بسم الله الرحمن الرحيم

BioChemistry | MID

Test Bank

Introduction	Lipids
pH & Buffers	Nucleic Acids
Carbohydrates	Amino acids & Peptides

Written by : Abdallah Al-Abdallat
Hashem Al-Halalmeh
Mousa Al-Neimat

Reviewed by : Rayan Theeb

Introduction to Biochemistry

Q1

Question : Which of the following best describes the primary goal of biochemistry?

A) To study the anatomical features of humans

B) To examine how cells reproduce

C) To understand the chemical basis of life processes

D) To diagnose diseases based on symptoms

E) To analyze population genetics and heredity

Ans: C

Q2

Question : Which of the following is NOT classified as a major macromolecule in the human body?

A) Carbohydrates

B) Lipids

C) Proteins

D) Nucleic Acids

E) Buffers

Ans: E

Q3

Question : Which of the following elements is NOT one of the four that make up about 96% of the human body's mass?

A) Carbon

B) Calcium

C) Hydrogen

D) Oxygen

E) Nitrogen

Ans: B

Q4

Question : The percentage by mass of the major elements in the human body is approximately:

A) 96%

B) 98.5%

C) 98%

D) 96.5%

E) 99%

Ans: B

Q5

Question : Which of the following best describes electronegativity?

A) The number of electrons in an atom’s outer shell

B) The total energy required to break a covalent bond

C) The ability of an atom to donate electrons to another atom

D) The attraction between two oppositely charged ions

E) The atom’s ability to withdraw electrons in a covalent bond toward itself

Ans: E

Q6

Question : Which of the following statements **correctly** explains the relationship between covalent bond polarity and non-covalent interactions?

A) Non-covalent interactions only occur in molecules with non-polar covalent bonds

B) A polar covalent bond arises when electrons are equally shared between two atoms

C) Polarity in covalent bonds creates partial charges that enable non-covalent interactions like hydrogen bonding

D) If a bond has an electronegativity difference greater than 0.4, it is considered non-polar

E) Covalent bonds are weaker than all types of non-covalent interactions

Ans: C

Q7

Question : Why do hydrophobic interactions occur between nonpolar molecules in an aqueous environment?

A) Because nonpolar molecules are naturally attracted to each other

B) Because nonpolar molecules form hydrogen bonds with each other

C) To increase interaction with water molecules

D) To minimize repulsion between nonpolar atoms

E) To reduce contact with water and increase system stability

Ans: E

Q8

Question : Which of the following properties of carbon makes it essential for forming the molecular backbones of biomolecules?

A) It can form up to four stable covalent bonds with a variety of atoms

B) It forms weak, easily breakable bonds with other elements

C) It can ionize easily to form charged molecules

D) It is the most electronegative element in biological systems

E) It always forms linear molecules with no branching or rings

Ans: A

Q9

Question : Which of the following best explains why pure carbon forms like graphite and diamond are not water-soluble?

A) They are polar and easily form hydrogen bonds with water

B) They are made of carbon atoms that readily ionize in water

C) They consist of nonpolar carbon atoms with no affinity for polar solvents

D) They are bonded to oxygen, nitrogen, or sulfur, making them highly hydrophilic

E) They form covalent bonds with water molecules through electron transfer

Ans: C

Q10

Question : Which of the following properties contributes most to water's ability to act as an excellent biological solvent?

A) Its large molecular size and low polarity

B) Its angular shape and strong ionic bonds

C) Its high cohesiveness and large molar mass

D) Its small size, polarity, and ability to form hydrogen bonds

E) Its ability to dissolve only nonpolar molecules effectively

Ans: D

Q11

Question : Which of the following statements about acids and bases is TRUE?

A) A base is a substance that donates protons to the solution.

B) H^+ is an ionization state of hydrogen known as a hydride.

C) An acid is a substance that produces H^+ (or H_3O^+) when dissolved in water or reacts with other substances.

D) A diprotic acid donates three protons when dissolved in water.

E) The conjugate base of an acid cannot accept a proton once the acid donates it.

Ans: C

Q12

Question : Why does the strength of an acid change after it donates the first proton, especially in diprotic or triprotic acids?

A) Because the pH of the solution becomes neutral

B) Because the chemical structure changes after proton loss, altering its ability to donate additional protons

C) Because the acid becomes more concentrated after the first proton is donated

D) Because the acid forms covalent bonds with water molecules

E) Because the acid becomes fully ionized after the first proton loss

Ans: B

Q13

Question : Which of the following statements about acids and bases is TRUE?

A) Strong acids partially dissociate in water and are easily reversible.

B) Strong bases have a weak affinity for protons.

C) Strong acids dissociate completely, producing large amounts of H^+ (or H_3O^+).

D) Multi-protic acids donate all their protons with equal strength.

E) Weak acids produce large amounts of H^+, greatly affecting pH.

Ans: C

Q14

Question : Which of the following best describes chemical equilibrium in acid–base reactions?

A) It happens when the rates of the forward and reverse reactions become equal

B) It means the reactions have stopped completely

C) It occurs when the concentrations of all products exceed those of the reactants

D) It applies only to strong acids and bases

E) It occurs only when $[HA] = [A^-]$

Ans: A

Q15

Question : Which of the following statements is TRUE regarding the relationship between Ka and pKa?

A) A high Ka corresponds to a low pKa and indicates strong acidity

B) Ka and pKa are unrelated values used in different systems

C) A low Ka means the acid is strong and dissociates completely

D) A strong acid always has a high pKa and a low Ka

E) Ka can be zero if the acid is weak

Ans: A

Q16

Question : How many equivalents of H^+ are produced by 20.5 grams of H_3PO_4?

(Molar mass of H_3PO_4 = 98 g/mol)

A) 0.07 equivalents

B) 0.21 equivalents

C) 0.63 equivalents

D) 1.15 equivalents

E) 2.25 equivalents

Ans: C

Q17

Question : Which of the following is NOT typically classified as an electrolyte in the human body?

A) Phosphate (PO_4^{3-})

B) Sulfate (SO_4^{2-})

C) Potassium (K^+)

D) Calcium (Ca^{2+})

E) Albumin

Ans: E

Q18

Question : What volume of 0.085 M HNO_3 is required to completely neutralize 15 mL of 0.12 M $Ba(OH)_2$?

A) 15.00 mL

B) 21.18 mL

C) 30.00 mL

D) 42.35 mL

E) 60.00 mL

Ans: D

Q19

Question : Which of the following statements about antacids is NOT correct?

A) Antacids are alkaline compounds that neutralize gastric HCl.

B) Antacids reduce stomach acidity and relieve symptoms of dyspepsia.

C) Antacids increase the activity of pepsin by lowering the pH to 1–2.

D) Common antacids include magnesium hydroxide and calcium carbonate.

E) Raising stomach pH with antacids can reduce protein digestion.

Ans: C

pH and Buffers

Q1

Question : Find the Ka of a 0.05 M weak acid HA whose $[H^+]$ is 2×10^{-4} M.

A) 4×10^{-8}

B) 1×10^{-6}

C) 8×10^{-7}

D) 2×10^{-6}

E) 1×10^{-7}

Ans: C

Q2

Question : Which of the following best explains why pH is biologically important?

A) It directly controls DNA replication.

B) It determines the water solubility of carbohydrates.

C) It increases the rate of all enzymatic reactions regardless of their structure.

D) It regulates the number of red blood cells in plasma.

E) It influences protein structure by affecting ionic interactions.

Ans: E

Q3

Question : How is the pH of a solution most accurately measured today?

A) By using litmus paper

B) By color-changing acid–base indicators

C) By measuring the amount of base added

D) By using electrodes that detect H^+ concentration

E) By observing protein denaturation in a solution

Ans: D

Q4

Question : Which of the following best explains why a 1×10^{-10} M HCl solution has a pH slightly below 7, not 10?

A) HCl becomes a weak acid at low concentrations

B) The solution is saturated with OH^- ions at this concentration

C) Water autoionization contributes significantly to $[H^+]$ at very low acid concentrations

D) The pH scale changes at low concentrations

E) The presence of Cl^- ions reduces the pH

Ans: C

Q5

Question : Why does a 0.01 M solution of acetic acid (a weak acid) have a pH higher than that of 0.01 M HCl?

A) Acetic acid does not fully dissociate, so fewer H^+ ions are released

B) Acetic acid completely dissociates, unlike HCl

C) Acetic acid produces more hydroxide ions (OH^-)

D) HCl is a base while acetic acid is an acid

E) Acetic acid has a higher molecular weight than HCl

Ans: A

Q6

Question : Why does an acetic acid–acetate buffer resist drastic pH changes when a small amount of acid or base is added?

