# Biology

## iHOSA Sample Test

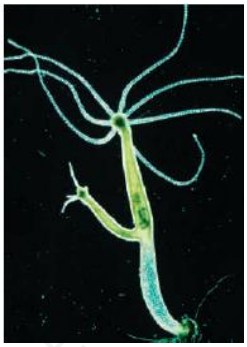
***CONFIDENTIALITY STATEMENT: This test is the property of iHOSA.***

1. The process of fossilization typically begins when an organism or traces of it ____.

a. settle on the seafloor
b. are pressurized under the weight of sediment
c. crystallize into minerals
d. become covered with sediments, mud, or ash

2. Living organisms are members of all of the levels listed below. However, rocks are components of _____.

a. both the ecosystem and the biosphere
b. the population
c. the ecosystem only
d. the biosphere only



3. The organism shown above is using which of the following types of reproduction?

a. asexual budding
b. sexual production of eggs
c. hermaphroditic cofertilization

d. fragmentation

4. The “Adam’s apple” is located in the ____.

a. glottis

b. pharynx

c. trachea

d. larynx

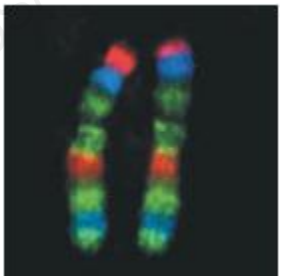
5. Mendel's dihybrid crosses, but not his monohybrid crosses, show that

a. some genes are linked together.

b. the two alleles controlling a trait are divided equally among the gametes.

c. alleles for different traits are inherited independently.

d. one of the pair of alleles is dominant to the other.



6. The figure above represents _____.

a. nonhomologous chromosomes

b. maternal chromosomes that are identical

c. paternal chromosomes that are identical

d. homologous chromosomes

7. Which of the following is a key feature of the scientific process that helps ensure objectivity and accuracy in research?

A. Relying on a single experiment to draw conclusions

B. Using large sample sizes and repeating experiments to minimize sampling error

C. Ignoring statistical significance when interpreting results

D. Avoiding collaboration with other researchers to maintain independent results

8. Gregor Mendel's experiments with pea plants led to the discovery of basic principles of inheritance. According to Mendel's findings, what is TRUE about a heterozygous individual?

A. They have two identical alleles for a gene.

B. The dominant allele is expressed while the recessive allele is hidden.

C. They possess two recessive alleles for a gene.

D. Both alleles are recessive, so the recessive trait is expressed.

9. What causes the movement of water into a sieve element from surrounding cells?

A. Active transport of water into the sieve element

B. Diffusion of water molecules into the companion cell

C. The increase in sugar concentration in the sieve tube

D. Pressure from the sink region

10. Which of the following is a consequence of long-term cortisol elevation due to stress or a disorder?

A. Enhanced immune system function

B. Improved memory and learning

C. Suppression of inflammatory responses

D. Increased risk of infections

11. What is the primary function of the cecum in rabbits?

A. To store food before digestion

B. To grind food into smaller particles

C. To digest cellulose-rich plant parts with the help of bacteria

D. To transport food from the mouth to the stomach

12. Which of the following characteristics is NOT typical of monocots?

A. Parallel leaf veins

B. One cotyledon

C. Flowers typically in multiples of three

D. Vascular bundles arranged in a netlike array

13. Which hormone is unique to invertebrates and controls molting in arthropods?

A. Estrogen

B. Testosterone

C. Ecdysone

D. Insulin

14. Which of the following options is the component of thyroid hormone?

A. Iodine

B. Sodium

C. Potassium

D. Fluorine

15. After a concussion, how long does it usually take for the brain to resume normal function?

A. 1-2 days

B. 7-10 days

C. 1 month

D. 6 months

16. Which of the following statements best describes a clade in evolutionary biology?

A. A clade includes only species that share a common habitat, not necessarily a common ancestor.

B. A clade consists of an ancestor and all of its descendants that share a derived character.

C. A clade is a group of species that have evolved from different ancestors without sharing any traits.

D. A clade represents only the most recent species in a particular lineage.

17. What principle does carbon dating rely on to estimate the age of once-living organisms?

A. The constant ratio of $^{14}C$ to $^{12}C$ in the atmosphere

B. The decay of $^{14}C$ in an organism's remains after death

C. The assimilation of $^{12}C$ by plants during photosynthesis

D. The increasing concentration of $^{14}C$ in the atmosphere over time

18. Which of the following descriptions about the DNA's structure is incorrect?

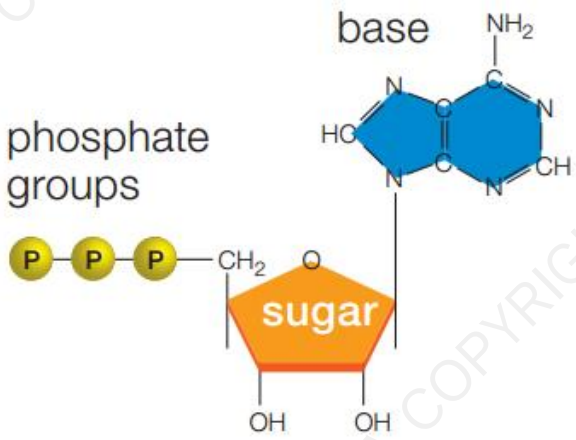
A. Each nucleotide is built from three smaller molecules: a nitrogen-containing base, a five-carbon sugar, and a chain of three phosphate groups.

