proprep

Workbook

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Introduction to Biology

The Study of Life

Questions

1) 1. Order the scientific method steps with the process of solving the problem.

2. Based on the results of the experiment, is the hypothesis correct?
3. If it is incorrect, propose some alternative hypotheses.

a. Observation	1. My TV works.
b. Question	2. The electrical outlet is dysfunctional.
c. Hypothesis (answer)	3. If something is wrong with the outlet, my TV also won't work when plugged into it.
d. Prediction	4. My radio doesn't play music.
e. Experiment	5. I plug my TV into the outlet.
f. Result	6. Why doesn't my radio work?

2) Decide if each of the following is an example of inductive or deductive reasoning.

a. The teacher used PowerPoint in the last few classes. Therefore the teacher will use PowerPoint tomorrow.
b. All chimpanzees are mammals, all mammals have kidneys. Therefore, all chimpanzees have kidneys.
c. Gravity makes things fall; my wallet fell from the table due to gravity.
d.

3) Decide if each of the following is an example of inductive or deductive reasoning.

a. My father was loud when he was angry. All fathers are loud when they are angry.
b. My kindergarten teacher liked apples. My first-grade teacher liked apples. My second-grade teacher will like apples, too.
c. Since all women are mortal, and Madonna is a woman, Madonna is mortal.

4) I. Is a car alive?
II. Which of the key properties shared by all living organisms does it have?
III. Which properties does it lack?
Properties of life:

- Order
- Response to stimuli/environment
- Energy processing
- Regulation
- Homeostasis
- Growth and development
- Reproduction
- Evolutionary adaptation

5) Which of the following statements is false?

a. Atoms exist within molecules/macromolecules which exist within organelles.
b. Ecosystems exist within communities which exists within the biosphere.
c. Cells exist within tissues which exist within organs.
d. Organisms exist within populations which exist in communities

6) All populations taken together make up a/an

a. organism
b. biosphere
c. community
d. ecosystem

7) All members of one species living within a specific area form a/an

a. biosphere
b. ecosystem
c. population
d. community
e. country

8) Which correctly indicates the sequence of organization, from the smallest to the largest?

a. Cell, organ, tissue, organism
b. Cell, organ, organ system, tissue
c. Cell, tissue, organ, organism
d. Organism, organ system, organ, tissue

9) All living things in a particular area together with the non-living factors of that environment form a/an

a. population
b. ecosystem
c. community
d. biosphere

10) Which of the following sciences is not a natural science?

a. Biology
b. Space science
c. Chemistry
d. Computer science

11) Only a testable hypothesis is scientifically valid. What is the meaning of testable?

a. A controlled experiment can indicate if the hypothesis is correct or incorrect.
b. There are several options in the hypothesis, one of which is correct.
c. The hypothesis has been proven wrong.
d. None of the above.

12) The type of logical thinking that arrives to a general conclusion from a specific results or related observations is called _____.

a. Deductive reasoning.
b. The scientific method.
c. Hypothesis-based science.
d. Inductive reasoning.

13) A child notices that his rabbits that are regularly exposed to the sun seem to grow more quickly than those not exposed to the sun. As a result, he determines that rabbits grow better when exposed to sun. This example most closely resembles which type of reasoning?

a. Inductive reasoning.
b. Deductive reasoning.
c. Neither, because no hypothesis was made.
d. Both inductive and deductive reasoning.

14) The smallest living biological structure unit is a/an _____.

a. Tissue.
b. Organelle.
c. Cell.
d. Molecule.

15) The organism present at the root of a phylogenetic tree represents the organism that evolved _____.

a. Most recently.
b. First.
c. From mammals.
d. Most accurately.

Answers

1) 1. **Order the scientific method steps with the process of solving the problem.**
2. Based on the results of the experiment, is the hypothesis correct?
3. If it is incorrect, propose some alternative hypotheses.

a. Observation- My radio doesn't play music.
b. Question- Why doesn't my radio work?
c. Hypothesis (answer)- The electrical outlet is dysfunctional.
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1. Order the scientific method steps with the process of solving the problem.
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1. Order the scientific method steps with the process of solving the problem.
2. Based on the results of the experiment, is the hypothesis correct?
3. **If it is incorrect, propose some alternative hypotheses.**

a. Observation- My radio doesn't play music.
b. Question- Why doesn't my radio work?
c. Hypothesis (answer)- The Radio is not turned on.
d. The Radio is broken.

2) a. inductive
b. deductive
c. deductive

3) a. inductive
b. inductive
c. deductive

4)

- ✓ Order
- ✓ Response to stimuli/environment
- ✓ Energy processing
- ✓ Regulation
- × Homeostasis
- × Growth and development
- × Reproduction
- × Evolutionary adaptation

5) b
6) c
7) c
8) c
9) b
10) d
11) a
12) d
13) a
14) c
15) b

The Chemical Foundation of Life

Questions

1) Radon's (Rn) atomic number is 86 and its mass number 222.
How many neutrons does it have?

a. 86
b. 43
c. 222
d. 136

2) Variations in the number of neutrons in the atom's nuclei are called _____.

a. Charged protons.
b. Anions.
c. Isotopes.
d. Neutral atoms.

