Carry out identification tests on 4 liquid samples for proteins, lipids, carbohydrates (starch, reducing and non-reducing sugars) in order to identify which biological molecules each sample contains.

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Introduction

In this experiment, we tested 4 different samples for different biological molecules. These tests included Starch, reducing sugar, proteins, lipids and non-reducing sugars. The 2 types of sugars we tested for have various differences, such as a reducing sugar has a free aldehyde or ketone group and reduces the copper (II) ion, normally a blue colour in solutions such as fehling's or benedict's, to a copper (I) ion, which is normally a reddish brown colour. This is compared to a non reducing sugars where you must hydrolyse it to its constituent monosaccharides, if a solution is a non-reducing agent it will then test positive on the benedict's test, after neutralising the compound.

Materials, Procedure

Please see Appendix 1.

Results

Please see appendix 2.

Discussion

During our tests, we used both positive and negative controls, the reason for it is to provide a consistent result against that we can compare the samples to. The positive control, being something that we know will be what we are testing for, and the negative having the opposite effect.

Looking at the results, sample 4 came out negative for all of the tests that we performed, those being Starch, reducing sugar, Protein and Lipid, and so we would needed to complete a further test to work out what it is. Where sample 4 had come out positive on the final test, it is feasible that it is a non-reducing sugar.

In the reducing sugar test, we observed the colour change of the benedict's solution turn from Blue, due to containing a Cu 2+ ion, to an orange, red colour, reducing the ion charge by 1, thereby gaining an electron, creating a redox reaction. A reducing sugar is any monosaccharide with a free hemiacetal, usually an Aldehyde or ketone group, in this case it is likely that it contained an Aldehyde group.

In the biuret test for proteins, the sodium hydroxide in the biuret solution breaks the peptide bonds linking the amino acids, this allows the copper (II) to form a coloured substance with parts of the amino acids which shows the presence of proteins.

Conclusion

After completing the tests, it was possible to work out what each sample is:

Sample 1 - This sample tested positive for the Biuret test, this is proved by matching to the positive control. In the other tests, it came negative in the Benedicts and lipids test. However during the Starch test, it had turned blue, until we picked it up to swirl the test tube. The sample turned clear with the movement, after this discovery we added a few more drops of Iodine to the sample and it had turned blue. This, shows that it is highly likely that it was protein. However, it could also contain trace amounts of starch, just that the protein was preventing the starch from showing.

Sample 2 - In the first 3 tests, the solution separated from the sample by either floating on top, or in the case of iodine sinking to the bottom and forming a ball in the centre. From this we could deduce that this was some sort of fat, as it was behaving similar to oil floating on water, thereby containing a high amount of Lipids. During the lipid test, it was the only sample to be absorbed into the paper straight away.

Sample 3 - This sample, appeared to contain more than one of the biological molecules. In the starch and reducing sugar tests, it tested positive on both, so it is safe to say that it contains both starch and reducing sugar. In the protein test it had turned blue, however after a few minutes rest it turned orange and had separated. This shows that there is a likelihood that this sample contains peptides.

Sample 4 - This sample, as I explained previously (in the discussion section), is highly likely to be a Non-reducing sugar as it tested negative on all of the tests we had performed other than the final test, which we only performed on this one.

Evaluation

Overall, the experiment was successful as we were able to identify the different molecules in the samples as stated above. In the lipid test, I mistakenly used the positive control twice, however we were able to fix it as we used a different section of paper so we were able to save the test and get accurate results. If we could have repeated the experiment, I would like to have our own equipment and mixtures, rather than sharing between different groups. This, could cause cross contamination between the pipettes without knowing. It was however, a variable that was outside of our control. I would also mark the pipettes with what solution it was used with, again preventing any potential cross contamination and therefore causing inaccurate results.

References

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