B. DNA takes its name from deoxyribose, the sugar component of its nucleotides. Only four types of nucleotides make up DNA, and all have a deoxyribose.

C. Adenine and guanine are called purines; their bases have single carbon rings. Thymine and cytosine are pyrimidines; their bases have double carbon rings.

D. The four types differ in their component base: adenine (A), guanine (G), thymine (T), or cytosine (C).

19. Based on the image below, which nucleotide does it show?




A. TTP.

B. ATP.

C. CTP.

D. GTP.

20. Which of the following statements about acids and bases is correct?

A. A base increases the concentration of hydrogen ions in water.

B. A fluid with more hydroxide ions than hydrogen ions has a pH below 7.

C. A strong acid ionizes completely in water, while a weak acid does not.

D. A pH of 7 indicates an acidic solution.

# General Chemistry

## iHOSA Test Sample

***CONFIDENTIALITY STATEMENT: This test is the property of iHOSA.***

1. A tin compound used for electroplating steel has the formula $SnCl_2$. What is the systematic name of this compound?

a. stannic chloride
b. stannous chloride
c. tin chloride
d. tin(II) chloride

2. Diethyl ether can be made from ethanol. The reaction is as follows: $2C_2H_5OH(l) \rightarrow (C_2H_5)_2O(l) + H_2O(l)$ The percent yield of diethyl ether in one experiment was 94.0% and the actual yield was 68.6 g. How much ethanol did the chemist use in this experiment?

a. A.45.4g
b. B.73.0g
c. C.80.2g
d. D.90.7g

3. Which of the following equations is not balanced?

a. $4Al + 3O_2 \rightarrow 2Al_2O_3$
b. $C_2H_6 + O_2 \rightarrow 2CO_2 + 3H_2O$
c. $2KClO_3 \rightarrow 2KCl + O_2$
d. $4P_4 + 5S_8 \rightarrow 4P_4S_{10}$

4. The strength of the triple bond in the $N_2$ molecule is important

a. both kinetically and thermodynamically
b. kinetically but not thermodynamically

c. thermodynamically but not kinetically

d. neither thermodynamically nor kinetically

5. Choose the molecule with the strongest bond.

a. $CH_4$

b. $H_2O$

c. $NH_3$

d. HF

6. When considering the effect of a catalyst on a system that has not reached equilibrium, which of the following is true?

a. The addition of a catalyst has absolutely no effect on the reaction.

b. The addition of a catalyst speeds up the forward reaction.

c. The addition of a catalyst speeds up the reverse reaction.

d. The addition of a catalyst causes the system to reach equilibrium faster.

7. The following initial rate data were found for the reaction

$$2MnO_4^- + 5H_2C_2O_4 + 6H^+ \rightarrow 2Mn^{2+} + 10CO_2 + 8H_2O$$

| $[MnO_4^-]_0$ | $[H_2C_2O_4]_0$ | $[H^+]_0$ | Initial Rate (*M*/s) |
|---|---|---|---|
| $1 \times 10^{-3}$ | $1 \times 10^{-3}$ | 1.0 | $2 \times 10^{-4}$ |
| $2 \times 10^{-3}$ | $1 \times 10^{-3}$ | 1.0 | $8 \times 10^{-4}$ |
| $2 \times 10^{-3}$ | $2 \times 10^{-3}$ | 1.0 | $1.6 \times 10^{-3}$ |
| $2 \times 10^{-3}$ | $2 \times 10^{-3}$ | 2.0 | $1.6 \times 10^{-3}$ |

Which of the following is the correct rate law?

a. Rate = $k[MnO_4^-]^2 [H_2C_2O_4]^5 [H^+]^6$

b. Rate = $k[MnO_4^-]^2 [H_2C_2O_4][H^+]$

c. Rate = $k[MnO_4^- ][H_2C_2O_4][H^+]$

d. Rate = $k[MnO_4^-]^2 [H_2C_2O_4]$

8. The temperature is 75.0 °F. Convert this temperature to the Kelvin and choose the correct answer.

A. 297.04 K

B. 300.15 K

C. 273.15 K

D. 295.15 K

9. Which method is best suited for separating a mixture of sand and water?

A. Simple distillation

B. Filtration

C. Chromatography

D. Electrolysis

10. Which of the following statements best explains Dalton's reasoning for the formula of water being OH?

A. Dalton assumed that the formula for water should be as simple as possible, leading him to conclude that the formula is OH.

B. Dalton's experiments showed that 8 g of oxygen combined with 1 g of hydrogen to form water, so he concluded the formula must be OH.

C. Dalton could not specify the relative masses of oxygen and hydrogen unambiguously, so he assigned them arbitrary masses of 8 and 1 respectively.

D. Dalton believed that the formula for water should have one oxygen atom for every two hydrogen atoms, leading him to assign the formula $H_2O$.

