Mini Review

Iodometric determination of glucose and ribose using potassium iodate as novel reagent in acetic acid medium

Abstract

In this work, we have reported a simple, cost effective and reliable method for the determination of glucose iodometrically by making use of potassium iodate. This volumetric method determines glucose instantly, thereby greatly reduces the time of determination.

Keywords: HIO₃, glucose, iodometry, molecular weight, gluconic acid, distilled water, oxidation, hydroxyl group, sodium thiosulphate, metabolism, colorimetric, aromatic amines

Introduction

Glucose is the major carbohydrate found in blood and a chief source of energy in human body. The blood glucose levels are perfectly maintained under the influence of hormones like insulin. However the hormonal imbalance sometimes may result in abnormalities of glucose metabolism and results in diseased condition. Thus the detection of blood glucose levels can provide a basic understanding of the hormonal imbalance. In a similar way, a blank titration was conducted throughout the experiment. In a typical experiment, a known excess of standard solution of HIO₃ was added to a known amount of glucose. After completion of the reaction, unreacted HIO₃ was determined by iodometry. By carrying out a blank experiment simultaneously, the amount of HIO₃ consumed was determined. As the overall reaction requires one mole of HIO₃ per molecule of glucose, which is equivalent to one mole of iodine and hence the molecular weight ‘m’ of glucose is determined using the following equation.

\[ M = \frac{2000 \times W}{(V₁ - V₂) \times N} \]

Where, \( M \) = Molecular weight of Glucose
\( W \) = Weight of the given sample
\( V₁ \) = Volume of sodium thiosulphate consumed (Blank)
\( V₂ \) = Volume of sodium thiosulphate consumed (experimental)
\( N \) = Molarity of sodium thiosulphate

Determination of molecular weight of glucose/ribose: An accurately weighed (20-60mg) sample of glucose/ribose was dissolved in distilled water (10ml) in an Erlenmeyer flask. To this, a solution of 0.01mol of HIO₃ was introduced and it was heated to about 65°C on water bath, to this solution about 5ml of dilute sulphuric acid and 5ml of 10% potassium iodide was added and the liberated iodine was titrated against the standardized sodium thiosulphate solution using starch as indicator. In a similar way, a blank titration was conducted without adding glucose. From the difference in the volume of sodium thiosulphate solution consumed, the molecular weight ‘m’ was calculated using the above equation.

Results and discussions

The method reported here makes use of the fact that glucose is known to undergo an oxidative dehydrogenation by HIO₃, yielding the gluconic acid by consuming one mole of HIO₃ per one molecule of
glucose or ribose (Scheme 1). Generally a known volume of HIO₃ is added to known mass of Glucose, after the completion of the reaction, the unreacted HIO₃ is determined iodometrically. By carrying out a parallel blank experiment the amount of the HIO₃ consumed is determined. As the overall reactions require one mole CAT per one mole of the Glucose, which is equivalent to mole of iodine, weight of the Glucose is determined by using equation shown above.

\[
\text{KIO}_3 + \text{AcOH} \rightarrow \text{HIO}_3 + \text{AcOK}
\]

**Scheme 1**

**Conclusion**

We have developed a reliable, cost effective method for the determination of glucose using mild conditions and without the use of any sophisticated instruments and also this method requires short time.

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**Conflicts of interest**

The author declares that there are no conflicts of interest.

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