A) Acetic acid is a strong acid that neutralizes all added base completely

B) The buffer components react with added H^+ or OH^-, minimizing pH change through reversible equilibrium

C) Water in the buffer solution prevents ion formation

D) The buffer components are too weak to dissociate, so no pH change occurs

E) Buffers work only when the pH is exactly 7, so they always remain stable

Ans: B

Q7

Question : What happens when a strong acid (H^+) is added to a buffer solution composed of a weak acid (HA) and its conjugate base (A^-)?

A) The pH increases rapidly due to accumulation of H^+

B) H^+ binds to A^-, forming more HA and minimizing the pH change

C) H^+ converts directly to water, preventing any pH change

D) The acid component of the buffer is neutralized and becomes inactive

E) OH^- is produced to balance the added H^+

Ans: B

Q8

Question : A titration curve shows that 25 mL of NaOH is required to completely neutralize 25 mL of an unknown acid solution. The x-axis reaches 1.0 equivalent at the equivalence point. What can you conclude about the acid?

A) It is a strong acid

B) It is a diprotic acid

C) It has a pKa greater than 7

D) It is a monoprotic acid

E) It cannot be neutralized by NaOH

Ans: D

Q9

Question : During the titration of a weak acid with a strong base, which of the following occurs precisely at the midpoint of the titration curve?

A) The acid is fully dissociated, and the pH equals 7

B) The concentration of conjugate base is twice that of the undissociated acid

C) The strongest buffering capacity has been surpassed

D) All the acid has been neutralized and converted into salt

E) The pH equals the pKa of the acid

Ans: E

Q10

Question : Which of the following best explains why a buffer loses its effectiveness when too much acid or base is added?

A) The strong acid or base completely inhibits the ionization of water

B) The conjugate acid and base neutralize each other entirely, forming an inert compound

C) The concentration of buffer components becomes too low to resist further pH changes

D) The buffer starts to behave like a strong acid or base at high concentrations

E) The pKa of the buffer changes due to excess H^+ or OH^-

Ans: C

Q11

Question : What is meant by the buffer capacity?

A) The buffer’s color and odor

B) The pKa of the buffer being close to the desired pH

C) The buffer’s molecular weight

D) The buffer’s ability to conduct electricity

E) The buffer’s solubility in organic solvents

Ans: B

Q12

Question : A buffer solution contains 0.1 M acetic acid and 0.2 M acetate ion. Given that the pKa of acetic acid is 4.8, what is the approximate pH of the solution?

A) 4.5

B) 4.8

C) 6.2

D) 5.8

E) 5.1

Ans: E

Q13

Question : A buffer contains 0.12 M HF and 0.14 M NaF. The Ka of HF is 3.5×10^{-4}. What is the approximate pH of the buffer?

A) 3.49

B) 3.65

C) 3.57

D) 3.61

E) 3.52

Ans: E

Q14

Question : If 0.03 M HCl is added to a buffer made of 0.1 M HF and 0.13 M NaF, which of the following best describes what happens to the pH?

A) pH increases due to added HCl

B) pH decreases due to formation of extra HF

C) pH remains unchanged

D) pH increases due to neutralization of NaF

E) pH decreases due to dissociation of HF

Ans: B

Q15

Question : A lactate buffer contains 70% lactic acid and 30% lactate. The pKa of lactic acid is 3.86. What is the pH of the buffer?

A) 3.50

B) 3.31

C) 3.75

D) 3.86

E) 4.00

Ans: A

Q16

Question : Which of the following buffer systems would be most effective at maintaining a pH close to 9?

A) 0.1 M CH_3COOH / 0.1 M CH_3COONa (pKa = 4.76)

B) 0.1 M H_2CO_3 / 0.1 M HCO_3^- (pKa = 6.4)

C) 0.1 M NH_4^+ / 0.1 M NH_3 (pKa = 9.25)

D) 0.1 M HCl / 0.1 M Cl^-

E) 0.1 M H_3PO_4 / 0.1 M $H_2PO_4^-$ (pKa = 2.1)

Ans: C

Q17

Question : What is the effect of adding a small amount of NaOH to a buffer containing 0.1 M lactic acid and 0.1 M sodium lactate (pKa = 3.86)?

A) The pH will decrease significantly

B) The pH will increase slightly

C) The pH will stay the same

D) The buffer will be destroyed immediately

E) The solution will become acidic

Ans: B

Q18

Question : Which of the following combinations can form an effective buffer solution?

A) NaOH and NaCl

B) HCl and NaCl

C) HNO_3 and $NaNO_3$

D) CH_3COOH and CH_3COONa

E) NaOH and KOH

Ans: D

Q19

Question : Which of the following best describes the behavior of a triprotic buffer in varying pH environments?

A) It releases all three protons simultaneously at low pH

B) It only works effectively in alkaline solutions above pH 9

C) It loses buffering capacity when pH drops below 4

D) It cannot resist changes in H^+ concentration due to weak conjugate bases

E) It has three distinct pKa values and releases protons stepwise depending on pH

Ans: E

Q20

Question : A solution was prepared by dissolving **0.02 moles of acetic acid** in water to make 1 liter of solution. What is the pH of this solution? ***(pKa = 4.8)***

A) 4.80

B) 2.00

C) 4.32

D) 6.50

E) 3.25

Ans: E

Q21

Question : Why can proteins act as effective buffers in both intracellular and extracellular environments?

A) They are present in large quantities and therefore resist pH change by dilution alone

B) Their primary structure allows them to bind acids and bases non-specifically

C) Their amino acid side chains, such as histidine, can reversibly bind H^+ or CO_2

D) They carry a permanent negative charge that neutralizes added protons

E) Proteins increase the solubility of acids and bases, reducing their effect on pH

Ans: C

Q22

Question : What are the two main substances that form the carbonic acid–bicarbonate buffer system in the body?

A) CO_2 and H_2O

B) HCl and NaOH

C) Oxygen and glucose

D) Ammonia and phosphate

E) ATP and lactic acid

Ans: A

Q23

Question : What makes the carbonic acid–bicarbonate buffer system effective in the human body?

A) It involves CO_2 and water forming a weak acid that can reversibly dissociate

B) It relies on high levels of carbonic anhydrase to break down carbonic acid

C) It uses nitrogen gas from the environment as a base

D) It requires ATP from the mitochondria to drive the buffering reaction

E) It depends on enzymes that convert lactic acid into bicarbonate

Ans: A

Q24

Question : What is the normal pH of blood?

A) 6.1

B) 5.1

C) 7.1

D) 7.4

E) 4.8

Ans: D

Q25

Question : Why is the bicarbonate buffer system still used in blood even though the blood's pH (7.4) is outside the optimal buffering range of this system (5.1–7.1)?

A) Because bicarbonate is a strong acid

B) Because the system is open and controlled by lungs and kidneys

C) Because blood contains more proteins than bicarbonate

D) Because the body does not require strict pH regulation

E) Because water increases the buffer's pKa to match blood pH

Ans: B

Q26

Question : Which of the following can lead to respiratory alkalosis?

A) Asthma

B) Starvation

C) Emphysema

D) Hyperventilation

E) Ketone body production

Ans: D

Q27

Question : Which statement of the following best explains how respiratory problems can cause acidosis or alkalosis?

A) CO_2 acts as a base, so its decrease leads to acidosis

B) An increase in CO_2 from lung problems can lower pH and cause acidosis

C) The kidneys remove CO_2, so their failure leads to acidosis

D) CO_2 levels do not affect pH significantly

E) A decrease in ketone bodies raises CO_2 levels, causing alkalosis

Ans: B

Q28

Question : In the case of respiratory acidosis caused by poor lung function, what is the body's compensatory response?

A) Excreting more bicarbonate via the kidneys

B) Increasing proton production by the kidneys

C) Decreasing CO_2 production in cells

D) Retaining more bicarbonate to bind excess H^+

E) Increasing breathing rate to reduce bicarbonate

Ans: D

Q29

Question : In metabolic alkalosis, which of the following represents the appropriate respiratory compensation?

A) Increase in renal H^+ excretion

B) Decrease in CO_2 exhalation by hypoventilation

C) Increase in CO_2 exhalation by hyperventilation

D) Excretion of more bicarbonate by the kidneys

E) Production of more ketone bodies by the liver

Ans: B

Q30

Question : A patient shows increased arterial CO_2 and decreased blood pH. Which of the following best describes the compensation expected from the kidneys?

A) Decreased HCO_3^- reabsorption and increased H^+ retention

B) Increased HCO_3^- reabsorption and increased H^+ secretion

C) Increased excretion of CO_2

D) Increased reabsorption of phosphate

E) Decreased ammonium ion production

Ans: B

Q31

Question : What happens to blood pH when CO_2 levels increase?

A) pH decreases

B) pH increases

C) pH stays the same

D) pH fluctuates rapidly

E) pH becomes neutral

Ans: A

Q32

Question : In metabolic acidosis, what primary change occurs?

