

The use of controls
and indicators to find
what macromolecules
are in an unknown ...



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The objective of this lab was to discover what macro molecules were in the unknown using different substances as experimental controls. Experimental controls are samples used in a lab that have a known outcome.

This outcome can show what an unknown is comprised of. A positive control shows what the outcome of the experiment should look like if the experiment were to work. A negative control shows what would happen to the substance if the experiment were to go wrong. When compared to the control, what type of macromolecules in the unknown can be discovered (Enlexica, Inc, 2008).

Indicators are usually used to expose a certain substance within a substance and normally shown through a colour change. These indicators were used to create the controls and used to identify certain macro molecules in different substances. The three different indicators that were used in this lab were Lugol's iodine solution, Benedict's solution and Biuret solution (Buckley Jr., 2003).

Lugol's solution, otherwise known as iodine solution is an indicator used to find starch in a substance. This solution is made of 5% iodine, 10% potassium and 85% distilled water. The positive outcome of this indicator shows the presence of starch in an organic compound by turning a dark-blue or black colour in the presence of starch or reddish-brown in the presence of glycogen from its original pale yellow colour (Answers Corporation, 2008). The reason the substance turns these colours is because of the staining of Lugol's solution on coiled polysaccharide molecules in the starch and glycogen.

Lugol's solution does not stain simple sugars because it only stains polysaccharides which are starches and glycogen, or complex sugars.

Benedict's solution is used to indicate the presence of an aldehyde or ketone functional group. An aldehyde functional group is found in a reducing sugar when in a basic solution. A reducing sugar is a sugar that has a potentially free aldehyde group that is used for reducing alkaline solutions. Examples of reducing sugars are monosaccharides and most disaccharides (Answers Corporation, 2008). Benedict's solution is an excellent indicator of reducing sugars because it is an alkaline.

This solution contains cupric sulphate which is reduced to cuprous ions by the aldehyde group in the reducing sugar. The cuprous ions, when heated, form a precipitate of cuprous oxide, which can range from yellow to green or red to brown. The precipitate shows that the test is positive and the substance is in fact a reducing sugar (Pearson Education, 2007). Biuret solution is used to indicate proteins and peptides in a substance. Biuret solution is a mixture of copper II sulphate and potassium hydroxide. The copper atoms will react with the peptide bonds, which are the bonds within proteins, to produce a colour change.

A violet colour change occurring from the original light blue means that the substance contains protein. Proteins are composed of different arrangements of the 20 different amino acids. Amino acids are held together by peptide bonds (Holland, 1999). Within these experiments there were negative and positive controls.

Of course all of these controls were used to figure out what the unknown could have been. All of the controls were clear colourless liquids except honey, which was slightly yellow, and beer, which was brown. Read also salivary amylase experiment. In the iodine solution test for starches and glycogen the two positive controls were 1% glycogen solution and 1% starch solution.

These substances turned into the colours that they were expected to change to, glycogen to brown and starch to dark blue because they are both polysaccharides and the iodine solution stains the polysaccharide coils. The negative controls did not change colour and stayed as a pale yellow. Beer however, was a darker colour than the rest of the negative controls, but that is because it started darker than the rest and was coloured to begin with. These results were expected because the other controls were mostly simple sugars and protein which do not have the polysaccharide coils. The unknown appeared to be a positive result because it turned a brown colour, meaning there is glycogen present (Answers Corporation, 2008). In the Benedict's solution test for reducing sugars there were five positive controls.

The positive controls were the glucose solution, maltose solution, honey, lactose solution and beer. The glucose solution, maltose solution and lactose solution were expected because they are all monosaccharides and disaccharides which have the aldehyde or ketone functional groups that reduce the cupric sulphate to cuprous ions that combine with oxygen to create a precipitate called cuprous oxide (Pearson Education, 2007). Honey is made of monosaccharides glucose and fructose that contain the aldehyde or ketone functional groups which is why honey had a positive result <https://assignbuster.com/the-use-of-controls-and-indicators-to-find-what-macromolecules-are-in-an-unknown-essay/>

(Wikipedia, 2008). Beer contains a “ starch” which is malt. Malt is very high in maltose which is a disaccharide that also contains the aldehyde or ketone functional group (Wikipedia, 2008). The unknown tested positive because it ended up with a precipitate and change colour to burnt orange when heated with the Benedict’s solution.

In the Biuret solution test for protein there was only one positive control. The positive control was protein. This was expected because not only was this test made to indicate the presence of protein, but the copper reacted with the peptide bonds formed between the amino acids in the protein to induce the violet colour (Holland, 1999). The honey turned a darker yellow colour. This could be because of preservatives in the honey that may have reacted with the Biuret solution. The beer was a brown colour because of the darker original colour this is still a negative result.

The unknown did not have a positive result and therefore does not contain any protein. Unknown number 281 contains glycogen and reducing sugar as shown in Table 1: Results of Iodine Test for Starch and Glycogen, and Table 3: Results for Benedict’s Test for Reducing Sugars. The positive controls in those two experiments were very similar to the result of the unknown mixed with iodine solution and Benedict’s solution. The results for the unknown in the Biuret test were similar to the negative control, meaning it did not contain protein.

These controls worked very well in comparing and contrasting to aid in finding what macromolecules were in the unknown.