11. Which of the following substances does not contain covalent bonds?

A. Water ($H_2O$).

B. Carbon dioxide ($CO_2$).

C. Calcium chloride ($CaCl_2$).

D. Sulfur dioxide ($SO_2$).

12. Natural chlorine is composed of 75.77% $^{35}Cl$ atoms and 24.23% $^{37}Cl$ atoms. Using the masses of $^{35}Cl$ (34.968853 u) and $^{37}Cl$ (36.965903 u), calculate the average atomic mass for natural chlorine as _____.

A. 35.44 u.

B. 36.90 u.

C. 34.76 u.

D. 35.00 u.

13. Ethanol, commonly known as ethyl alcohol, is a colorless, volatile liquid with a distinct odor. It is a type of alcohol that is widely used both as a recreational beverage and as an industrial chemical. What is the mass percent of hydrogen in ethanol ($C_2H_5OH$)?

A. 6.20 %.

B. 13.33 %.

C. 13.07 %.

D. 5.20 %.

14. Which of the following statements is true about the molecules and their polarity and dipole moments?

A. $NH_3$ has a dipole moment because N is more electronegative than H.

B. $CO_2$ has a dipole moment because it is a linear molecule.

C. $H_2O$ has no dipole moment due to its bent structure.

D. $BF_3$ has a dipole moment because it has a trigonal planar structure.

15. Consider the following reaction: $2H_2(g)+O_2(g)\rightarrow 2H_2O(g)$

Given the following bond energy values:

H-H bond energy = +436 kJ/mol

O=O bond energy = +498 kJ/mol

H-O bond energy = -463 kJ/mol (for 1 mole of $H_2O$)

Using these values, what is the overall enthalpy change (ΔH) for the reaction?

A. −444 kJ

B. +444 kJ

C. −572 kJ

D. +572 kJ

16. Which of the following statements correctly describes hydrogen bonding and its effects on the physical properties of substances?

A. Hydrogen bonding occurs between molecules that have nonpolar bonds and affects the boiling points of their hydrides.

B. Hydrogen bonding is a type of dipole-dipole interaction that occurs specifically when hydrogen is bonded to highly electronegative atoms such as oxygen, nitrogen, or fluorine.

C. Hydrogen bonds are stronger than covalent bonds and are responsible for breaking apart molecules during phase changes.

D. The presence of hydrogen bonds decreases the boiling point of substances due to increased molecular repulsion.

17. Consider the reaction of nitrogen gas ($N_2$) with hydrogen gas ($H_2$) to form ammonia ($NH_3$): $N_2(g)+3H_2(g)\rightarrow 2NH_3(g)$. Based on the table below, in an experiment, the initial concentrations of nitrogen and hydrogen are recorded, and their changes over time are noted:

| Time (s) | $[N_2]$ (mol/L) | $[H_2]$ (mol/L) |
|---|---|---|
| 0 | 0.300 | 0.600 |
| 30 | 0.250 | 0.450 |

Calculate the average rate of the reaction based on the change in concentration of $H_2$ over the first 30 seconds.

A. $2.50\times10^{-2}$ mol/L·s.

B. $1.00\times10^{-2}$ mol/L·s.

C. $5.00\times10^{-2}$ mol/L·s.

D. $3.00\times10^{-2}$ mol/L·s.

18. Consider the reaction between ozone ($O_3$) and nitrogen monoxide (NO) with the following proposed mechanism:

**Step 1:** $O_3 \rightarrow O_2 + O$ (fast)
**Step 2:** $O + NO \rightarrow NO_2$ (slow)

The experimentally determined rate law for the overall reaction is: Rate=k[NO ][$O^3$]$^2$.

Which of the following statements is true regarding this reaction mechanism?

A. The overall reaction is bimolecular.

B. The rate-determining step is the second step.

C. The intermediate in the mechanism is $O_2$.

D. The mechanism does not satisfy the requirement of matching the experimentally determined rate law.

19. Consider the following equilibrium reaction: $2NO_2(g)+O_2(g)\leftrightarrow 2N_2O(g)$, At a certain temperature, the equilibrium constant K is $4.0\times10^{-2}$. If 1.0 mole of $NO_2$ and 0.5 moles of $O_2$ are placed in a 2.0 L flask, what are the equilibrium concentrations of $NO_2$?

A. 0.45 M

B. 0.25 M

C. 0.35 M

D. 0.10 M

20. According to Le Châtelier's principle, which of the following statements is true regarding the factors that affect the position of a chemical equilibrium?

A. Increasing the temperature of an exothermic reaction will shift the equilibrium to the right, favoring the formation of products.

B. Decreasing the pressure in a system with unequal moles of gas on either side of the equilibrium will shift the equilibrium towards the side with more moles of gas.

C. Adding a catalyst to a reaction at equilibrium will shift the equilibrium to favor the formation of products.

D. Increasing the concentration of a reactant will shift the equilibrium to the left, favoring the formation of reactants.

# Behavioral Health

## iHOSA Test Sample

***CONFIDENTIALITY STATEMENT: This test is the property of iHOSA.***

1. What is the term for a trait's frequency in a population which is determined by the survival and reproductive success of the organism with the trait?