A) Increased CO_2 levels

B) Increased bicarbonate (HCO_3^-) levels

C) Decreased bicarbonate (HCO_3^-) levels

D) Decreased CO_2 levels

E) Increased oxygen levels

Ans: C

Q33

Question : A patient with metabolic alkalosis has a blood pH above 7.45. What is the expected compensatory respiratory response?

A) No change in breathing rate

B) Increase oxygen intake

C) Decreased bicarbonate secretion

D) Hyperventilation to decrease CO_2 levels

E) Hypoventilation to increase CO_2 levels

Ans: E

Carbohydrates

Q1

Question : What unique property allows carbohydrates to participate in immune recognition?

A) High lipid solubility

B) Negative charge

C) Viscosity and hydrophilicity

D) Long hydrocarbon tails

E) Presence of sulfur groups

Ans: C

Q2

Question : Which of the following best explains why carbohydrates are well-suited for roles in cellular recognition on cell surfaces?

A) They provide long-term energy reserves

B) Their hydrophilic nature allows them to interact with the aqueous environment

C) They are insoluble in water, making them stable on membranes

D) They form rigid structures for membrane integrity

E) They neutralize extracellular pH fluctuations

Ans: B

Q3

Question : Which of the following is required for a compound to be considered a carbohydrate?

A) Must contain nitrogen

B) Must be an alcohol

C) Must have a ring structure

D) Must be hydrophobic

E) Must contain a carbonyl group

Ans: E

Q4

Question : What happens when a ketose sugar undergoes oxidation?

A) It directly becomes a carboxylic acid

B) It loses all hydroxyl groups

C) It is first converted into an aldose, then oxidized

D) It is reduced into an aldehyde

E) It becomes an amino sugar

Ans: C

Q5

Question : Which of the following correctly matches the compound with its classification or product after a chemical change?

A) Dihydroxyacetone — aldose

B) Glyceraldehyde — ketose

C) Alcohol — still considered a carbohydrate

D) Aldose → oxidation → carboxylic acid

E) Ketose → reduction → carboxylic acid

Ans: D

Q6

Question : Which of the following best describes a monosaccharide?

A) A carbohydrate that contains nitrogen

B) A carbohydrate that can be hydrolyzed into two simpler sugars

C) A carbohydrate that cannot be hydrolyzed into a simpler one

D) A carbohydrate with more than one carbonyl group

E) A lipid-derived sugar molecule

Ans: C

Q7

Question : What is the correct IUPAC-type description for the molecular formula of carbohydrates?

A) $CH_3(CH_2)nOH$

B) $(CH_2O)n$

C) CnH_2nO_2

D) H_2CO_3

E) CHON

Ans: B

Q8

Question : Which of the following is the simplest ketose?

A) Dihydroxyacetone

B) Glucose

C) Fructose

D) Ribose

E) Glyceraldehyde

Ans: A

Q9

Question : What functional group must be present in a compound for it to be considered a carbohydrate?

A) Carbonyl group

B) Hydroxyl group

C) Carboxyl group

D) Amino group

E) Methyl group

Ans: A

Q10

Question : Which of the following disqualifies a molecule from being categorized as a carbohydrate?

A) Possession of a hydroxyl group

B) Being water-soluble

C) Having a ring structure

D) Having a carbon backbone of 3–6 atoms

E) Complete reduction to alcohols

Ans: E

Q11

Question : Which of the following is an example of a disaccharide?

A) Glucose

B) Cellulose

C) Raffinose

D) Mannose

E) Sucrose

Ans: E

Q12

Question : Which of the following naturally occurring carbohydrate-containing molecules is directly involved in determining blood group antigens?

A) Inulin

B) Glycoproteins

C) Starch

D) Cellulose

E) Mucopolysaccharides

Ans: B

Q13

Question : Polysaccharides are best described as:

A) Sugars that consist of one unit

B) Sugars that contain 2 to 10 units

C) Sugars that can be hydrolyzed to two monomers

D) Long chains of polymeric sugar units

E) Sugars with no glycosidic bonds

Ans: D

Q14

Question : the following sugar is:

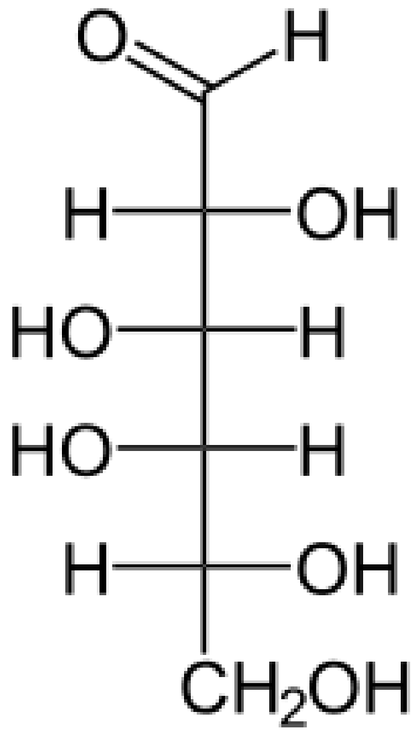
A) D-Glucose

B) D-Mannose

C) L-Glucose

D) L-Galactose

E) D-Galactose



Ans: E

Q15

Question : the following sugar is:

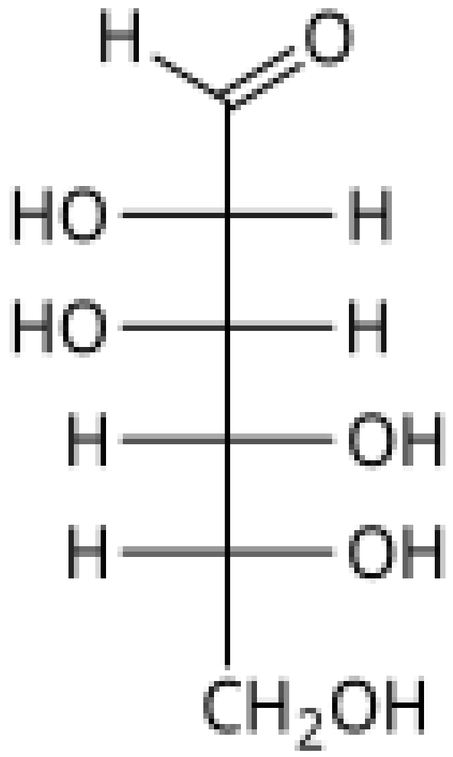
A) D-Glucose

B) D-Mannose

C) L-Glucose

D) L-Galactose

E) D-Galactose



Ans: B

Q16

Question : the following sugar is:

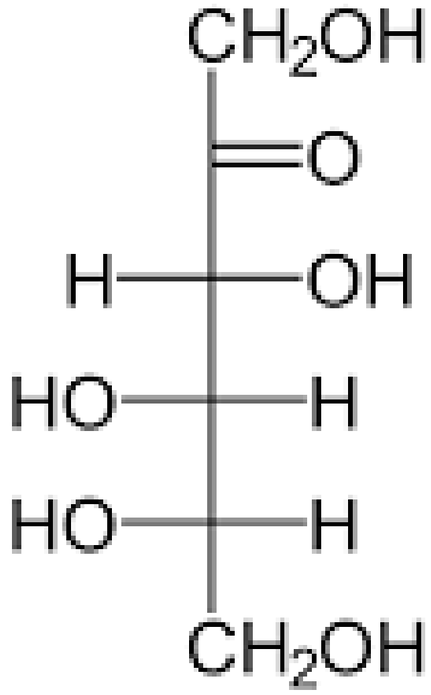
A) L-Fructose

B) L-Glucose

C) L-Galactose

D) L-Mannose

E) L-Ribose



Ans: A

Q17

Question : the following sugar is:

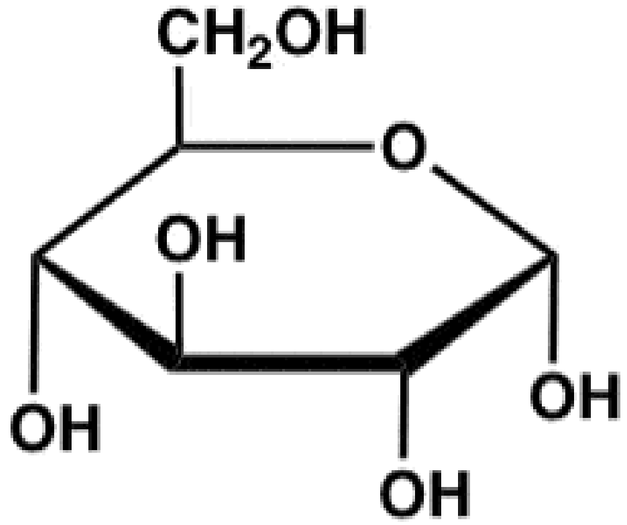
A) D-Glucose

B) D-Mannose

C) L-Glucose

D) L-Galactose

E) D-Galactose



Ans: A

Q18

Question : How many stereoisomers does an aldohexose have?

