Final Exam:
Monday March 15th
2pm
Room ITC 211

100 pts: 3rd Midterm
75 pts: Cumulative

Chapter 30: Urinary System

Maintains homeostatic conditions within body fluids.

*Excretory System*

Human Urinary System:
More than just the need to pee….

Homeostatic Functions:
1) Maintain water balance
2) Regulate [ion] (Na⁺, K⁺, Ca²⁺, Cl⁻)
3) Maintain blood pH
4) Maintain blood pressure and [O₂] in blood
5) Eliminate cellular waste (e.g. urea)

Urea = Product of amino acid metabolism

Uric Acid: Secreted by animals in xeric (dry) conditions (birds/reptiles)

Gross Anatomy of the Kidney:
- 1/4 of cardiac output delivered to kidneys (1.25 L/min)

Nephron: Functional unit of the kidney
- 1 million / kidney

Chapter 30: Urinary System

Nephron Anatomy:
1) Glomerulus:
   - Capillary bed
2) Bowman’s Capsule:
   - Collects fluids from blood
3) Tubule:
   - Conducting tube
     (a) Proximal Tubule
     (b) Loop of Henle
     (c) Distal Tubule
     (d) Collecting Duct

Chapter 30: Urinary System

Human Urinary System:
1) Kidneys
   - Filter blood
   - Reabsorb nutrients
2) Ureters
   - Transport urine away from kidney
   - Movement via peristalsis
3) Bladder
   - Stores urine
   - Maximum capacity ~ 1L
4) Urethra
   - Transport urine from bladder to outside body
     - Internal sphincter (invol.)
     - External sphincter (vol.)

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Chapter 30: Urinary System

**Nephron Physiology:**

1) **Filtration:**
   - Movement of materials
   - glomerulus → Bowman’s capsule
   - Ions, nutrients, waste, water
   - **Filtrate = Filtered fluids**

2) **Tubular Reabsorption:**
   - Water / nutrients returned to blood
   - Proximal Tubule / Loop of Henle
   - Active Transport (nutrients / ions)
   - Osmosis (water)

3) **Tubular Secretion:**
   - Wastes / excess substances move from blood to filtrate (e.g. drugs, H+)
   - Distal Tubule

4) **Concentration:**
   - Additional water removed (collecting ducts)

**Summary of Nephron Physiology:**

**Urine:** Waste and remaining water from nephron
- 95% water / 5% solutes (ions, urea)

**Micturition** (urination)
- Ureter
- Urogenital diaphragm
- External urethral sphincter (inv.
- Internal urethral sphincter (vol.)
Chapters 26: Urinary System

Micturition (urination)

Sensory Input (spinal cord)

Stretch (~200 ml)

(signals muscles to relax)

Brain

Chapters 30: Urinary System

Homeostatic Functions of Kidney:
(1) Eliminate waste  } Nephron of Kidney
(2) Balance [ion]
(3) Maintain pH

(4) Regulate water balance:
• Collecting duct permeability variable
• Impermeable = 22.5 L urine / day
• Permeable = 1.5 L urine / day
• Permeability controlled via hormones
  • Antidiuretic Hormone (Pituitary)
  • Increases permeability
  • Controlled via negative feedback

(5a) Regulate blood pressure:
  • Low BP → Kidneys release renin
    • Catalyzes formation of angiotensin
      • Constricts arterioles (= ↑ BP)

(5b) Regulate [O₂] in blood:
  • Low [O₂] → Kidneys release erythropoietin (↑ RBCs)