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Name:_____ Class:_____ Date:_____

EOC Chapter 2 - MC

1. Which of the following is *not* a generally recognized characteristic of most (if not all) living organisms?
   a. the ability to reproduce
   b. the ability to maintain homeostasis
   c. the ability to obtain energy directly from sunlight
   d. the ability to sense and respond to the environment
   e. the ability to grow

ANSWER: c

2. A collection of amino acids could be used to build a
   a. protein.
   b. complex carbohydrate.
   c. triglyceride.
   d. nucleic acid.
   e. cell.

ANSWER: a

3. What subatomic particles are located in the nucleus of an atom?
   a. protons
   b. neutrons
   c. electrons
   d. protons, neutrons, and electrons
   e. protons and neutrons

ANSWER: e

4. When an atom loses an electron, what happens?
   a. It becomes positively charged.
   b. It becomes negatively charged.
   c. It becomes neutral.
   d. Nothing happens.
   e. Atoms cannot lose an electron because atoms have a defined number of electrons.

ANSWER: a

5. If a cell were unable to take up or make sugars, which class of molecule(s) would it be unable to make?
   a. carbohydrates
   b. proteins
   c. lipids
   d. nucleic acids
   e. both carbohydrates and nucleic acids

ANSWER: e

6. The basic building blocks of life are

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a. DNA molecules.
b. cells.
c. proteins.
d. phospholipids.
e. inorganic molecules.

ANSWER: b

7. The cell membrane is made of
a. water.
b. proteins.
c. phospholipids.
d. nucleotides.
e. both proteins and phospholipids.

ANSWER: e

8. The "stickiness" of water results from the _____ bonding of water molecules.
a. hydrogen
b. ionic
c. covalent
d. acidic
e. hydrophobic

ANSWER: a

9. As an acidic compound dissolves in water, the pH of the water
a. increases.
b. remains neutral.
c. decreases.
d. doesn't change.
e. becomes basic.

ANSWER: c

10. In a water molecule, the bond between the oxygen atom and a hydrogen atom is a(n) _____ bond.
a. covalent
b. hydrogen
c. ionic
d. hydrophobic
e. noncovalent

ANSWER: a

11. Which of the following is/are most likely to dissolve in olive oil?
a. a polar molecule

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b. a nonpolar molecule
c. a hydrophilic molecule
d. either a polar molecule or a hydrophilic molecule
e. either a nonpolar molecule or a hydrophilic molecule

ANSWER: b

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Name:_____ Class:_____ Date:_____

EOC Chapter 2 - Essay

1. What is homeostasis? Why is it important to living organisms?

ANSWER: Homeostasis is the ability to maintain a relatively stable internal environment, even when the external environment changes. Homeostasis helps maintain the conditions necessary for life: many of the molecules and processes of life cannot function outside a narrow range of, for example, pH and temperature.

2. What does it mean to say that a macromolecule is a polymer? Give an example.

ANSWER: A polymer is a molecule made up of smaller and typically repeating subunits. Examples include proteins, which are made up of amino acids; complex carbohydrates, which are made up of simple sugars or monosaccharides; and nucleic acids, which are made up of nucleotides.

3. How would you assess whether or not a possibly living organism from another planet were truly alive?

ANSWER: Answers will vary. In general, you should look for evidence of the characteristics of life described in the chapter, such as the abilities to grow, reproduce, and maintain homeostasis. You could also look for molecules that make up living organisms on Earth (e.g., proteins, amino acids, sugars).

4. Which of the characteristics of living organisms (if any) allow you to distinguish between living and formerly living (that is, dead) organisms? Explain your answer.

ANSWER: Answers will vary. In general, dead organisms still have cells (or remains of cells), but are not growing, reproducing, obtaining or using energy, or responding to their environment.

5. You are searching for life in a sample of dirt. If you had evidence that carbon dioxide was being consumed and converted to glucose, what could you conclude about the presence of a living organism in your sample? Explain your answer.

ANSWER: It is possible that a living organism is present and carrying out metabolic reactions. However, it is also possible that abiotic (nonliving) reactions are occurring. Further investigation would be required: for example, you could attempt to isolate an organism from the dirt. Or you could take a sample of the dirt and sterilize it (to destroy any organisms) and see if carbon dioxide was still being consumed and glucose was still being produced.

6. Consider the types of lipid.

a. How does a sterol, such as cholesterol, differ from a triglyceride?
b. Structurally, what do triglycerides and phospholipids have in common?

ANSWER: a. Structurally, a sterol is made up of four connected carbon rings, whereas a triglyceride has three fatty acids bonded to a glycerol. Functionally, sterols are hormones or membrane components, whereas triglycerides are energy-storing molecules.
b. Both have fatty acids bonded to a glycerol. They differ in the number of fatty acids, and whether or not a phosphate group is present.