A) 8

B) 10

C) 12

D) 16

E) 32

*aldohexose has 4 chiral centers

Ans: D

Q19

Question : Which one of the following pairs is mismatched?

A) Glucose – Found in all disaccharides and polysaccharides

B) Galactose – Usually found freely in fruits and blood

C) Fructose – Sweetest naturally occurring sugar

D) Glucose – Primary fuel for glycolysis in all body cells

E) Galactose – Rarely found as a free monosaccharide

Ans: B

Q20

Question : Which of the following statements about sugar cyclization is INCORRECT?

A) In cells, most pentoses and hexoses exist in cyclic (ring) form.

B) The carbonyl carbon becomes a new chiral center during cyclization.

C) Cyclization of sugars prevents them from forming isomers like glucose and galactose.

D) Anomers differ only in the configuration around the anomeric carbon.

E) The anomeric carbon results from the cyclization of the carbonyl group.

Ans: C

Q21

Question : Which of the following statements about anomeric carbons and sugar cyclization is CORRECT?

A) The anomeric carbon is always chiral, whether in ring or open-chain form.

B) Alpha and beta forms differ in the orientation of the CH2OH group only.

C) Anomers refer to sugar isomers that differ at multiple chiral centers.

D) In the cyclic form, the anomeric carbon becomes chiral, forming alpha and beta anomers.

E) Beta anomers always have OH and CH2OH on opposite sides.

Ans: D

Q22

Question : Which of the following statements about the anomeric carbon is TRUE?

A) The anomeric carbon is located at carbon 1 in both aldoses and ketoses.

B) The anomeric carbon is always achiral in the ring form of sugars.

C) The α and β forms (anomers) differ only in the orientation of the OH group at the anomeric carbon.

D) The α and β forms of sugars differ in the number of carbon atoms.

E) In ketoses, the anomeric carbon is located at carbon 1, just like in aldoses.

Ans: C

Q23

Question : Which of the following statements about esterification of monosaccharides is TRUE?

A) Esterification of monosaccharides occurs in key metabolic reactions such as glycolysis.

B) Monosaccharides are esterified with phosphate groups only during DNA replication.

C) Esterification involves the removal of phosphate groups from monosaccharides.

D) Glucose cannot be esterified to form glucose-6-phosphate.

E) Esterification converts monosaccharides into disaccharides.

Ans: A

Q24

Question : Which of the following statements about Tollens' reagent and carbohydrates is TRUE?

A) All carbohydrates, regardless of structure, give a positive Tollens' test.

B) Tollens' reagent detects carbohydrates that undergo reduction.

C) A silver mirror appears only when non-reducing sugars are present.

D) Disaccharides never give a positive Tollens' test.

E) Carbohydrates with a free anomeric carbon can act as reducing sugars.

Ans: E

Q25

Question : Which sequence correctly describes the enzymatic reactions occurring in glucose test strips used for diabetes monitoring?

A) Glucose oxidase oxidizes all sugars → color appears immediately.

B) Peroxidase oxidizes glucose → hydrogen peroxide reacts with glucose oxidase → color forms.

C) Glucose oxidase oxidizes glucose → hydrogen peroxide is formed → peroxidase reacts with H_2O_2 and a color substrate → colored product forms.

D) Glucose oxidase reacts with any reducing sugar → peroxidase breaks down glucose → color change occurs.

E) Glucose oxidase and peroxidase combine to form glucose directly → color change results.

Ans: C

Q26

Question : What is the product formed when glucose is oxidized by a weak oxidizing agent such as Tollens' reagent?

A) Glucuronic acid

B) Gluconic acid

C) Glucose-6-phosphate

D) Fructose

E) Sorbitol

Ans: B

Q27

Question : Which statement best describes the selective oxidation of glucose using a weak oxidizing agent like Tollens' or Fehling's solution?

A) Both the aldehyde and primary alcohol groups are oxidized, forming glucaric acid

B) The aldehyde group at carbon 1 is oxidized to a carboxylic acid, forming gluconic acid

C) The ketone group is oxidized to a secondary alcohol, forming sorbitol

D) The entire glucose molecule is oxidized into carbon dioxide and water

E) The oxidation occurs at carbon 6, forming glucuronic acid

Ans: B

Q28

Question : What is the product formed when glucose is treated with a strong oxidizing agent that oxidizes both terminal carbons?

A) Gluconic acid

B) Glucuronic acid

C) Glucaric acid

D) Sorbitol

E) Galactaric acid

Ans: C

Q29

Question : Which of the following statements correctly describes the enzymatic oxidation of glucose to glucuronic acid?

A) Both the aldehyde at C1 and the alcohol at C6 are oxidized, producing glucaric acid.

B) Glucose is reduced at carbon 1 and oxidized at carbon 6, forming glucuronic acid.

C) The aldehyde at C1 is converted into an alcohol, while C6 remains unchanged.

D) The alcohol group at C6 is selectively oxidized to a carboxylic acid by enzymes, while the aldehyde at C1 remains intact.

E) Glucose is completely resistant to enzymatic oxidation at any carbon due to the stability of its ring form.

Ans: D

Q30

Question : Which of the following correctly explains why DNA contains deoxyribose instead of ribose?

A) The absence of the 2'-OH group in deoxyribose makes DNA more stable

B) Ribose contains a phosphate group that makes DNA unstable

C) Deoxyribose is sweeter than ribose, improving genetic function

D) Deoxyribose contains more oxygen, allowing faster base pairing

E) Ribose is unable to form glycosidic bonds with nitrogenous bases

Ans: A

Q31

Question : Which of the following best describes what happens during the reduction of a sugar?

A) Oxygen is added

B) A phosphate group is added

C) Hydrogen is added, or oxygen is removed

D) The sugar is broken into smaller parts

E) A carbon is replaced with nitrogen

Ans: C

Q32

Question : Which carbon in glucose is most easily phosphorylated during esterification with phosphate groups?

A) Carbon 1, because it is the most reactive carbon in the ring

B) Carbon 2, because it has a hydroxyl group

C) Carbon 3, because it is at the center of the molecule

D) Carbon 6, because it lies outside the ring and is more accessible

E) Carbon 5, because it is next to the anomeric carbon

Ans: D

Q33

Question : Which of the following best describes a glycosidic bond?

A) A bond between two phosphate groups

B) A bond between a sugar’s anomeric carbon and an –OH or –OR group

C) A bond between the carbon 6 of glucose and oxygen

D) A bond between two hydrogen atoms in a sugar

E) A bond that only occurs in linear forms of sugars

Ans: B

Q34

Question : What must be true about a monosaccharide for it to form a glycosidic bond?

A) It must be in its linear form

B) It must have a free aldehyde group

C) It must be phosphorylated

D) It must have a carboxylic acid group

E) It must be in its cyclic form with an available anomeric carbon

Ans: E

Q35

Question : What type of bond is responsible for connecting monosaccharides in polysaccharides?

A) Glycosidic bond

B) Ionic bond

C) Hydrogen bond

D) Phosphodiester bond

E) Ester bond

Ans: A

Q36

Question : Which carbon is required for a compound to be classified as a glycoside?

A) Carbon 2

B) Carbon 3

C) The last carbon in the chain

D) The anomeric carbon

E) Any carbon with an –OH group

Ans: D

Q37

Question : What distinguishes a glycoside from other sugar derivatives like glucosamine?

A) Glycosides are always disaccharides

B) Glycosides contain only ketone groups

C) Glycosides involve the anomeric carbon in bonding

D) Glycosides must have phosphate groups

E) Glycosides form only during glycolysis

Ans: C

Q38

Question : Which of the following factors helps determine whether a disaccharide is reducing or non-reducing?

A) A disaccharide is reducing only if both anomeric carbons are free.

B) A disaccharide is reducing if at least one anomeric carbon is free

C) A disaccharide is non-reducing if one anomeric carbon is free.

D) The number of monosaccharides in the disaccharide determines if it is reducing.

E) Only disaccharides with alpha glycosidic bonds are reducing.

Ans: B

Q39

Question : Which of the following correctly describes the key steps to characterize a disaccharide?

A) Type of glycosidic bond, polarity, melting point

B) Types of monosaccharides, α/β configuration, and linkage carbons

C) Color, sweetness, reducing power

D) α/β configuration, ring size, and aromaticity

E) Number of hydroxyl groups, linearity, and branching

Ans: B

Q40

Question : Which of the following statements about maltose is correct?

A) Maltose consists of two fructose units linked by a β-1,4-glycosidic bond.

B) Maltose is a non-reducing disaccharide formed during protein breakdown.

C) Maltose is formed from the hydrolysis of starch and contains two glucose units linked by an α-1,4-glycosidic bond.

