In the present study having 32 wards of North Indore city, two samples collected from each wards. Most of wards are covered by the Industrial areas in North Indore city. In some wards the water is supplied by tube well water, Narmada water project and Yashwant Sager Project. Mostly Underground water is the only source as drinking water for the industrial areas of North Indore city.

Indore city is the metropolitan and industrial centre of Madhya Pradesh and lies in the heart of Malwa plateau at an altitude of 553 m above sea level, on the banks of the khan River. It is the commercial capital of the state of Madhya Pradesh. The population pressure on the city is ever growing. The population of Indore city is 1960631 as 2011 census.

Water samples were analyzed physically, chemically and bacteriological by Standard method of water and waste water (APHA, 1989) and practical methods for water pollution studies (Trivedy et.al., 1987).

**pH**

After testing the pH meter electrode was removed from buffer solution. Rinsed, dried and placed into the sample to be tested. pH of the sample was read on the pH meter directly.

**Total Dissolved Solids**

Total dissolved solids of the drinking water sample were measured by TDS meter directly.

**Electrical Conductivity**

Electrical conductivity of the water samples was measured by conductivity meter. Specific conductivity in µmhos/cm was represented.
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Total Hardness

50 ml sample was taken in flask and 1 ml of ammonia buffer solution and five drop of Erichrome black-T indicator were added and the solution was titrated with EDTA solution until the wine red colour changed to clear blue. The total hardness was calculated by the relation

\[ \text{Total hardness} = \frac{\text{ml titrant} \times 1000}{50} \]

Calcium Hardness

50 ml sample was taken in a flask and 2 ml of 1N NaOH and murexide were added and mixed. The contents were titrated with EDTA solution until the pink colour change to dark purple. Calcium hardness as mg CaCO$_3$ calculated by the relation.

\[ \text{Calcium hardness} = \frac{\text{ml titrant} \times 1000}{50} \]

Magnesium Hardness

Magnesium hardness was calculated by the relation.

\[ \text{Magnesium hardness} = \text{Total hardness} - \text{calcium hardness} \times 0.244 \]

Carbonates, Bicarbonates and Total Alkalinity

50 ml sample was taken in a flask. To this two drop of Phenolphthalein indicator was added. On change of colour to pink, the samples were titrated with sulphuric acid titrant till the disappearance of pink colour. The volume of titrant used was recorded (P) and carbonate alkalinity was calculated using relation-1.

To the sample three drops of methyl orange indicator were added and was titrated using sulphuric acid titrant and on the end point the yellow colour
Materials and Methods

changed to pink orange. The volume of titrant used was recorded (M) and the bicarbonate alkalinity was calculated using relation-2.

Total alkalinity was calculated using relation -3.

1- $\text{CO}_3 \text{ mg/l} = \frac{P \times 1000}{50}$

2- $\text{HCO}_3 = \frac{M \times 1000}{50}$

3- Total Alkalinity = $\frac{P + M \times 1000}{50}$

Chlorides

To a flask containing 50 ml sample potassium chromate indicator was added and the content was titrated with silver nitrate titrant to brisk red end point. Chloride content was calculated in mg/l by the relation.

$\frac{ml \text{ titrant} \times 0.141 \times 35.46 \times 1000}{50}$

Fluoride

By Spands method (Spectrophotometric)

Fluoride iron reacts with zirconium ion to form stable complex ion $\text{ZrF}_6$ which bleaches the reddish colour of zirconium and alizarine complex. 50 ml sample + 5 ml SPAND reagent + zirconium acid reagent mix & read at 570 nm compare with standard calibration curve of solutions of different concentrations of anhydrous sodium fluoride.

Nitrate

Nitrate was determined using brucine sulfanilic acid method. To a 10 ml. sample in Nessler’s tube 2 ml. of NaCL solution was added and 10 ml. of
Materials and Methods

Sulphuric acid solution was added. 05 ml of Brucine Sulfunilic acid solution was added and mixed thoroughly and reading was obtained on 410 nm.

\[
\text{Mg/l Nitrate-N} = \frac{\text{mg NO}_3\text{--N}}{10}
\]

**Sulphate**

To a 100 ml. sample in a flask 5 ml. of conditioning reagent was added. Sulphates were determined by turbidimetric method. Barium chloride crystals were added. Solution was taken in cuvettes and read at 420 nm.

\[
= \frac{\text{Mg SO}_4 \text{ from Curve} \times 1000}{50}
\]

**Sodium**

Sodium content in water samples was determined by flame photometer. 50 ml. of samples was aspirates into the capillary using sodium filter and the readings were recorded. Result in mg/l were calculated using the standard curve.

**Potassium**

Potassium content were determined in similar manner by flame Photometer using potassium filter and result in mg/l were obtained from the standard curve.

**Iron**

Take 50 ml sample in a 150 ml conical flask. Added 2 m conc. HCL and 1 ml of Hydroxylamine hydrochloride solution and boil the content.
Cool and added 10 ml ammonium acetate buffer and 2 ml phenanthroline solution. Made up the volume to 100 ml and after 10 Minutes take the readings at 510 n on a spectrophotometer.

And find concentration of iron with the help of standard curve.

**Copper**

Bathocuproine method

50 ml sample was taken in a 250 ml Erlenmeyer flask and added 1 ml HCL, 5 m NH₂ OH, HCL solution, 5 ml sodium citrate solution and 2 ml disodium bathocuproine disulfonate solution one by one. The solution was measured at 484 nm on a Spectrophotometer. The concentration of copper was calibrated by standard curve.

\[
\text{Copper Mg/l} = \frac{\mu g \text{Cu}}{\text{ml sample}}
\]

**Lead**

Lead was determined with the help of Atomic Absorption spectrophotometer.

**Zinc**

Determined the concentration of Zn on the Atomic absorption spectrophotometer, set the instrument at 213.9 nm, use 2n Hollow cathode Lamp, and aspirated sample in air acetylene flame and found concentration of zinc with the help of calibration curve.

**Cadmium**
Determined the concentration of Cd on the atomic absorption spectrophotometer, set the instrument at 228.8 nm, use cadmium Hollow cathode lamp and aspirated the sample in Air-acetylene Flame and found concentration of Cadmium with the help of calibration curve.

**Mercury**

By dithizone method (spectrophotometer)

Mercury ion reacts with dithizone in chloroform to from orange colour & measured at 492 nm on spectrophotometer.

100 ml sample + 1 ml potassium permanganate + 10 ml conc. Sulphuric acid stir & boil + 5 ml potassium persulphate coolkeep for 30 min + 5 drop Hydroxylamine Hydrochloride filter + 25 ml dithizone solution take organic layer in separating funnel wash with dithizone & extract with 0.25 N sulphuric acid + 50 ml 0.25 N sulphuric acid + 10 ml potassium bromide discard dithizone layer. Add 20 ml phosphate buffer + 10 ml dithiozone at 492 nm. Compare with calibration curve with standard solution of Mercuric chloride.