The University of Jordan
School of Engineering
Electrical Engineering Department

EE 449
Instrumentation and Control Lab

EXPERIMENT 10 REPORT
BASICS OF THERMOCOUPLE

Section # ___________ Group # ___________

	Student Name	**ID**
1.		
2.		
3.		
4.		

EXPERIMENT 10
BASICS OF THERMOCOUPLE

PROCEDURE A: VOLTAGE VERSUS TEMPERATURE CURVE

2. Record the voltage reading when the K type thermocouple is reading your current ambient (room) temperature.

. . . .

4. Record the voltage reading when the J type thermocouple is reading your current ambient (room) temperature.

. . . .

9. If you notice that the change in temperature is very slow as you reach closer to room temperature, you can speed things up further by pouring some of the cold water from the cold-water mug into the hot-water mug. Wait for 5 seconds for the temperature to settle and take the reading.

Glass thermometer reading	K type thermocouple voltage reading (mV)	J type thermocouple voltage reading (mV)
80 °C		
79 °C		
78 °C		
77 °C		
76 °C		
75 °C		
74 °C		
73 °C		
72 °C		
71 °C		
70 °C		
69 °C		
68 °C		
67 °C		
66 °C		
65 °C		
64 °C		
63 °C		
62 °C		
61 °C		

60 °C		
59 °C		
58 °C		
57 °C		
56 °C		
55 °C		
54 °C		
53 °C		
52 °C		
51 °C		
50 °C		
49 °C		
48 °C		
47 °C		
46 °C		
45 °C		
44 °C		
43 °C		
42 °C		
41 °C		
40 °C		
39 °C		
38 °C		
37 °C		
36 °C		
35 °C		
34 °C		
33 °C		
32 °C		
31 °C		
30 °C		

10. Plot (**by hand**) the voltage values for both the K type thermocouple and J type thermocouple (on the same graph using different colors) versus the glass thermometer temperature readings. Use a scatter diagram for each.

See next page

11. Use MATLAB or Excel to calculate the best line fit for each of the two curves above, draw that fit on the above diagram, and write down the mathematical expressions below.

. . . .

. . . .

. . . .

. . . .

12. Did you get a graph similar to the one shown in page 6, or a different one. Explain your findings.

. . . .

. . . .

. . . .

. . . .

PROCEDURE B: MEASURING THE TIME CONSTANT

5. Place the K type thermocouple in the cold-water mug. Wait for the voltage to settle. Record the steady-state voltage value you read from Voltmeter K.

. . . .

7. Quickly (but *carefully*) move the K type thermocouple from the cold-water mug immediately to the hot-water mug and keep it there. Simultaneously start the stop watch. Now record the voltage values you see on Voltmeter K every 2 seconds in the table below. One student can monitor the stop watch, another one can move the thermocouple and a third student can record Voltmeter K readings. Alternatively, you can use your phone camera to record a video of Voltmeter K readings for about half a minute after moving the thermocouple to the hot-water mug. Then you can re-watch the video to record the values in the following table every 2 second increments.

Time (seconds)	K type thermocouple voltage reading (mV)
0 sec	
2 sec	
4 sec	
6 sec	
8 sec	
10 sec	
12 sec	
14 sec	

16 sec	
18 sec	
20 sec	
22 sec	
24 sec	
26 sec	
28 sec	
30 sec	

8. Plot (**by hand**) the voltage values for the K type thermocouple versus time (in seconds).

See page 7

9. Identify the time constant, τ, for the thermocouple on the above graph, and write its value below.

. . . .

. . . .

10. Repeat the same procedure for the J type thermocouple by placing it in the cold-water mug, let the voltage settle, and then moving it suddenly to the hot-water mug. You can switch off Voltmeter K now to avoid mistakes in reading the voltage. Fill the table below from Voltmeter J readings.

Time (seconds)	J type thermocouple voltage reading (mV)
0 sec	
2 sec	
4 sec	
6 sec	
8 sec	
10 sec	
12 sec	
14 sec	
16 sec	
18 sec	
20 sec	
22 sec	
24 sec	
26 sec	
28 sec	
30 sec	

11. Plot (**by hand**) the voltage values for the J type thermocouple versus time (in seconds).

See page 8

12. Identify the time constant, τ, for the thermocouple on the above graph, and write its value below.

. . . .

. . . .

Q. Explain below the advantages and disadvantages of placing the cold junction in iced water (see figure below) compared to just using an isothermal block for the cold junction.

. . . .

. . . .

. . . .

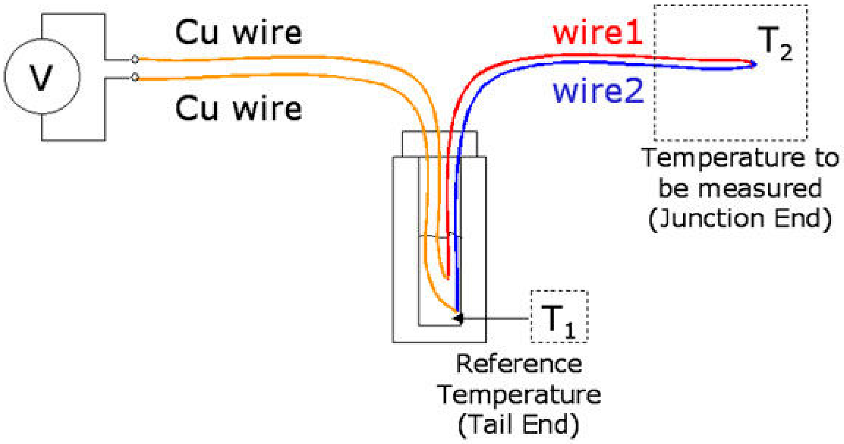
. . . .

. . . .

. . . .

. . . .

. . . .



** **End** **