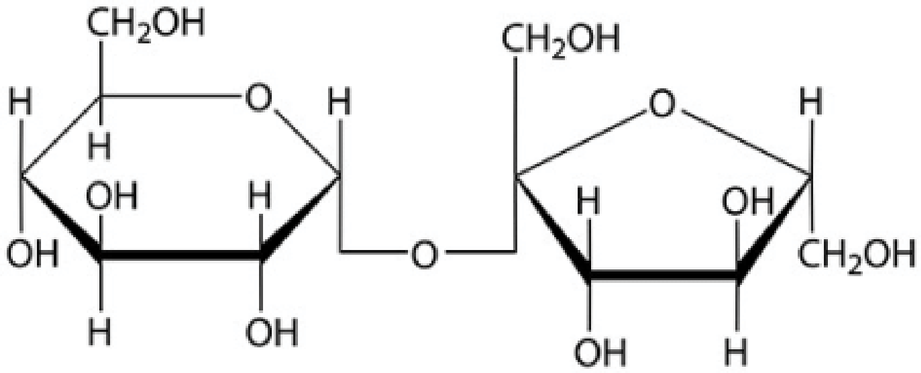
D) Maltose contains one glucose and one galactose unit and cannot reduce Tollens' reagent.

E) Maltose is produced by the condensation of sucrose and glucose during fermentation.

Ans: C

Q41

Question : The name of the following molecule is:



A) Lactose

B) α-D-Glucopyranosyl-(1→4)-α-D-Glucopyranose

C) Maltose

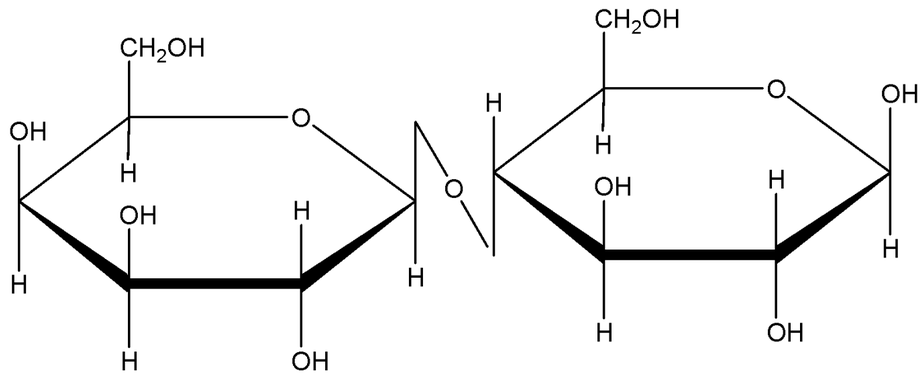
D) α-D-Glucopyranosyl-(1→2)-β-D-Fructofuranose

E) β-D-Galactopyranosyl-(1→4)-α-D-Glucopyranose

Ans: D

Q42

Question : The name of the following molecule is:



A) α-D-Glucopyranosyl-(1→4)-α-D-Glucopyranose

B) Maltose

C) β-D-Galactopyranosyl-(1→4)-β-D-Glucopyranose

D) α-D-Glucopyranosyl-(1→2)- β -D-Fructofuranose

E) Sucrose

Ans: C

Q43

Question : Which of the following statements about lactose intolerance is **incorrect**?

A) Lactose can normally be hydrolyzed into glucose and galactose by the enzyme lactase.

B) Lactose intolerance is caused by insufficient lactase production in the intestines.

C) Undigested lactose draws excess water into the intestines, leading to diarrhea.

D) Bacterial fermentation of lactose produces gases such as CO_2 and methane.

E) People with lactose intolerance cannot absorb glucose and galactose from any source.

Ans: E

Q44

Question : Which of the following statements about lactulose is true?

A) Lactulose is naturally found in milk and digested like lactose.

B) Lactulose is a synthetic derivative of lactose where the glucose is converted to fructose.

C) Lactulose is easily digested and absorbed in the small intestine.

D) Lactulose is used to treat constipation because it is digested quickly.

E) Lactulose causes constipation by absorbing water in the intestines.

Ans: B

Q45

Question : The name of the following molecule is:

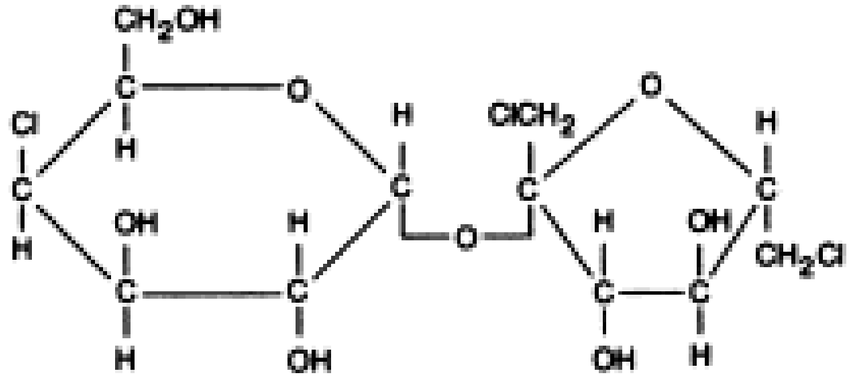
A) Sucralose

B) Lactose

C) Lactulose

D) Maltose

E) Sucrose



Ans: A

Q46

Question : Which of the following best explains the cause of galactosemia?

A) Excessive production of glucose from galactose.

B) Genetic deficiency of enzymes needed to convert galactose into glucose.

C) Increased breakdown of galactitol in the liver.

D) Overproduction of galactose in the intestines.

E) Lack of water retention inside cells leading to dehydration.

Ans: B

Q47

Question : What is the primary consequence of enzyme deficiency in galactosemia?

A) Excessive galactose is converted into glucose, causing hyperglycemia

B) Galactose is excreted unchanged in the urine, leading to dehydration

C) Galactose is converted into galactitol, which accumulates and causes cell damage

D) Galactitol enhances brain function but causes cataracts

E) The lack of galactose in cells reduces energy production

Ans: C

Q48

Question : Which of the following best explains why raffinose causes intestinal bloating?

A) It contains lactose, which is poorly digested in adults

B) Its glucose component is rapidly absorbed, increasing osmotic pressure

C) It enhances secretion of digestive enzymes, causing inflammation

D) It is a non-reducing sugar that accumulates in the intestines

E) It resists hydrolysis in the human gut and is fermented by bacteria into gases

Ans: E

Q49

Question : In polysaccharides, the reason they exhibit minimal reducing behavior is:

A) The hydroxyl groups are ionized

B) There are no carbonyl groups in their chains

C) Only the terminal anomeric carbon is free and reactive

D) The glycosidic bonds block all carbon atoms

E) Their high molecular weight reduces solubility

Ans: C

Q50

Question : What determines the reducing ability of a sugar in solution?

A) Presence of hydroxyl groups

B) Linear vs. cyclic conformation

C) Molecular weight

D) Degree of saturation

E) pH of the medium

Ans: B

Q51

Question : Which of the following is not typically used as criteria to describe and classify polysaccharides?

A) Whether the polysaccharide contains only glucose or other monosaccharides

B) The branching pattern of the polymer chain

C) The type of glycosidic linkages (α or β)

D) The enzyme used to hydrolyze the glycosidic bond

E) The number of carbon atoms involved in the linkage between units

Ans: D

Q52

Question : Which of the following is a homopolysaccharide?

A) Lactose

B) Raffinose

C) Maltose

D) Sucrose

E) Glycogen

Ans: E

Q53

Question : What is the main function of starch in plants?

A) Structural support

B) Transport of water

C) Cell signaling

D) Energy storage

E) Protein synthesis

Ans: D

Q54

Question : What type of bond is responsible for the branching in amylopectin?

A) α-1,6

B) α-1,4

C) β-1,4

D) β-1,6

E) α-1,2

Ans: A

Q55

Question : A polysaccharide isolated from a plant has both α-1,4 and α-1,6 glycosidic bonds. What form of starch is it most likely to be?

A) Cellulose

B) Amylose

C) Glycogen

D) Amylopectin

E) Chitin

Ans: D

Q56

Question : Where is glycogen primarily found?

A) Plants

B) Animals

C) Fungi

D) Bacteria

E) Algae

Ans: B

Q57

Question : Which of the following best describes glycogen?

A) Linear chain of fructose

B) Branched polymer of galactose

C) Highly branched glucose polymer

D) Disaccharide of glucose and fructose

E) Structural protein

Ans: C

Q58

Question : Which of the following best explains why glycogen can release glucose faster than amylopectin?

A) It contains β-linkages that are easier to hydrolyze

B) It has longer unbranched chains

C) It forms cross-links with proteins

D) It has more frequent branching, increasing enzyme accessibility

E) It has fewer anomeric carbons

Ans: D

Q59

Question : Dextran is primarily found in which organisms?