A. migration

B. natural selection

C. adaptation

D. mutation

2. What part of the nervous system contains structures involved with the management of sleep, arousal and facial expression?

A. cerebellum

B. pons

C. medulla

D. cerebellum

3. Sleepwalking cannot happen during _____ because the body is effectively paralyzed.

A. ROM sleep

B. N-ROM sleep

C. REM sleep

D. N-REM sleep

4. The term that refers to factors that are reflexive or that occur without learning is:

A. unconditioned.

B. impulsive.

C. conditioned.

D. spontaneous.

5．Another term for declarative memory is _____ memory.

A. semantic

B. explicit

C. episodic

D. reconstructive

6．A patient with schizophrenia that lacks goal-oriented behavior is exhibiting asociality or:

A. avolition.

B. delusions.

C. dissociation.

D. hallucinations.

7．Individuals diagnosed with OCD appear to have greater grey matter density in the _____ area of the brain.

A. posterior cingulate

B. orbitofrontal cortex

C. basal ganglia

D. reticular formation

8．Virtual reality is a relatively new technology that is showing promise for the treatment of:

A. phobias and PTSD.

B. somatic symptom disorder.

C. dissociative identity disorder.

D. anxiety and ADHD.

9．According to NIAAA, alcohol-impaired driving accounts for ____ percent of all driving fatalities in the United States.

A. 31

B. 24

C. 17

D. 9

10．Psychologists approach happiness from two different perspectives. The term for the approach that focuses on obtaining pleasure and avoiding pain is:

A. contentment.

B. eudaimonic.

C. self-actualization.

D. hedonic.

11．What is an example of natural selection?

A. A moth population shifts to darker colors due to pollution.

B. Faster rabbits reproduce more and pass on their traits.

C. A genetic mutation leads to the development of blond hair.

D. Huntington’s disease increases in frequency due to chance.

12．Which of the following statements best describes the relationship between the CNS and PNS?

A. The PNS includes all nerves that branch outward from the CNS.

B. The CNS is a part of the PNS and extends to peripheral organs.

C. The PNS functions only to send signals to the brain.

D. The CNS and PNS are independent systems.

13．What is one of the advantages of lateralization in animals?

A. It improves an animal's ability to multitask.

B. It enhances an animal's ability to communicate through vocalizations.

C. It increases the size of the brain's hemispheres.

D. It allows animals to process complex thoughts and ideas more effectively.

14．What is the primary function of the autonomic nervous system?

A. Control of skeletal muscles for voluntary movements

B. Regulation of the activities of glands and organs

C. Processing sensory information from the environment

D. Managing motor skills and reflexes for daily tasks

15. Which of the following activities would NOT be considered observational learning?

A. Learning to repair a household item by observing a family member do it

B. Watching professional chefs on TV to learn cooking techniques

C. Playing a sport using techniques developed through personal experimentation

D. Shadowing a professional to learn workplace skills

16. What does encoding specificity refer to in memory?

A. A process where memories are stored without any context

B. A way to generalize memories for easier recall

C. A method of recalling events with perfect accuracy

D. A process where memories encode unique combinations of details

17. What does anhedonia refer to?

A. Excessive interest in activities that were previously enjoyable

B. Temporary enjoyment of routine daily tasks

C. Increased pleasure from new activities and hobbies

D. Disinterest in activities that previously provided pleasure

18. Which of the following is a known risk factor for post-traumatic stress disorder (PTSD)?

A. Smaller hippocampal volume

B. Larger amygdala size

C. Higher serotonin levels

D. Increased cortical thickness

19. What is a common symptom of tardive dyskinesia caused by antipsychotic medications?

A. Tremors and involuntary movements

B. Sudden loss of appetite and weight loss

C. Increased heart rate and blood pressure

D. Difficulty with memory and cognitive processing

20. What does long-term potentiation (LTP) refer to?

A. The weakening of communication between two neurons over time.

B. The enhancement of communication between two neurons after activation.

C. The loss of neuron connections due to inactivity over time.

D. The suppression of neuron activity during learning processes.

# Pathophysiology

## iHOSA Test Sample

***CONFIDENTIALITY STATEMENT: This test is the property of iHOSA.***

1. Predisposing factors make a person or group more vulnerable to disease. These risk factors include all of the following EXCEPT:

A. age and gender.

B. homeostasis.

C. lifestyle and environment.

D. heredity.

2. An infection transmitted from mother to newborn is classified as a _____ transmission.

A. direct

B. horizontal

C. incidence

D. vertical

3. Digoxin is used in specific cases to treat congestive heart failure by:

A. decreasing blood flow to the extremities.

B. reducing the volume of fluid in the body.

C. strengthening and slowing the heartbeat.

D.relieving pain and edema.

4. During an appendectomy, the appendix is removed from the:

A. cecum.

B. duodenum.

C. pylorus.

D. rectum.

5. The cognitive functions that will be affected if the frontal lobe of the brain sustains serious injury is:

a. balance and coordination.
b. eyesight and balance.
c. memory and speech.
d. hearing and balance.

