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Determination of Amount of Dosages of Bleaching Powder required for the Disinfection of different Samples of Water taken from Different Water tables of Patna

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The quality of water is of vital concern for mankind as it is directly linked with human welfare. Pollution of drinking water is found to cause many water borne diseases and epidemics. The major source of water pollution are domestic and industrial wastes which are discharged into natural water bodies. Treatment of drinking water is done mainly by chlorination.

The amount of chlorine added to water should be optimum one. It should neither be too large to make the water corrosive nor very small so as to leave some bacteria.

Chlorination of drinking water is done with bleaching powder. Its aqueous solution contains dissolved chlorine which is liberated by the action of water on bleaching powder.

The water containing the proper dosages of bleaching powder should have chlorine slightly in excess. The excessive chlorine can be detected by adding a little of potassium iodide, acetic acid and starch solution to the samples and a blue colour is produced.

Blue colouration is produced due to the formation of starch iodide complex.

Most of all the portable water which are taken for analysis in this project are found to be contaminated. 1% bleaching powder solution is required to disinfect the contamination and was used in the range of 0.5 to 2.5.

Key words: *Water pollution, Disinfection, Chlorination.*

Introduction: The quality of water is of vital concern for mankind as it is directly linked with human welfare. Pollution of drinking water is found to cause many water borne diseases and epidemics. The major sources of water pollution are domestic and industrial wastes which are discharged into natural water bodies. Thus, natural water may contain many impurities and has to be purified for drinking purposes. Treatment of drinking water is generally, done in three steps:

(1) Aeration to settle the suspended matter.

(2) Co-agulation of small particles and suspended matter

(3) Disinfection by chlorination to kill viruses, bacteria etc.

Out of these three, chlorination is the crucial and important. Small amounts of chlorine may leave some harmful bacteria in the water and if the chlorine is added in excess, then also the water becomes harmful because of the corrosive nature of chlorine.

Theory :

The amount of chlorine added to water should be optimum one. It should neither be too large to make the water corrosive nor very small so as to leave some bacteria.

Chlorination of drinking water is done with bleaching powder, which is a yellowish white compound of chlorine having formula $CaOCl_2.H_2O$. Its aqueous solution contains dissolved chlorine which is liberated by the action of water on bleaching powder.

$$CaOCl_2.H_2O(s)+H_2O_{(l)} = Ca(OH)_{2(aq)} + Cl_{2(aq)}$$

The water containing the proper dosages of bleaching powder should have chlorine slightly in excess. This excessive chlorine can be detected by adding a little of potassium iodide, acetic acid and starch to the sample when blue colour is produced.

Blue colour is produced due to formation of starch iodine complex. Iodine is liberated from the oxidation of iodide by excessive chlorine.

$CaOCl_2 + 2H^+ + 2I = I_2 + H_2O + CaCl_2$

I_2 + starch = starch – I_2complex (blue in colour)

This minimum amount of the bleaching powder required for disinfection of water sample can be determined as –

1. Taking some volume of the water sample in five containers.
2. Adding increasing amount of a standard solution of bleaching powder in these.
3. Giving sufficient time for the disinfection process, and then
4. Adding little of solid KI, acetic acid and starch solution into each of the containers, and observing for the appearance of blue colour.

Bleaching powder amount present in the container showing blue colour and having minimum amount of the bleaching powder solution in it is the proper dosage required for disinfection of water sample.

Procedure:

1 gram bleaching powder was weighed and it was transferred into a 250ml beaker. 100ml of distilled water was measured through a measuring cylinder and the solution of the bleaching powder was made. The suspension was allowed to settle down and the solution was filtered. This filtrate was labeled as 1% bleaching powder solution.

Then five 250ml conical flask was taken and was numbered from 1 to 5.

50 ml of the water sample was transferred into each flask with the help of a measuring cylinder.

Then 0.5ml, 1 ml, 1.5ml, 2ml, 2.5ml of the bleaching powder solution was added with the help of burette in each flask. The contents of the flask was gently shaken and then it was left for about half an hour.

