

CHAPTER - III

RESULTS AND DISCUSSION



3.1 RESULTS

TABLE NO.1

THE COULOMETRIC ESTIMATION OF DIFFERENT SUGARS

CONDITIONS :

- 1) pH = 8
- 2) Current = 40 mA
- 3) Temperature = 25°C

| Name of the sugar | Sugar taken (mg) | Time measured (Sec) | Sugar found (mg) | %Error | Average % Error |
|-------------------|------------------|---------------------|------------------|--------|-----------------|
| 1 | 2 | 3 | 4 | 5 | 6 |
| D-Arabinose | 2 | 65 | 2.0207 | 1.03 | 1.22 |
| | 4 | 131 | 4.0725 | 1.81 | |
| | 8 | 261 | 8.1139 | 1.42 | |
| | 12 | 390 | 12.1243 | 1.03 | |
| | 14 | 456 | 14.1761 | 1.25 | |
| | 16 | 520 | 16.1658 | 1.03 | |
| | 18 | 585 | 18.1865 | 1.03 | |
| D-Xylose | 2 | 65 | 2.0207 | 1.03 | 1.02 |
| | 4 | 131 | 4.0725 | 1.81 | |
| | 8 | 262 | 8.1450 | 1.81 | |
| | 12 | 391 | 12.1554 | 1.29 | |
| | 14 | 453 | 14.0829 | 0.59 | |
| | 16 | 517 | 16.0725 | 0.45 | |
| | 18 | 580 | 18.0310 | 0.17 | |

| 1 | 2 | 3 | 4 | 5 | 6 |
|-----------|----|-----|---------|--------|------|
| | 2 | 57 | 2.1283 | 6.41 | |
| | 4 | 110 | 4.1072 | 2.68 | |
| | 8 | 220 | 8.2145 | 2.68 | |
| D-Glucose | 12 | 330 | 12.3218 | 2.68 | 2.39 |
| | 14 | 380 | 14.1887 | 1.34 | |
| | 16 | 430 | 16.0557 | 0.34 | |
| | 18 | 485 | 18.1093 | 0.60 | |
| ----- | | | | | |
| | 2 | 27 | 2.0162 | 0.81 | |
| | 4 | 55 | 4.1072 | 2.68 | |
| Maltose | 8 | 107 | 7.9905 | - 0.11 | 0.75 |
| | 12 | 161 | 12.0231 | 0.19 | |
| | 14 | 188 | 14.0394 | 0.28 | |
| | 16 | 216 | 16.1303 | 0.81 | |
| | 18 | 242 | 18.0720 | 0.40 | |
| ----- | | | | | |
| | 2 | 27 | 2.0162 | 0.81 | |
| | 4 | 55 | 4.1072 | 2.68 | |
| | 8 | 107 | 7.9905 | - 0.11 | |
| Lactose | 12 | 161 | 12.0231 | 0.19 | 0.75 |
| | 14 | 188 | 14.0394 | 0.28 | |
| | 16 | 216 | 16.1303 | 0.81 | |
| | 18 | 242 | 18.0720 | 0.40 | |
| ----- | | | | | |

| 1 | 2 | 3 | 4 | 5 | 6 |
|-----------|----|-----|---------|--------|------|
| | 2 | 16 | 1.9714 | - 1.42 | |
| | 4 | 33 | 4.0661 | 1.65 | |
| Raffinose | 8 | 65 | 8.0090 | 0.11 | 0.82 |
| | 12 | 97 | 11.9520 | - 0.39 | |
| | 14 | 113 | 13.9234 | - 0.54 | |

TABLE NO. 2

THE EFFECT OF PH ON COULOMETRIC ESTIMATION OF SUGARS

CONDITIONS :

- 1) pH = 8.4
- 2) Current = 40 mA
- 3) Temperature = 25°C

| Name of the sugar | Sugar taken (mg) | Time measured (Sec) | Sugar found (mg) | %Error | Average %Error |
|-------------------|------------------|---------------------|------------------|--------|----------------|
| 1 | 2 | 3 | 4 | 5 | 6 |
| D-Arabinose | 4 | 130 | 4.0414 | 1.03 | 0.82 |
| | 6 | 195 | 6.0621 | 1.03 | |
| | 8 | 258 | 8.0207 | 0.25 | |
| | 10 | 324 | 10.0725 | 0.72 | |
| | 12 | 390 | 12.1243 | 1.03 | |
| | 16 | 520 | 16.1658 | 1.03 | |
| D-Xylose | 20 | 648 | 20.1450 | 0.72 | 0.87 |
| | 4 | 130 | 4.0414 | 1.03 | |
| | 6 | 195 | 6.0621 | 1.03 | |
| | 8 | 258 | 8.0207 | 0.25 | |
| | 10 | 324 | 10.0725 | 0.72 | |
| | 12 | 390 | 12.1243 | 1.03 | |
| | 16 | 520 | 16.1658 | 1.03 | |
| | 20 | 650 | 20.2072 | 1.03 | |

| 1 | 2 | 3 | 4 | 5 | 6 |
|-----------|----|-----|---------|------|------|
| | 2 | 54 | 2.0162 | 0.81 | |
| | 4 | 107 | 3.9952 | 0.11 | |
| | 6 | 161 | 6.0115 | 0.19 | |
| D-Glucose | 8 | 215 | 8.0278 | 0.34 | 0.53 |
| | 10 | 322 | 12.0231 | 0.19 | |
| | 16 | 430 | 16.0557 | 0.34 | |
| | 20 | 545 | 20.3496 | 1.74 | |
| | 4 | 54 | 4.0325 | 0.81 | |
| | 6 | 81 | 6.0488 | 0.81 | |
| Maltose | 8 | 108 | 8.0651 | 0.81 | 0.75 |
| | 12 | 161 | 12.0231 | 0.19 | |
| | 16 | 215 | 16.0557 | 0.34 | |
| | 20 | 272 | 20.3123 | 1.56 | |
| | 4 | 54 | 4.0325 | 0.81 | |
| | 6 | 81 | 6.0488 | 0.81 | |
| | 8 | 108 | 8.0651 | 0.81 | |
| Lactose | 12 | 161 | 12.0231 | 0.19 | 0.73 |
| | 14 | 188 | 14.0394 | 0.28 | |
| | 16 | 215 | 16.0557 | 0.34 | |
| | 20 | 273 | 20.3870 | 1.93 | |

| 1 | 2 | 3 | 4 | 5 | 6 |
|-----------|----|-----|---------|------|------|
| | 4 | 33 | 4.0661 | 1.65 | |
| | 6 | 49 | 6.0376 | 0.62 | |
| Raffinose | 8 | 65 | 8.009 | 0.11 | 0.77 |
| | 12 | 98 | 12.0752 | 0.62 | |
| | 16 | 131 | 16.1413 | 0.88 | |

TABLE NO.3

 THE EFFECT OF pH ON COULOMETRIC ESTIMATION OF SUGARS

CONDITIONS :

- 1) pH = 8.8
- 2) Current = 40 mA
- 3) Temperature = 25°C

| Name of the sugar | Sugar taken (mg) | Time measured (Sec) | Sugar found (mg) | % Error | Average %Error |
|-------------------|------------------|---------------------|------------------|---------|----------------|
| 1 | 2 | 3 | 4 | 5 | 6 |
| D-Arabinose | 4 | 130 | 4.0414 | 1.03 | 0.65 |
| | 6 | 195 | 6.0621 | 1.03 | |
| | 8 | 258 | 8.0207 | 0.25 | |
| | 12 | 388 | 12.0621 | 0.51 | |
| | 16 | 515 | 16.0102 | 0.06 | |
| D-Xylose | 20 | 650 | 20.2072 | 1.03 | 0.65 |
| | 4 | 130 | 4.0414 | 1.03 | |
| | 6 | 195 | 6.0621 | 1.03 | |
| | 8 | 258 | 8.0207 | 0.25 | |
| | 12 | 388 | 12.0621 | 0.51 | |
| D-Glucose | 16 | 515 | 16.0102 | 0.06 | 0.50 |
| | 20 | 650 | 20.2072 | 1.03 | |
| | 4 | 108 | 4.0325 | 0.81 | |
| | 6 | 161 | 6.0115 | 0.19 | |
| | 8 | 215 | 8.0278 | 0.34 | |
| | 12 | 322 | 12.0231 | 0.19 | |
| | 16 | 430 | 16.0557 | 0.34 | |
| | 20 | 542 | 20.2376 | 1.18 | |

| 1 | 2 | 3 | 4 | 5 | 6 |
|-----------|----|-----|---------|------|------|
| | 4 | 54 | 4.0325 | 0.81 | |
| | 6 | 81 | 6.0488 | 0.81 | |
| Maltose | 8 | 108 | 8.0651 | 0.81 | |
| | 12 | 161 | 12.0231 | 0.19 | 0.62 |
| | 16 | 215 | 16.0557 | 0.34 | |
| | 20 | 270 | 20.1629 | 0.81 | |
| | 4 | 54 | 4.0325 | 0.81 | |
| | 6 | 81 | 6.0488 | 0.81 | |
| | 8 | 108 | 8.0651 | 0.81 | |
| Lactose | 10 | 134 | 10.0068 | 0.06 | 0.54 |
| | 12 | 161 | 12.0231 | 0.19 | |
| | 16 | 215 | 16.0557 | 0.34 | |
| | 20 | 270 | 20.1629 | 0.81 | |
| | 4 | 33 | 4.0661 | 1.65 | |
| | 6 | 49 | 6.0376 | 0.62 | |
| Raffinose | 8 | 65 | 8.0090 | 0.11 | 0.55 |
| | 10 | 81 | 9.9805 | 0.19 | |
| | 12 | 98 | 12.0752 | 0.62 | |
| | 16 | 130 | 16.0181 | 0.11 | |

