

Experiment to identify macromolecules



**ASSIGN
BUSTER**

Identification of Some Macromolecules

Introduction

The purpose of the experiment was to select and analyze the presence of macromolecules based on the reactive properties of several known substances, and one unknown, when confronted with three tests. The three tests are composed of the Benedict's Test, Iodine Test and Biuret Test, all three of which are done to identify a select molecule in the solution. The Benedict's Test had the purpose of, upon addition of its reagent (Benedict's Solution [copper(II) sulphate combined with a mixture of both hydrated sodium citrate and sodium carbonate]), testing the presence of a reducing sugar by forming a red (may vary slightly) precipitate (Daintith, 2008). The Iodine Test is a test that proceeded in a similar fashion to test for the presence of starch and glycogen. In the case of presence of starch, the substance turned blue, meaning that the presence of amylose was affected by the iodine test solution added (Garcia, 2010). The same test done for glycogen instead yielded a red colour, which, despite its similarities, was primarily due to its increased complexity in branches and greater molecular mass (Beyer & Walter, 1997). Lastly, the third test was the Biuret Test. In the Biuret Test, the solutions were being tested for peptide bonds through the addition of a controlled amount of sodium hydroxide, and 1% copper (II) sulphate, which are present in both proteins and peptides, having yielded a violet colour if the result was positive (Daintith & Elizabeth, 2010).

Materials and Methods

All procedures were carried out as outlined in Lab 2: Identification of Some Macromolecules, BIOL 130L lab manual, pages 25-32 (Department of Biology, 2018). No deviations were made to these protocols.

Results

Solution Number and Composition Colour Change

1 (1% glucose solution) Brown

2 (0.3%
glucose1phosphate) No change

3 (1% maltose solution) Reddish Brown

4 (5% honey solution) Brown

5 (1% sucrose solution) No change

6 (1% lactose solution) Reddish Brown

7 (1% glycogen
solution) No change

8 (1% starch solution) No change

9 (1% protein) No change

10 (beer) Slight darkening
(Yellow/Orange-ish)

11 (distilled water) No change

12 (Unknown #8) Reddish Brown

Table 1: Colour change upon completion of the Benedict Test

Table 1 demonstrates the colour change present in each of the solution numbers after the addition of Benedict's solution, for all values where "No change" was correspondingly not present, a colour change indicative of some form of result is present.

Solution Number and Composition Colour Change

1 (1% glucose solution) No
change

2 (0.3%
glucose1phosphate) No
change

3 (1% maltose solution) No
change

4 (5% honey solution) No
change

5 (1% sucrose solution) No
change

6 (1% lactose solution) No

	change
7 (1% glycogen solution)	Red
8 (1% starch solution)	Blue
9 (1% protein)	No change
10 (beer)	No change
11 (distilled water)	No change
12 (Unknown #8)	No change

Table 2: Colour change upon completion of the Iodine Test

Table 2 displays the colour change in each given substance upon the addition of the yellow-tinged Iodine solution to the given substance.

Solution Number and Composition Colour Change

1 (1% glucose solution)	No change
2 (0.3%)	No

glucose1phosphate)	change
3 (1% maltose solution)	No change
4 (5% honey solution)	No change
5 (1% sucrose solution)	No change
6 (1% lactose solution)	No change
7 (1% glycogen solution)	No change
8 (1% starch solution)	No change
9 (1% protein)	Violet
10 (beer)	No change
11 (distilled water)	No change
12 (Unknown #8)	No

change

Table 3: Colour change upon completion of the Biuret Test

Table 3 provides the colour changes to the twelve given substances upon completion of the biuret test on each of the substances.

Discussion

The results were largely in agreement with the description of the procedure, the Benedict's Test was expected to react with solutions containing a reducing sugar, meaning that solutions containing free ketone or aldehyde groups, which are normally monosaccharide or disaccharide sugars, produced such a result and are therefore identifiable as such through a precipitate of a different colour than the original substance forming (within a colour range) (Daintith & Elizabeth, 2010). Five different substances proceeded to a red, reddish brown or brown precipitate (1, 3, 4, 6, 12), as seen in Table 1, agreeing with the expected result that it would react with monosaccharide and disaccharide sugars, seeing as it reacted with glucose, honey (which naturally contains glucose/fructose), maltose, and lactose (Beyer & Walter, 1997). In regards to substance number ten (beer) reacting with the Benedict's solution, the difference from the original colour was relatively minimal, however, it was enough of a change to note the possibility of the presence of maltose in beer, seeing as it is commonly used in the making process of some alcoholic beverages (primarily beer). Through the Benedict's Test, it was noted in Table 1 that the Unknown #8 solution produced a reddish brown precipitate during the test, meaning that its

behaviour most closely resembled that of the maltose and lactose solutions, although nothing more than that was observable through the test.

Through the Iodine Test, it was proven (within the limitations of the given amount of substances) that the test provided clear indication of the presence of both glycogen and starch in its intended manner. Because of the controlled substances, it was clear to see that the Iodine Test reacted with the intended substances (the glycogen solution, and the starch solution), yielding a red colour with substance 7 (glycogen) as seen in Table 2 (Beyer & Walter, 1997). The same can be said for the blue colour present in substance 8 (starch), but, although a comment in regards to the potential presence of maltose in substance 10 (beer) was made for the Benedict's Test, it seems to be the case that starch was not identified in the same substance, even though the process of making beer is often met with the use of starch (Garcia, 2010).

Finally, the Biuret Test provided the expected, but also the most minimal (quantitatively) results in comparison to the other two tests, as seen in Table 3. The Biuret Test that was expected to identify the presence of peptide-bonds in proteins and peptides successfully reacted with substance 9, a solution of 1% protein, turning it to a violet colour (Daintith & Elizabeth, 2010).

Unknown Solution #8, otherwise known as Substance/Solution #12 did not provide a positive result for the Iodine Test and Biuret Test, meaning that it is likely to contain a reducing sugar and not a solution containing starch, glycogen or peptide-bonds. As expected, the distilled water negative control

did not react with any of the tests, meaning that all of the positive controls for the respective tests (glucose and fructose for Benedict's Test, starch and glycogen for Iodine Test and protein for Biuret Test) and negative controls were successfully in effect providing for an accurate representation of how the experiment should have gone.

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