Chemistry Project on Determination of Contents of Cold Drinks

Chemistry investigatory project (2022-2023)

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%class% - %section%

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**Introduction**

The era of cold drinks began in 1952 but the industrialization in India marked its be-ginning with launching of Limca and Goldspot by parley group of companies. Since, the beginning of cold drinks was highly proftable and luring, many multinational compa-nies launched their brands in India like Pepsi and Coke.

Now days, it is observed in general that majority of people viewed Sprite, Fanta and Limca to give feeling of lightness, while Pepsi and Thumps Up to activate pulse and brain.

**Theory**

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Cold drinks of different brands are composed of alcohol, carbohydrates, carbon dioxide, phosphate ions etc. These soft drinks give feeling of warmth, lightness and have a tangy taste which is liked by everyone. Carbon dioxide is responsible for the formation of froth on shaking the bottle.

The carbon dioxide gas is dissolved in water to form carbonic acid which is also re-sponsible for the tangy taste. Carbohydrates are the naturally occurring organic com-pounds and are major source of energy to our body. General formula of carbohydrates is CX (H2O)Y.

On the basis of their molecule size carbohydrates are classifed as:-

Monosaccharide, Disaccharides and Polysaccharides. Glucose is a monosaccharide with formula C6H12O6 .It occurs in Free State in

the ripen grapes in bones and also in many sweet fruits. It is also present in human blood to the extent of about 0.1%. Sucrose is one of the most useful disaccharides in our daily life. It is widely distributed in nature in juices, seeds and also in fowers of many plants. The main source of sucrose is sugar cane juice which contain 15-20 % su-crose and sugar beet which has about 10-17 % sucrose. The molecular formula of sucrose is C12H22O11. It is produced by a mixture of glucose and fructose. It is non-re-ducing in nature whereas glucose is reducing. Cold drinks are a bit acidic in nature and their acidity can be measured by fnding their pH value. The pH values also depend upon the acidic contents such as citric acid and phosphoric acid.

**Aim**

Comparitive Study and Qualitative Analysis of different brands of Cold Drinks available in market.

**Apparatus Required**

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* Test Tubes
* Test Tube Holder
* Test Tube Stand
* Stop Watch
* Beaker
* BunsenBurner
* pH Paper
* Tripod Stand
* China Dish
* Wire Gauge

**Chemicals Required**

Iodine Solution , Potassium Iodide , Sodium Hydroxide

Lime Water , Fehling’s A & B Solution , Concentrated Nitric Acid

Benedict Solution , Ammonium Molybdate

**Detection Of pH**

**Experiment**

Small samples of cold drinks of different brands were taken in a test tube and put on the pH paper. The change in colour of pH paper was noticed and was compared with stan-dard pH scale.



**Observation**

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**Sr. No.** **Name Of The Drink** **Colour Change** **pH Value**

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1. Coca Cola Pinkish 2 – 3



2. Sprite Dark Orange 3



3. Limca Light Orange 4



4. Fanta Orange 3–4



**Inference**

Soft Drinks are generally acidic because of the presence of citric acid and phosphoric acid. pH values of cold drinks of different brand are different due to the variation in amount of acidic content.

**Test For Carbon Dioxide**

**Experiment**

As soon as the bottles were opened, one by one the samples were passed through lime water. The lime water turned milky.

**Observation**

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**Sr. No.** **Name Of The Drink** **Time taken (sec)** **Conclusion**

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1. Coca Cola 28 CO2 is present



2. Sprite 20 CO2 is present



3. Limca 38 CO2 is present



4. Fanta 36 CO2 is present



**Inference**

All the soft drinks contain dissolved carbon dioxide in water. The carbon dioxide (CO2) dissolves in water to form carbonic acid, which is responsible for its tangy taste.



**Chemical Reaction**

Ca(OH)2 (s) + CO2 (g) → CaCO3 (s) + H2O(l)

**Test For Glucose**

**Experiment**

Glucose is a reducing sugar acid. Its presence is detected by the following test:-

* **Benedict’s Reagent Test**

Small samples of cold drinks of different brands were taken in a test tube and a few drops of Benedict’s reagent were added. The test tube was heated for few seconds. Formation of reddish color confrmed the presence of glucose in cold drinks.

**Observation**

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**Sr. No.** **Name Of The Drink** **Observation** **Conclusion**

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|  |  |  |  |
| --- | --- | --- | --- |
| 1. | Coca Cola | Reddish Colour | Glucose is Present |
|  |  | Precipitate |  |



|  |  |  |  |
| --- | --- | --- | --- |
| 2. | Sprite | Reddish Colour | Glucose is Present |
|  |  | Precipitate |  |



|  |  |  |  |
| --- | --- | --- | --- |
| 3. | Limca | Reddish Colour | Glucose is Present |
|  |  | Precipitate |  |



|  |  |  |  |
| --- | --- | --- | --- |
| 4. | Fanta | Reddish Colour | Glucose is Present |
|  |  | Precipitate |  |



**Inference**

All the samples gave positive test for glucose with Benedict’s reagent. Hence all the drinks contain glucose.

* **Fehling’s Solution Test**

Small samples of cold drinks of different brands were taken in a test tube and a few drops of Fehling’s A solution and Fehling’s B solution was added in equal amount. The test tube was heated in water bath for 10 minutes. Appearance of brown precipitate confrmed the presence of glucose in cold drinks.

