

# PHSI2005:

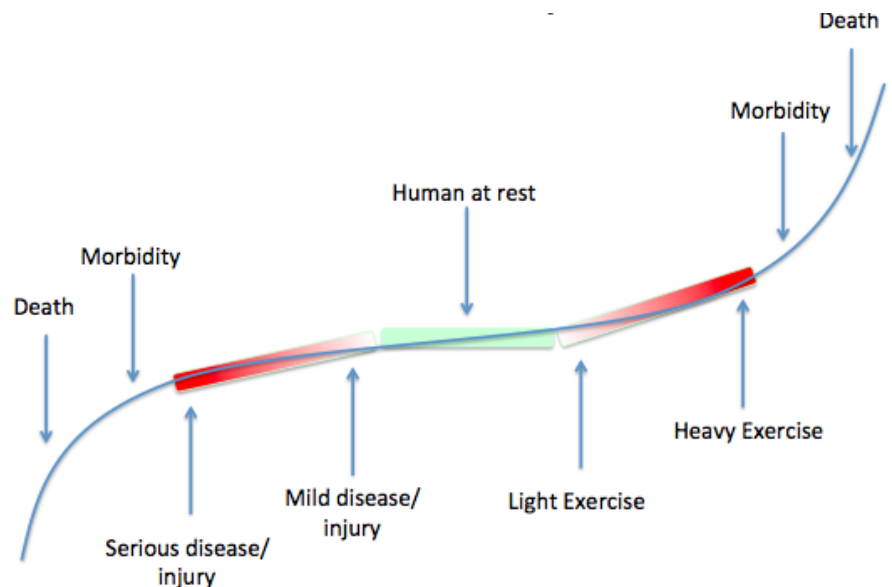
## Concepts in Physiology

### Physiology and Homeostasis:

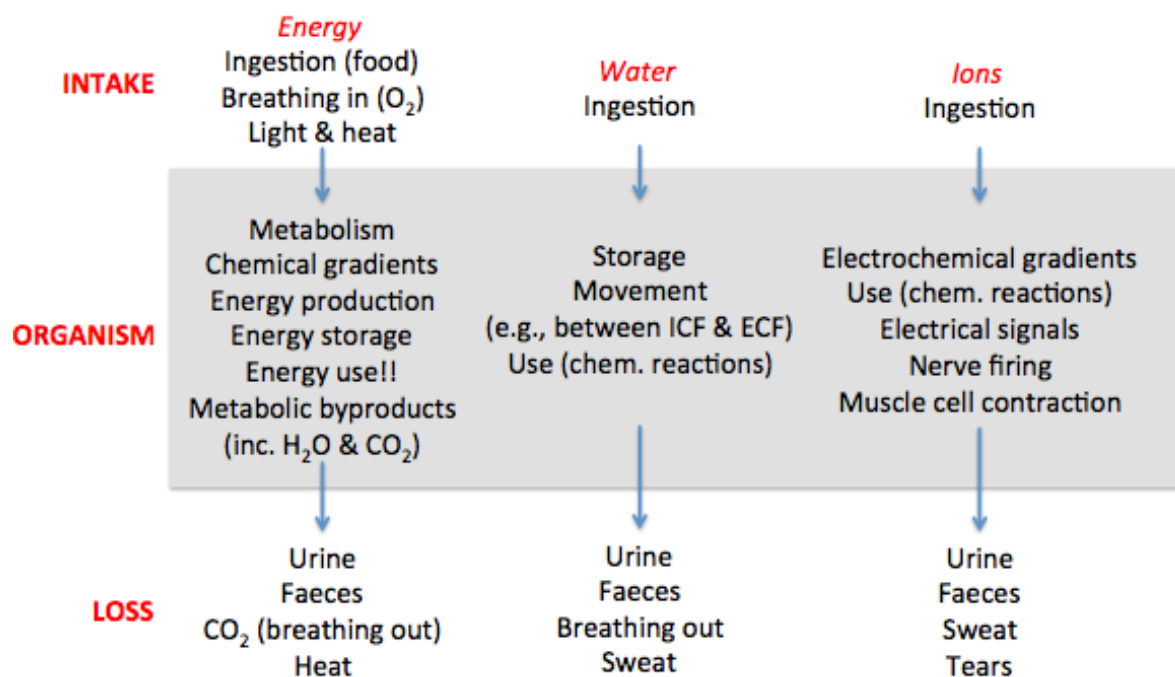
#### Definition of Homeostasis:

- Homeo= like
- Stasis= state
- Effectively a steady state or set of states
- **Not an equilibrium state**
- Homeostasis= comfort zone
  - Note: this line could represent any

physiological function EG: Energy and exercise (blood pressure, etc.), cell production (blood cells, etc), diurnal cycles (sleep, rest, etc) and other molecular events (metabolism, etc).



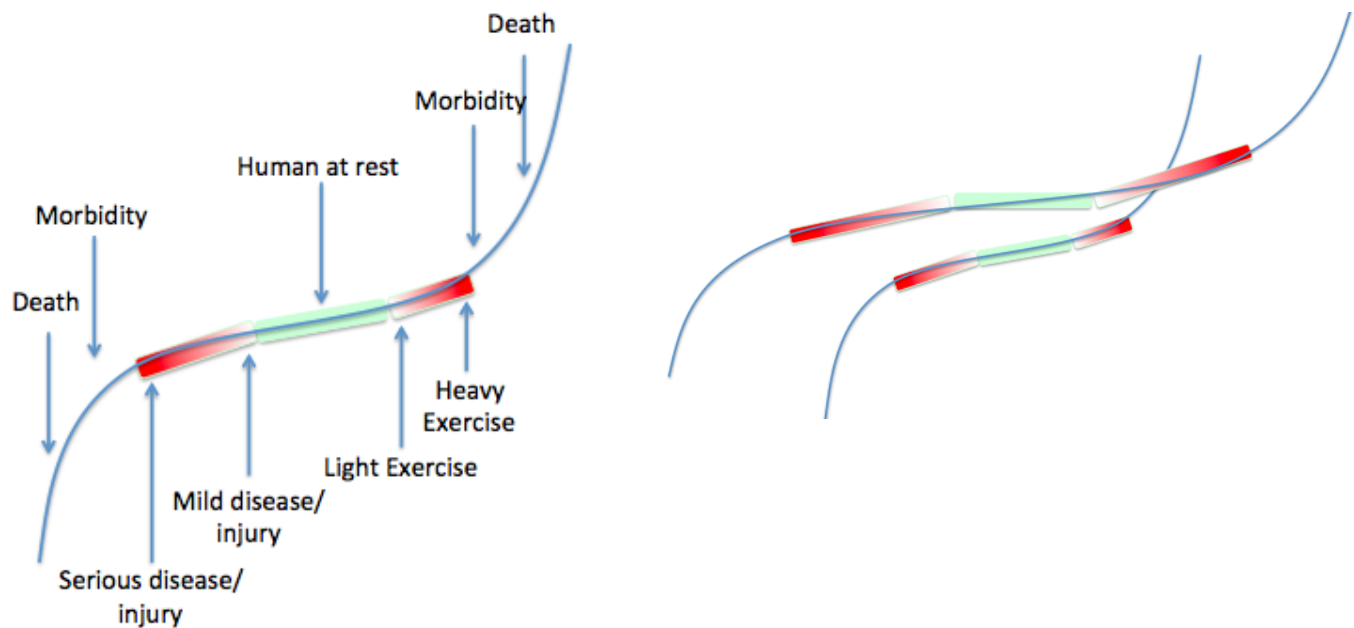
- Homeostasis is a steady state requiring intakes and losses



- Other losses include:

- Blood/ Tissue loss: injury/ amputation
- Diarrhea, vomiting, diuresis: diuretics, cholera
- Disease: muscle wasting, cancer, nerve loss (Alzheimer's)

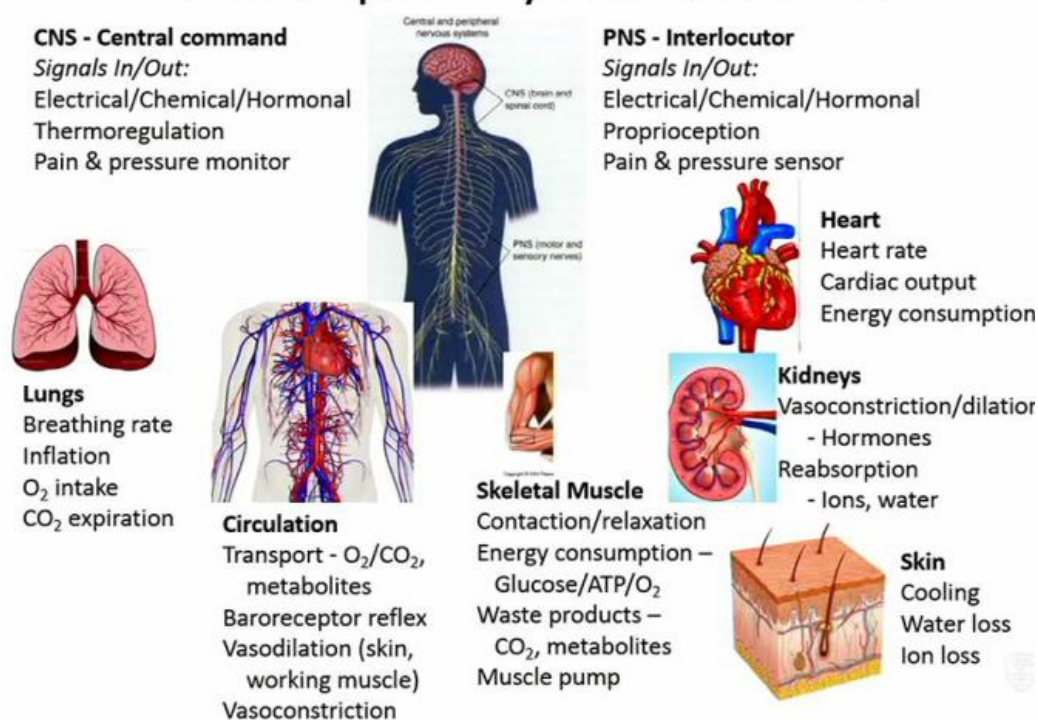
Homeostasis (comfort zone) vs Pathophysiology (no comfort zone):



Definition of Physiology:

- Interconnectedness of all things
- Molecular → cellular → tissues → organs → systems → organism

## An example – Dynamic Exercise



## Membranes, Gradients and Transport:

### Lipid Bilayer:

- Plasma membrane contains bipolar phospholipids (hydrophilic head groups, long hydrophobic tails) and cholesterol
- Self assembling and stable
- **Barrier to:**
  - Large hydrophobic molecules
  - Atomic ions-  $\text{Na}$ ,  $\text{Cl}^-$ , etc.
  - Polar molecules- glucose, water
  - Charged molecules- amino acids
  - Large molecules- proteins
- Note: Pathophysiology- many drugs are acid or base molecules- small hydrophobic cells that can penetrate lipid bilayer of cells

### Fluid Mosaic Model of Membranes:

- **Lipid bilayer** is modified by addition of:
  - **Transmembrane proteins** (EG channels, transporters, receptors): extend all the way across the cell membrane
  - **Membrane-attached proteins** (EG cytoskeleton- linking proteins)
  - Specialized **lipids** and **glycoproteins**
- Channels and Transporters selectively modify permeability of membrane
- Receptors receive and interpret signals