6. Menopause in women occurs because the:

a. endometrium ages and cannot maintain a pregnancy.
b. pituitary gland secretes less prolactin with age.
c. ovaries shrink and alter the production of estrogen.
d. uterus becomes fibrocystic after age 50.

7. A patient with an inherited kidney disease who is prone to hematuria and hypertension probably will be diagnosed with:

a. hydronephrosis.
b. hydronephroma.
c. polycystic kidney.
d. Wilms' tumor.

8. Hemophilia A is an example of which type of genetic inheritance?

A. X-linked recessive

B. Autosomal recessive

C. Autosomal dominant

D. Y-linked recessive

9. What is the primary role of nociceptors in the body?

A. Relaying pain signals to the nervous system

B. Detecting changes in body temperature

C. Monitoring blood pressure levels

D. Detecting tactile sensations such as vibration

10．What is the chromosomal abnormality that causes Down syndrome?

A. A missing chromosome 21

B. An extra chromosome 21

C. A duplication of the X chromosome

D. A deletion of chromosome 21

11．Why is surrounding tissue removed along with a malignant tumor during surgery?

A. To reduce inflammation caused by the tumor

B. To avoid damaging the lymph nodes

C. To prevent the tumor from recurring

D. To make space for chemotherapy drugs

12．What term describes a period during which a disease's signs and symptoms subside or disappear, but is not considered a cure?

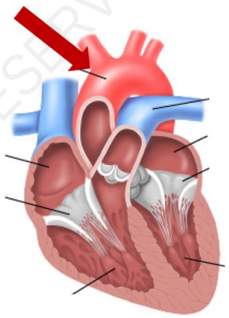
A. Remission

B. Exacerbation

C. Complication

D. Relapse

13．What is the structure pointed to by the red arrow in the image?



A. Right atrium

B. Pulmonary artery

C. Left ventricle

D. Aorta

14．How is a blockage in blood vessels detected during angiocardiography?

A. By injecting a contrast dye into the cardiovascular system

B. By measuring electrical activity in the heart

C. By using ultrasound waves to visualize blood flow

D. By analyzing blood samples for clotting factors

15．Which of the following statements about sickled red blood cells is NOT correct?

A. Sickled red blood cells are inflexible and obstruct small blood vessels.

B. Sickled red blood cells form due to an abnormal type of hemoglobin, called hemoglobin S.

C. Sickled red blood cells lead to ischemia, causing pain and tissue damage.

D. Sickled red blood cells are more durable and longer lasting than normal red blood cells.

16．Which of the following is NOT a criterion needed for a positive diagnosis of celiac disease?

A. Positive serologic testing

B. Biopsy of the small intestine showing changes in the mucosal lining

C. Improvement while on a gluten-free diet

D. Elevated blood glucose levels

17．What happens to the liver cells lining the bile ducts when bile accumulates due to chronic cholecystitis?

A. They undergo inflammation and become cancerous.

B. They experience necrosis and fibrosis.

C. They regenerate rapidly to repair the ducts.

D. They produce excessive enzymes to break down bile.

18．Which of the following statements about Huntington chorea is NOT correct?

A. Huntington chorea is a hereditary degenerative disease caused by an autosomal-dominant trait.

B. The disease causes progressive atrophy of the brain, particularly the cerebral cortex and basal ganglia.

C. The condition is characterized by ceaseless, involuntary movements called chorea.

D. Symptoms typically begin during childhood and progress rapidly.

19．Which of the following is NOT a subdivision of the autonomic nervous system (ANS)?

A. Sympathetic

B. Parasympathetic

C. Somatic

D. Enteric

20．Trismus is a typical symptom of _____.

A. Botulism

B. Polio

C. Rabies

D. Tetanus

# Biotechnology

## iHOSA Test Sample

***CONFIDENTIALITY STATEMENT: This test is the property of iHOSA.***

1. The class of macromolecules that directs the synthesis of all other cellular molecules are:

A. hormones.

B. proteins.

C. nucleic acids.

D. mitochondrion.

2. What is the anticodon for a tRNA of GCA?

A. CAU

B. CUG

C. CGU

D. CGA

3. An example of the medical use of peptides is:

A. as a vaccine antigen to initiate an antibody response.

B. the creation of enzymes to supplement digestive pancreatic enzymes.

C. to speed up the synthesis of hormones.

D. the ability to hold thousands of compound samples.

4. The term for each human cell having two chromosomes with the same genes in the same order is:

A. homologous pairs.

B. molecular cloning.

C. balanced pairs.

D. duplicate formulation.

5. All of the following are nonscientific positions in the biotechnology industry EXCEPT:

A. information systems.

B. marketing and sales.

C. quality control.

D. regulatory affairs.

6. A process by which, in an oxygen-deprived environment, a cell converts sugar into lactic acid or ethanol to create energy is:

A. fermentation.

B. recombinant DNA technology.

C. polymerization.

D. stem cell technology.

7. Hybridization is an effective method for binding complementary nucleic acids to:

A. break down a cell membrane.

B. find the location of the genes of interest.

C. produce large quantities of a genes

D. transform cells.

8. Which of the following product is NOT the biotechnological products?

A. Recombinant Human Insulin

B. COVID-19 mRNA Vaccines

C. Artemisinin

D. Alemtuzumab (a monoclonal antibody used in the treatment of multiple sclerosis)

9. Which of the following test kits can NOT be developed to detect whether individuals have been infected with an RNA virus by directly identifying the presence of the virus protein M in their blood?

