**Enzymes and Energy Quiz Study Guide**

1. Please fill in the blanks:

*An enzyme is usually a(n) that the rate of*

***BIOMOLECULE INCREASES/DECREASES***

*chemical reactions by lowering the .* ***TYPE OF ENERGY***

1. CHECK Endergonic or Exergonic for each reaction characteristic

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Reaction term | Energy released | Energy absorbed | Forms bonds | Breaks bonds | Reactants higher in energy than products | Reactants lower in energy than products | Photosynthesis  | Cellular respiration |
| Endergonic |  |  |  |  |  |  |  |  |
| Exergonic |  |  |  |  |  |  |  |  |

1. Write down the formula for **photosynthesis**:

Circle the reactants and underline the products.

Is this reaction **ENDERGONIC** or **EXERGONIC**? *Circle one.*

1. Write down the formula for **cellular respiration**:

Circle the reactants and underline the products.

Is this reaction **ENDERGONIC** or **EXERGONIC**? *Circle one.*

1. Label the graphs A & B below as **endergonic** or **exergonic.**



 **B**

**A**

1. Identify which energy graph above matches each chemical reaction below (CIRCLE **A** or **B**):
2. Cellular Respiration A or B
3. Glow stick reaction A or B
4. Photosynthesis A or B
5. Chemical hand warmer reaction A or B
6. Chemical ice pack reaction A or B
7. List **2** ways that enzyme activity may be increased in living cells.
8. List **5** factors that can **stop** or **slow** down enzyme activity in living cells.

|  |  |
| --- | --- |
| Factor | Explain an example of this we saw/talked about in class |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |

1. If the substrate concentration within a cell is doubled, what will happen to individual enzyme speed (rate of products produced by the enzyme) over time? (CIRCLE) Increase decrease stay same
2. Review possible results for the starch “packing peanut” demo below … Indicate what color each color indicator would be if it was added to the peanut & saliva solution after soaking in human saliva enzymes for 10 minutes:

|  |  |  |  |
| --- | --- | --- | --- |
| Color indicator | No hydrolysis reaction yet … ALL STARCH | Some hydrolysis = some STARCH and some GLUCOSE | Hydrolysis complete = ALL GLUCOSE |
| Iodine color |  |  |  |
| Benedict’s Solution color |  |  |  |

1. Define **activation energy**:
2. Explain how activation energy relates to enzyme activity. *(i. e., what do enzymes do to this activation energy?)*
3. ***Label the following features in the figure to the right*** Substrate: Active site:

 Products:

 Enzyme

1. Identify another term for **substrate**:
2. Explain how can heat denature an enzyme?
3. List **2** additional factors that may denature enzymes.
4. List 3 reasons why adding a second enzyme to a cell would gradually slow down the speed of the first enzyme?
5. Fill in the table below, summarizing the classroom demonstrations we have completed thus far:

|  |  |  |  |
| --- | --- | --- | --- |
| **Material studied/demo done** | **Substrate** | **Enzyme** | **Cells that contain the enzyme** |
| Starch “Packing Peanut” demo |  |  |  |
| “smoothies … fizzle out” demo |  |  |  |
| Dot Lab |  |  |  |

1. Explain why bubbles form when you put hydrogen peroxide on a cut?
2. Diagram a molecule of **ATP** below. POINT to the location(s) of energy storage within the molecule.



A

B

Study the diagram of ATP formation above and then answer the following 4 questions (21-25)

21. Identify which part of the circular diagram is an **endergonic** process? (CIRCLE) A B

22. Identify which part of the circular diagram is an **exergonic** process? (CIRCLE) A B

23. Identify which part of the circular diagram show energy being released for cellular use? (CIRCLE) A B

24. What would you name the enzyme that helps catalyze the hydrolysis of ATP? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

25. How is the stored potential energy within this molecule released?

**Analogies.** Please complete the analogies below.

 26. OSE : carbohydrate :: \_\_\_\_\_\_\_\_\_\_\_\_ : enzyme

 27. energy absorbed : endergonic :: energy released : \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 28. key : lock :: substrate : \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 29. spark : fire :: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ : chemical reaction

Study the graph below and answer the following questions.

 Strangase **Robertsase**

0 20 40 60 80 100 120 140 160 180 200 220 240

1. Provide an appropriate TITLE for this graph:
2. At what temperature does **Strangase** work best?
3. At what temperature does **Robertsase** work best?
4. Which enzyme functions over the longest range of temperatures:
5. Which enzyme achieves the highest rate of chemical reaction:
6. Circle the temperature at which both enzymes work the best: 80 100 120 140 160 200
7. Circle the temperature at which NEITHER enzyme would work: 80 100 120 140 160 200
8. Circle the temperature at which ONLY Strangase has enzyme activity: 20 50 100 180 200
9. As the temperature increases from 50 🡪 70 (F), what happens to the rate of Strangase enzyme?
	1. It increases
	2. It decreases
	3. It stays the same
	4. It increases at first and then decreases

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1. A student places a piece of radish into a test tube containing H2O2 and observes that it bubbles for 4 minutes and then stops bubbling. Predict what will happen if twice as much H2O2 is placed into the test tube?
	1. It will not bubble
	2. It will bubble twice as long (8 minutes)
	3. It will bubble for the same amount of time (4 minutes)
	4. It will bubble for half the amount of time (2 minutes)
2. Suppose a student repeats the Starchase demo using the starch packing peanut. What color do you predict the two indicators will be if the student boils the saliva for 5 minutes before adding the saliva?

Iodine color: \_\_\_\_\_\_\_\_\_\_\_\_\_\_ Benedict’s color? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_