7. What are the arguments for and against considering viruses living organisms?

ANSWER: For: They can reproduce (within host cells), and as they reproduce, they can respond to that cellular environment and use energy from the host cell.
Against: They cannot reproduce in the absence of a host cell, and they do not grow (that is, become larger in size). Viral particles cannot obtain or use energy on their own, and—unlike living organisms—they are not made of cells.

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EOC Chapter 2 - Essay

8. Why do phospholipids form a bilayer in water-based solutions?

ANSWER: Because phospholipids have hydrophilic (water-loving) heads and hydrophobic (water-fearing) tails, a bilayer is a stable configuration in an aqueous environment. The heads of each half of the bilayer face the surrounding water, and the hydrophobic tails cluster together (away from the water) in the interior of the bilayer.

9. Is olive oil hydrophobic or hydrophilic? What about salt? Explain your answer.

ANSWER: Olive oil does not mix with water, so is hydrophobic; it is made up of hydrophobic triglycerides. Salt will dissolve in water, so is hydrophilic. When salt dissolves, the charged Na+ and Cl– ions can interact with the water molecules.

10. Coffee or tea with sugar dissolved in it is an example of a water-based solution.

a. What is the solvent in such a beverage?
b. What is the solute in such a beverage?
c. Given that the sugar has dissolved in the beverage, are sugar molecules hydrophobic or hydrophilic?

ANSWER: a. The solvent in coffee and tea is water.
b. The main solute is the dissolved sugar molecules, but there are also additional compounds in coffee and tea that dissolve in the water as the beverage is prepared.
c. Because the sugar dissolves in water, sugar is hydrophilic.

11. How do ionic bonds compare to hydrogen bonds? What are the similarities and differences?

ANSWER: Both ionic bonds and covalent bonds are strong bonds when the compound is dry. Covalent bonds form through the sharing of electrons (pairs of electrons). Ionic bonds are strong electrical attractions between oppositely charged ions.

12. Why do olive oil and vinegar (a water-based solution) tend to separate in salad dressing? Will added salt dissolve in the oil or in the vinegar? Explain your answer.

ANSWER: Olive oil and vinegar separate because the oil is hydrophobic, and the vinegar is water based. The hydrophobic triglycerides in the oil tend to cluster together, and the water molecules interact with other water molecules. The salt is hydrophilic, and will dissolve in the vinegar—its charged ions (Na+ and Cl–) can interact with the partial charges on water molecules.

13. Look at Infographic 2.9. For the substances drain cleaner, coffee, and soda, answer the following questions: Is the substance an acid or a base? What is the hydrogen ion concentration relative to a solution with a neutral pH?

ANSWER: Drain cleaner is a base. Its pH of 14 means that it has a lower hydrogen ion concentration than a neutral solution (107 times lower). Coffee is an acid. Its pH of 5 means that it has a higher hydrogen ion concentration than a neutral solution (100 times higher). Soda is an acid. Its pH of ~3 means that it has a hydrogen ion concentration that is 10,000 times higher than a neutral solution.

14. One approach to finding out if there is life on Mars is to bring Martian dirt samples to Earth for analysis. What are possible considerations for science and society if a Martian life form is released on Earth? Given that *Curiosity* has landed on Mars, what are the possible consequences if an Earth life form is released on Mars? What steps can mission control take to minimize these risks?

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ANSWER: There are many possible answers. Martian life brought back to Earth could cause disease or otherwise be harmful to species and the environment on Earth (e.g., if it outcompeted Earth species or released toxic waste products). If an Earth life form on Mars survived, it could have unintended consequences on the Martian environment or any Martian species (if they exist). Ways to minimize the risks of introducing non-native species to other planets include careful sterilization of *Curiosity* components before launching it to Mars to ensure that *Curiosity* harbors no living Earth organisms. Similarly, risks of introducing Martian life forms to Earth can be minimized by isolating and sterilizing any material brought to Earth from Mars.

15. Your tax dollars are being invested in projects such as the *Curiosity* rover project. Investigate the NASA website to learn more about NASA's rationale for the investment in this mission. Now draft a letter to your congressional representative that expresses your opinion about this expenditure of taxpayer dollars. If you agree, state specific reasons why you think this a good investment of your money. If you disagree, state your reasons, and describe at least two other scientific programs that you would prefer to see funded, providing a rationale for why these are more important.

ANSWER: Specific letters will vary.

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EOC Chapter 2 - FB

1. Glucose (a monosaccharide) has the molecular formula $C_6H_{12}O_6$. How many carbon atoms are in each glucose molecule: _____? Provide your answer in numeric form.
ANSWER: 6

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