PHYS 202 Heat Transfer Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Heat transfer by conduction: Heat transfer by radiation:

 

1. One way that heat is transferred from place to place inside the human body is by the flow of blood. Which one of the three heat transfer processes best describes this action of the blood? Justify your answer.

2. The amount of heat per second conducted from the blood capillaries beneath the skin to the surface is 240 J/s. The energy is transferred a distance of 2.0×10–3 m through a body whose surface area is 1.6 m2. Assuming that the thermal conductivity is that of body fat, determine the temperature difference between the capillaries and the surface of the skin.

3. A person’s body is producing energy internally due to metabolic processes. If the body loses more energy than metabolic processes are generating, its temperature will drop. If the drop is severe, it can be life-threatening. Suppose a person is unclothed and energy is being lost via radiation from a body surface area of 1.40 m2, which has a temperature of 34 °C and an emissivity of 0.700. Suppose that metabolic processes are producing energy at a rate of 115 J/s. What is the temperature of the coldest room in which this person could stand and not experience a drop in body temperature?