INTRODUCTION
Temperature is one of the most important factors that determine life on earth. Among numerous means achieved by existing living organisms under various thermal conditions, "thermodynamic freedom" (Burton, 1955) of homoiotherms is undoubtedly the most ingenious achievement. Homoiotherms, the birds and mammals, have developed this ingenious property due to the evolution of an efficient thermoregulating mechanism in them. However, in the evolutionary scale and under various conditions they lack or lose the ability in maintaining the thermodynamic freedom. Animals show an evolution of thermoregulation in both the phylogenetic and ontogenetic scales. In the ontogenetic scales the animals born naked with little or no fur on the body at birth usually suffer from a defective regulation of body temperature. This is seen in the baby rabbits and the human babies, but guineapigs which are born fully coated with fur have little difficulty in temperature regulation (Gulick, 1957). In the phylogenetic scale of thermoregulatory evolution from poikilothermy to homoiothermy, poikilotherms evolve into the heteroiotherms. These are poorly regulating lower mammals, such as sloths, opossums and bats, which show some temperature fluctuation with that of the environment and enter into a state of cold narcosis at low air temperature (Prosser, 1955). Some of the higher homoiotherms also show fluctuations of their body temperature with that of the environment as a physiological adaptation, such as camels in deserts (Schmidt-Nielsen et al, 1956). With respect to the behaviour of oxidative enzymes in cold ambient temperature (Sadhu, 1959), birds show homoiothermic behaviour only in a narrow range of ambient temperature.

It was observed that the poikilotherms which were originally classified on the basis of lack of thermoregulatory power, could also regulate their body temperature to a certain extent by reacting with the
environment most favourably. On cold days, they would adjust themselves at such angles to the solar rays that they would enjoy the maximum benefit, while on hot days they would seek the shelter of rocks and trees. This slight thermodynamic freedom was made possible by the so-called ectothermal control in contradiction to the intrinsic or endothermal control of homiotherms. Again in the homiotherm group there were many animals which were homiothermic only at some temperature, while at others they are either hypothermic or hyperthermic. This led us to conclude that the evolution from poikilothersy to homiothermy did not occur by sudden saltation process, but by steps. After the first stage of poikilothersy, the second stage of thermoregulatory evolution emerged with the heterotherms. These heterotherms are poorly regulating lower mammals, such as sloths, opossums and bats which show temperature fluctuation with that of the environment. Like the poikilothersy they regulate their body temperature mostly by chemical processes, viz., acceleration of oxidation of foodstuffs, while the physical regulation by heat retention is only poorly developed and at very low ambient temperature, they enter into a stage of cold narcosis.

In the third stage of evolution, these mammals show quite a bit of fluctuations of their body temperature with that of the environment as a physiological adaptation, such as the camels in the desert and these are called pleotherms. In high ambient temperature of desert, the body temperature of the camel rises and this reduces the gradient of skin-ambient temperature and thus the inevitable heat gain that is the cause of heat stroke and death in the desert. The camel is not appreciably affected by this rise of body temperature and it does not suffer from the thirst lag so common in man in the desert. The camel drinks all the water that is needed for the body, taking no excess and just making up its deficit. It appears that the Australian aboriginals belong to this group of pleotherms.
and since they sleep naked on winter nights, their skin temperature falls reducing the skin-ambient temperature differential, but a system of counter-current heat exchanges between the artery and its venae comites in the extremities saves the core heat, thus protecting the nutritive circulation to the periphery without undue loss of core heat to the cold night.

The fourth stage of thermoregulatory evolution is shown in the stenothermy or stenothermal homeothermy of birds and baby mammals. The birds and baby mammals are not fully homeothermic. Their enzyme systems, especially the oxidative ones, have an activity intermediate between the poikilotherms and the fully developed homeotherms, they show a rise of blood sugar (Thermoglycemia) with a rise of ambient temperature. This stenothermy is shown by baby mammals which are born naked without fur for a long time, but other mammals show it for a while only. This is an obligatory phase, therefore, in the full development of homeothermy of man which may be described as the fifth or final stage of thermoregulatory evolution or Euthermal homeothermy. The birds have stopped at the stenothermal phase.

With the above perspective in the background, the thesis has been introduced in two sections:

(1) General survey of thermoregulation in birds and mammals.

(2) Scheme of Work.