Urinary System

1. Urinary System
    - A. Functional Unit: Nephron
        - i. Number of nephrons per kidney
        - ii. Cardiac Output and kidney
        - iii. Homeostasis
2. Location and External Anatomy
    - A. Retroperitoneal
    - B. Hilus
    - C. Protective Coverings / Structures
        - i. Ribs
        - ii. Renal Capsule
        - iii. Adipose Capsule
        - iv. Renal Fascia
        - v. Pararenal Fat
3. Internal Anatomy
    - A. Renal Medulla
        - i. Renal Pyramids
            - a. Papilla
        - ii. Renal Columns
    - B. Renal Cortex

i. Cortical Region

ii. Juxtamedullary Region

C. Renal Pelvis

i. Major Calyces

ii. Minor Calyces

4. Blood Supply (you do not need to know vessels in gray, as usual)

Renal Artery
↓
Interlobar Arteries
↓
Arcuate Arteries
↓
Interlobular Arteries
↓
Afferent Arterioles
↓
Glomerulus
↓
Efferent Arteriole
↓
Peritubular Capillaries and/or Vasa Recta
↓
Interlobular Veins
↓
Arcuate Veins
↓
Interlobular Veins
↓
Renal Vein

5. Nerve Supply: Sympathetic Branch of the Autonomic NS, only.

    - Renal Plexus

6. The Nephron (General Anatomical Overview)

    A. Nephron Types

        i. Cortical Nephrons

        ii. Juxtamedullary Nephron

    B. Vascular Component

        i. Afferent Vessel

        ii. Glomerulus

        iii. Efferent Vessel

        iv. Peritubular Capillaries

        v. Vasa Recta (juxtamedullary Nephrons, only)

    C. Tubular Component

        i. Glomerular Capsule

        ii. Proximal Convoluted Tubule

        iii. Nephron Loop

        iv. Distal Convoluted Tubule

        v. Collecting Duct

7. The Nephron (DETAILED OVERVIEW)

(Note, this may be included in "8" below, ask prof.)

A. Renal Corpuscle or Glomerular (Bowman's) Capsule

i. Glomerular (Bowman's) Capsule

ii. Capsular Space

iii. Parietal Layer

iv. Visceral Layer

a. Podocytes

v. Glomerulus Histology

a. Fenestrated Endothelia

b. Basement Membrane

c. Podocytes

- Pedicels
- Filtration Slit

vi. Filtration

a. Arteriole diameter differences

b. Hydrostatic pressure vs. Osmotic Pressure

c Glomerular Filtrate

B. Proximal Convoluted Tubule and Tubular Reabsorption

i. Histology

ii. Function

a. Sodium

- Active and Passive Transport Mechanisms
- Electrostatic Attraction
- Osmosis
- "Obligatory Water Reabsorption"

b. Glucose and Amino Acids

- Sodium Co-Transport

C. Vasa Recta and Maintenance of Medullary Concentration Gradient

a. Physiology/permeability

b. Counter Current Mechanism or Multiplier

c. Water/salt reabsorption, continued

D. Loop of the Nephron (Loop of Henle) and Production of "Working Volume"

i. Descending Limb

a. Physiology/permeability

b. Water reabsorption, continued

ii. Ascending Limb

a. Physiology/permeability

b. Counter Current Mechanism or Multiplier (with Vasa Recta)

c. "Working Volume" production

E. Distal Convoluted Tubule and Regulation

i. Histology

a. Sodium and Potassium

- Sodium / Potassium Exchange Pumps
- Potassium
- ADH and Water Absorption

F. Collecting Duct and Regulation

i. Hypothalamus, osmoreceptors, and ADH

G. Juxtaglomerular Apparatus and Regulation

i. Regions

a. Juxtaglomerular Cells

b. Macula Densa

ii. Water / Salt Regulation

a. Hypothalamus, osmoreceptors, and ADH

- ADH and Water Absorption

* Aquaporins

iii. Blood Pressure Regulation

a. Renin-Angiotensinogen system

* Diameter Changes

* Pressure Changes

- Aldosterone

* Sodium / Potassium Exchange Pumps

* Water movement and Blood Pressure Changes

8. Accessory Excretory Structures

A. Ureters

i. Mucosa

a. Transitional epithelium

b. Lamina propria

ii. Muscularis

a. Circular Muscle

b. Longitudinal Muscle

ii. Adventitia (Not Serosa)

B. Urinary Bladder

i. Rugae

ii. Mucosa

a. Transitional epithelium

b. Lamina propria

iii. Muscularis

a. Detrusor Muscle

iv. Adventitia

v. Internal Urethral Sphincter

vi. External Urethral Sphincter

vii. Micturition

C. Urethra

i. Female Urethra

ii. Male Urethra

a. Prostatic Portion

b. Membranous Portion

c. Penile or spongy Portion

9. Urine and Micturition

A. Composition of Urine

i. Normal Constituents

ii. Abnormal Constituents