A. ELISA Kit with Anti-Protein M Antibodies - An Enzyme-Linked Immunosorbent Assay (ELISA) kit that uses antibodies specific to virus protein M to capture and detect the protein in blood samples.

B. Fluorescent Antibody Staining Kit for Protein M - A kit that uses fluorescently labeled antibodies to identify and visualize virus protein M within blood samples under a fluorescence microscope.

C. PCR Kit for Viral RNA Detection - A Polymerase Chain Reaction (PCR) kit designed to amplify and detect the RNA of the virus, not specifically the presence of virus protein M.

D. Western Blot Kit for Protein M Detection - A kit that uses antibodies to detect virus protein M after the protein has been separated by gel electrophoresis and transferred to a membrane.

10. Which of the following best describes the actions of the professor and their team regarding the small molecule drug F and its effect on tumor growth?

The research assistant conducts experiments using drug F on tumor cells, and the student observes a slowdown in tumor cell growth.

They concluded that drug F can inhibit tumor growth based the experimental data.

The professor proposes that drug F can inhibit tumor growth.

The growth rate of the tumor cells was significantly reduced after treatment with drug F.

A. 1) Experiment; 2) Hypothesis; 3) Results; 4) Observation

B. 1) Experiment; 2) Results; 3) Hypothesis; 4) Observation

C. 1) Observation; 2) Hypothesis; 3) Results; 4) Experiment

D. 1) Experiment; 2) Hypothesis; 3) Observation; 4) Results

11. Which of the following statements is correct?

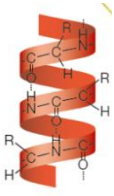
A. The DNA sequence directly forms the polypeptide chain through RNA transcription and translation, not skipping RNA steps.

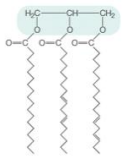
B. The RNA sequence, derived from DNA, determines the protein structure by specifying the amino acid sequence.

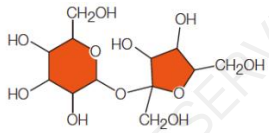
C. The arrangement of nitrogen bases on the DNA strand is transcribed into mRNA, which is then translated into a specific amino acid sequence in the protein.

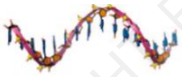
D.Amino acids themselves do not influence the arrangement of nitrogen bases in the DNA strand.

12. Which of the following structures correctly matches the cellular molecule provided?

A. Sugars - 

B. Lipids - 

C. Proteins - 

D. DNA - 

13. What is the reason that ultraviolet (UV) radiation exposure can lead to skin cancer?

A. UV radiation increases the production of melanin in the skin.

B. UV radiation can damage the DNA within skin cells, leading to mutations.

C. UV radiation stimulates the immune system to attack skin cells.

D. UV radiation promotes the growth of healthy skin cells.

14. Which of the following pairs correctly matches the term with the direction of genetic information flow?

A. Transcription: DNA to DNA

B. Translation: mRNA to Protein

C. DNA Replication: RNA to DNA

D. Reverse Transcription: DNA to RNA

15. What is the first step in the process of DNA extraction?

A. Breaking open the cell membrane to release the DNA.

B. Removing proteins to purify the DNA.

C. Precipitating DNA using isopropanol.

D. Directly amplifying the DNA using PCR.

16. In the process of constructing recombinant DNA, what type of chemical bond is formed by the actions of restriction endonucleases and DNA ligases?

A. Hydrogen bonds

B. Phosphodiester bonds

C. Peptide bonds

D. Ionic bonds

17. If you want to amplify a DNA molecule by 1 billion times (109), how many PCR cycles are required, assuming that the DNA doubles with each cycle?

A. 10 cycles

B. 20 cycles

C. 30 cycles

D. 40 cycles

18. Which of the following methods can be used to introduce DNA into human cells?

1. heat shock
2. electrical pulses
3. lipid clusters
4. nanoparticles
5. genetically engineered viruses

A. 12345

B. 25

C. 2345

D. 235

19. Which of the following is a key advantage of the CRISPR-Cas9 gene editing system over viral vector-based gene therapy?

A. CRISPR-Cas9 is less accurate than viral vectors but faster to apply.

B. CRISPR-Cas9 can precisely target and modify any part of the genome in a living cell without the risks associated with viral vectors.

C. CRISPR-Cas9 requires the use of a viral vector to introduce the necessary genes into cells.

D. CRISPR-Cas9 can only be used to edit genes in somatic cells, not in gametes or embryos.

20. The restriction enzyme EcoRII recognizes the palindromic sequence 5'-A TGTAA-3' and cuts between the A and T on both strands. What type of ends are generated after the cleavage?