**Observation**

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|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Sr. No.** | **Name Of The Drink** | **Observation** | **Conclusion** | |
|  |  |  |  |  |
| 1. | Coca Cola | Reddish Brown | Glucose is Present | |
|  |  | Precipitate |  |  |
|  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
| 2. | Sprite | Reddish Brown | Glucose is Present | |
|  |  | Precipitate |  |  |
|  |  |  |  |  |
| 3. | Limca | Reddish Brown | Glucose is Present | |
|  |  | Precipitate |  |  |
|  |  |  |  |  |
| 4. | Fanta | Reddish Brown | Glucose is Present | |
|  |  | Precipitate |  |  |
|  |  |  |  |  |

**Inference**



All samples gave positive test for glucose with Fehling’s (A & B) solutions. Hence all the cold drinks contain glucose.

**Test For Phosphate**

**Experiment**

Small samples of each brand of cold drinks were taken in separate test tubes and Ammonium Molybdate followed by concentrated Nitric Acid (HNO3) was added to it. The solution was heated. Appearance of canary-yellow precipitate confrmed the pres-ence of phosphate ions in cold drinks.

**Observation**

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|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Sr. No.** | **Name Of The Drink** | **Observation** | **Conclusion** | | |
|  |  |  |  |  |  |
|  |  |  |  | | |
| 1. | Coca Cola | Canary Yellow | Phosphate is Present |  |  |
|  |
|  |  | Precipitate |  |  |  |
|  |  |  |  |  |  |
| 2. | Sprite | Canary Yellow | Phosphate is Present | | |
|  |  | Precipitate |  |  |  |
|  |  |  |  |  |  |
| 3. | Limca | Canary Yellow | Phosphate is Present | | |
|  |  | Precipitate |  |  |  |
|  |  |  |  |  |  |
| 4. | Fanta | Canary Yellow | Phosphate is Present | | |
|  |  | Precipitate |  |  |  |
|  |  |  |  |  |  |



**Inference**

All the soft drinks samples gave positive test for phosphate ions. Hence all the cold drinks contain phosphate.

**Test For Alcohol**

**Experiment**

Small samples of each brand of cold drinks were taken in separate test tubes and Iodine followed by Potassium Iodide and Sodium Hydroxide (NaOH) solution was added to each test tube. Then the test tubes were heated in hot water bath for 30 min-utes. Appearance of yellow coloured precipitate confrmed the presence of alcohol in cold drinks.

**Observation**

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**Sr. No.** **Name Of The Drink** **Observation** **Conclusion**

****

1. Coca Cola Yellow Precipitate Alcohol is Present



2. Sprite Yellow Precipitate Alcohol is Present



3. Limca Yellow Precipitate Alcohol is Present



4. Fanta Yellow Precipitate Alcohol is Present



**Inference**

All the cold drinks samples gave positive test for alcohol. Hence all the cold drinks con-tain alcohol.



**Chemical Reaction**

CH3CH2OH + 4I2 + 6NaOH → CHI3 + HCOONa + 5NaI + 5H2O

**Test for Sucrose**

**Experiment**

5 ml samples of each brand of cold drinks were taken in separate china dishes and were heated very strongly until changes occur. Black coloured residue left confrmed the presence of sucrose in cold drinks.

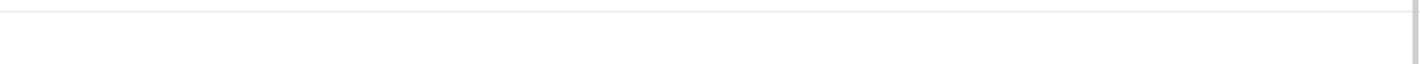
**Observation**

****

**Sr. No.** **Name Of The Drink** **Observation** **Conclusion**

****

1. Coca Cola Black Residue Sucrose is Present



2. Sprite Black Precipitate Sucrose is Present



3. Limca Black Precipitate Sucrose is Present



4. Fanta Black Precipitate Sucrose is Present



**Inference**

All the brands of cold drinks contain sucrose. But amount of sucrose varies in each brand of drink. Fanta contains highest amount of sucrose.

**Result**

After conducting several tests, it was concluded that the different brands of cold drinks namely.

* Coca Cola
* Sprite
* Limca
* Fanta

All contains glucose, alcohol, sucrose, phosphate and carbon dioxide. All cold drinks are acidic in nature. On comparing the pH value of different brands Coca Cola is the most acidic and Limca is least acidic of all the four brands taken.

Among the four samples of cold drinks taken, Sprite has the maximum amount of dis-solved carbon dioxide and Fanta has the minimum amount of dissolved carbon dioxide.

**Precautions**

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Some of the precautions which need to be taken care of are

* Concentrated solutions should be handled with immense care.
* Hands should be washed thoroughly after performing each experiment.
* If possible, one should wear hand gloves to prevent from any possible damage.
* If chemicals come into contact with your skin or eyes, fush immediately with copious amounts of water.
* Never leave burners unattended. Turn them off whenever you leave your workstation.

**Conclusion**

**DIS-ADVANTAGES OF COLD DRINKS**

* Soft drinks are little more harmful than sugar solution. As they contain sugar in large amount which cause problems in diabetes patients.Soft drinks can cause weight gain as they interfere with the body’s natural ability to suppress hunger feeling.
* Soft drinks have ability to dissolve the calcium so they are also harmful for our bones.
* Soft drinks contain “phosphoric acid” which has a pH of 2.8. So they can dissolve a nail in about 4 days.
* For transportation of soft drinks syrup the commercial truck must use the hazardous matter place cards reserved for highly consive material.
* Soft drinks have also ability to remove blood so they are very harmful to our body.

**OTHER USES OF COLD DRINKS**

* Cold drinks can be used as toilet cleaners.
* They can remove rust spots from chrome car humpers.
* They clean corrosion from car battery terminals.
* Soft drinks are used as an excellent ‘detergent’ to remove grease from clothes.
* They can loose a rusted bolt.

Bibliography

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