bacterial peptidoglycan cell wall
16.	X	polar amino acids are characterized by having an <u>ionizable R- group</u>
17.	X	The Phosphodiester bond of a polynucleotide is very strong <u>ionic</u> bond, and for this reason DNA is remarkably stable. DNA can be boiled and even autoclaved without



		<u>optically active.</u>
11.	X	Z form of DNA is a synthetic left-handed CG- very rich double helix produced under <u>high humidity</u> conditions.
12.	X	In a double stranded DNA organisms, the ratio of purines : pyrimidines is <u>organism specific</u>
13.	X	Modified nucleosides triphosphate such as 2', 3' dideoxycytidine (2', 3' ddCTP) could be used to treat cancer and virally infected cells by inhibiting the <u>transcription</u> of the DNA.



strong **ionic** bond, and for this reason DNA is remarkably stable. DNA can be boiled and even autoclaved without degrading.

18. **x** All monosaccharides are reducing sugars **except** dihydroxyacetone

19. **X** O_2 , N_2 , and CO_2 are nonpolar gases because electrons are **shared equally** by atoms.

20. **X** In glucose linear form the orientation of the $-H$ and $-OH$ groups around the carbon atom # 5 determines the **anomeric** forms of glucose



12.	X	In a double stranded DNA organisms, the ratio of purines to pyrimidines is <u>organism specific</u>
13.	X	Modified nucleosides triphosphate such as 2', 3' dideoxycytidine (2', 3' ddCTP) could be used to treat cancer and virally infected cells by inhibiting the <u>transcription</u> of the DNA.
14.	X	Amphipathic compounds contain regions that are <u>polar</u> and charged and regions that are <u>polar</u> but uncharged



		α and β anomers of the monosaccharide in aqueous solution
3.	X	Proline residues are constraint for α helix formation as they introduce a destabilizing kink in an α -helix in addition to their limited ability to form <u>interchain</u> hydrogen bonds with other residues.
4.	X	Sucrose is a disaccharide formed from D-glucose and D-fructose with its glycosidic bond formed between <u>non-anomeric</u> carbon atoms; therefore, sucrose is a non-reducing sugar



		strong ionic bond, and for this reason DNA is remarkably stable. DNA can be boiled and even autoclaved without degrading.
18.	x	All monosaccharides are reducing sugars except dihydroxyacetone
19.	X	O ₂ , N ₂ , and CO ₂ are nonpolar gases because electrons are shared equally by atoms.
20.	X	In glucose linear form the orientation of the —H and —OH groups around the carbon atom # 5 determines the anomeric forms of glucose

		crystalline ice structure
29.	✓	Lactose is a reducing disaccharide formed from D-galactose and D-glucose and it is abbreviated as Gal $\beta(1 \rightarrow 4)$ Glc
30.	✓	The double bonds of polyunsaturated fatty acids are almost never conjugated but are separated by a methylene (CH ₂) group
31.	✓	The net charge of a cysteine dissolved in high alkaline (pH>12) solution is (-2)



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|-----|---|---|
| 15. | X | The enzyme lysozyme is notably present in tears and kills bacteria by hydrolyzing the <u>peptide bonds</u> of the crosslinked short peptides of the bacterial peptidoglycan cell wall |
| 16. | X | polar amino acids are characterized by having an <u>ionizable R-group</u> |
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26.	✓	carbonic anhydrase (CAH) is an enzyme found inside the RBCs and catalyzes the reversible formation/breakdown of carbonic acid
27.	✓	snRNA are nucleic acids with enzymatic activities.
28.	✓	The cohesive forces provided by the many hydrogen bonds between water molecules are responsible for making H ₂ O liquid at room temperature and forming the H ₂ O crystalline ice structure

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5.	x	all amino acids except glycine contain at least one <u>symmetric</u> carbon and are optically active.
6.	X	Chloride shift occurs across the red blood cells (RBCs) of the active (respiring) tissue and the lungs (Alveoli), and it represents the exchange <u>of hydroxide (OH⁻) ions</u> with chloride (Cl ⁻) ions to keep the RBC uncharged

1



7.	X	The “flickering clusters” is the phrase that has been applied to the <u>strong-connected</u> groups of water molecules interlinked by hydrogen bonds in liquid water.
8.	X	The net charge of acidic amino acid at high pH is <u>(-1)</u>
9.	X	The colligative properties of water depend only on the number of solute particles in a given amount of water and alter its physical properties: osmotic pressure, boiling point, freezing point, and <u>heat of vaporization</u>