TABLE NO. 4

THE EFFECT OF pH ON COULOMETRIC ESTIMATION OF SUGARS

CONDITIONS :

- 1) pH = 9.1
- 2) Current = 40 mA
- 3) Temperature = 25°C

| Name of the sugar | Sugar taken (mg) | Time measured (Sec) | Sugar found (mg) | %Error | Average %Error |
|-------------------|------------------|---------------------|------------------|--------|----------------|
| 1 | 2 | 3 | 4 | 5 | 6 |
| D-Arabinose | 2 | 65 | 2.0207 | 1.03 | 0.88 |
| | 4 | 130 | 4.0414 | 1.03 | |
| | 8 | 260 | 8.0829 | 1.03 | |
| | 12 | 390 | 12.1243 | 1.03 | |
| | 14 | 456 | 14.1761 | 1.25 | |
| | 16 | 518 | 16.1036 | 0.64 | |
| | 18 | 580 | 18.0310 | 0.17 | |
| D-Xylose | 2 | 65 | 2.0207 | 1.03 | 0.72 |
| | 4 | 130 | 4.0414 | 1.03 | |
| | 8 | 260 | 8.0829 | 1.03 | |
| | 12 | 389 | 12.0932 | 0.77 | |
| | 14 | 453 | 14.0829 | 0.59 | |
| | 16 | 517 | 16.0725 | 0.45 | |
| | 18 | 580 | 18.0310 | 0.17 | |

| 1 | 2 | 3 | 4 | 5 | 6 |
|-----------|----|-----|---------|------|------|
| | 2 | 55 | 2.0536 | 2.68 | |
| | 4 | 109 | 4.0699 | 1.74 | |
| | 8 | 216 | 8.0651 | 0.81 | |
| D-Glucose | 12 | 323 | 12.0604 | 0.50 | 1.19 |
| | 14 | 379 | 14.1514 | 1.08 | |
| | 16 | 430 | 16.0557 | 0.34 | |
| | 18 | 488 | 18.2213 | 1.22 | |
| | 2 | 27 | 2.0162 | 0.81 | |
| | 4 | 54 | 4.0324 | 0.81 | |
| | 8 | 108 | 8.0651 | 0.81 | |
| Maltose | 12 | 161 | 12.0231 | 0.19 | 0.74 |
| | 14 | 190 | 14.1887 | 1.34 | |
| | 16 | 216 | 16.1303 | 0.81 | |
| | 18 | 242 | 18.0720 | 0.40 | |
| | 2 | 27 | 2.0162 | 0.81 | |
| | 4 | 54 | 4.0324 | 0.81 | |
| | 8 | 108 | 8.0651 | 0.81 | |
| Lactose | 12 | 162 | 12.0977 | 0.81 | 0.76 |
| | 14 | 190 | 14.1887 | 1.34 | |
| | 16 | 215 | 16.0557 | 0.34 | |
| | 18 | 242 | 18.0720 | 0.40 | |

| 1 | 2 | 3 | 4 | 5 | 6 |
|-----------|----|-----|---------|--------|------|
| | 2 | 16 | 1.9714 | - 1.42 | |
| | 4 | 32 | 3.9429 | - 1.42 | |
| | 8 | 65 | 8.0090 | 0.11 | |
| Raffinose | 12 | 98 | 12.0752 | 0.62 | 0.85 |
| | 14 | 114 | 14.0466 | 0.33 | |
| | 16 | 130 | 16.0181 | 0.11 | |
| | 18 | 149 | 18.3592 | 1.99 | |

TABLE NO. 5

SUMMARISED AVERAGE PERCENTAGE ERRORS AT DIFFERENT pH VALUES

CONDITIONS :

- 1) Current = 40 mA
- 2) Temperature = 25°C

| Name of the Sugar | Average Percentage Errors at pH | | | |
|-------------------|---------------------------------|------|------|------|
| | 8.0 | 8.4 | 8.8 | 9.1 |
| D-Arabinose | 1.22 | 0.82 | 0.65 | 0.88 |
| D-Xylose | 1.02 | 0.87 | 0.65 | 0.72 |
| D-Glucose | 2.39 | 0.53 | 0.50 | 1.19 |
| Maltose | 0.75 | 0.75 | 0.62 | 0.74 |
| Lactose | 0.75 | 0.73 | 0.54 | 0.76 |
| Raffinose | 0.82 | 0.77 | 0.55 | 0.85 |

TABLE NO.6

THE EFFECT OF CURRENT MAGNITUDES ON COULOMETRIC ESTIMATION OF SUGARS

CONDITIONS :

- 1) pH = 8.8
- 2) Current = 35 mA
- 3) Temperature = 25°C

| Name of the Sugar | Sugar taken (mg) | Time measured (Sec) | Sugar found (mg) | %Error | Average % Error |
|-------------------|------------------|---------------------|------------------|--------|-----------------|
| 1 | 2 | 3 | 4 | 5 | 6 |
| D-Arabinose | 2 | 76 | 2.0673 | 3.36 | 4.09 |
| | 4 | 152 | 4.1347 | 3.36 | |
| | 6 | 228 | 6.2020 | 3.36 | |
| | 8 | 310 | 8.4326 | 5.40 | |
| | 10 | 386 | 10.5 | 5.00 | |
| D-Xylose | 2 | 76 | 2.0673 | 3.36 | 4.09 |
| | 4 | 152 | 4.1347 | 3.36 | |
| | 6 | 228 | 6.2020 | 3.36 | |
| | 8 | 310 | 8.4326 | 5.40 | |
| | 10 | 386 | 10.5 | 5.00 | |
| D-Glucose | 2 | 62 | 2.02563 | 1.28 | 2.05 |
| | 4 | 124 | 4.05126 | 1.28 | |
| | 6 | 188 | 6.1422 | 2.37 | |
| | 8 | 250 | 8.1678 | 2.09 | |
| | 10 | 315 | 10.2915 | 2.91 | |
| | 12 | 376 | 12.2844 | 2.37 | |

| 1 | 2 | 3 | 4 | 5 | 6 |
|-----------|----|------|---------|------|------|
| | 2 | 31 | 2.02563 | 1.28 | |
| | 4 | 61.5 | 4.0185 | 0.46 | |
| Maltose | 6 | 93 | 6.0768 | 1.28 | 1.27 |
| | 8 | 123 | 8.03718 | 0.46 | |
| | 12 | 186 | 12.1537 | 1.28 | |
| | 16 | 252 | 16.4664 | 2.91 | |
| | 2 | 31 | 2.02563 | 1.28 | |
| | 4 | 61.5 | 4.0185 | 0.46 | |
| | 6 | 93 | 6.0768 | 1.28 | |
| Lactose | 8 | 124 | 8.1025 | 1.28 | 1.57 |
| | 12 | 187 | 12.2191 | 1.82 | |
| | 16 | 253 | 16.5317 | 3.32 | |
| | 4 | 38 | 4.0969 | 2.42 | |
| | 6 | 57 | 6.1454 | 2.42 | |
| Raffinose | 8 | 75 | 8.0860 | 1.07 | 1.55 |
| | 10 | 95 | 10.2423 | 2.42 | |
| | 12 | 112 | 12.0752 | 0.62 | |
| | 16 | 149 | 16.0643 | 0.40 | |

TABLE NO. 7

THE EFFECT OF CURRENT MAGNITUDES ON COULOMETRIC ESTIMATION OF
SUGARS

CONDITIONS :

- 1) pH = 8.8
- 2) Current = 45 mA
- 3) Temperature = 25°C

| Name of the Sugar | Sugar taken (mg) | Time measured (Sec) | Sugar found (mg) | % Error | Average % Error |
|-------------------|------------------|---------------------|------------------|---------|-----------------|
| 1 | 2 | 3 | 4 | 5 | 6 |
| D-Arabinose | 2 | 57 | 1.9935 | - 0.32 | |
| | 4 | 115 | 4.0220 | 0.55 | |
| | 6 | 172 | 6.0155 | 0.25 | |
| | 8 | 229 | 8.0090 | 0.11 | 0.43 |
| | 12 | 344 | 12.0310 | 0.25 | |
| | 16 | 458 | 16.0183 | 0.11 | |
| D-Xylose | 20 | 580 | 20.2849 | 1.42 | |
| | 2 | 57 | 1.9935 | - 0.32 | |
| | 4 | 115 | 4.0220 | 0.55 | |
| | 6 | 172 | 6.0155 | 0.25 | |
| | 8 | 229 | 8.0090 | 0.11 | 0.43 |
| | 12 | 344 | 12.0310 | 0.25 | |
| | 16 | 458 | 16.0183 | 0.11 | |
| | 20 | 580 | 20.2849 | 1.42 | |

| 1 | 2 | 3 | 4 | 5 | 6 |
|-----------|----|-------|---------|------|------|
| | 2 | 48 | 2.0162 | 0.81 | |
| | 4 | 95.5 | 4.0115 | 0.28 | |
| D-Glucose | 6 | 143 | 6.0068 | 0.11 | 0.51 |
| | 8 | 190.5 | 8.0021 | 0.02 | |
| | 12 | 290 | 12.1818 | 1.5 | |
| | 20 | 478 | 20.0789 | 0.39 | |
| | 2 | 24 | 2.0162 | 0.81 | |
| | 4 | 48 | 4.0325 | 0.81 | |
| | 6 | 71.5 | 6.0068 | 0.11 | |
| Maltose | 8 | 95.5 | 8.0231 | 0.28 | 0.54 |
| | 12 | 143 | 12.0137 | 0.11 | |
| | 16 | 190.5 | 16.0043 | 0.02 | |
| | 20 | 242 | 20.3310 | 1.65 | |
| | 4 | 48 | 4.0325 | 0.81 | |
| | 8 | 95.5 | 8.0231 | 0.28 | |
| | 10 | 119 | 9.9974 | 0.02 | |
| Lactose | 12 | 143.5 | 12.0557 | 0.46 | 0.51 |
| | 16 | 191 | 16.0463 | 0.28 | |
| | 20 | 241 | 20.2469 | 1.23 | |

| 1 | 2 | 3 | 4 | 5 | 6 |
|-----------|----|-------|---------|--------|------|
| | 4 | 29 | 4.0199 | 0.49 | |
| | 6 | 43.5 | 6.0299 | 0.49 | |
| | 8 | 58 | 8.0398 | 0.49 | |
| Raffinose | 10 | 72.5 | 10.0498 | 0.49 | 0.50 |
| | 12 | 86 | 11.9212 | - 0.65 | |
| | 14 | 101 | 14.0004 | 0.00 | |
| | 16 | 116.5 | 16.1490 | 0.93 | |