3) The nucleus of an atom typically contains _____.

a. Electrons and neutrons.
b. Only neutrons.
c. Only protons.
d. Protons and neutrons.
e. Protons and electrons.

4) Atomic mass is the:

a. Weight of an element.
b. Number of protons.
c. Number of protons and electrons.
d. Number of protons and neutrons.
e. Number of neutrons, and electrons.

5) An acidic solution has a high concentration of _____.

a. Hydroxide ions (OH-).
b. Hydrogen ions (H+).
c. Carboxylic aids.
d. Sodium.

6) When two atoms share electrons a(n) _____ is formed

a. Ion.
b. Covalent bond.
c. Ionic bond.
d. Hydrogen bond.
e. Van der Waals interaction.

7) Which bond represents a weak chemical bond?

a. Hydrogen bond.
b. Nonpolar covalent bond.
c. Covalent bond.
d. Polar covalent bond.

8) Which of the following statement is true?

a. Ionic bond is the strongest bond.
b. Hydrogen bonds are responsible for cohesive and adhesive properties of the water.
c. Van der Waals interactions are the strongest bond.
d. Covalent bonds are the weakest bond.
e. None of the above is true.

9) When a base is added to a solution, the pH should _____.

a. Decrease.
b. Increase.
c. Stay the same.
d. Cannot tell without testing.

10) One carbon molecule can bond up to_____ other atom(s) or molecule(s).

a. One.
b. Eight.
c. Ten.
d. Four.

11) Organic compounds:

a. Always contain nitrogen.
b. Are synthesized by only animal cells.
c. Always contain carbon.
d. Always contain oxygen.

12) What is the difference between ionic bonds and covalent bonds?

13) How do buffers prevent pH changes?

14) Why is carbon considered essential for organic life?

15) Which of the following statement is false?

a. Water is the universal solvent.
b. Water destabilizes temperature.
c. Water is essential for life.
d. Water cohesive and adhesive properties are responsible for surface tension.

16) Which statement is false?

a. Acids donate hydrogen ions; (H+) bases donate hydroxide ions (OH–).
b. Both addition of bases and acids, can change the pH of a solution.
c. Acids and bases will not neutralize each other.
d. Acids and bases can mix together.

17) A basic solution has a _____ pH and can be neutralized by _____.

a. Low; adding more hydrogen ions.
b. High; adding more hydroxide ions.
c. Low; removing hydrogen ions.
d. High; removing hydroxide ions.
e. None of the above.

Answer Key

1) d

2) c

3) d

4) a

5) b

6) b

7) a

8) b

9) b

10) d

11) c - Organic chemistry is the study of carbon compounds

12) Ionic bonds are created between ions. The electrons are not shared between the atoms, but rather are associated more with one ion than the other.
Ionic bonds are created between ions. The electrons are not shared between the atoms, but rather are associated more with one ion than the other. Ionic bonds are strong bonds, but are weaker than covalent bonds, meaning it takes less energy to break an ionic bond compared to a strong covalent bond, where electrons are actually shared between the two atoms.

13) Buffers absorb the free hydrogen ions and hydroxide ions that result from chemical reactions. Because they can bond to these ions, they prevent increases or decreases in pH. An example of a buffer system is the bicarbonate system in the human body. This system is able to absorb hydrogen and hydroxide ions, preventing changes in pH and enabling cells to function properly.

14) Carbon is the basic building block for all organic molecules. Organic molecules essentially form cells and other structures, where all biological processes of life are carried out.

15) b

16) c

17) d

Biological Macromolecules

Questions

1) A substitution mutation occurs, and cytosine is replaced with adenine. What is the expected impact this will have on the DNA structure?

2) A dehydration reaction leads to formation of

a. Monomers.
b. Water.
c. Water and polymers.
d. Polymer.

3) Breakdown of polymers involves which of the following reactions?

a. Hydrolysis.
b. Dehydration.
c. Condensation.
d. Covalent bond.

4) Which molecule/s are monosaccharides?

a. Fructose
b. Glucose
c. Galactose
d. All of the above

5) Amylopectin and amylose are:

a. Monosaccharides
b. Disaccharides
c. Lipids
d. Polysaccharides

6) Which of the following molecules is abundant in plant cell walls?

a. Starch
b. Cellulose
c. Glycogen
d. Lactose

7) Lactose is formed by a _____ bond between glucose and _____.

a. glycosidic; lactose.
b. glycosidic; galactose.
c. hydrogen; sucrose.
d. hydrogen; fructose.