24.	✓	At high pH, the net charge of monoamino dicarboxylic α -amino acid is (-2)
25.	✓	26:3($\Delta^{9,15,19}$): this represents a 25-carbon tail polyunsaturated fatty acid with three double bonds between C-9 and C-10, between C-15 and C-16 and between C-19 and C-20.
26.	✓	carbonic anhydrase (CAH) is an enzyme found inside the RBCs and catalyzes the reversible formation/breakdown of carbonic acid



10.	X	Molecules that contain at least one chiral carbon are <u>optically active</u> .
11.	X	Z form of DNA is a synthetic left-handed CG- very rich double helix produced under <u>high humidity</u> conditions.
12.	X	In a double stranded DNA organisms, the ratio of purines : pyrimidines is <u>organism specific</u>
13.	X	Modified nucleosides triphosphate such as 2', 3' dideoxycytidine (2', 3' ddCTP) could be used to treat cancer and virally infected cells by inhibiting the



21.	✓	Optically active molecules must have at least one stereogenic center
22.	✓	Generally the ionizable polar substances have more effect than non ionizable substances on the colligative properties of water.
23.	✓	The number of α (1 $\rightarrow$ 6) bonds per mole of starch is lower than the number of α (1 $\rightarrow$ 6) bonds per mole of glycogen

3



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32.	✓	In the active (respiring) tissue, lowering the pH inside the red blood cells (RBCs) decreases the affinity of hemoglobin to Oxygen.
33.	✓	In non-reducing disaccharides a double-headed arrow connects the symbols specifying the anomeric carbons and their configurations
34.	✓	The presence of monoamino dicarboxylic α -amino acid near the N-terminus stabilizes the α -helix secondary structure of the polypeptide chain.

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crystalline ice structure

29.	✓	Lactose is a reducing disaccharide formed from D-galactose and D-glucose and it is abbreviated as Gal $\beta(1 \rightarrow 4)$ Glc
30.	✓	The double bonds of polyunsaturated fatty acids are almost never conjugated but are separated by a methylene (CH ₂) group
31.	✓	The net charge of a cysteine dissolved in high alkaline (pH > 12) solution is (-2)



		crystalline ice structure
29.	✓	Lactose is a reducing disaccharide formed from D-galactose and D-glucose and it is abbreviated as Gal $\beta(1 \rightarrow 4)$ Glc
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homopolysaccharide with $\beta(1 \rightarrow 4)$ glycosidic bonds linking their monomers. In chitin the hydroxyl group at carbon atom # 2 of the D-glucose is replaced by an acetylated amino group.

36. ☒ For same weight of crystalline ice and liquid water, Ice is less dense but larger in size than Liquid water

37. ☒ Making of ice is associated with a decrease of the entropy, while the complementary binding between the polar enzyme and its polar substrate is accompanied with a increase in entropy



33.	✓	In non-reducing disaccharides a double-headed arrow connects the symbols specifying the anomeric carbons and their configurations
34.	✓	The presence of monoamino dicarboxylic α -amino acid near the N-terminus stabilizes the α -helix secondary structure of the polypeptide chain
35.	✓	Chitin and cellulose are almost similar linear homopolysaccharide with $\beta(1 \rightarrow 4)$ glycoside bonds linking their monomers. In chitin the hydroxyl group at carbon atom # 2 of the D-glucose is replaced by an acetylated



36.	✓	For same weight of crystalline ice and liquid water, Ice is less dense but larger in size than Liquid water
37.	✓	Making of ice is associated with a decrease of the entropy, while the complementary binding between the polar enzyme and its polar substrate is accompanied with a increase in entropy
38.	✓	The net charge of basic amino acid at low pH is (+2)
39.	✓	Condensation reaction connects a monomer to a monomer or to a growing polymer



Part II: (12 points) : Circle THE BEST CORRECT answer in each of the followings:

1- Of the following segments of DNA molecules, two have a melting temperature (T_m) of about 50°C . But one has a T_m of 43°C . Which one?

