Enzymes Worksheet Ch. 6 Section 2
Read the following paragraph to answer the questions below

What are enzymes?
Enzymes are biological catalysts – they speed up the chemical reactions that take place inside all cells, but without being used up in the process. There are many thousands of different types of enzymes, and each one catalyzes a different reaction. Cells create enzymes based on instructions carried in the cell’s genes (DNA).

What are enzymes made of?
Enzymes are protein molecules, and so are made up of amino acids. Most enzymes contain between 100 and 1,000 amino acids. These amino acids are joined together in a long chain, which is folded to produce a unique 3D structure. Different types of enzymes have different shapes and functions because the sequence and type of amino acids in their structure is different.

Why are enzymes so specific?
Enzymes are very specific about which reactions they catalyze. Only molecules with exactly the right shape will bind to the enzyme and react. These are the reactant, or substrate, molecules. The part of the enzyme to which the reactant binds (attaches) is called the active site. This is a very specific shape and the most important part of the enzyme.

1. a) Fill in the gaps in the following sentences using the words in the box below.

| different catalysts function the same amino acids catalysts |

i) Enzymes are biological .................... that speed up chemical reactions in living organisms.

ii) Enzymes are protein molecules, which are made up of long chains of ....................

iii) The sequence and type of amino acids are .................... in each protein, so they produce enzymes with many different shapes and functions.

iv) The shape of an enzyme is very important to its ....................

b) Enzymes catalyze chemical reactions involved in important processes in the human body. Name one of these processes. Pg. 159 ....................

c) Label the image with the following terms: active site, reactant, enzyme. Pg.160
2. a) Explain what would happen if a reactant molecule with a different shape to the enzyme came into contact with the enzyme's active site. Pg. 160

b) Name two factors that affect the rate of enzyme-catalyzed reactions. Pg. 160

c) i) Infer: What do you think would happen to an enzyme's reaction rate if the temperature or pH changed significantly beyond the enzyme’s optimum level?

ii) Would this have a positive or negative affect on the body?

3. A group of students decided to carry out an investigation to find out how enzyme activity is affected by temperature changes. They put samples of salivary amylase and starch into two test tubes. Salivary amylase is an enzyme that breaks down starch into maltose. Its optimum (best) temperature for activity is around 37°C.

a) What do you think happened to the rate of reaction when they increased the temperature of the first test tube to 37°C?

b) What do you think happened to the enzyme activity when the students decreased the temperature of the second test tube to 0°C?

Read the following paragraph to answer the questions below

Functions of Digestive System

There are 3 main functions of the digestive system. The digestive system ingests food, breaks it down so nutrients can be absorbed, and eliminates what cannot be digested. Mechanical digestion involves chewing food to break it down into smaller pieces. It also includes the action of muscles in the stomach and small intestine to moves and churn (mix) the food as it travels. Chemical digestion involves the breakdown of macromolecules in food into smaller molecules or monomers. The smaller the substance, the easier these molecules can be absorbed into the body’s cells.

What are examples of digestive enzymes?

Enzymes are protein molecules that speed up biological reactions. For digestion, it would be to speed up the rate of breaking down biomolecules, such as carbohydrates, proteins, and lipids. When you chew, amylase, and enzyme found in saliva, begins the process of chemical
digestion by breaking down starches (complex carbohydrates) into simple sugars such as glucose. The acidic environment in the stomach is favorable to the action of **pepsin**, an enzyme involved in the process of the chemical digestion of proteins. Proteins in the food you eat will be broken down into amino acids which can then be used by your cells to rebuild into proteins your body requires such as muscle. In the small intestine, you can find **lipase**, an enzyme involved in the process of the chemical digestion of lipids (fats). The completion of chemical digestion depends on accessory organs such as the pancreas, where most of the digestive enzymes are produced.

4. a) Fill in the missing words in the following text about enzymes and digestion.

………………... enzymes are produced by specialized cells in the pancreas and digestive tract. From there, the enzymes pass out of the cells, into the ………………. and small intestine where they come into contact with food molecules. Here, they catalyze the ………………. of large molecules turning them into monomers, which are then more easily absorbed by the body.

b) Write down the name of the nutrient next to the enzyme that breaks it down. Use the words in the box below. *Use device to look up if needed

| fats | sucrose | starch | proteins | carbohydrates | hydrochloric acid |

i) Carbohydrase is an enzyme that breaks down …………………
ii) Protease is an enzyme that breaks down …………………
iii) Lipase is an enzyme that breaks down …………………
iv) Amylase is an enzyme that breaks down …………………

c) Infer: Lactase is an enzyme that helps your body break down milk sugar called lactose. A person who does not produce enough lactase eats a bowl of ice cream. What do you think will be the effect on the person?

Infer: Lactose is found in milk products. It is converted by the body into a usable form in a series of chemical reactions. The diagram shows the series of reactions that convert lactose into a usable form.

If enzyme 2 is denatured (destroyed), the levels of which substance will increase?..........................
1. The enzyme would most likely affect reactions involving
   a. molecule A, only
   b. molecule C, only
   c. molecule C and D
   d. molecules B and D
   e. molecules A and C

2. What is the optimal pH for both enzymes?
   a. Pepsin _____________
   b. Trypsin _____________

3. Predict the reactivity of trypsin at pH 14.

4. When do neither enzyme work?

5. Compare the rate of the pepsin-catalyzed reaction at pH 3 with the rate of the trypsin-catalyzed reaction at pH 3.

6. Based on the graph, what can you infer about the pH of a stomach and an intestine? Justify your answer.