8) Which of the following characteristics is not present in saturated fat?

a. At room temperature they are solid.
b. They have single bonds within the carbon chain.
c. They are usually obtained from animal sources.
d. They tend to dissolve in water easily.

9) Phospholipids are components of

a. Animal cells plasma membrane.
b. The ring structure of steroids.
c. DNA and RNA.
d. Polymeric hydrocarbon chains.

10) When water and oil are mixed, oil separates from the water because oils are

a. Hydrophobic.
b. Hydrophilic.
c. Lipids.
d. Both A and C.

11) The process, which converts unsaturated fatty acids into saturated fatty acids is:

a. Hydration.
b. Dehydration.
c. Dehydrogenation.
d. Hydrogenation.

12) The molecule at the right is a(n):

a. Carbohydrate.
b. Protein.
c. DNA.
d. Amino acid.

13) The monomer unit of proteins is?

a. Nucleotides.
b. Disaccharides.
c. Amino acids.
d. tRNA.

14) There are ____ common amino acids which differ from each other by the ___

a. 20; number of carbons.
b. 20; the amino group.
c. 21; the carboxylic group.
d. 20: The R group.
e. 25; the length of amino acid.

15) α helix and the β-pleated sheet are part of _____ protein structure?

a. Primary.
b. Secondary.
c. Tertiary.
d. Quaternary.

16) A nucleotide of RNA may contain _____.

a. Ribose, uracil, and a phosphate group.
b. Deoxyribose, uracil, and a phosphate group.
c. Deoxyribose, thymine, and a phosphate group.
d. Ribose, thymine, and a phosphate group.

17) The building blocks of nucleic acids are _____.

a. Phosphates.
b. Nitrogenous bases.
c. Amino acids.
d. Nucleotides.

18) The 4 major biological macromolecules include:

a. Carbohydrates, saccharides, lipids, proteins.
b. Carbohydrates, lipids, proteins, amino acids.
c. Carbohydrates, lipids, proteins, nucleic acids.
d. None of the above.

19) Biological macromolecules are considered organic because?

20) Describe the differences and similarities between starch and glycogen.

21) Explain the role of lipids in plants and/or animals (at least three functions).

22) Explain the consequence of an amino acid substituted for another in a polypeptide chain.

23) Describe the differences in the four protein structures.

24) What are the structural differences between RNA and DNA?

25) What are three types of RNA and how do they function?

Answer Key

1) Adenine is larger than cytosine and will not be able to base pair properly with the guanine on the opposing strand. This will cause the DNA to bulge. DNA repair enzymes may recognize the bulge and replace the incorrect nucleotide.
2) c
3) a
4) d
5) d
6) b
7) b
8) d
9) a
10) a
11) d
12) d
13) c
14) d
15) b
16) a
17) d
18) c
19) Biological macromolecules are organic because they contain carbon.
20) Glycogen and starch are both polysaccharides.
They are the storage form of glucose.
Starch is used by plants. It can be branched or unbranched, and is stored in cells of the roots, leaves, and seeds.
Glycogen is the animal equivalent of starch. It is highly branched and is stored in liver and muscle cells.
21) Fat serves as a valuable way for animals to store energy.
Fat provides insulation.
Waxes can protect plant leaves, bird feathers, and mammalian fur from getting wet.
Phospholipids and steroids are important components of animal cell membranes, as well as plant, fungal, and bacterial membranes.
Lipid hormones serve as chemical messengers
22) A change in gene sequence can lead to a different amino acid being added to a polypeptide chain instead of the normal one. This causes a change in protein structure and function.

23) Primary structure is the linear sequence of the amino acids in a protein.
Secondary structure is the regular structure of proteins formed by intramolecular hydrogen bonding between the oxygen atom of one amino acid residue and the hydrogen attached to the nitrogen atom of another amino acid residue, forming alpha-helix structure and/or beta-pleated sheet.
Tertiary structure is the three-dimensional conformation of a protein, including interactions between secondary structural elements; formed from interactions between amino acid side chains and quaternary structure which is association with the interaction between discrete polypeptide subunits in a protein.

24) DNA has a double-helix structure. The sugar and the phosphate are on the outside of the helix and the nitrogenous bases are in the interior. The monomers of DNA are nucleotides containing deoxyribose, one of the four nitrogenous bases (A, T, G and C), and a phosphate group.
RNA is usually single-stranded and is made of ribonucleotides that are linked by phosphodiester linkages. A ribonucleotide contains ribose (the pentose sugar), one of the four nitrogenous bases (A, U, G, and C), and the phosphate group.

25) Messenger RNA (mRNA) is the mediator between DNA and proteins.
Transfer RNA (tRNA) carries a single amino acid to the site of protein synthesis.
Ribosomal RNA (rRNA) is a major constituent of the ribosome- a cellular machine that synthesizes proteins.