A) Animals

B) Yeast and bacteria

C) Plants

D) Algae

E) Fungi

Ans: B

Q60

Question : What makes cellulose a structural polysaccharide?

A) It contains fructose units

B) It has β-linkages that form rigid linear chains

C) It has random coiling due to branching

D) It is soluble in water

E) It uses α-(1→6) linkages for flexibility

Ans: B

Q61

Question : What sugar is directly involved in linking the amino acid chains in the bacterial cell wall?

A) N-acetylmuramic acid (NAM)

B) N-acetylglucosamine (NAG)

C) Glucose

D) Fructose

E) Galactose

Ans: A

Q62

Question : Why do glycosaminoglycans have high viscosity and lubrication properties?

A)They have large molecular weight

B) They have many glycosidic bonds

C) They are highly branched polymers

D) They contain hydrophobic groups

E) They contain negatively charged carboxylate or sulfate groups

Ans: E

Q63

Question : How do proteoglycans contribute to cell proliferation?

A) By degrading extracellular matrix proteins

B) By acting as hormone receptors

C) By binding and presenting growth factors to cells

D) By providing energy for cell division

E) By synthesizing DNA

Ans: C

Q64

Question : In N-linked glycosylation, sugars are added to which amino acid residue?

A) Serine

B) Threonine

C) Glutamine

D) Hydroxylysine

E) Asparagine

Ans: E

Lipids

Q1

Question : Lipids, unlike carbohydrates, are difficult to structurally identify because:

A) They have a symmetrical structure

B) They are entirely polar

C) They are chemically heterogeneous

D) They all contain glycerol backbones

E) Their functional groups are always hidden

Ans:C

Q2

Question : The test that produces a bad odor is due to the formation of:

A) Glycerol nitrate

B) Ketone bodies

C) Acrolein from glycerol dehydration

D) Free fatty acids

E) Cholesterol esters

Ans: C

Q3

Question : In omega-naming of fatty acids, ω-3 implies that:

A) The third carbon from the carboxyl end is unsaturated

B) The third carbon is hydroxylated

C) The first double bond is on the third carbon from the methyl end

D) There are three double bonds in the molecule

E) Three methyl groups are attached to the chain

Ans:C

Q4

Question : The acyl prefix in lipid chemistry refers to:

A) Hydroxyl-attached carbon

B) Carbonyl-attached carbon group without specifying chain length

C) A methylated ester group

D) Amino-acid bonded lipids

E) The specific naming of C2 compounds

Ans:B

Q5

Question : The melting point of a fatty acid is most significantly increased by:

A) Decreasing the number of double bonds

B) Increasing the degree of unsaturation

C) Shortening the hydrocarbon chain

D) Adding polar functional groups

E) Replacing the COOH with an alcohol

Ans:A

Q6

Question : Why are saturated fats more associated with atherosclerosis than unsaturated fats?

A) They react with bile salts in the gut

B) Their structure allows tight packing in blood vessels

C) They undergo spontaneous polymerization

D) They are water-soluble and diffuse easily

E) They increase protein synthesis in endothelium

Ans:B

Q7

Question : What is the key difference between lipid and carbohydrate synthesis?

A) Lipids form hydrogen bonds, carbohydrates form ionic bonds

B) Lipids form peptide bonds; carbohydrates form ester bonds

C) Carbohydrates form ether (glycosidic) bonds; lipids form ester bonds

D) Lipids require enzymes, carbohydrates do not

E) Carbohydrates have no condensation reactions

Ans:C

Q8

Question : Which of the following is a true statement about glycerol?

A) It is a volatile hydrocarbon

B) It produces acrolein upon hydration

C) It is amphipathic and insoluble

D) It forms esters with up to three fatty acids

E) It lacks hydroxyl groups

Ans:D

Q9

Question : Which feature makes trans-unsaturated fats harmful despite being ″unsaturated″?

A) They contain omega-6 chains

B) They pack tightly like saturated fats

C) They are more soluble than cis fats

D) They are digested in the colon

E) They are essential fatty acids

Ans:B

Q10

Question : During hydrogenation of oils, a partial reaction can result in:

A) Removal of all glycerol

B) Formation of trans-fatty acids

C) Generation of bile salts

D) Dehydration of fatty acids

E) Formation of lecithins

Ans:B

Q11

Question : In emulsification, the dual nature of bile salts allows:

A) Solubilizing both proteins and fats

B) Simultaneous breakdown of carbohydrates and lipids

C) Interaction with both fat and water molecules

D) Increased bile production by hepatocytes

E) Neutralization of acidic chyme

Ans:C

Q12

Question : Why are essential fatty acids more affected by hydrogenation?

A) They are stored in lysosomes

B) They contain multiple reactive double bonds

C) They are only produced in the intestine

D) They are solid at room temperature

E) They are resistant to hydrolysis

Ans:B

Q13

Question : What role does choline play in lecithin structure?

A) Neutralizes the phosphate group

B) Provides hydrophobicity

C) Serves as the nitrogenous polar head

D) Acts as a fatty acid

E) Serves as an enzyme cofactor

Ans: C

Q14

Question : Which statement best describes lecithinase in snake venom?

A) Forms soap from neutral fats

B) Synthesizes lung surfactant

C) Enhances phospholipid synthesis

D) Hydrolyzes bile salts

E) Converts lecithin to lysolecithin causing RBC rupture

Ans: E

Q15

Question : Lecithin deficiency in premature infants causes:

A) Hypoglycemia

B) Pulmonary hypertension

C) Respiratory distress due to lack of lung surfactant

D) Increased platelet aggregation

E) Low blood lipid levels

Ans: C

Q16

Question : Which best distinguishes waxes from neutral lipids?

A) Waxes are digested by lipases

B) Waxes are composed of glycerol

C) Waxes are primarily trans-fat based

D) Waxes are indigestible and non-saponifiable

E) Neutral lipids lack any fatty acids

Ans:D

Q17

Question : What's the major reason why hydrogenated fats are used despite health risks?

A) Longer shelf-life due to stability

B) Improved color and flavor

C) Enhanced protein-binding capacity

D) Ability to increase cholesterol absorption

E) Resistance to emulsification

Ans:A

Q18

Question : What feature of cardiolipin makes the inner mitochondrial membrane exceptionally impermeable to protons?

A) Its high degree of unsaturation

B) Its ability to form hydrogen bonds

C) Its high concentration and unique structure

D) Its interaction with glycolipids

E) Its replacement of cholesterol in the membrane

Ans:C

Q19

Question : The inner mitochondrial membrane's impermeability to protons is critical for:

A) Maintaining calcium homeostasis

B) Preventing cholesterol accumulation

C) Driving ATP synthesis through ATP synthase

D) Facilitating lipoprotein transport

E) Enhancing protein synthesis in the matrix

Ans:C

Q20

Question : Which nitrogenous base is NOT found in cephalins?

A) Ethanolamine

B) Serine

C) Threonine

D) Choline

E) All of the above are found in cephalins

Ans:D

Q21

Question : Inositol is classified as:

A) A cyclic alcohol with six hydroxyl groups

B) An amino alcohol

C) A SUGAR

D) A polyunsaturated fatty acid

E) A ketone-based lipid

Ans:A

Q22

Question : Sphingomyelins differ from ceramides by the addition of:

A) Fatty acid

B) Phosphate and choline

C) Glucose

D) Galactose and fucose

E) Sialic acid

Ans:B

Q23

Question : Which glycolipid contains a single sugar unit?

A) Cerebroside

B) Globoside

C) Ganglioside

D) Sphingomyelin

E) Phosphatidylinositol

Ans:A

Q24

Question : In the ABO blood group system, the B antigen differs from the O antigen by having:

A) Galactose attached to galactose

B) Galactose attached to fucose

C) N-acetylgalactosamine attached to galactose

D) Glucose instead of galactose

E) Sialic acid on the terminal sugar

Ans:A

Q25

Question : The primary role of chylomicrons is to:

A) Transport cholesterol from liver to cells

B) Transport cholesterol from cells to liver

C) Transport dietary lipids from the GI tract to the liver

D) Transport lipids to adipose tissue only

E) Provide membrane structural support

Ans:C

Q26

Question : Leukotrienes differ from prostaglandins in that they:

A) Are cyclic

B) Are derived from cholesterol

C) Require COX enzymes

D) Lack a cyclic structure

E) Contain no double bonds

Ans:D

Q27

Question : Phospholipase A_2 acts specifically at:

A) C1 of glycerol backbone

B) C2 of glycerol backbone

C) C3 of glycerol backbone

D) The terminal methyl group

E) The polar head group

Ans:B

Q28

Question : Which eicosanoid is a potent vasodilator and inhibits platelet aggregation?

