

## Estimation of Chloride Hardness in Drinking Water in University of Education, Vehari Campus, Vehari, Punjab, Pakistan

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### Abstract

The drinking water in University of Education Vehari (UEV) was analyzed to monitor its Chloride hardness. This project was performed in chemistry Lab of UEV. The chemical/analytical test used to analyze the water Chloride hardness was Argentometric Titration or Mohr Method of analysis. In this test, a water sample was tested properly in chemistry lab. From the results, the molarity of Chloride content was calculated. The molarity of resulted Chloride was 0.0133, showing the most hardness of water. It is declared that due to hardness of Chloride amounts in drinking water, the water of university is unfit for drinking. This concentration of Chloride ions in very small water sample is too much. In normal, we daily intake 6-8 glasses of water which means 800-1000 ml or 1 L daily. If we calculate this concentration for 1 L, it will be most dangerous especially for human health. Chloride hardness causes various typical issues, for example, evaporator scaling, washing, spots on sink, sturdiness of hair and skin. It is also said that hard water causes diverse therapeutic problems; for example, urolithiasis, cardiovascular confusion, kidney problems, anencephaly. It can cause most of stomach diseases in humans. So, authors recommended using this water after boiling, filtration or chlorination of water.

**Keywords:** Sodium bentonite; Cetyltrimmonium bromide; Titration; Meta-xylene; Kinetic model equations; Remediation; Argentometric

### Introduction

Common assets are the imperative abundance of our nation, water is one of them. Water is a meander of the nature. "No existence without water" is a typical motto relying on the way that water is one of the normally happening fundamental prerequisites of all life supporting exercises [1]. Water is a requisite natural resource on earth. Safe drinking water is the prime need of every human being [2]. It is a dynamic framework, containing living and in addition non-living, natural, inorganic, solvent and additionally insoluble substances. So its quality is probably going to change step by step and from source to source. Water quality parameters are the physical, substance and organic attributes of water [3]. The water which entities drink and use for different reasons for existing is perfect water [4]. This infers the water must be free of germs and chemicals and be cleared. Safe drinking-water is a fundamental requirement for human advancement, and wellbeing. So, it is a globally acknowledged human right [5].

Groundwater is the real source of drinking water [6]. Over half population on the earth relies on ground water. Just 1% section is accessible ashore to drink, agribusiness, local power era, modern fulfilment, transportation and waste transfer [7]. By and large, drinking water containing distinctive Calcium and Magnesium salts and other overwhelming metals including Cd, Cr, Co, Hg, Ni, Pb, Zn and so on [8].

Hard water contains a higher than typical grouping of Calcium and Magnesium particles [9]. The explanation for is shake sort, sedimentary shake, which is rich in Calcium and Magnesium [10]. Water hardness causes various distinctive issues, for example,

evaporator scaling, washing, spots on sink, sturdiness of hair and skin. It is additionally said that hard water likewise causes different medical issues like as urolithiasis, cardiovascular confusion, kidney issues, anencephaly and disease [11-14]. Most extreme reasonable level endorsed by WHO for drinking water is 500 mg/l as set. As per a few orders, water having hardness up to 75 mg/l is named soft, 76-150 mg/l is decently soft, 151-300 mg/l as hard and more than 300 mg/l as very hard [15].

New water shortage is expanding internationally on account of overpopulation [16-18]. Numerous scientists have likewise dealt with the water and human right [19]. The extreme ingestion of any one of these salts and overwhelming metals including Cd, Cr, Co, Hg, Ni, Pb and Zn effectively affect human wellbeing [20]. The total population is expanding step by step and this ceaseless increment in population brings about lack of new water accessibility around there. The persistent expanding population raises the necessity of water for the generation of sustenance stuff, agribusiness, industry and the local usage [21]. In Pakistan drinking water is persistently being disintegrated because of untreated civil and mechanical water and waste from farming profluent. There are various potential sources that can make the pollution of water make it hazardous for drinking [22].

