University of M'sila

Physics department 2020/2021

Third year, Energy physics

Text N°1 : HEAT TRANSFER

Heat transfer is a branch of thermal engineering that concerns the generation, use, conversion, and exchange of thermal energy and heat between physical systems. As such, heat transfer is involved in almost every sector of the economy. Heat transfer is classified into various mechanisms, such as **thermal conduction, thermal convection and thermal radiation**.

Heat conduction (or **thermal conduction**) is the movement of heat from one object to another one that has different temperature when they are touching each other. For example, we can warm our hands by touching hot-water bottles. When the cold hands touch the hot-water bottle, heat flows from the hotter object (hot-water bottle) to the colder one (hand). It means that , heat flows from the body (or the region) of higher temperature to another body (region) of lower temperature, as described by the second law of thermodynamics.

Heat convection is the transfer of heat from one place to another by the movement of fluids (liquids and gases). The flow of fluid may be forced by external processes. In this case the fluid is forced to flow by use of a pump, fan or other mechanical means.

In other cases, **Natural convection**, known also as **free convection** is a mechanism, or type of mass and heat transport, in which the fluid motion is generated only by **density differences** in the fluid occurring due to temperature gradients . For example, when water is heated on a stove, hot water from the bottom of the pan rises, displacing the colder denser liquid.

Thermal radiation occurs through a vacuum or any transparent medium (solid or fluid). It is the transfer of energy by means of photons in electromagnetic waves governed by the same laws.

I. Translate the above text into Arabic

II. Read the text carefully and then answer about the following questions:

1. What are the different modes of heat transfer?
2. Where can Thermal **radiation** occur??
3. What is the difference between forced an free convection?. (in short answer)

III. Turn the following sentences into negative and interrogative form:

1. I am a good student in English
2. **Thermal radiation** occurs through a vacuum or any transparent medium
3. **Heat conduction** is the movement of heat from one object to another one.

IV. Translate the following text into Arabic then to English

Tous les matériaux rayonnent de l'énergie dans toutes les directions, à la suite du mouvement continuel de vibration de leurs molécules situées en surface.
Le rayonnement solaire comporte essentiellement des radiations de courtes longueurs d'onde émises à très hautes températures.

Good Luck

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