A) Thromboxane A_2

B) Leukotriene C_4

C) Prostacyclin C

D) Prostaglandin E_2

E) Lipoxin A_4

Ans:C

Q29

Question : In aspirin therapy for cardiovascular protection, the main biochemical mechanism is:

A) Activation of prostacyclin synthesis

B) Irreversible inhibition of platelet COX-1

C) Competitive inhibition of leukotriene synthesis

D) Blockade of phospholipase C

E) Reversible inhibition of thromboxane synthase

Ans:B

Nucleic acids: DNA and RNA

Q1

Question : one of the following is the scientific explanation why DNA wraps around histones:

A) DNA is negatively charged and histones are positively charged which makes neutralisation resulting in decreasing the repulsion between nucleosome.

B) DNA is positively charged and histones are positively charged which makes neutralisation resulting in decreasing the repulsion between nucleosome.

C) DNA found it difficult to stay stable due to its long structure, so it wraps around histones to stabilise itself

D) DNA doesn't warp around histones since it is frequently used for RNA transcription.

E) DNA has partially negative charge and histones has partially positive charge which make covalent interactions between them an this is energetically more favourable than every one of them being in its own.

Ans: A

Q2

Question : One of the following is TRUE regarding the cells' genetic material :

A) DNA in skin cells is in the form of chromatin when the cell is not preparing for division and in the form of chromosomes when the cell is preparing for division.

B) DNA in nerve cells is in the form of chromatin when the cell is not preparing for division and in the form of chromosomes when the cell is preparing for division.

C) DNA contains the nitrogenous bases Adenine, Cytosine, Guanine and Uracil.

D) RNA contains the nitrogenous bases Adenine, Cytosine, Guanine and Thymine.

E) All of the previous options are true,

Ans: A

Q3

Question : Which of the following are purine bases ?

A) Guanine and Uracil.

B) Cytosine and Thymine.

C) Thymine and Uracil.

D) Cytosine and Uracil.

E) Adenine and Guanine.

Ans: E

Q4

Question : Cytosine differs from uracil by having a(n):

A) Methyl group rather than amino group.

B) Keto group rather than amino group.

C) An extra amino group.

D) Phosphate group rather than amino group.

E) All of the previous options are incorrect.

Ans: C

Q5

Question : One of the following is INCORRECT regarding the Nitrogenous bases.

A) Purines have two fused rings and contain 4 nitrogen atoms.

B) Pyrimidines have one ring containing 4 carbon atoms.

C) Thymine differs from cytosine by having a methyl group and two keto groups, while cytosine has an amino group and one keto group.

D) Thymine differs from uracil by having a methyl group; both have one keto group.

E) Uracil differs from cytosine by having keto groups instead of amino groups.

Ans: D

Q6

Question : all of the following are correct regarding nucleic acids EXCEPT :

A) Nucleic acids polymers are made of monomers called nucleotides.

B) DNA is always composed of double strands.

C) RNA is always composed of single strand.

D) RNA is involved in protein synthesis while most of the DNA is not fully understood

E) Nucleoside is part of nucleotide.

Ans: C

Q7

Question : one of the following is INCORRECT regarding nucleosome :

A) It consists of short DNA sequences wrapped around a collection of proteins (H2A, H2B, H3 and H4 two of each).

B) Histone H1 is bounded to the wrapped DNA sequence from outside.

C) Linker DNA connects two nucleosome with each other.

D) Histone H1 that is bounded to the octomer with DNA wrapping around them, are collectively called chromatoside.

E) Nucleosome is present to shorten the length of DNA so it can take less space and to reduce repulsion between negatively charged DNA sequences since Histone is positively charged neutralising them.

Ans: D

Q8

Question : one of the following is incorrect regarding nucleotides and nucleosides:

A) Nucleotides can have up to 3 phosphate groups in their structure.

B) Nucleotide is a Nucleoside attached to at least one phosphate group by its carbon number 5 oxygen atom.

C) Nucleotide is a Nucleoside attached to at least one phosphate group by its carbon number 3.

D) Nucleotides can work as an energy source if they are present outside the nucleus.

E) All of the above statements are correct

Ans: C

Q9

Question : the reason why we read nucleic acids strands from 5’ to 3’ :

A) The reading direction was historically acceptable and then it became accepted by most biochemists

B) The reading of the strands is based on how they are built by adding of nucleotide by its phosphate group to the free 3’ free end.

C) Because the phosphate group of an incoming nucleotide forms a bond with the 5’-OH of the existing chain, defining the direction of elongation.

D) Non of the previous options are correct.

E) All of the previous options are correct.

Ans: B

Q10

Question : How do humans differ from one another (human from human):

A) By having different amounts of DNA.

B) By having variations in protein structure.

C) By having different types of RNA.

D) By the number of chromosomes.

E) A + D

Ans: B

Q11

Question : Which nitrogenous base combination forms **three** hydrogen bonds in DNA?

A. Adenine–Uracil

B. Adenine–Thymine

C. Cytosine–Thymine

D. Guanine–Cytosine

E. Uracil–Guanine

Ans:D

Q12

Question : Which of the following contributes most to the increased stability of Cytosine Guanine base pair-rich DNA regions?

A) Hydrogen bonds between sugar and phosphate.

B) Stronger phosphodiester bonds.

C) More hydrogen bonds between G and C.

D) Stacking interactions between AT pairs.

E) All of the previous options are true.

Ans: C

Q13

Question: one of the following is INCORRECT regarding genome:

A) Genome is the whole genetic material in living being, species and an individual or cell.

B) Nuclear Genome is composed of 3 X 10^9 nucleotides which carry 20000 genes.

C) Bacterial genome is classified into two types : Bacterial DNA and plasmids, both have crucial roles that if we remove one of the them cell can’t survive.

D) We can use bacterial genome to produce a specific proteins by adding suitable genes and separate synthesised proteins.

E) Mitochondrial genome is composed of 16500 base pairs which synthesize 37 protein that work specifically in respiratory processes.

Ans: C

Q14

Question : one of the following is correct regarding DNA:

A) DNA is a double strand helical structure where backbones are oriented outside while nitrogenous bases are oriented to the inside.

B) Hydrogen bonds play a crucial role in stabilizing forces due to hydrogen bond strength individually.

C) Helical twisting results in maximising the hydrogen interactions between nucleotides within the same DNA strand.

D) Helical twisting results in maximising the hydrogen interaction between pentoses in nucleotides between DNA strands.

E) All of the previous options are incorrect.

Ans: A

Q15

Question : In a double-stranded DNA molecule, if 30% of the bases are cytosine, adenine percentage is:

A) 30%

B) 20%

C) 35%

D) 25%

E) Provided information aren’t enough.

Ans: B

Q16

Question : In a double-stranded DNA molecule, if 30% of the bases are adenine, the percentage of uracil is:

A) 30%

B) 20%

C) 10%

D) 0%

E) Provided information aren’t enough.

Ans: D

Q17

Question : Plasmids in bacteria are characterized by all EXCEPT:

A) They are infectious like viruses.

B) They can carry antibiotic resistance genes.

C) They replicate independently.

D) They are circular DNA.

E) All of the previous options are correct.

Ans: A

Q18

Question : Which of the following stabilizes the DNA double helix :

A) Phosphodiester bonds only

B) Hydrogen bonds and hydrophobic stacking

C) Ionic bonds between sugars

D) Covalent bonds between bases

E) still understood how DNA stabilises its double helix structure.

Ans: B

Q19

Question: you want to synthesis a protein so u can inject it in a specific human cell, the best method to achieve this is by:

A) Adding the gene that can cause the synthesis of this protein to the human DNA so it can be synthesised.

B) Injecting a new protein into human will always cause degradation of the protein since it is transported into new environment.

C) The only way to have new protein in human is by extracting it from other living being and injecting it.

D) Adding the gene that can cause the synthesis of this protein to bacterial DNA and then extracting it when it is synthesised so it can be used.

E) It is impossible to inject a protein to the human body.

Ans: D

Amino Acids & Peptides

Q1

Question : The central carbon in an amino acid is called:

A) Beta carbon.

B) Gamma carbon.

C) Alpha carbon.

D) Delta carbon.

E) Omega carbon

Ans: C

Q2

Question : In biological systems, which form of amino acids is incorporated into proteins:

A) D-amino acids.

B) L-amino acids.

C) Both D and L forms.

D) Racemic mixture.

E) None of the above.

Ans: B

Q3

Question : An amino acid at physiological pH (7.4) typically has:

A) $-NH_3^+$ and $-COO^-$ groups

B) $-NH_2$ and -COOH groups

C) Only $-NH_3^+$ groups

D) No charged groups

E) You can’t detect only by knowing the side group.

Ans: A

Q4

Question : The peptide bond:

A) Allows free rotation around the C-N bond.

B) It is between carboxyl and amino groups of adjacent amino acids.

C) It is between carbonyl group and amino group of adjacent amino acids.