a) AGTACGCTAG
TCATGCGATC

b) GAATTTAAAC
CTTAAATTIG

c) ATTGATGCTT
TAACTACGAA

d) TTTAAACCCT
AAATTGGGA

2- Given that the boiling point of Acetic acid (CH_3COOH) is 118°C and the elevation or increase in the boiling point of Acetic acid is 2.9°C per mole of solute. What is the boiling point of 0.1 M solution of sodium sulphate Na_2SO_4 dissolved in Acetic acid

a) 109.3°C

b) 126.7°C

c) 118.87°C

d) 117.13°C

e) None of the choices is correct



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39. ☒ Condensation reaction connects a monomer to a monomer or to a growing polymer

40. ☒ At neutral pH, both polar uncharged and polar charged amino acids exist as zwitterion and can act as either an acid or a base

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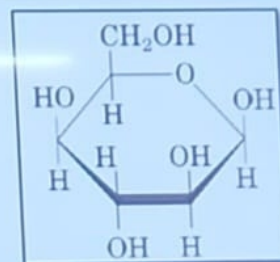


Na₂SO₄ dissolved in Acetic acid

- a) 109.3 °C b) 126.7 °C c) **118.87 °C** d) 117.13 °C e) None of the choices is correct

3- The following molecule is:

- | | |
|-----------------------|------------------|
| a) α-L-glucose | b) α-D-galactose |
| c) β-L-glucose | d) β-D-glucose |
| e) β-L-galactose | f) α-D-glucose |



4- The following two molecules are called:

- | | |
|----------------|--------------------|
| a) isomers | b) anomers |
| c) enantiomers | d) Racemic mixture |

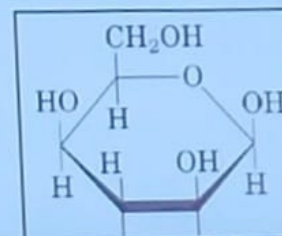


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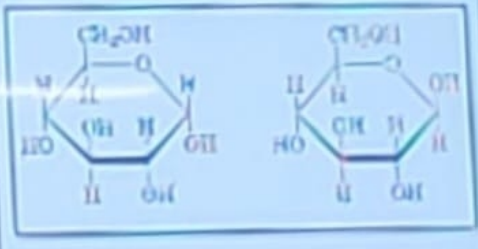
3- The following molecule is:

- | | |
|-------------------------------|--------------------------------|
| a) $\alpha\text{-L-glucose}$ | b) $\alpha\text{-D-galactose}$ |
| c) $\beta\text{-L-glucose}$ | d) $\beta\text{-D-glucose}$ |
| e) $\beta\text{-L-galactose}$ | f) $\alpha\text{-D-glucose}$ |



4. The following two molecules are called:

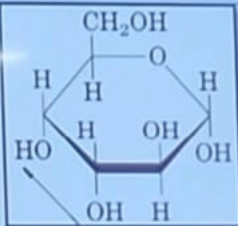
a) isomers	b) anomers
c) enantiomers	d) Racemic mixture
e) None of the choices is correct	



6

5- The following molecule is:

a) α -L-glucose	b) β -L-glucose	c) β -L-galactose
d) β -D-glucose	e) α -D-galactose	f) α -L-galactose



6- The following molecule is:

a) α -D-Fructose	b) α -L-galactose	c) β -L-galactose
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CH₂OH

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6- The following molecule is:

a) α -D-Fructose	b) α -L- galactose	c) β -L-galactose
d) β - L- ribose	e) α -L-ribose	f) α -L-Fructose

Part III: (8 points) - The following figure shows the titration curve of phosphoric acid (H_3PO_4).

What is the predominant (المائد/الاكثر تواجداً) molecule (s) at each point (from A-E).

Giving that for phosphoric acid H_3PO_4 : $\text{Pka}_1=2.14$ $\text{Pka}_2=6.86$ $\text{PKa}_3= 12.4$

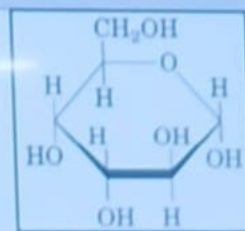
Point	The predominant molecule (s)
A	
B	
C	
D	
E	

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5. The following molecule is:

- | | | |
|------------------------|--------------------------|--------------------------|
| a) α -L-glucose | b) β -L-glucose | c) β -L-galactose |
| d) β -D-glucose | e) α -D-galactose | f) α -L-galactose |



6. The following molecule is:

- | | | |
|-------------------------|--------------------------|-------------------------|
| a) α -D-Fructose | b) α -L-galactose | c) β -L-galactose |
|-------------------------|--------------------------|-------------------------|



