Ambekeshwar Group Of Institutions



Technology & Management, Lucknow

**Session: 2023-24**

Practical File

# **Branch:- CSE 2nd Year | 3rd Sem**

**Subject:- Environmental studies**

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INDEX

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S. no.** | **Name of Exp.** | **Date** | **Subject**  **Teacher**  **Sign** | **Academic**  **Co-ordinator**  **Sign** |
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**Experiment No: 1**

**Object: -** To find the pH value of a given water sample with the help of a pH meter.

**Apparatus and reagents**

1. pH meter
2. pH electrode
3. Stand
4. Buffer solution of pH 4 and 7
5. Beker 250ml

**Principle: -**

1. The concentration of H+ and OH- in neutral water is equal.
2. The concentration of H+ in acidic water is greater than that of OH-.
3. The concentration of OH- in alkaline water is greater than the concentration of H+.
4. Acids or bases decompose water into H+ and OH-.
5. pH value – The pH value of a solution is equal to the logarithm of the reciprocal of the concentration of hydrogen ion H+.

Value of pH in neutral water = log10 []

(vi) The concentration of H+ ion in neutral water is 10-7.

= log10 []

= 7

**NOTE-**

* The pH value of neutral water is 7.
* The pH value of acidic water ranges from 0 to 7.
* The pH value of alkaline water ranges from 7 to 14.

**pH Meter**

1. It has a joint electrode which is made by joining two electrodes.
2. In this one electrode is Quinhydrone and the other is Calomel electrode.
3. The concentration of H' between the two electrodes on dipping the joint electrode in solution. A potential difference is produced in the ratio.
4. The potential difference is measured in mv by a pH meter.
5. Apparatus is calibrated directly to the ratio of this potential difference to the pH value.
6. The pH value of a solution can be determined with the help of a pH meter.

**Procedure: -**

1. First prepare the electrode for use.
2. First of all, the joint electrode is tightened in the spring clip of the stand. Thereafter, the rubber cap of the electrode is carefully detached and a solution of 7.5% potassium chloride is filled into the electrode about 5 mm below the hole in the rubber cap.
3. If the solution of potassium chloride (KCl) is already filled, then the rubber cap is put on like this. In this way the electrode is ready for use.
4. To calibrate the pH meter, the electrode is dipped in a buffer solution of pH 7.0.
5. Now adjust the temperature control slurry to the temperature of the buffer solution. heating of the buffer solution before Know from now on.
6. After this the functional selector switch (F.S. switch) is brought to the pH position and the display reading is brought to the pH of the buffer solution with the help of Calibrate knob.
7. Now Functional selector switch is called S.T.D. position by.
8. Now take the electrode out of the buffer solution, wash it with distilled water and tissue paper. clean with.
9. Thereafter, the combined electrode is placed in a standard buffer solution of pH 4.0are immersed and the temperature regulator adjusts the slurry to the temperature of the buffer solution.
10. Now F.S. The switch is brought to the pH position. The slope controller is then rotated to adjust the display reading to the pH value (4 pH) of the standard buffer solution.
11. Now check the display reading by dipping the electrode in distilled water and wiping it with a tissue paper in a buffer solution of pH 7.0. Now the pH meter is calibrated.
12. Now F.S. switch to ST.D. By bringing the electrode to the by position, remove the electrode from the buffer solution, wash it in distilled water and clean it with a tissue paper.
13. Now repeat the whole process with water sample.
14. The reading of pH meter is noted from the display. This reading is the pH value of the water sample Will happen.
15. In this way by taking three readings of the water sample, we find their average.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| pH Value | Temperature | | | | | | |
| 0 | 10 | 20 | 30 | 40 | 50 | 60 |
| 4.0 | 4.006 | 3.998 | 4.002 | 4.015 | 4.035 | 4.066 | 4.102 |
| 7.0 | 7.114 | 7.055 | 7.011 | 6.982 | 6.967 | 6.969 | 6.972 |
| 9.0 | 9.384 | 9.302 | 9.219 | 9.137 | 9.056 | 8.976 | 8.892 |

**Note: -** The pH value of the buffer solution varies with temperature, so the display reader should be adjusted to the pH value of the buffer solution's current temperature.

Table 1 - Change in pH value of buffer solution with temperature

* Table-1 shows that the change in pH value with temperature is negligible. Therefore, the display reading can be adjusted to pH values of 4, 7 and 9.2 respectively.
* The instrument should be calibrated at the pH value of the current temperature to determine the exact pH value.

**Observation: -**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Description of sample** | **No. of sample** | **Temperature** | **pH value** | **Average pH value** |
|  | **1** | **-** | **-** | **-** |
|  | **2** | **-** | **-** | **-** |
|  | **3** | **-** | **-** | **-** |

**Result -** pH value of the given water sample is =………………

**Precautions: -**

1. The pH should be calibrated with a standard buffer solution.

2. Use 3M or saturated solution of KCI.