TABLE NO. 8

THE EFFECT OF CURRENT MAGNITUDES ON COULOMETRIC ESTIMATION OF
SUGARS

CONDITIONS :

- 1) pH = 8.8
- 2) Current = 50 mA
- 3) Temperature = 25°C

| Name of the Sugar | Sugar taken (mg) | Time measured (Sec) | Sugar found (mg) | % Error | Average % Error |
|-------------------|------------------|---------------------|------------------|---------|-----------------|
| 1 | 2 | 3 | 4 | 5 | 6 |
| D-Arabinose | 2 | 52 | 2.02072 | 1.03 | 1.24 |
| | 4 | 105 | 4.0803 | 2.00 | |
| | 8 | 208 | 8.0829 | 1.03 | |
| | 12 | 313 | 12.1632 | 1.36 | |
| | 16 | 415 | 16.1269 | 0.79 | |
| D-Xylose | 2 | 52 | 2.0207 | 1.03 | 1.18 |
| | 4 | 104 | 4.0414 | 1.03 | |
| | 6 | 155 | 6.0233 | 0.38 | |
| | 8 | 206 | 8.0051 | 0.06 | |
| | 12 | 309 | 12.0077 | 0.06 | |
| | 16 | 415 | 16.1269 | 0.79 | |
| D-Glucose | 2 | 43 | 2.0069 | 0.34 | 0.78 |
| | 4 | 86 | 4.0139 | 0.34 | |
| | 6 | 130 | 6.0675 | 1.12 | |
| | 8 | 173 | 8.0745 | 0.93 | |
| | 10 | 216 | 10.0814 | 0.81 | |
| | 12 | 259 | 12.0884 | 0.73 | |
| | 16 | 347 | 16.1957 | 1.22 | |

| 1 | 2 | 3 | 4 | 5 | 6 |
|-----------|----|-----|---------|------|------|
| | 4 | 43 | 4.0139 | 0.34 | |
| | 6 | 65 | 6.0675 | 1.12 | |
| | 8 | 86 | 8.0278 | 0.34 | |
| Maltose | 10 | 108 | 10.0814 | 0.81 | 0.51 |
| | 12 | 129 | 12.0417 | 0.34 | |
| | 16 | 172 | 16.0557 | 0.34 | |
| | 20 | 215 | 20.0696 | 0.34 | |
| | 4 | 43 | 4.0139 | 0.34 | |
| | 6 | 65 | 6.0675 | 1.12 | |
| | 8 | 86 | 8.0278 | 0.34 | |
| Lactose | 10 | 108 | 10.0814 | 0.81 | 0.47 |
| | 12 | 129 | 12.0417 | 0.34 | |
| | 14 | 150 | 14.0020 | 0.01 | |
| | 16 | 172 | 16.0557 | 0.34 | |
| | 4 | 26 | 4.0045 | 0.11 | |
| | 8 | 52 | 8.0090 | 0.11 | |
| Raffinose | 12 | 78 | 12.0136 | 0.11 | 0.11 |
| | 16 | 104 | 16.0181 | 0.11 | |
| | 20 | 130 | 20.0226 | 0.11 | |

TABLE NO. 9

SUMMARISED AVERAGE PERCENTAGE ERRORS AT DIFFERENT CURRENT
MAGNITUDES

CONDITIONS :

1) pH = 8.8

2) Temperature = 25°C

| Name of the Sugar | Average Percentage Errors at Current | | | |
|-------------------|--------------------------------------|-------|-------|-------|
| | 35 mA | 40 mA | 45 mA | 50 mA |
| D-Arabinose | 4.09 | 0.65 | 0.43 | 1.24 |
| D-Xylose | 4.09 | 0.65 | 0.43 | 1.18 |
| D-Glucose | 2.05 | 0.50 | 0.51 | 0.78 |
| Maltose | 1.27 | 0.62 | 0.54 | 0.51 |
| Lactose | 1.57 | 0.54 | 0.51 | 0.47 |
| Raffinose | 1.55 | 0.55 | 0.50 | 0.11 |

TABLE NO. 10

 THE EFFECT OF TEMPERATURE ON COULOMETRIC ESTIMATION OF SUGARS

CONDITIONS :

- 1) pH = 8.8
- 2) Current = 45 mA
- 3) Temperature = 30°C

| Name of the sugar | Sugar taken (mg) | Time measured (Sec) | Sugar found (mg) | %Error | Average %Error |
|-------------------|------------------|---------------------|------------------|--------|----------------|
| D-Arabinose | 2 | 57.5 | 2.0110 | 0.55 | |
| | 4 | 114.5 | 4.0045 | 0.11 | |
| | 6 | 172 | 6.0155 | 0.25 | |
| | 8 | 229 | 8.0090 | 0.11 | 0.40 |
| | 10 | 287 | 10.0375 | 0.37 | |
| | 12 | 344 | 12.0310 | 0.31 | |
| D-Xylose | 2 | 57.5 | 2.0110 | 0.55 | |
| | 4 | 114.5 | 4.0045 | 0.11 | |
| | 6 | 172 | 6.0155 | 0.25 | 0.40 |
| | 8 | 229 | 8.0090 | 0.11 | |
| | 10 | 287 | 10.0375 | 0.37 | |
| | 12 | 344 | 12.0310 | 0.31 | |
| D-Glucose | 2 | 47.5 | 1.9952 | - 0.23 | |
| | 4 | 95.5 | 4.0115 | 0.28 | |
| | 6 | 143 | 6.0068 | 0.11 | 0.20 |
| | 8 | 191 | 8.0231 | 0.28 | |
| | 12 | 286 | 12.0137 | 0.11 | |

| Name of the sugar | Sugar taken (mg) | Time measured (Sec) | Sugar found (mg) | %Error | Average %Error |
|-------------------|------------------|---------------------|------------------|--------|----------------|
| Maltose | 2 | 23.8 | 1.9994 | - 0.02 | 0.19 |
| | 4 | 47.5 | 3.9905 | - 0.23 | |
| | 6 | 71.5 | 6.0068 | 0.11 | |
| | 8 | 95.5 | 8.0231 | 0.28 | |
| | 10 | 119.5 | 10.0394 | 0.39 | |
| | 12 | 143 | 12.0137 | 0.11 | |
| Lactose | 4 | 47.5 | 3.9905 | - 0.23 | 0.22 |
| | 6 | 71.5 | 6.0068 | 0.11 | |
| | 8 | 95.5 | 8.0231 | 0.28 | |
| | 10 | 119.5 | 10.394 | 0.39 | |
| | 12 | 143 | 12.0137 | 0.11 | |
| Raffinose | 4 | 29 | 4.0199 | 0.49 | 0.49 |
| | 8 | 58 | 8.0398 | 0.49 | |
| | 12 | 87 | 12.0598 | 0.49 | |
| | 16 | 116 | 16.0797 | 0.49 | |
| | 18 | 130.5 | 18.0897 | 0.49 | |

TABLE NO.11THE EFFECT OF TEMPERATURE ON COULOMETRIC ESTIMATION OF SUGARS

CONDITIONS :

- 1) pH = 8.8
- 2) Current = 45 mA
- 3) Temperature = 35°C

| Name of the sugar | Sugar taken (mg) | Time measured (Sec) | Sugar found (mg) | %Error | Average % Error |
|-------------------|------------------|---------------------|------------------|---------|-----------------|
| D-Arabinose | 4 | 90 | 3.1476 | - 21.30 | |
| | 6 | 160 | 5.598 | - 6.73 | |
| | 8 | 180 | 6.2953 | - 21.30 | - 18.29 |
| | 10 | 235 | 8.2189 | - 17.81 | |
| | 12 | 270 | 9.443 | - 21.30 | |
| | 16 | 360 | 12.5906 | - 21.30 | |
| D-Xylose | 4 | 90 | 3.1476 | - 21.30 | |
| | 6 | 160 | 5.598 | - 6.73 | |
| | 8 | 180 | 6.2953 | - 21.30 | - 18.29 |
| | 10 | 235 | 8.2189 | - 17.81 | |
| | 12 | 270 | 9.443 | - 21.30 | |
| | 16 | 360 | 12.5906 | - 21.30 | |
| D-Glucose | 4 | 60 | 2.5203 | - 36.99 | |
| | 6 | 120 | 5.0407 | - 15.98 | |
| | 8 | 180 | 7.5611 | - 5.48 | - 13.53 |
| | 10 | 225 | 9.4543 | - 5.48 | |
| | 12 | 275 | 11.5517 | - 3.73 | |

| Name of the sugar | Sugar taken (mg) | Time measured (Sec) | Sugar found (mg) | %Error | Average % Error |
|-------------------|------------------|---------------------|------------------|---------|-----------------|
| Maltose | 4 | 20 | 1.6802 | - 57.99 | - 39.78 |
| | 6 | 40 | 3.3604 | - 43.99 | |
| | 8 | 60 | 5.0407 | - 36.99 | |
| | 10 | 80 | 6.7209 | - 32.79 | |
| | 12 | 100 | 8.4012 | - 29.98 | |
| | 16 | 120 | 10.0814 | - 36.99 | |
| Lactose | 4 | 20 | 1.6802 | - 57.99 | - 39.78 |
| | 6 | 40 | 3.3604 | - 43.99 | |
| | 8 | 60 | 5.0407 | - 36.99 | |
| | 10 | 80 | 6.7209 | - 32.79 | |
| | 12 | 100 | 8.4012 | - 29.98 | |
| | 16 | 120 | 10.0814 | - 36.99 | |
| Raffinose | 4 | 25 | 3.4654 | - 13.36 | - 13.12 |
| | 6 | 38 | 5.2675 | - 12.20 | |
| | 8 | 50 | 6.9309 | - 13.36 | |
| | 12 | 75 | 10.3963 | - 13.36 | |
| | 16 | 100 | 13.8618 | - 13.36 | |

