**Experiment No. (4)**

**Calculate standard deviation and standard error )) ))**

**Used Tools:**

 Three beakers. 1-

Four calories. 2-

3- Hot water, cold water with ice grits, normal water.

**The theoretical part:**

**1- Arithmetic mean :** ****

2- **Standard deviation :** $\sqrt{\frac{\sum\_{}^{}(Xi ) ^{2} - \frac{\sum\_{}^{}\left(Xi-X\right)^{2}}{n} ^{ }}{n-1}}$

**3- standard error: **

**The method of work:**

1- We measure the temperature of the four thermometers with the laboratory temperature.

2- We measure the temperature of the four thermometers for both normal water, hot water and ice water.

3- We record the readings of each of the thermometers for all the above cases as in the table shown below.

4- We calculate the arithmetic mean for each of the cases using Law No. (1).

 5- We calculate the standard deviation for each of the cases using Law No. (2).

6- We calculate the standard error for each of the cases using Law No. (3).

7- Then we discuss the experience and the reasons for the errors in the readings.

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| **المحرار** | **عند درجة حرارة المختبر** | **عند درجة حرارة الماء الاعتيادي** | **عند درجة حرارة الماء الساخن** | **عند درجة حرارة ماء الثلج** |
| 1 | 28 | 30 | 60 | 2 |
| 2 | 25 | 28 | 65 | 3 |
| 3 | 23 | 32 | 68 | 4 |
| 4 | 22 | 35 | 67 | 1 |