### Experimental

#### Chemicals

Water sample (collected from Girls Hostel in University of Education Vehari Campus), Silver Nitrate ( $\text{AgNO}_3$ ) solution (0.01 M), Eriochrome Black-T (indicator).

## Methods

The water sample was taken from girl's hostel in University of Education Vehari Campus and was analyzed to check its Chloride hardness. First of all, we washed all the apparatus with distilled water and dried them on oven, then weighed 0.1698 g AgNO<sub>3</sub> on electrical balance. We took 100 ml conical flask, added weighted AgNO<sub>3</sub> in it, filled up to the mark and then shook it well [23-25]. It was 0.01 M AgNO<sub>3</sub> solution. Then, we took a 10 ml water sample in a flask. Added few drops of indicator in sample flask and sample color was changed into wine red. After this, we took a burette and filled it with 0.01 M AgNO<sub>3</sub> up to zero mark. By using burette, titrated the sample until the

purple blue color was appeared which was endpoint. Repeated the experiment and calculated the molarity of sample (Table 1).

Preparation of 0.01 M AgNO<sub>3</sub> solution:

$$1 \text{ M} = 169.8 \text{ g}/1000 \text{ ml}$$

$$1 \text{ M} = 16.98 \text{ g}/100 \text{ ml}$$

$$1/100 \text{ M} = (16.98 \text{ g}/100) \times 100 \text{ ml}$$

$$0.01 \text{ M} = 0.1698 \text{ g}/100 \text{ ml}$$

No.	Initial volume of AgNO <sub>3</sub> used (V <sub>i</sub> ) ml	Final volume of AgNO <sub>3</sub> used (V <sub>f</sub> ) ml	V <sub>f</sub> -V <sub>i</sub> =V <sub>1</sub> ml
1	0	13.5	13.5
2	13.5	26.5	13
3	26.5	40	13.5
Average=13.33 ml			

Table 1: Concentration of Silver nitrate (AgNO<sub>3</sub>) used in Chloride containing water.

$$M_1=0.01 \text{ M}, V_1=13.33 \text{ ml}, n_1=1, M_2=?, V_2=10 \text{ ml}, n_2=1$$

AgNO<sub>3</sub>=Chloride ion

$$M_1 V_1 n_1 = M_2 V_2 n_2$$

$$0.01 \times 13.331 = M_2 \times 10 \times 1$$

$$M_2 = 0.01 \times 13.331/10$$

$$M_2 = 0.0133.$$

## Results and Discussion

The molarity of resulted Chloride was 0.0133, showing the most hardness of water. After the analytical tests, it is resulted that the water sample of girl's hostel in University of Education Vehari Campus is very hard and unfit for drinking because it contains 0.013 molar Chloride ions per 10 ml of water sample. This concentration of Chloride ions in very small water sample is too much while, normally we daily intake 6-8 glasses of water i.e., 800-1000 ml or 1 L daily [26-28]. If we calculate this concentration for 1 L, it will be most dangerous especially for human's health. So, it is not safe to drink, because of contamination of high amounts of Chloride contents more than suitable recommended amount of Chloride acceptable for health. Chloride hardness causes various distinctive issues, for example, evaporator scaling, washing, spots on sink, sturdiness of hair and skin. It is additionally said that hard water likewise causes different medical issues like as urolithiasis, cardiovascular confusion, kidney issues, anencephaly and disease.

## Conclusion

From the results, the molarity of resulted Chloride was 0.0133, showing the most hardness of water. It is declared that due to high hardness of Chloride amounts in drinking water, the water of girl's hostel in University of Education Vehari Campus is unfit for drinking. This hardness causes health diseases in humans. Chloride hardness causes various typical issues, for example, evaporator scaling, washing, spots on sink, sturdiness of hair and skin. It is also said that hard water

causes diverse therapeutic problems; for example, urolithiasis, cardiovascular confusion, kidney problems, anencephaly. It can cause most of stomach diseases in humans. So, authors recommended using this water after boiling, filtration or water treatment by an expert chemist specialized in relevant field of analysis. Treatment of water must be done by an expert chemist, because the unusual amount of chlorine is also much toxic for health of humans.

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