TABLE NO. 12

THE EFFECT OF TEMPERATURE ON COULOMETRIC ESTIMATION OF SUGARS

CONDITIONS :

- 1) pH = 8.8
- 2) Current = 45 mA
- 3) Temperature = 40°C

| Name of the sugar | Sugar taken (mg) | Time measured (Sec) | Sugar found (mg) | %Error | Average %Error |
|-------------------|------------------|---------------------|------------------|--------|----------------|
| 1 | 2 | 3 | 4 | 5 | 6 |
| D-Arabinose | 2 | 75 | 2.623 | 31.15 | 36.54 |
| | 4 | 150 | 5.2461 | 31.15 | |
| | 6 | 230 | 8.044 | 34.06 | |
| | 8 | 315 | 11.0168 | 37.71 | |
| | 12 | 510 | 17.8367 | 48.63 | |
| D-Xylose | 2 | 75 | 2.623 | 31.15 | 36.54 |
| | 4 | 150 | 5.2461 | 31.15 | |
| | 6 | 230 | 8.044 | 34.06 | |
| | 8 | 315 | 11.0168 | 37.71 | |
| | 12 | 510 | 17.8367 | 48.63 | |
| D-Glucose | 2 | 60 | 2.5203 | 26.01 | 26.01 |
| | 4 | 120 | 5.0407 | 26.01 | |
| | 6 | 180 | 7.5611 | 26.01 | |
| | 8 | 240 | 10.0814 | 26.01 | |
| | 10 | 300 | 12.6018 | 26.01 | |

| 1 | 2 | 3 | 4 | 5 | 6 |
|-----------|----|-----|----------|-------|-------|
| | 4 | 60 | 5.0407 | 26.01 | |
| | 6 | 90 | 7.5611 | 26.01 | |
| Maltose | 8 | 120 | 10.0814 | 26.01 | 27.69 |
| | 10 | 160 | 13.4419 | 34.41 | |
| | 12 | 180 | 15.1222 | 26.01 | |
| | 4 | 60 | 5.0407 | 26.01 | |
| | 6 | 90 | 7.5611 | 26.01 | |
| Lactose | 8 | 120 | 10.0814 | 26.01 | 27.69 |
| | 10 | 160 | 13.4419 | 34.41 | |
| | 12 | 180 | 15.1222 | 26.01 | |
| | 4 | 30 | 4.1585 | 3.96 | |
| | 8 | 60 | 8.3171 | 3.96 | |
| Raffinose | 10 | 80 | 11.08949 | 10.89 | 5.34 |
| | 12 | 90 | 12.4756 | 3.96 | |
| | 16 | 120 | 16.6342 | 3.96 | |

TABLE NO. 13

SUMMARISED AVERAGE PERCENTAGE ERRORS AT DIFFERENT TEMPERATURES

CONDITIONS :

- 1) pH = 8.8
- 2) Current = 45 mA

| Name of the Sugar | Average Percentage Errors at temperature | | | |
|-------------------|--|------|---------|-------|
| | 25°C | 30°C | 35°C | 40°C |
| D-Arabinose | 0.43 | 0.40 | - 18.29 | 36.54 |
| D-Xylose | 0.43 | 0.40 | - 18.29 | 36.54 |
| D-Glucose | 0.51 | 0.20 | - 13.53 | 26.01 |
| Maltose | 0.54 | 0.19 | - 39.78 | 27.69 |
| Lactose | 0.51 | 0.22 | - 39.78 | 27.69 |
| Raffinose | 0.50 | 0.49 | - 13.12 | 5.34 |

TABLE NO. 14

THE ESTIMATION OF D-ARABINOSE AGAINST BROMINE BY VISUAL METHOD

CONDITIONS :

- 1) pH = 8.8
- 2) Temperature = 25°C

| Sr. No. | Sugar (2 mg/ml) taken (ml) | Br ₂ (0.025M) added (ml) | Br ₂ consumed in terms of 0.05N Na ₂ S ₂ O ₃ (ml) | Sugar taken (mg) | Sugar found (mg) | %Error | Average % Error |
|---------|----------------------------|-------------------------------------|---|------------------|------------------|--------|-----------------|
| 1 | 1.0 | 10 | 0.56 | 2.0 | 2.1000 | 5.00 | |
| 2 | 2.5 | 10 | 1.39 | 5.0 | 5.2125 | 4.25 | |
| 3 | 5.0 | 10 | 2.75 | 10.0 | 10.3125 | 3.12 | 2.52 |
| 4 | 10.0 | 10 | 5.34 | 20.0 | 20.025 | 0.12 | |
| 5 | 20.0 | 20 | 10.68 | 40.0 | 40.05 | 0.12 | |

TABLE NO. 15

THE ESTIMATION OF D-XYLOSE AGAINST BROMINE BY VISUAL METHOD

CONDITIONS :

1) pH = 8.8

2) Temperature = 25°C

| Sr. No. | Sugar (2 mg per ml) taken (ml) | Br ₂ (0.025M) added (ml) | Br ₂ consumed in terms of 0.05N Na ₂ S ₂ O ₃ (ml) | Sugar taken (mg) | Sugar found (mg) | %Error | Average % Error |
|---------|--------------------------------|-------------------------------------|---|------------------|------------------|--------|-----------------|
| 1 | 1 | 10 | 0.58 | 2 | 2.175 | 8.75 | |
| 2 | 2.5 | 10 | 1.40 | 5 | 5.25 | 5.0 | |
| 3 | 5 | 10 | 2.75 | 10 | 10.3125 | 3.12 | 5.00 |
| 4 | 10 | 10 | 5.35 | 20 | 20.0625 | 0.31 | |
| 5 | 20 | 20 | 10.68 | 40 | 40.05 | 0.12 | |

TABLE NO. 16

THE ESTIMATION OF D-GLUCOSE AGAINST BROMINE BY VISUAL METHOD

CONDITIONS :

- 1) pH = 8.8
- 2) Temperature = 25°C

| Sr. No. | Sugar (2 mg/ml) taken (ml) | Br ₂ (0.025M) added (ml) | Br ₂ consumed in terms of 0.05M Na ₂ S ₂ O ₃ (ml) | Sugar taken (mg) | Sugar found (mg) | %Error | Average % Error |
|---------|----------------------------|-------------------------------------|---|------------------|------------------|--------|-----------------|
| 1 | 1 | 10 | 0.47 | 2 | 2.1168 | 5.84 | |
| 2 | 2.5 | 10 | 1.15 | 5 | 5.1796 | 3.59 | |
| 3 | 5 | 10 | 2.23 | 10 | 10.134 | 1.34 | 2.23 |
| 4 | 10 | 10 | 4.45 | 20 | 20.0428 | 0.21 | |
| 5 | 20 | 20 | 8.90 | 40 | 40.0856 | 0.21 | |

TABLE NO. 17

THE ESTIMATION OF MALTOSE AGAINST BROMINE BY VISUAL METHOD

CONDITIONS :

1) pH = 8.8

2) Temperature = 25°C

| Sr. No. | Sugar taken (mg/ml) (ml) | Br ₂ (0.025M) added (ml) | Br ₂ consumed in terms of 0.05N Na ₂ S ₂ O ₃ (ml) | Sugar taken (mg) | Sugar found (mg) | %Error | Average % Error |
|---------|--------------------------|-------------------------------------|---|------------------|------------------|--------|-----------------|
| 1 | 2.5 | 10 | 0.58 | 5 | 5.2246 | 4.49 | |
| 2 | 5 | 10 | 1.14 | 10 | 10.2691 | 2.69 | |
| 3 | 10 | 10 | 2.24 | 20 | 20.1779 | 0.88 | 1.74 |
| 4 | 10 | 10 | 2.23 | 20 | 20.0878 | 0.43 | |
| 5 | 20 | 15 | 4.45 | 40 | 40.0856 | 0.21 | |

TABLE NO. 18THE ESTIMATION OF LACTOSE AGAINST BROMINE BY VISUAL METHOD

CONDITIONS :

1) pH = 8.8

2) Temperature = 25°C

| Sr. No. | Sugar taken (ml) | Br ₂ (0.025M) added (ml) | Br ₂ consumed in terms of 0.05N Na ₂ S ₂ O ₃ (ml) | Sugar taken (mg) | Sugar found (mg) | % Error | Average %Error |
|---------|------------------|-------------------------------------|---|------------------|------------------|---------|----------------|
| 1 | 1 | 10 | 0.25 | 2 | 2.252 | 12.6 | |
| 2 | 2.5 | 10 | 0.57 | 5 | 5.1345 | 2.69 | |
| 3 | 5 | 10 | 1.13 | 10 | 10.1790 | 1.79 | 3.54 |
| 4 | 10 | 10 | 2.23 | 20 | 20.0878 | 0.43 | |
| 5 | 20 | 20 | 4.45 | 40 | 40.0856 | 0.21 | |