D) Is broken by phosphorylation .

E) Is a type of glycosidic linkage.

Ans: C

Q5

Question : Allosteric regulation of proteins involves:

A) Competitive inhibition at the active site.

B) Binding of an effector to one subunit changes the affinity of the other subunits for a specific substance.

C) Proteolytic cleavage.

D) Phosphorylation of serine residues

E) Phosphorylation of cysteine residues

Ans: B

Q6

Question : which one of the following is mismatched regarding amino acids:

A) Amino acids bond→ peptide bond.

B) Peptide bond→ rigid and rotational.

C) Bond rotation→ due to the presence of resonance structure.

D) Cα and nitrogen bond→ rotational.

E) Cα and carbonyl group bond→ rotational.

Ans: B

Q7

Question : The ability of hemoglobin to change shape when binding oxygen is an example of:

A) Structural stability

B) Enzymatic catalysis.

C) Protein denaturation.

D) Structural flexibility.

E) Hormonal regulation.

Ans: D

Q8

Question : The side chain (R group) of an amino acid determines its:

A) Only its polarity

B) Only its solubility in water.

C) Only its molecular weight.

D) Only its function.

E) All of the above.

Ans: E

Q9

Question : What makes glycine unique among amino acids?

A) It has a thiol group.

B) It is the only aromatic amino acid.

C) It is achiral due to its side chain.

D) It is an essential amino acid.

E) It is an inessential amino acid.

Ans: C

Q10

Question : What is the total charge of a neutral amino acid (without charged side chain) at pH = 13?

A) +1

B) 0

C) -1

D) -2

E) +2

Ans: C

Q11

Question : Which of the following is NOT classified as a polar uncharged amino acid at pH=7 ?

A) Asparagine

B) Glutamine

C) Serine

D) Alanine

E) Tyrosine

Ans: D

Q12

Question : Depending on the provided table, a polypeptide that is composed of {Ala-Arg-Asn-Cys-Met-Trp}, the total charge at PH= 5:

A) -1

B) 0

C) +1

D) +2

E) +3

Amino Acid	Abbreviation		pK_1	pK_2	pK_R	pI
	3-Letters	1-Letter	-COOH	$-NH_3^+$	R group	
Alanine	Ala	A	2.34	9.69	-	6.00
Arginine	Arg	R	2.17	9.04	12.48	10.76
Asparagine	Asn	N	2.02	8.80	-	5.41
Aspartic Acid	Asp	D	1.88	9.60	3.65	2.77
Cysteine	Cys	C	1.96	10.128	8.18	5.07
Glutamic Acid	Glu	E	2.19	9.67	4.25	3.22
Glutamine	Gln	Q	2.17	9.13	-	5.65
Glycine	Gly	G	2.34	9.60	-	5.97
Histidine	His	H	1.82	9.17	6.00	7.59
Isoleucine	Ile	I	2.36	9.60	-	6.02
Leucine	Leu	L	2.36	9.60	-	5.98
Lysine	Lys	K	2.18	8.95	10.53	9.74
Methionine	Met	M	2.28	9.21	-	5.74
Phenylalanine	Phe	F	1.83	9.13	-	5.48
Proline	Pro	P	1.99	10.60	-	6.30
Serine	Ser	S	2.21	9.15	-	5.58
Threonine	Thr	T	2.09	9.10	-	5.60
Tryptophan	Trp	W	2.83	9.39	-	5.89
Tyrosine	Tyr	Y	2.20	9.11	10.07	5.66
Valine	Val	V	2.32	9.62	-	5.96

Ans: C

Q13

Question : Depending on the provided table, a polypeptide that is composed of {Asp-Glu-Lys-Tyr-Gly-Arg}, the total charge at PH= 4:

A) -2

B) -1

C) 0

D) +1

E) +2

Amino Acid	Abbreviation		pK_1	pK_2	pK_R	pI
	3-Letters	1-Letter	-COOH	$-NH_3^+$	R group	
Alanine	Ala	A	2.34	9.69	-	6.00
Arginine	Arg	R	2.17	9.04	12.48	10.76
Asparagine	Asn	N	2.02	8.80	-	5.41
Aspartic Acid	Asp	D	1.88	9.60	3.65	2.77
Cysteine	Cys	C	1.96	10.128	8.18	5.07
Glutamic Acid	Glu	E	2.19	9.67	4.25	3.22
Glutamine	Gln	Q	2.17	9.13	-	5.65
Glycine	Gly	G	2.34	9.60	-	5.97
Histidine	His	H	1.82	9.17	6.00	7.59
Isoleucine	Ile	I	2.36	9.60	-	6.02
Leucine	Leu	L	2.36	9.60	-	5.98
Lysine	Lys	K	2.18	8.95	10.53	9.74
Methionine	Met	M	2.28	9.21	-	5.74
Phenylalanine	Phe	F	1.83	9.13	-	5.48
Proline	Pro	P	1.99	10.60	-	6.30
Serine	Ser	S	2.21	9.15	-	5.58
Threonine	Thr	T	2.09	9.10	-	5.60
Tryptophan	Trp	W	2.83	9.39	-	5.89
Tyrosine	Tyr	Y	2.20	9.11	10.07	5.66
Valine	Val	V	2.32	9.62	-	5.96

Ans: D

Q14

Question : Which amino acid is described as having an imidazole ring in its side chain?

A) Tyrosine

B) Histidine

C) Tryptophan

D) Phenylalanine

E) Arginine

Ans: B

Q15

Question : Which two atoms in the side chain create polarity in polar uncharged amino acids?

A) Carbon and Hydrogen

B) Phosphorus and Iron.

C) Oxygen and Nitrogen.

D) Chlorine and Sodium.

E) Fluorine and Carbon.

Ans: C

Q16

Question : Which amino acid is classified as an imino acid due to its side chain forming a ring with the backbone nitrogen?

A) Tryptophan

B) Glycine

C) Proline

D) Phenylalanine

E) Methionine

Ans: C

Q17

Question : At pH=6, the side chain of glutamic acid will likely be:

A) Positively charged

B) Protonated and neutral

C) Deprotonated and negatively charged

D) Nonpolar

E) Aromatic

Ans: C

Q18

Question : The zwitterion form of an amino acid occurs:

A) When the side chain is fully protonated.

B) At pH = 1

C) When net charge is +1

D) When total charge is zero.

E) At pH above the pKa of the side chain.

Ans: D

Q19

Question : What enzyme catalyzes the conversion of phenylalanine to tyrosine?

A) Tyrosine hydroxylase.

B) DOPA decarboxylase.

C) Phenylalanine hydroxylase.

D) Monoamine oxidase.

E) Arginase.

Ans: C

Q20

Question : Which amino acid is NOT considered essential?

A) Phenylalanine

B) Tyrosine

C) Lysine

D) Methionine

E) Valine

Ans: B

Q21

Question : What is the function of monoamine oxidases?

A) Synthesize neurotransmitters

B) Degrade monoamine neurotransmitters

C) Transport amino acids

D) Hydroxylate tyrosine

E) Activate hormones

Ans: B

Q22

Question : What amino acid is a precursor for nitric oxide (NO)?

A) Glutamate

B) Arginine

C) Histidine

D) Lysine

E) Proline

Ans: B

Q23

Question : Which vitamin is essential for the carboxylation of glutamate in blood clotting?

A) Vitamin C

B) Vitamin D

C) Vitamin K

D) Vitamin B12

E) Vitamin A

Ans: C

Q24

Question : What condition is caused by a deficiency in Vitamin C affecting collagen synthesis?

A) Rickets

B) Scurvy

C) Anemia

D) Osteoporosis

E) Beriberi

Ans: B

Q25

Question : Aspartame is composed of which two amino acids?

A) Glycine and Alanine

B) Aspartic acid and Phenylalanine

C) Glutamate and Cysteine

D) Serine and Threonine

E) Tyrosine and Methionine

Ans: B

Q26

Question : What type of bond links amino acids in a peptide chain?

A) Hydrogen bond.

B) Ionic bond.

C) Peptide bond (Amide bond).

D) Disulfide bond.

E) Ester bond.

Ans: C

Q27

Question : Which level of protein structure involves alpha helices and beta sheets?

A) Primary

B) Secondary

C) Tertiary

D) Quaternary

E) Pentameric

Ans: B

Q28

Question : Which amino acid can exist in the cis configuration in peptides?

A) Glycine.

B) Alanine.

C) Proline.

D) Serine.

E) Valine.

Ans: C

For any feedback, scan the code or click on it.

Corrections from previous versions:

Versions	Slide # and Place of Error	Before Correction	After Correction
V0 → V1			
V1 → V2			

رسالة من الفريق العلمي

إِذا غامَرتَ في شَرَفٍ مَرومِ

فَلا تَقنَع بِما دونَ النُجومِ