University of Mosul

College of Science

Department of Physics

Second Stage

Heat and Thermodynamic

2024 – 2025

Lecture 4: Thermocouple thermometers & Radiation

Preparation

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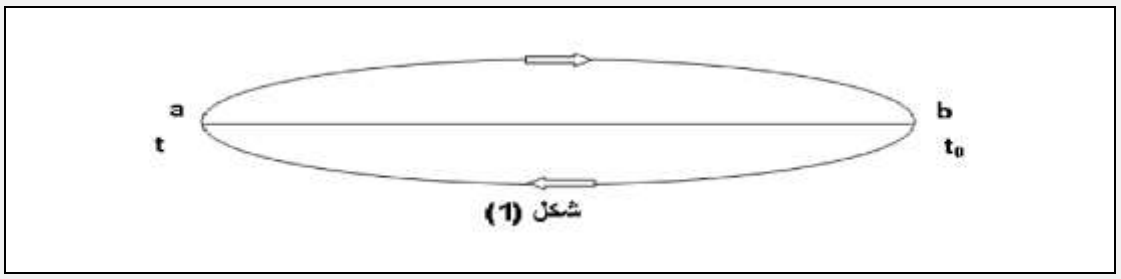
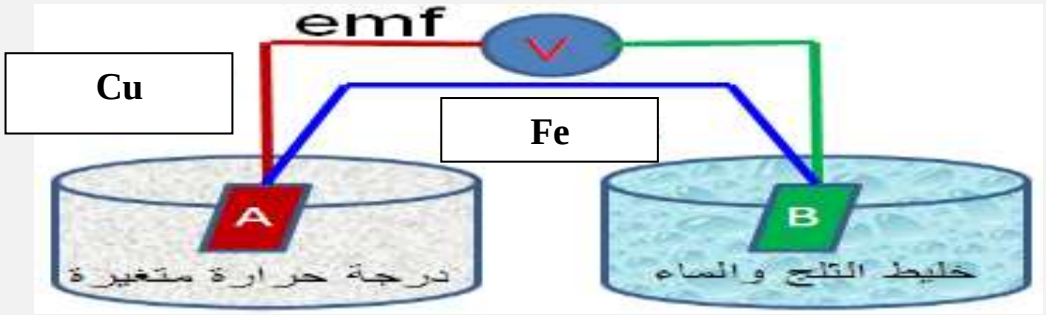
4. Thermocouple thermometers: they are thermometers that work according to the principle of changing the electric motive force generated in the thermocouple circuit when the difference between the two temperatures of the two contact points changes.

The thermocouple consists of connecting two wires together and one end of it is heated to the temperature t (the hot meeting) while the other end is kept at a temperature of t_0 (the cold meeting), so (e.m.f) is generated due to the difference in temperature and an electric current passes in the closed circuit and found .



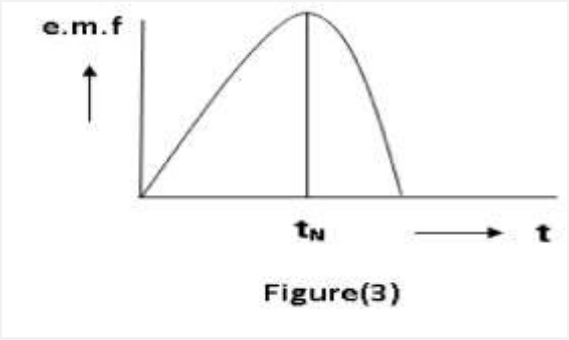
شكل (1)



Experimentally, the (e.m.f) generated depends on the temperature according to the following relationship:

$E= A+Bt+Ct^2+Dt^3$

t_N : the degree of parity, which is the degree to which the (e.m.f) is at its maximum value.



Figure(3)

The Sepic effect

This phenomenon was discovered by the scientist Sepic in 1821, where he found that when two ends of wires a and b are connected from two different metals (called thermocouple) from both ends to form two ends and heat one of the ends, and keep the other end with a constant temperature degree (zero degrees Celsius).

The Peltier Effect:

If an electric current passes through a thermocouple; And the temperature at the contact points is equal, then the applied voltage difference (electric current) will cause one of the contact points to heat up and the second point cool, and if the current is reversed, the situation is reversed and the amount of temperature rise ,This effect opposes the effect of Sepic

Thomson Effect:

If there is a thermal gradient in a certain metal wire, a e.m.f is generated in the wire, you know a e.m.f

5. Radiation thermometers: It depends on the amount of radiation heat emitted by the body whose temperature is to be measured. Such a thermometer is used to measure very high temperatures such as the sun and the ovens, these Thermometers are called pyrometers and built based on:

1. The quality of radiation from the body

2. radiation intensity

3 Radiation temperature (red, yellow, white) $T \alpha 1/\lambda$

There are two types of pyrometers(Total radiation Pyrometer ,Optical pyrometer.