TABLE NO. 19

THE ESTIMATION OF RAFFINOSE AGAINST BROMINE BY VISUAL METHOD

CONDITIONS :

- 1) pH = 8.8
- 2) Temperature = 25°C

| Sr. No. | Sugar (2mg/ml) taken (ml) | Br ₂ (0.025M) added (ml) | Br ₂ consumed in terms of 0.05N Na ₂ S ₂ O ₃ (ml) | Sugar taken (mg) | Sugar found (mg) | % Error | Average %Error |
|---------|---------------------------|-------------------------------------|---|------------------|------------------|---------|----------------|
| 1 | 2.5 | 10 | 0.08 | 5 | 1.1890 | - 76.21 | |
| 2 | 5 | 10 | 0.17 | 10 | 2.5267 | - 74.73 | |
| 3 | 10 | 10 | 0.25 | 20 | 3.7157 | - 81.42 | -63.68 |
| 4 | 20 | 10 | 0.40 | 40 | 5.9452 | - 85.13 | |
| 5 | 15 | 10 | 2.0 | 30 | 29.726 | - 0.91 | |

TABLE NO. 20

THE POTENTIOMETRIC TITRATION OF D-ARABINOSE (0.025M) WITH
BROMINE SOLUTION (0.0275M)

| Sr. No. | Sugar added (ml) V | Emf measured (mv) E | ΔE (mv) | ΔV (ml) | $\Delta E / \Delta V$ (mv/ml) | Mean volume (ml) |
|---------|-----------------------|------------------------|-----------------|-----------------|-------------------------------|------------------|
| 1 | 0 | 712 | - | - | - | - |
| 2 | 4 | 676 | 36 | 4 | 9 | 2 |
| 3 | 8 | 608 | 68 | 4 | 17 | 6 |
| 4 | 9 | 565 | 43 | 1 | 43 | 8.5 |
| 5 | 10 | 498 | 67 | 1 | 67 | 9.5 |
| 6 | 10.2 | 481 | 17 | 0.2 | 85 | 10.1 |
| 7 | 10.4 | 448 | 33 | 0.2 | 165 | 10.3 |
| 8 | 10.6 | 389 | 59 | 0.2 | 295 | 10.5 |
| 9 | 10.8 | 367 | 22 | 0.2 | 110 | 10.7 |
| 10 | 11.0 | 356 | 11 | 0.2 | 55 | 10.9 |
| 11 | 12 | 326 | 30 | 1 | 30 | 11.5 |

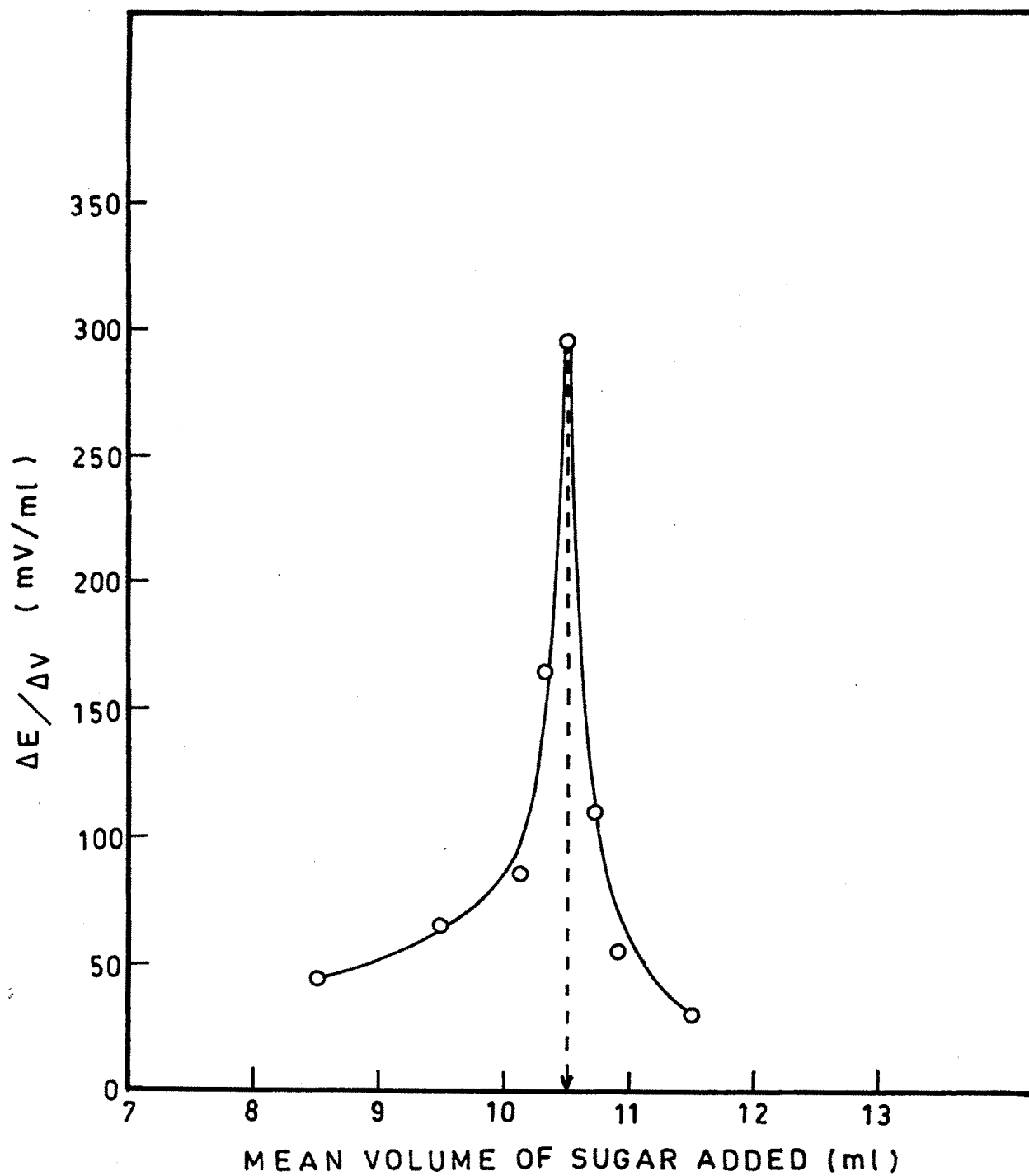


FIG. 3 - DERIVATIVE CURVE FOR THE POTENTIOMETRIC TITRATION OF D-ARABINOSE (0.025 M) AGAINST BROMINE .

TABLE NO. 21

THE POTENTIOMETRIC ESTIMATION OF D-ARABINOSE

CONDITIONS :

1) pH = 8.0

2) Temperature = 25°C

| Sr. No. | Br ₂ (0.0275M) added (ml) | End point detected (ml) | Sugar taken (mg) | Sugar found (mg) | % Error | Average %Error |
|---------|--------------------------------------|-------------------------|------------------|------------------|---------|----------------|
| 1 | 10 | 10.5 | 39.375 | 41.25 | 4.76 | |
| 2 | 2.5 | 2.1 | 10.5 | 10.3125 | - 1.78 | |
| 3 | 5 | 4.3 | 21.5 | 20.625 | - 4.06 | + 2.93 |
| 4 | 10 | 8.5 | 42.5 | 41.25 | - 2.94 | |
| 5 | 15 | 12.5 | 62.5 | 61.875 | - 1.00 | |



TABLE NO. 22

THE POTENTIOMETRIC TITRATION OF D-XYLOSE (0.025M) WITH BROMINE
SOLUTION (0.0275M)

| Sr. No. | Sugar added (ml) V | Emf measured (mV) E | ΔE (mV) | ΔV (ml) | $\Delta E/\Delta V$ (mV/ml) | Mean volume (ml) |
|---------|-----------------------|------------------------|-----------------|-----------------|-----------------------------|------------------|
| 1 | 0 | 730 | - | - | - | - |
| 2 | 4 | 684 | 46 | 4 | 11.5 | 2 |
| 3 | 8 | 620 | 64 | 4 | 16 | 6 |
| 4 | 9 | 581 | 39 | 1 | 39 | 8.5 |
| 5 | 10 | 524 | 57 | 1 | 57 | 9.5 |
| 6 | 10.4 | 483 | 41 | 0.4 | 102.5 | 10.2 |
| 7 | 10.6 | 454 | 29 | 0.2 | 145 | 10.5 |
| 8 | 10.8 | 420 | 34 | 0.2 | 170 | 10.7 |
| 9 | 11 | 364 | 56 | 0.2 | 280 | 10.9 |
| 10 | 11.2 | 345 | 19 | 0.2 | 95 | 11.1 |
| 11 | 11.4 | 338 | 7 | 0.2 | 35 | 11.3 |
| 12 | 12 | 332 | 6 | 0.6 | 10 | 11.7 |

