**DIAS Study Guide**

***The Practice of Science, Water, MacroMolecules, Enzymes & Activation Energy***

1. The independent variable is the --- of an experiment.
	1. Cause
	2. Effect
	3. Constant
	4. Control
2. The independent variable is found on the
	1. X axis
	2. Y axis
	3. Both axis’

**QUESTIONS 3-4:**

A Team of biology students performed an experiment to test the effects of four different solutions on a de-shelled, raw chicken egg. Each raw, unbroken chicken egg of the same size was placed in each of four different solutions. Twenty-four hours later the following results we obtained.



3. Using the data table above and your knowledge about the process of science, which solution would represent the control in this experiment?

A. Solution A

B. Solution B

C. Solution C

D. Solution D

4. What is the independent variable in this experiment?

A. Solution A, B & C.

B. Solution D only

C. The eggs

D. Mass

**Water**

5. A florist places a bouquet of white carnations in water containing blue dye. After a time, the flowers turn blue. What process helped the carnations to change color?

1. Specific heat
2. Surface tension
3. Cohesion and adhesion of water molecules
4. Formation of covalent bonds between hydrogen and oxygen molecules

6. Large bodies of water, such as lakes and oceans, do not quickly fluctuate in temperature. What is the reason for this phenomenon?

A. Water is an acid

B. Water is a versatile solvent

C. Water acts as a buffer

D. Water has a high heat capacity

7. Many fish and aquatic plants can survive a cold winter because the layer of ice that forms at the top of the lake insulates the water below and prevents the lake from freezing solid. What unique property of water contributes to this effect?

A. Water absorbs heat when it evaporates and forms a gas

B. Water expands and becomes less dense when it freezes

C. Water molecules completely separate into ions in solutions

D. Water forms hydrogen bonds with ions and other polar substances

8. Water is often called the "universal solvent" because many substances can be dissolved in water. What property of water allows it to be such a versatile solvent?

A. Purity

B. Polarity and cohesion

C. High heat capacity

D. Expansion upon freezing

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**Macromolecules**

**QUESTIONS 9-10:**



9. Which of the following diagrams below is an example of a protein?

A. 1

B. 3

C. 2

D. 4

10. Which of the following diagrams below is an example of a lipid?

A. 1

B. 3

C. 2

D. 4

11. In living organisms, lipids function mainly as:

1. Sources of stored energy and transmitters of genetic information
2. Sources of stored energy and components of cellular membranes
3. Transmitters of genetic information and catalysts of chemical reactions
4. Catalysts of chemical reactions and components of cellular membranes

 **Study the diagram below of the cell membrane.**



12. Which macromolecule makes up the majority of the cell membrane?

A. Nucleotide

B. Lipid

C. Protein

D. Carbohydrate

13. Baby food manufacturers sometimes use proteases in their products. Proteases catalyze the breakdown of the proteins in these foods, making digestion easier for infants.

**Proteases are which of the following types of molecules?**

A. Enzyme

B. Fatty acid

C. Carbohydrate

D. Nucleic acid

14. Ovalbumin is a protein found in eggs. Which of the following **best** describes the molecular structure of ovalbumin?

A. A group of six carbon atoms joined in a ring.

B. A chain of amino acids folded and twisted into a molecule

C. A set of three fatty acids attached to a molecule of glycerol

D. A sequence of nitrogenous bases attached to a sugar phosphate backbone

15. What is the function of macromolecule subunit below?



A. Energy

B. Catalyst

C. Stores genetic information

D. Composes the majority of the cell membrane

16. The diagram below shows a monomer a macromolecule. Which type of molecule contains these monomers?



A. Carbohydrates

B. Proteins

C. Nucleic acid

D. Lipid

**Enzymes**

17. Some bacteria live in hot springs.  Their cells contain enzymes that function best at temperatures of 70 °C or higher.  At the temperature of 50 °C, how will the enzymes in these bacterial cells most likely be affected?

1. The enzymes will be destroyed by lysosomes
2. The enzymes will lose their bond structure and fall apart
3. The enzymes will require less energy to function than at 70 °C
4. The enzymes will not increase the rate of reactions as much as they would at 70 °C

18. Many of the proteins in the human body are enzymes that catalyze chemical reactions. What is the relationship between enzymes and activation energy?

1. When an enzyme catalyzes a reaction, it increases the activation energy of the reaction
2. When an enzyme catalyzes a reaction, it increases the activation energy of the product
3. When an enzyme catalyzes a reaction, it decreases the activation energy of the reaction
4. When an enzyme catalyzes a reaction, it does not affect the activation energy of the reaction

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| 19. As food travels through the digestive system, it is exposed to a variety of pH levels.  The stomach has a pH of 2 due to the presence of hydrochloric acid (HC1), and the small intestine has a pH ranging from 7 to 9.  HC1 converts pepsinogen into pepsin, an enzyme that digests proteins in the stomach.  Which of the following most likely happens to pepsin as it enters the small intestine?  |
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| --- | --- |
| A. | It will be destroyed |
| B. | It begins to replicate |
| C. | Its shape changes to engulf large proteins |
| D. | Its activity increases to digest more proteins |

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20. The graph above shows how the activity of an enzyme changes over a range of pH values.

 ***Which of the following conclusions can be drawn from this graph?***

A. The optimum pH of the enzyme is 6.6

B. The optimum pH of the enzyme is 5.8

C. The enzyme’s activity continually increases as pH increases from 5.0 to 9.0

D. The enzyme’s activity is greater around pH of 8.0 than around pH of 5.0

21. The human body maintains a temperature of around 98.6 degrees at all times. Enzymes are involved in almost every chemical reaction in the body. Which of the following describes the connection between these two statements?

A. Enzymes function best at a specific temperature

B. The body needs to be warm to prevent hypothermia

C. The body is kept relatively warm to prevent too much enzyme action

D. There is no connection between the two statements

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| 22. Which of the following best explains why enzymes are necessary for many cellular reactions?A. Enzymes supply the oxygen necessary for the reactionsB. Enzymes change reactants from solid to liquids during the reactionsC. The reactions take up too much space in the cell if the enzymes are missingD. The reactions are too slow to meet the needs of the cell if enzymes are missing  |
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| 23. A student is investigating how reaction rate changes over a range of enzyme concentrations.  The student uses excess reactants.  Which of the following best represents the relationship between enzyme concentration and reaction rate? **(As concentration increases, what happens to reaction rate?)**  |
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| --- | --- | --- | --- |
| A. |  | B. |  |
| C. |  | D. |  |

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