A. Blunt ends

B. Sticky ends with a 5' overhang

C. Sticky ends with a 3' overhang

D. Sticky ends with a 2-base 3' overhang

# Biochemistry

## iHOSA Test Sample



1. Which of the following compounds would have the highest boiling point?
   A. $CH_3CH_2CH_2CH_3$
   B. $CH_3NH_2$
   C. $CH_3OH$
   **D. $CH_2F_2$**

2. Which subatomic particle is found in all isotopes of hydrogen?
   **A. Proton**
   B. Neutron
   C. Electron
   D. Positron

3. $CH_3C \equiv CCH_2CH_2Cl$ is named:
   A. 1-chloro-3-pentyne
   B. 5-chloro-2-pentene
   C. 1-acetylenyl-3-chloropropane
   **D. 5-chloro-2-pentyne**

4. The tendency for an atom to attract electrons to itself in a chemical bond is called:
   A. polarity.
   **B. electronegativity.**
   C. hydrophilicity
   D. electrophilicity.

5. Which of the following shows the correct order from most simple to most complex:
   A. atom, molecule, organelle, macromolecule.
   B. molecule, atom, macromolecule, organelle.

C. tissue, cell, organ.

*D.* atom, macromolecule, tissue, organ.

6. Structures which repeat over and over in secondary structure are called:

A. primary structure.

B. domain.

C. super secondary structure.

D. prosthetic group.

7. Which of the following statements about monosaccharides is correct?

A. The penultimate carbon of a monosaccharide is the carbon farthest from the aldehyde or ketone group in a Fischer projection.

B. The anomeric carbon is the carbon farthest from the carbonyl group in a monosaccharide.

C. In a pyranose form of a monosaccharide, the anomeric OH group is always on the opposite side of the ring from the $CH_2$ OH group.

D. Mutarotation refers to the interconversion between α- and β-anomers of a monosaccharide in aqueous solution.

8. Which of the following statements about the disaccharides is correct?

A. Sucrose contains a β-1,4-glycosidic bond between glucose and fructose.

B. Lactose consists of two glucose molecules linked by a β-1,4-glycosidic bond.

C. Maltose is formed by two glucose units linked by an α, β-1,2-glycosidic bond.

D. Cellobiose consists of two glucose molecules linked by a β-1,4-glycosidic bond.

9. Which of the following is a major health risk associated with consuming high levels of trans fats?

A. Decreased blood sugar levels

B. Increased serum cholesterol levels and higher LDL to HDL ratio

C. Increased blood flow to the heart

D. Improved liver function

10. Which of the following is an example of active transport?

A. Oxygen moving across the cell membrane by simple diffusion.

B. Glucose entering the cell via facilitated diffusion through a transporter protein.

C. Sodium ions being pumped out of the cell by the sodium–potassium ion pump (Na+/K+ ATPase).

D. Water moving across the membrane via osmosis.

11. Which of the following statements about the chirality of amino acids is TRUE?

A. All amino acids are chiral and exist as two enantiomers.

B. The D-isomer of amino acids is the most common form found in nature.

C. Glycine is the only amino acid that is chiral.

D. D-Amino acids are difficult to be found in the most living organisms.

12. Which of the following interactions is the weakest in terms of bonding strength?

A. Covalent Bonds

B. Salt Bridges

C. Hydrophobic Interactions

D. Hydrogen Bonds

13. According to enzyme nomenclature rules, how do histone methyltransferases catalyze reactions?

A. By connecting molecules with a methyl group to those without

B. By transferring a methyl group from a donor molecule, such as S-adenosyl-L-methionine (SAM), to a histone

C. By transferring a phosphate group from one molecule to another

D. By catalyzing the hydrolysis of peptide bonds in histones

14. Which of the following factors, when increased, can lead to an increase in the rate of enzyme-catalyzed reactions?

a. Temperature

b. pH

c. Substrate concentration

d. Enzyme concentration

e. Presence of an inhibitor

A. a b c d

B. a c d

C. a b d

D. a b c d e

15. Which of the following statements best describes the concept of an enzyme zymogen?

A. Zymogens are mature enzymes that have already been activated and are ready for use.

B. Zymogens are enzymes that have been permanently inactivated by mutation.

C. Zymogens are inactive precursors of enzymes that are converted to their active form by proteolysis.

D. Zymogens are enzymes that are synthesized in excess and stored for later use.

16. Which of the following statements accurately describes a process that occurs during DNA replication?

A. DNA replication is always bidirectional from a single origin of replication.

B. DNA replication involves the use of DNA polymerase, which adds nucleotides to the growing strand in a 3' to 5' direction.

C. DNA replication is semiconservative, meaning each new DNA molecule consists of one old and one new strand.

D. DNA replication requires RNA primers to initiate the synthesis of the lagging strand only.

17. What processes does a gene go through from DNA to protein?

A. Transcription, translation, and replication

B. Transcription, splicing, and translation

C. Replication, transcription, and modification

D. Translation, amplification, and replication

18. During the DNA replication process, which DNA strand is synthesized continuously, and which is synthesized in short fragments that are later joined together?