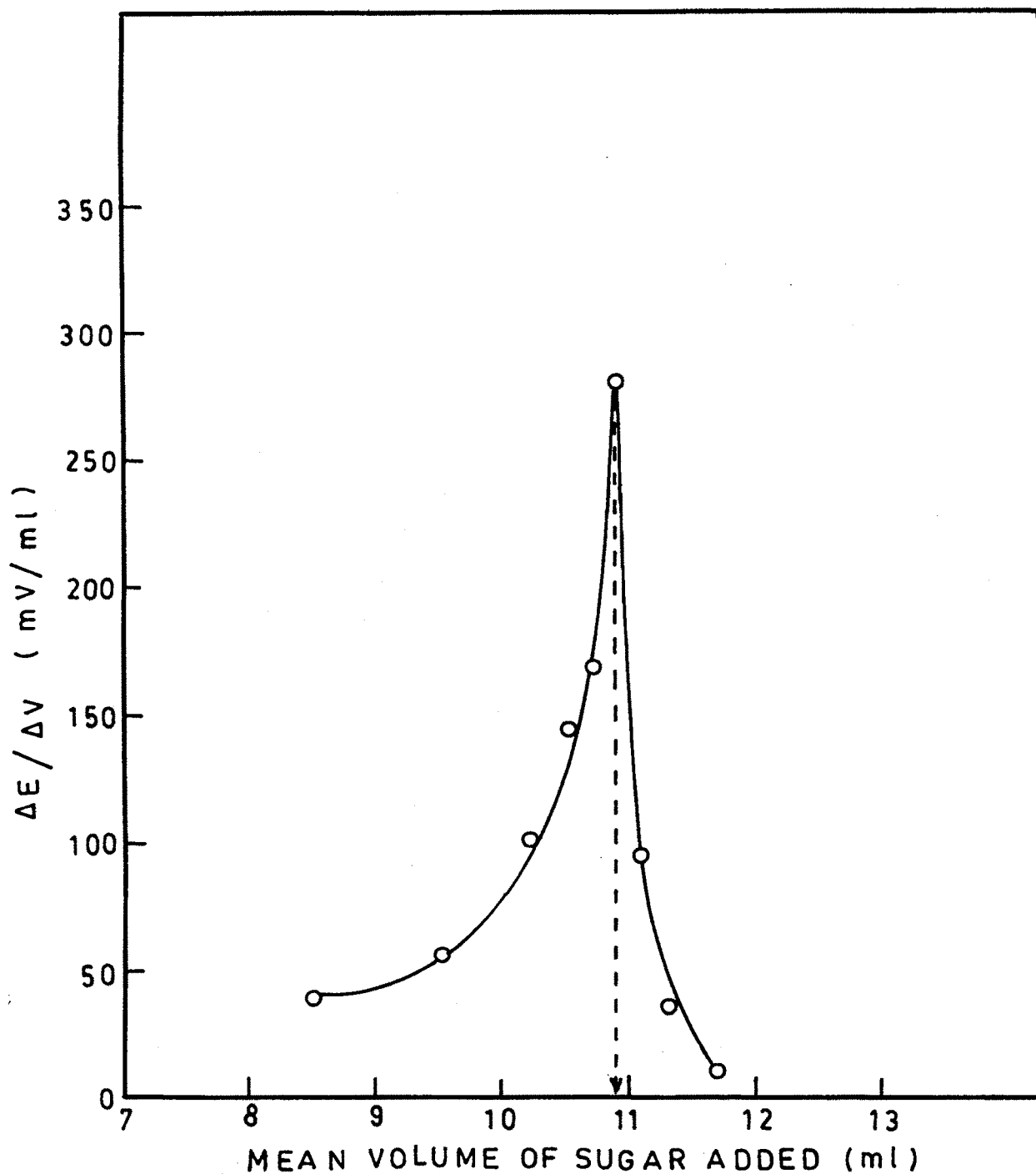


FIG. 4 — DERIVATIVE CURVE FOR THE POTENTIOMETRIC TITRATION OF D-XYLOSE (0.025 M) AGAINST BROMINE .

TABLE NO. 23

THE POTENTIOMETRIC ESTIMATION OF D-XYLOSE

CONDITIONS

1) pH = 8.0

2) Temperature = 25°C

| Sr. No. | Br ₂ (0.0275M) added (ml) | End point detected (ml) | Sugar taken (mg) | Sugar found (mg) | % Error | Average % Error |
|---------|--------------------------------------|-------------------------|------------------|------------------|---------|-----------------|
| 1 | 10 | 10.9 | 40.875 | 41.25 | 0.91 | |
| 2 | 2.5 | 2.1 | 10.5 | 10.3125 | - 1.78 | |
| 3 | 5 | 4.3 | 21.5 | 20.625 | - 4.06 | + 2.13 |
| 4 | 10 | 8.5 | 42.5 | 41.25 | - 2.94 | |
| 5 | 15 | 12.5 | 62.5 | 61.875 | - 1.00 | |

TABLE NO. 24

THE POTENTIOMETRIC TITRATION OF D-GLUCOSE (0.025M) WITH BROMINE
SOLUTION (0.0275M)

| Sr. No. | Sugar added (ml) V | Emf measured (mV) E | ΔE (mV) | ΔV (ml) | $\Delta E / \Delta V$ (mV/ml) | Mean volume (ml) |
|------------|-----------------------------|------------------------------|--------------------|--------------------|----------------------------------|------------------------|
| 1 | 0 | 712 | - | - | - | - |
| 2 | 4 | 684 | 28 | 4 | 7 | 2 |
| 3 | 8 | 632 | 52 | 4 | 13 | 6 |
| 4 | 9 | 593 | 39 | 1 | 39 | 8.5 |
| 5 | 10 | 524 | 69 | 1 | 69 | 9.5 |
| 6 | 10.2 | 506 | 18 | 0.2 | 90 | 10.1 |
| 7 | 10.4 | 479 | 27 | 0.2 | 135 | 10.3 |
| 8 | 10.6 | 444 | 35 | 0.2 | 175 | 10.5 |
| 9 | 10.8 | 381 | 63 | 0.2 | 315 | 10.7 |
| 10 | 11.0 | 362 | 19 | 0.2 | 95 | 10.9 |
| 11 | 11.2 | 353 | 9 | 0.2 | 45 | 11.1 |
| 12 | 12 | 329 | 24 | 0.8 | 30 | 11.6 |

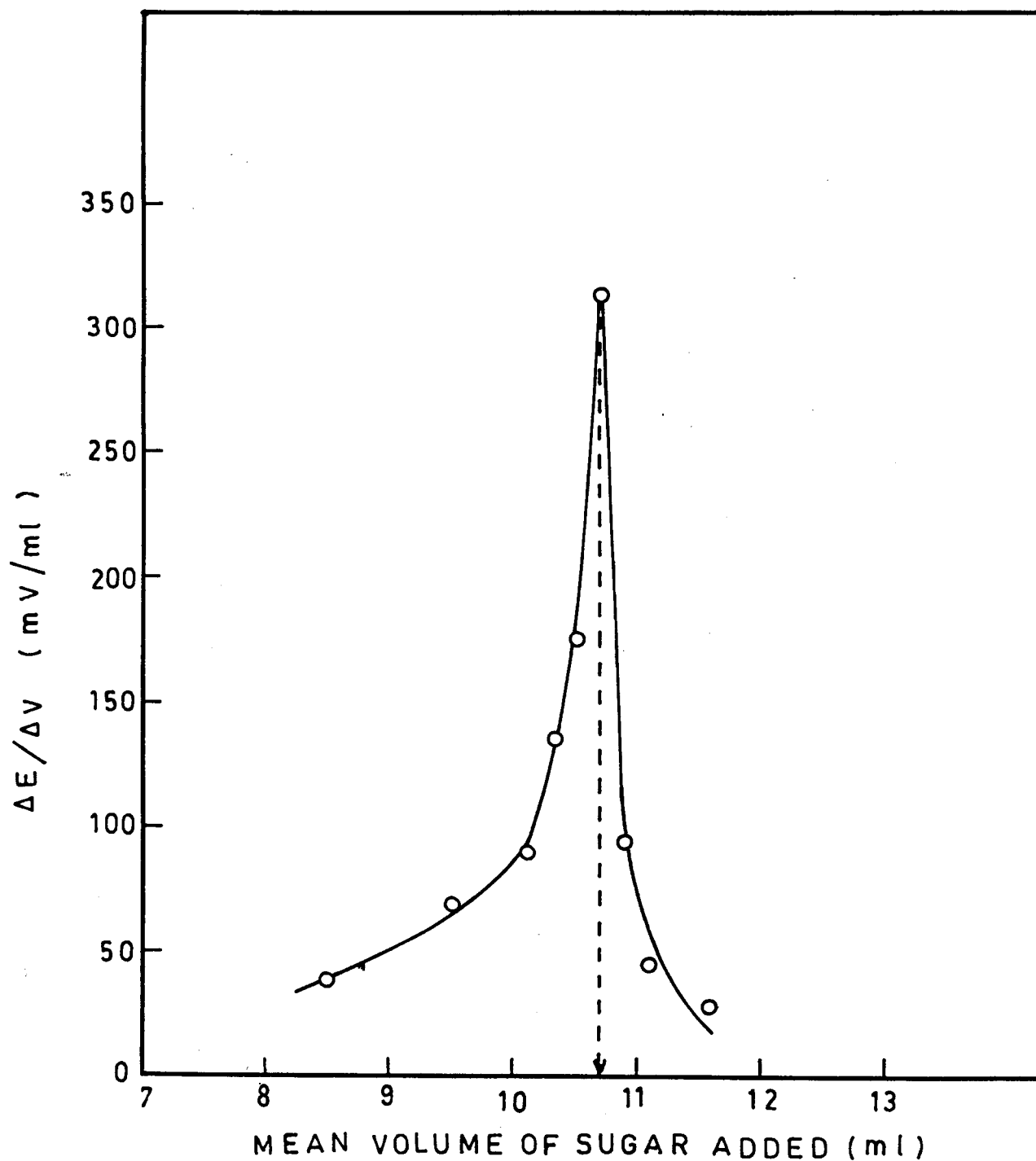


FIG. 5 — DERIVATIVE CURVE FOR THE POTENTIOMETRIC TITRATION OF D-GLUCOSE (0.025 M) AGAINST BROMINE .

