• Venules

-Know the factors that affect physiology of circulation

- Blood flow: volume of blood flowing through vessel, organ, or entire circulation in given period
  - Measured in ml/min
- Blood pressure (BP): force per unit area exerted on wall of blood vessel by blood
  - Expressed in mm Hg
- Resistance (peripheral resistance): opposition to flow
  1. Blood viscosity
     - Increased viscosity equals increased resistance
  2. Total blood vessel length
     - The longer the vessel, the greater the resistance encountered
  3. Blood vessel diameter
     - Has greatest influence on resistance
     - If radius increases, resistance decreases, and vice versa

-Relationship of flow, pressure and resistance

- Blood flow (F) is directly proportional to blood pressure gradient (ΔP)
  - If ΔP increases, blood flow speeds up
- Blood flow is inversely proportional to peripheral resistance (R)
  - If R increases, blood flow decreases, so
  - \[ F = \frac{\Delta P}{R} \]
  - R is more important in influencing local blood flow because it is easily changed by altering blood vessel diameter

-Mean arterial pressure

- Varies with cardiac cycle
  - Systolic blood pressure (SP) = maximum pressure
    - Due to ejection of blood into aorta
  - Diastolic blood pressure (DP) = minimum pressure
    - Not zero due to elastic recoil
  - The measured BP is shown as SP/DP
    - Example: 110 / 70
  - Pulse pressure (PP) is SP – DP
    - Example: 100 – 70 = 30
  - Mean Arterial Pressure (MAP) = DP + (PP/ 3)
    - Example: 70 + (30 / 3) = 80 mm Hg
Net filtration occurs at the arteriolar end of a capillary.

1. Diffusion through membrane (lipid-soluble substances)
2. Movement through intercellular clefts (water-soluble substances)
3. Movement through fenestrations (water-soluble substances)
4. Transport via vesicles or caveolae (large substances)

Capillary lumen

Hydrostatic pressure in capillary (HPc) "pushes" fluid out of capillary.

Hydrostatic pressure (HPc) = 35 mm Hg
Osmotic pressure (OPc) = 26 mm Hg
NFP = 10 mm Hg

Boundary (capillary wall)

Interstitial fluid

Hydrostatic pressure (HPb) in interstitial fluid "pushes" fluid into capillary.

HPb = 0 mm Hg
OPb = 1 mm Hg

Osmotic pressure (OPb) in interstitial fluid "pulls" fluid out of capillary.
• Fever: Abnormally high body temperature that is systemic response to invading microorganisms
  - Leukocytes and macrophages exposed to foreign substances secrete pyrogens
  - Pyrogens act on body’s thermostat in hypothalamus, raising body temperature

- Be familiar with the types of adaptive immune responses
  - Humoral immunity
    - Antibodies, produced by lymphocytes, circulate freely in body fluids
    - Humoral immunity has extracellular targets
  - Cellular Immunity
    - Lymphocytes act against target cell
    - Cellular immunity has cellular targets
  - Antigens: substances that can mobilize adaptive defenses and provoke an immune response
  - Characteristics of antigens
    - Can be a complete antigen or hapten (incomplete)
      - Complete antigen - foreign proteins, polysaccharides, lipids, and nucleic acids
      - Hapten: binds to body’s own proteins and together gets recognized as foreign substance
    - Contain antigenic determinants: parts of antigen that antibodies or lymphocyte receptors bind to