A. The leading strand is synthesized continuously, and the lagging strand is synthesized in short fragments.

B. The lagging strand is synthesized continuously, and the leading strand is synthesized in short fragments.

C. Both strands are synthesized continuously.

D. Both strands are synthesized in short fragments that are later joined together.

19. Which part of the human genome is considered the protein-coding region?

A. Introns

B. Exons

C. Telomeres

D. Microsatellite sequences

20. Which of the following options is not synthesized from cholesterol?

A. Aldosterone

B. Cortisol

C. Estrogen

D. Insulin

# Nutrition

## iHOSA Test Sample

1. Lactose, maltose and sucrose belong to which type of carbohydrate group?

A. Disaccharides

B. Liposaccharides

C. Monosaccharides

D. Polysaccharides

2. Diets high in cholesterol and saturated fats are thought to contribute to which condition?

A. diabetes mellitus

B. Atherosclerosis

C. Hypertension

D. Macular degeneration

3. Which of the following has a different classification of carbohydrates compared to the other three options?

A. Glucose

B. Fructose

C. Sucrose

D. Galactose

4. Under which circumstance is positive nitrogen balance most likely to occur?

A. Immobilization

B. Injury

C. Starvation

D. Children's growing

5. Which of the following statements about monosaccharides is CORRECT?

A. They are complex carbohydrates that require extensive digestion.

B. They are not absorbed directly into the bloodstream but require conversion in the liver first.

C. They are quickly absorbed from the intestine into the bloodstream without the need for digestion.

D. They can only be used by the body for immediate energy and cannot be stored for later use.

6. What elements are found in the molecular structure of carbohydrates?

A. Carbon (C), Nitrogen (N), and Oxygen (O)

B. Carbon (C), Hydrogen (H), and Oxygen (O)

C. Hydrogen (H), Oxygen (O), and Phosphorus (P)

D. Carbon (C), Hydrogen (H), and Sulfur (S)

7. Which process most commonly results in the formation of trans-fatty acids?

A. Dehydration

B. Hydrogenation

C. Fermentation

D. Oxidation

8. Which of the following are the major sources of monounsaturated fats?

A. Olive, canola, and peanuts

B. Corn, sunflower, and walnuts

C. Coconut, palm, and cashews

D. Butter, lard, and coconut

9. Vitamin E is classified as an antioxidant. This means it is useful in:

A. protecting red blood cells from hemolysis.

B. promoting blood clotting.

C. promoting sufficient respiratory intake of oxygen.

D. metabolism of proteins.

10. Which of the following is NOT a primary function of proteins in the human body?

A. Providing a primary source of energy in normal circumstances.

B. Acting as a buffer agent to help maintain pH balance.

C. Facilitating digestion and metabolism through enzymes like amylase and lipase.

D. Participating in cell signaling and transport, such as hemoglobin and transferrin.

11. Which of the following statements about the functions of water in the body is INCORRECT?

A. Water serves as a lubricant for joints and tissues.

B. Water helps maintain proper body temperature.

C. Water aids in digestion and nutrient absorption.

D. Water provides a direct source of energy for the body.

12. Which of the following correctly pairs a protein with its primary function in the human body?

A. Amylase - Regulation of blood sugar levels

B. Lipase - Digestion of fats

C. Antibodies - Digestion of proteins

D. Albumin - Strengthening muscle tissue

13. What electrolytes are primarily responsible for maintaining the balance between intracellular and extracellular fluids?

① Na+

② Cl-

③ Fe3+

④ K+

A. ①②③

B. ①③④

C. ①②④

D. ①②③④

14. What are the primary functions of choline in the human body?

A. Energy production and muscle contraction

B. Structural integrity of cell membranes and neurotransmitter synthesis

C. Regulation of blood sugar levels and digestion of proteins

D. Blood clotting and calcium absorption

15. Which of the following principles is important when considering nutrient supplementation?

A. Nutrient supplements should replace food intake

B. Vitamins are harmless regardless of the amount consumed

C. All nutrients work together to promote good health

D. Specific supplement usage should be based on popular trends

16. Regarding their clients' use of dietary supplements, what should the health care professionals be particularly aware of?

A. Dietary supplements eliminate the need for a balanced diet.

B. Most dietary supplements provide complete nutrition on their own.

C. Clients often do not inform health care providers about their use of dietary supplements.

D. Dietary supplements are necessary for all age groups and lifestyles.

17. Which of the following is NOT a kind of functional food?

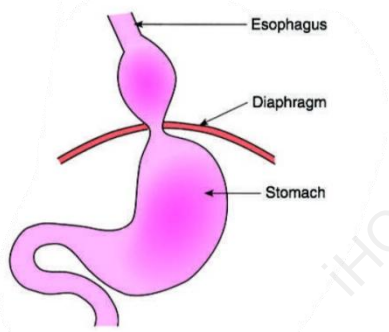
A. Soy-based foods

B. Orange juice

C. Folate-enriched breads

D. Dietary supplements

18. What digestive disease might the following picture represent?




A. Hiatal Hernia

B. Dyspepsia

C. Peptic Ulcers

D. Irritable Bowel Syndrome

19. High-fat diets _____.

A. usually are harmless

B. have been associated with breast and prostate cancer

C. provide large amounts of fiber and vitamin C

D. contribute to the health of the immune system

20. There are many types of cancer. What is the cancer of the soft tissues of the body such as muscle?

A. Carcinoma

B. Sarcoma

C. Lymphoma

D. Leukemia