TABLE NO. 25

THE POTENTIOMETRIC ESTIMATION OF D-GLUCOSE

CONDITIONS

1) pH = 8.0

2) Temperature = 25°C

| sr. No. | Br ₂ (0.0275M) added (ml) | End point detected (ml) | Sugar taken (mg) | Sugar found (mg) | % Error | Average % Error |
|---------|--------------------------------------|-------------------------|------------------|------------------|---------|-----------------|
| 1 | 10 | 10.7 | 48.1928 | 49.544 | 1.35 | |
| 2 | 2.5 | 2.5 | 12.5 | 12.386 | - 0.91 | |
| 3 | 5 | 4.9 | 24.5 | 24.772 | 1.11 | + 1.15 |
| 4 | 10 | 9.7 | 48.5 | 49.544 | 2.15 | |
| 5 | 15 | 14.9 | 74.5 | 74.316 | - 0.24 | |

TABLE NO. 26

THE POTENTIOMETRIC TITRATION OF MALTOSE (0.025M) AGAINST BROMINE
 SOLUTION (0.0275M)

| Sr. No. | Sugar added (ml) V | Emf measured (mv) E | ΔE (mV) | ΔV (ml) | $\Delta E / \Delta V$ (mV/ml) | Mean volume (ml) |
|---------|-----------------------|------------------------|-----------------|-----------------|-------------------------------|------------------|
| 1 | 0 | 713 | - | - | - | - |
| 2 | 4 | 685 | 28 | 4 | 7 | 2 |
| 3 | 8 | 623 | 62 | 4 | 15.5 | 6 |
| 4 | 9 | 589 | 34 | 1 | 34 | 8.5 |
| 5 | 10 | 536 | 53 | 1 | 53 | 9.5 |
| 6 | 10.2 | 518 | 18 | 0.2 | 90 | 10.1 |
| 7 | 10.4 | 493 | 25 | 0.2 | 125 | 10.3 |
| 8 | 10.6 | 465 | 28 | 0.2 | 140 | 10.5 |
| 9 | 10.8 | 427 | 38 | 0.2 | 190 | 10.7 |
| 10 | 11.0 | 367 | 60 | 0.2 | 300 | 10.9 |
| 11 | 11.2 | 351 | 16 | 0.2 | 80 | 11.1 |
| 12 | 11.4 | 343 | 8 | 0.2 | 40 | 11.3 |
| 13 | 12.0 | 337 | 6 | 0.6 | 10 | 11.7 |

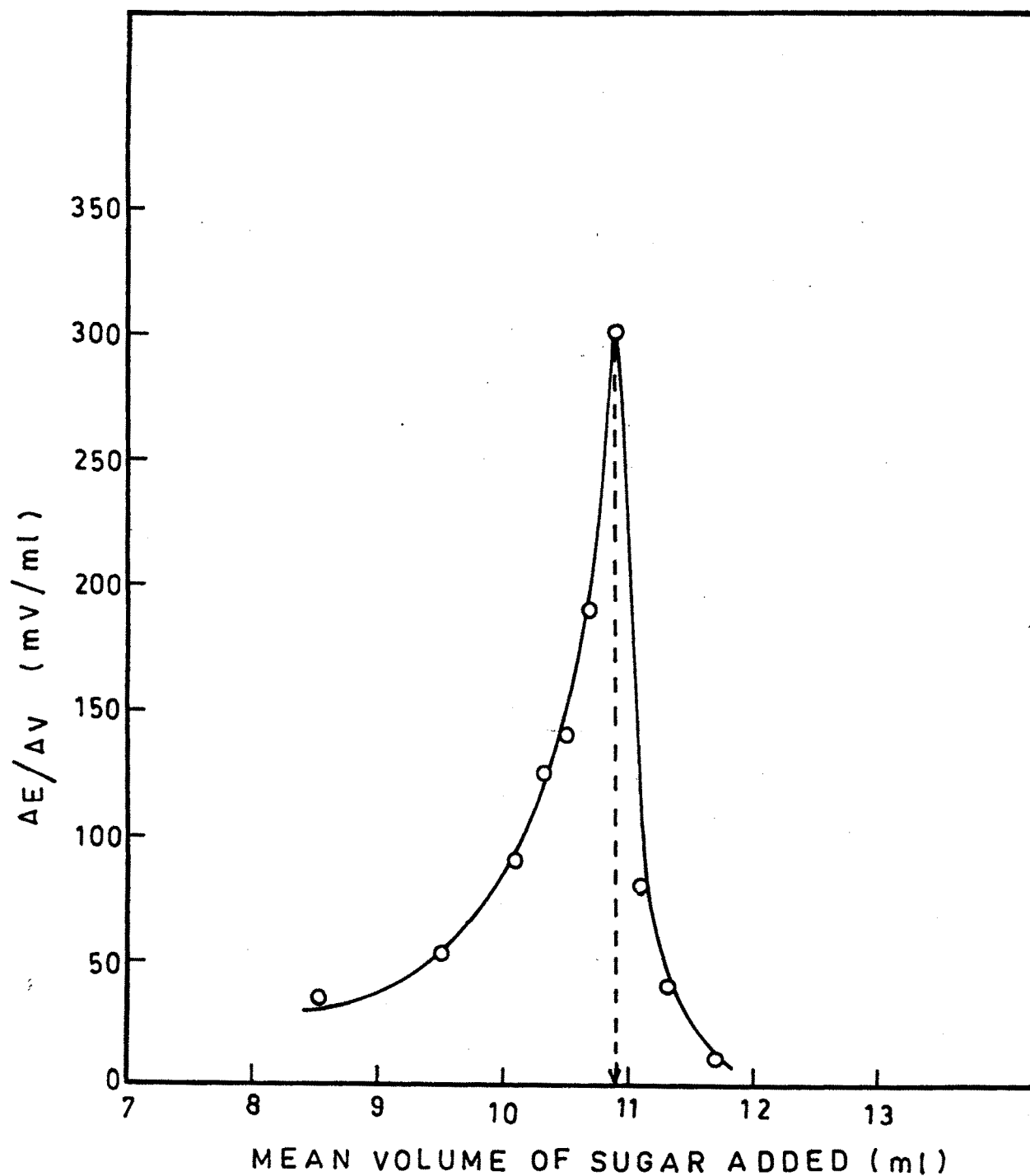


FIG. 6 - DERIVATIVE CURVE FOR THE POTENTIOMETRIC TITRATION OF MALTOSE (0.025 M) AGAINST BROMINE .

TABLE NO. 27THE POTENTIOMETRIC ESTIMATION OF MALTOSE

CONDITIONS :

1) pH = 8.0

2) Temperature = 25°C

| Sr. No. | Br ₂ (0.0275M) added (ml) | End point detected (ml) | Sugar taken (mg) | Sugar found (mg) | %Error | Average % Error |
|---------|--------------------------------------|-------------------------|------------------|------------------|--------|-----------------|
| 1 | 10 | 10.9 | 98.1872 | 99.088 | 0.91 | |
| 2 | 2.5 | 5.1 | 25.5 | 24.772 | - 2.85 | |
| 3 | 5 | 10.1 | 50.5 | 49.544 | - 1.89 | + 1.91 |
| 4 | 7.5 | 15.1 | 75.5 | 74.316 | - 1.56 | |
| 5 | 10 | 20.3 | 101.5 | 99.088 | - 2.37 | |

TABLE NO. 28

THE POTENTIOMETRIC TITRATION OF LACTOSE (0.025M) WITH BROMINE
SOLUTION (0.0275M)

| Sr.No. | Sugar added (ml) V | Emf measured (mV) E | ΔE (mV) | ΔV (ml) | $\Delta E / \Delta V$ (mV/ml) | Mean volume (ml) |
|--------|-----------------------|------------------------|-----------------|-----------------|-------------------------------|------------------|
| 1 | 0 | 720 | - | - | - | - |
| 2 | 4 | 700 | 20 | 4 | 5 | 2 |
| 3 | 8 | 670 | 30 | 4 | 7.5 | 6 |
| 4 | 9 | 640 | 30 | 1 | 30 | 8.5 |
| 5 | 10 | 570 | 70 | 1 | 70 | 9.5 |
| 6 | 10.6 | 516 | 54 | 0.6 | 90 | 10.3 |
| 7 | 10.8 | 476 | 40 | 0.2 | 200 | 10.7 |
| 8 | 11.0 | 416 | 60 | 0.2 | 300 | 10.9 |
| 9 | 12.0 | 371 | 45 | 1 | 45 | 11.5 |
| 10 | 13.0 | 346 | 25 | 1 | 25 | 12.5 |
| 11 | 14 | 331 | 15 | 1 | 15 | 13.5 |