After half an hour, about 0.5 grams of potassium iodide, 2 ml of acetic acid and 1ml of starch iodide solution was added in each flask. The contents was shaken gently and the number of flask having blue colouration was noted down along with the minimum amount of bleaching powder solution

Observation and Calculation :

Table 1: for Sample 1 (Ashiana nagar 270ft)

Number of flasks	Volume of Ca(Ocl)cl solution(ml)	Clearance Appearance
1	0.5ml	No
2	1ml	Yes
3	1.5ml	Yes
4	2ml	Yes
5	2.5ml	Yes

Calculation:

Minimum volume of bleaching powder solution producing blue colour = 1ml

Therefore, the Amount of bleaching powder present in 1ml of the solution= 1/100*1 = 0.01grams.

Since, 100ml of solution contains 1grams of bleaching powder.

Thus, 50ml water of 270 ft requires 0.01grams of bleaching powder for its disinfection.

Hence, 1000ml water of 270ft will require = 0.01*1000*1000/50= 200grams of bleaching powder.

Therefore, kilolitre of 270 ft water sample requires 200 grams of water for its disinfection.

Result:

Thus water sample of 270ft Ashiana Nagar region will require 200 grams of bleaching powder for its disinfection. Thus, for all other water samples table can be formulated as:

Table 2:

S.No.	Water samples	Volume of Ca(OCl)Cl and Appearance of Clearance				
		0.5ml	1ml	1.5ml	2ml	2.5ml
1	290ft Ashiana Nagar	No	Yes	Yes	Yes	Yes
2	310ft Ashiana Nagar	No	Yes	Yes	Yes	Yes
3	340ft Ashiana Nagar	Yes	Yes	Yes	Yes	Yes
4	270ft Patliputra	No	Yes	Yes	Yes	Yes
5	290ft Patliputra	No	Yes	Yes	Yes	Yes
6	310ft Patliputra	Yes	Yes	Yes	Yes	Yes
7	340ft Patliputra	Yes	Yes	Yes	Yes	Yes
8	270ft Shashtri Nagar	No	Yes	Yes	Yes	Yes
9	290ft Shashtri Nagar	No	Yes	Yes	Yes	Yes
10	310ft Shashtri Nagar	Yes	Yes	Yes	Yes	Yes
11	340ft Shashtri Nagar	Yes	Yes	Yes	Yes	Yes

RESULT: From the above table and after alculations the following result can be formulated

Table 3:

S.No	Sample	Minimum volume of Ca(oCl)Cl(ml)	Amount of Ca(OCl)Cl
1	290ft Ashiana Nagar	1ml	200grams
2	310ft Ashiana Nagar	1ml	200grams
3	340ft Ashiana Nagar	0.5ml	100grams
4	270ft Patliputra	1ml	200grams
5	290ft Patliputra	1ml	200grams
6	310ft Patliputra	0.5ml	100grams
7	340ft Patliputra	0.5ml	100grams
8	270ft Shashtri Nagar	1ml	200grams
9	290ft Shashtri Nagar	1ml	200grams
10	310ft Shashtri Nagar	0.5ml	100grams
11	340ft Shashtri Nagar	0.5ml	100grams

Conclusion :

Mostly all the water samples taken for analysis in this project were contaminated. 1% Bleaching Powder solution is required to disinfect the contamination and was used in the range of 0.5 to 2.5ml. Ashiana Nagar water sample requires of 270ft, 290ft, 310ft requires 200grams of bleaching powder for its disinfection and 340ft water sample requires 100 grams of bleaching powder for its disinfection. Whereas in Patliputra region 270ft and 290ft water sample requires 200grams of bleaching powder for its disinfection and 310ft and 340ft requires 100grams of bleaching powder for its disinfection. In Shashtrinagar region 270ft and 290ft water sample requires 200grams of bleaching powder for its disinfection and 310ft and 340ft requires 100grams of bleaching powder for its disinfection.

Thus, water sample of Ashiana Nagar is more polluted as compared to Patliputra and Shashtrinagar region..

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