I. RESOURCES: Text – Marchand, Chapter 4, pp 98–106
Coordinated with Laboratory on “Small Mammal Metabolism”

II. OVERVIEW OF THERMOREGULATION --- an organismic response to environment

A. CLASSIFICATION -- BASED UPON

1. MECHANISM OF HEAT GAIN OR LOSS:

Two Groups: _____ and _____

2. PATTERN OF BODY TEMPERATURE -- Three major groupings

a. Homeotherms -- _____

b. Poikilotherms – _____

c. Heterotherms – Temporal:_____and

– Regional: _____

B. HOMEOTHERMS -- MAINTAIN BODY TEMPERATURE AT or near a "SET POINT"

C. The “thermoregulatory challenge”

1. ENVIRONMENTAL CONDITIONS _____

2. LIVING SYSTEMS HAVE RELATIVELY NARROW_____.

3. HOMEOSTASIS = maintaining internal conditions WITHIN a TOLERANCE RANGE amid environmental fluctuations.

D. REQUIREMENTS FOR HOMEOSTATIC CONTROL:

1. Energy Exchange with Environment –

2. Sensory System to Monitor Environment –

3. Set Point –

4. Negative Feedback Mechanism –

III. PHYSICAL *versus* PHYSIOLOGICAL THERMOREGULATION

A. PHYSICAL –

B. PHYSIOLOGICAL –

> Can you see that this separation is somewhat artificial; here, we focus on “physical”

IV. PHYSICAL THERMOREGULATION -- Endotherm and Homeotherm in winter

A. INPUT–OUTPUT MODEL

1. HEAT INPUTS -- negligable from RADIATION (IR)...mostly METABOLIC

2. HEAT OUTPUTS–via _____ (BUT several assumptions):

a. V (latent heat loss) is _____

b. METABOLIC HEAT is _____

c. LOSSES BY C, L, IR can be grouped under CONDUCTION
(since conduction from body core is major determiner of body surface temperature

B. MATHEMATICAL MODEL -- for Conduction to explain animal structures and behavior

RELATIONSHIP: $Q_c = kA \dfrac{(T_b - T_a)}{d}$

Q_c = heat loss (Watts)
k = thermal conductivity
T_b = body core temp.
T_a = air temperature
A = area (cm^2)
d = distance (cm)

C. DISCUSSION:

2. How does model show a cooling environment?

3. How does model suggest animal strategies for conserving?

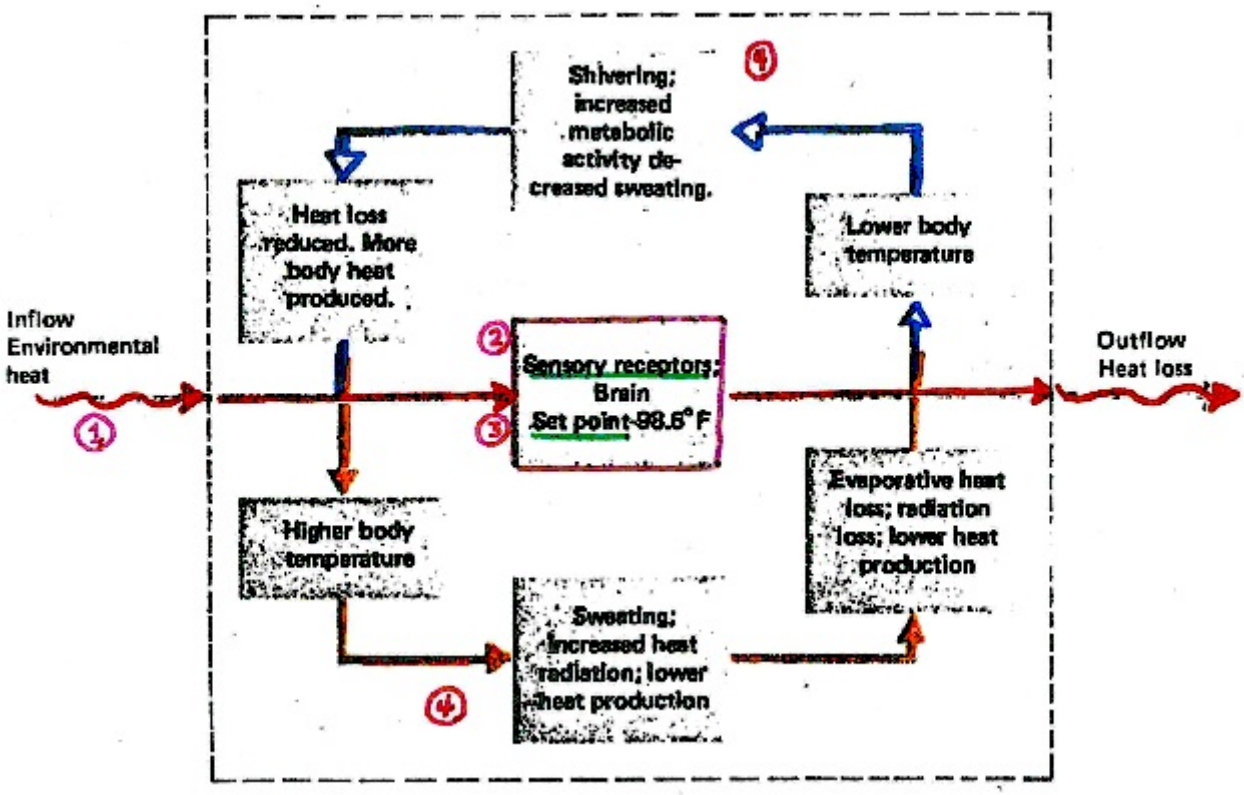
a.

b.

c.

d.

V. Next Topic: Relationship of “Physical” and “Physiological Thermoregulation”


Shivering; increased metabolic activity decreased sweating.
4
Heat loss reduced. More body heat produced.
Lower body temperature
Inflow Environmental heat
1
2
Sensory receptors; Brain Set point-98.6°F
3
Outflow Heat loss
Higher body temperature
Evaporative heat loss; radiation loss; lower heat production
Sweating; increased heat radiation; lower heat production
4