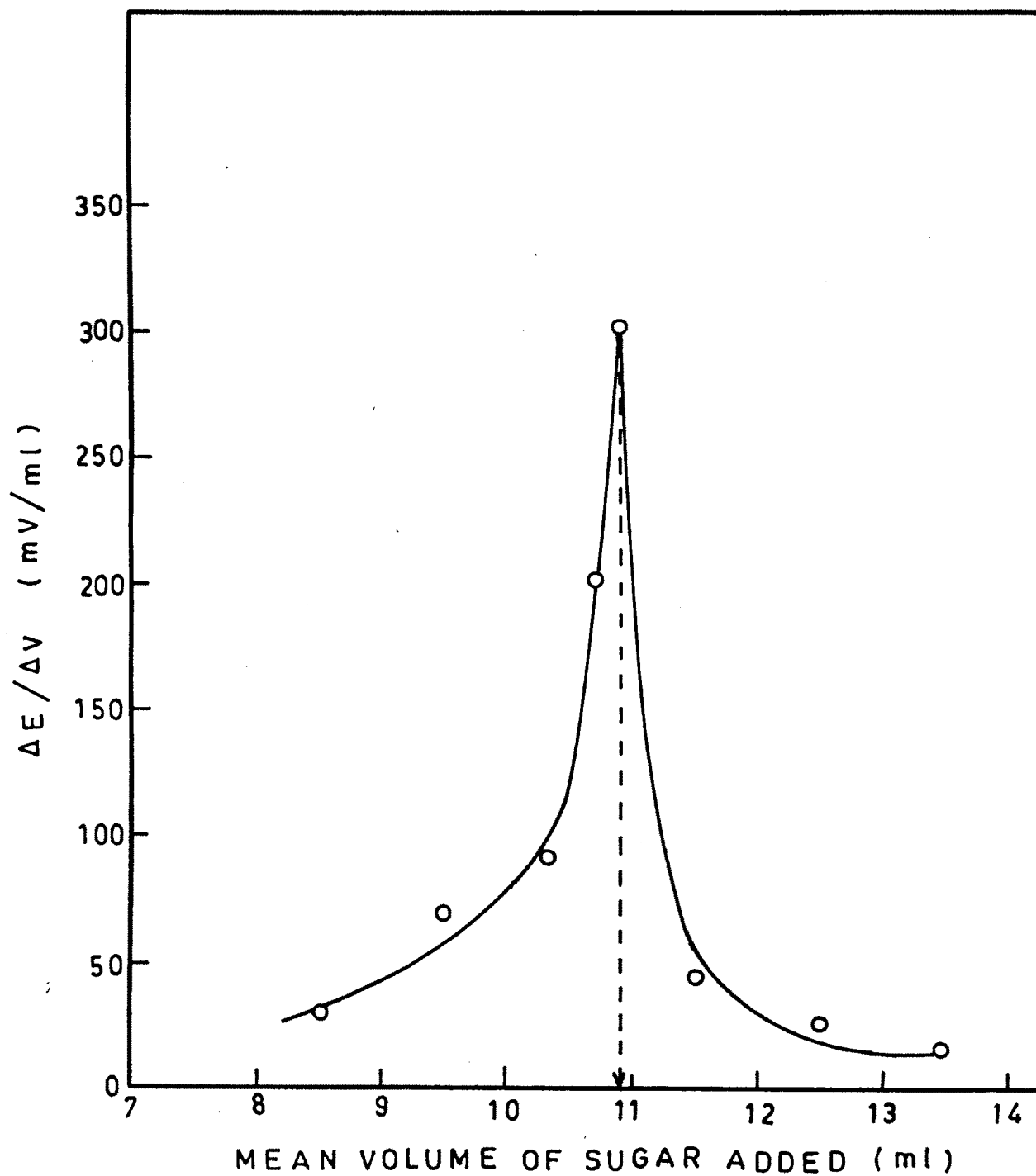


FIG. 7 - DERIVATIVE CURVE FOR THE POTENTIOMETRIC TITRATION OF LACTOSE (0.025 M) AGAINST BROMINE .

TABLE NO. 29

THE POTENTIOMETRIC ESTIMATION OF LACTOSE

CONDITIONS :

1) pH = 8.0

2) Temperature = 25°C

| Sr. No. | Br ₂ (0.0275M) added (ml) | End point detected (ml) | Sugar taken (mg) | Sugar found (mg) | % Error | Average % Error |
|---------|--------------------------------------|-------------------------|------------------|------------------|---------|-----------------|
| 1 | 10 | 10.9 | 98.1872 | 99.088 | 0.91 | |
| 2 | 2.5 | 5.1 | 25.50 | 24.772 | - 2.85 | |
| 3 | 5.0 | 10.1 | 50.5 | 49.544 | - 1.89 | + 1.91 |
| 4 | 10 | 20.3 | 101.5 | 99.088 | - 2.37 | |
| 5 | 7.5 | 15.1 | 75.5 | 74.316 | - 1.56 | |

TABLE NO. 30

COMPARISON OF RESULTS OBTAINED BY COULOMETRIC, POTENTIOMETRIC AND VISUAL METHODS

| Name of the Sugar | Sr. No. | Coulometric Method | | | | | Visual Method | | | | | Potentiometric Method | | | | | |
|-------------------|---------|--------------------|------------------|---------|-----------------|------------------|------------------|---------|-----------------|------------------|------------------|-----------------------|-----------------|------------------|------------------|---------|-----------------|
| | | Sugar taken (mg) | Sugar found (mg) | % Error | Average % Error | Sugar taken (mg) | Sugar found (mg) | % Error | Average % Error | Sugar taken (mg) | Sugar found (mg) | % Error | Average % Error | Sugar taken (mg) | Sugar found (mg) | % Error | Average % Error |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | | | |
| | | 4.0 | 4.005 | 0.11 | | 2.0 | 2.1000 | 5.00 | | 39.375 | 41.25 | 4.76 | | | | | |
| D-Arabinose | 2 | 6.0 | 6.0155 | 0.25 | | 5.0 | 5.2125 | 4.25 | | 10.5 | 10.3125 | -1.78 | | | | | |
| | 3 | 8.0 | 8.009 | 0.11 | 0.34 | 10.0 | 10.3125 | 3.12 | 2.52 | 21.5 | 20.625 | -4.06 | +2.93 | | | | |
| | 4 | 10.0 | 10.0375 | 0.37 | | 20.0 | 20.025 | 0.12 | | 42.5 | 41.25 | -2.94 | | | | | |
| | 5 | 12.0 | 12.031 | 0.31 | | 40.0 | 40.05 | 0.12 | | 62.5 | 61.875 | -1.0 | | | | | |
| | | 4.0 | 4.0045 | 0.11 | | 2.0 | 2.175 | 8.75 | | 40.875 | 41.25 | 0.91 | | | | | |
| D-Xylose | 2 | 6.0 | 6.0155 | 0.25 | | 5.0 | 5.25 | 5.0 | | 10.5 | 10.3125 | -1.78 | | | | | |
| | 3 | 8.0 | 8.009 | 0.11 | 0.34 | 10.0 | 10.3125 | 3.12 | 5.00 | 21.5 | 20.625 | -4.06 | +2.13 | | | | |
| | 4 | 10.0 | 10.0375 | 0.37 | | 20.0 | 20.0625 | 0.31 | | 42.5 | 41.25 | -2.94 | | | | | |
| | 5 | 12.0 | 12.031 | 0.31 | | 40.0 | 40.05 | 0.12 | | 62.5 | 61.875 | -1.00 | | | | | |

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
|---------|---|------|---------|--------|-------|------|---------|-------|------|---------|--------|--------|--------|
| | 1 | 2 | 1.9952 | - 0.23 | | 2.0 | 2.1168 | 5.84 | | 48.1928 | 49.544 | 1.35 | |
| | 2 | 4 | 4.0115 | 0.28 | | 5.0 | 5.1796 | 3.59 | | 12.5 | 12.386 | - 0.91 | |
| | 3 | 6 | 6.0068 | 0.11 | +0.20 | 10.0 | 10.134 | 1.34 | 2.23 | 24.5 | 24.772 | 1.11 | + 1.15 |
| D-Glu- | 4 | 8 | 8.0231 | 0.28 | | 20.0 | 20.0428 | 0.21 | | 48.5 | 49.544 | 2.15 | |
| cose | 5 | 12 | 12.0137 | 0.11 | | 40.0 | 40.0856 | 0.21 | | 74.5 | 74.316 | - 0.24 | |
| | 1 | 2.0 | 1.9994 | - 0.02 | | 5.0 | 5.2246 | 4.49 | | 98.1872 | 99.088 | 0.91 | |
| Maltose | 2 | 6.0 | 6.0068 | - 0.11 | 0.18 | 10.0 | 10.2691 | 2.69 | 1.74 | 25.5 | 24.772 | - 2.85 | + 1.91 |
| | 3 | 8.0 | 8.0231 | 0.28 | | 20.0 | 20.1779 | 0.88 | | 50.5 | 49.544 | - 1.89 | |
| | 4 | 10.0 | 10.0394 | 0.39 | | 20.0 | 20.0878 | 0.43 | | 75.5 | 74.316 | - 1.56 | |
| | 5 | 12.0 | 12.0137 | 0.11 | | 40.0 | 40.0856 | 0.21 | | 101.5 | 99.088 | - 2.37 | |
| | 1 | 4.0 | 3.9905 | - 0.23 | | 2.0 | 2.2520 | 12.60 | | 98.1872 | 99.088 | 0.91 | |
| | 2 | 6.0 | 6.0068 | 0.11 | | 5.0 | 5.1345 | 2.69 | | 25.50 | 24.772 | - 2.85 | |
| Lactose | 3 | 8.0 | 8.0231 | 0.28 | +0.22 | 10.0 | 10.1790 | 1.7 | 3.54 | 50.5 | 49.544 | - 1.89 | + 1.91 |
| | 4 | 10 | 10.0394 | 0.39 | | 20.0 | 20.0878 | 0.43 | | 75.5 | 74.316 | - 1.56 | |
| | 5 | 12.0 | 12.0137 | 0.11 | | 40.0 | 40.0856 | 0.21 | | 101.5 | 99.088 | - 2.37 | |

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
|----------------|---|------|---------|------|------|------|--------|---------|--------|----|----|----|----|
| | 1 | 4.0 | 4.0199 | 0.49 | | 5.0 | 1.1890 | - 76.21 | | - | - | - | |
| | 2 | 8.0 | 8.0398 | 0.49 | | 10.0 | 2.5267 | - 74.73 | | - | - | - | |
| | 3 | 12.0 | 12.0598 | 0.49 | 0.49 | 20.0 | 3.7157 | - 81.42 | -63.68 | - | - | - | |
| | 4 | 16.0 | 16.0797 | 0.49 | | 40.0 | 5.9452 | - 85.13 | | - | - | - | |
| | 5 | 18.0 | 18.0897 | 0.49 | | 30.0 | 29.726 | - 0.91 | | - | - | - | |
| Raffi- nose | | | | | | | | | | | | | |