

Explaining accurately experiment results — the effect of amylase on starch

Note that the combined teacher's and consultant's (John Polias) comments are in blue.

S4 Biology: *To learn how to explain scientifically the results of food test experiments*

Task: Students have to write an explanation for the following scenario in a scientific way.

A student performed an experiment to study the action of amylase on starch. He mixed equal volumes of 0.1% amylase solution and 1% starch solution in a test-tube. After 60 minutes, he carried out Benedict's test on the reaction mixture. A brick-red precipitate is formed. Explain why.

Guiding questions

These are the guiding questions to help students think in the right scientific sequence. Clearly, the guiding questions have two major functions: they break up the knowledge into manageable bits and they sequence the thinking correctly. Because this is an experiment, the starting point is the observation and then each step asks why. When the text is written after the experiment, the sequence is reversed because an explanation typically starts from the beginning reaction and ends with the final product

- 1. What is the brick-red precipitate?**
[Copper (I) oxide is the brick-red precipitate.]
- 2. Why does copper (I) oxide form?**
[(It forms because) Copper (II) ion in the Benedict's solution is reduced to copper (I) oxide.]
- 3. Why is the copper (II) ion in the Benedict's solution reduced?**
[(It is reduced because) a reducing sugar is present.]
- 4. What is the reducing sugar?**
[The reducing sugar is maltose.]
- 5. Why is maltose present?**
[(Maltose is present because) the starch is broken down by the amylase into maltose.]

Students then need to rewrite the above answers. From the first "raw materials" to the final product.

5. The amylase breaks down the starch into **a reducing sugar**.
4. **The reducing sugar is maltose**.
- 3 and 2. **Maltose** (a reducing sugar) reduces the copper (II) ion in the Benedict's solution to **a brick-red precipitate**.
1. **This precipitate** is called copper (I) oxide.

These notes, all answers to the guiding questions and all sequenced properly, are then connected to form the full explanation. In these examples, it is important, when students are learning how to write clear and accurate explanations, to have the known term (a reducing sugar) first and the new term (maltose) come after. Similarly, the observed part (brick-red precipitate) comes first and then the new term (copper oxide) comes after.

The amylase breaks down the starch into **a reducing sugar** (that is) **called maltose**.
Maltose reduces the copper (II) ion in the Benedict's solution to **a brick-red precipitate** (that is) **called copper (I) oxide**.

Another more concise version could be written:

The amylase breaks down the starch into **a reducing sugar called maltose**, which reduces the copper (II) ion in the Benedict's solution to **a brick-red precipitate called copper (I) oxide**.