Section 6.1: Review Answers

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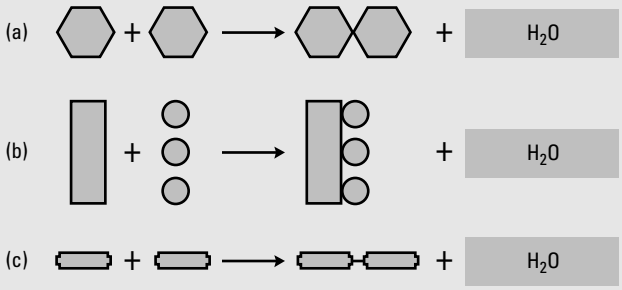
1. Macromolecules are different from inorganic substances because they are organic, larger, and more complex, often being polymers made by linking together many small, similar, chemical sub-units.

2. The following is one possible way to demonstrate these processes.



- Hexagons were chosen to represent glucose since it is a 6-carbon sugar. Using a rectangle for glycerol provides space for the three fatty acids to attach. The rectangles with the points were chosen for amino acids, as they are longer molecules with R groups extending from them. Other ideas are possible.

3. Fats such as butter and lard are animal in origin; they are solid at room temperature and the fatty acids are saturated, having single bonds between the carbons. Oils are of plant origin; they are liquid at room temperature and contain unsaturated fatty acids with double or triple bonds between the carbons.

4.

Macromolecule	Structure	Example	Function
sugars	monosaccharide (simple sugar with 3 – 7 carbon atoms) or dissacharide (double sugar)	glucose maltose	short term energy storage, transport
polysaccharides	composed of many monosaccharides linked together	starch	long term energy storage
lipids	glycerol and three fatty acids; phospholipids have two fatty acids and a phosphate group	fats and oils	energy storage and cell membranes
proteins	polymers of amino acids (An amino acid contains amine and carboxyl groups. Each is unique because of its R group.)	hemoglobin, fibrin, collagen, antibodies, enzymes, actin, and myosin	transport, blood clotting, support, immunity, catalysts, and muscle action
nucleic acids	polymers of nucleotides	DNA and RNA	transfer and expression of genetic information

5. Carbohydrates: maltose and cellulose
Lipid: hydrogenated soybean oil
Inorganic: salt

6. The following table is one way for students to answer this question.

Macromolecule	Identification Test	Positive Result
Starches	Iodine	Iodine turns from a brownish colour to blue-black when mixed with starch
Sugars	Benedict's Solution	A colour change from blue to varying colours, ranging from green to orange-red, depending on the amount of sugar present
Proteins	Biuret Solution	A colour change from blue to violet
Fats	Translucence Test	Fats leave a translucent (allowing light through) spot on unglazed paper

7. Enzymes are specialized proteins that speed up the rate of chemical reactions in living things in the same way that inorganic catalysts speed up reactions elsewhere.

8. Enzymes are specific in their functions because each type has a unique three-dimensional shape. The shape of each

enzyme is complementary to the shape of its substrate. Therefore, an enzyme that is complementary to the shape of a sucrose molecule would not link up with a maltose molecule.

9. An enzyme functions when it combines with its substrate. The active site of the enzyme is complementary in its shape to the substrate, so when the two molecules fit together, a chemical reaction involving the substrate is speeded up.

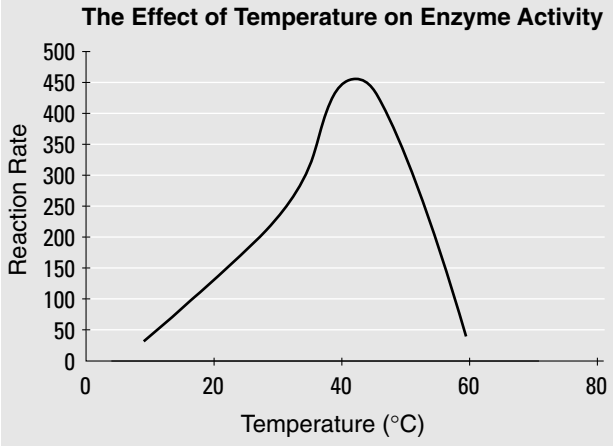
10. The following graph was produced using Microsoft Excel.

The procedure for producing such a graph is as follows:

(a) Enter sample ("made up") data that will demonstrate the effect of temperature on reaction rate in two adjacent columns in the Excel spreadsheet. Enter the data for the x-axis in the first column; y-axis data in the second column.
(b) Highlight the two columns of data, and select "INSERT", then "CHART". (The Chart Wizard, Step One will appears.)
(c) Select "XY (Scatter)" as the Chart Type and "smooth lines without markers" for the Chart sub-type.
(d) Click Next and Step Two will appear. Confirm that the correct data from the spreadsheet cells have been selected.
(e) Click Next and Step Three will appear. Enter the Chart Title and the Labels for the Values on each axis.
(f) Remove the gridlines by clicking on the "Gridlines" tab.
(g) Remove the legend by clicking on the "Legend" tab.
(h) Click Next and Step Four will appear. Place the chart in Sheet 1 in Excel.
(i) Click Finish.
(j) To rotate the label on the Y axis, right click on the label and select "Format Axis Title". Choose the "Alignment" tab and move the Orientation graphic to zero degrees.

SAMPLE DATA FOR THE GRAPH BELOW:

Temp	Rate
10	30
20	120
30	240
40	450
50	320
60	25



The optimum temperature for this enzyme-controlled reaction is about 40 °C.

When the temperature is colder than this, the bonds that determine enzyme shape are inflexible and the substrate molecules do not fit into the active site on the enzyme. At higher temperatures, the enzymes (which are proteins) become denatured. This also changes the shape of the active site.