URINARY SYSTEM
1. Name the three functions of the urinary system: 
   1) 
   2) 
   3) 

2. In urine formation, the body needs to concentrate wastes and produce a _______-tonic urine.

3. Glomerular filtration is movement of fluid out of the _______ and into the _______. At this point the fluid is called _______.

4. During reabsorption there is movement of the substance out of the nephron and into the _______.

5. At this point, what is reabsorbed by active transport from the proximal tubule? _______.

6. Name three things that move in and out of the distal tubule before the urine enters the collecting duct.

7. Under what circumstances can the glomerular filtration rate not compensate for changes in blood pressure?

8. What is the average GFR of an adult with both kidneys functioning?

9. Every drop of plasma travels through the kidneys approximately ____ times per day.

10. The proximal tubule is made of what type of epithelial tissue?

11. In the proximal tubule, the volume of the filtrate is decreased by ____%.

12. The descending limb is made of _________ epithelium and the thin segment is made of _________ epithelium.
13. In the descending limb, ______ and ______ diffuse in and ______ leaves. The concentration of the filtrate is greatly increased.

14. The ascending limb is composed of ______ epithelium and is permeable/impermeable (circle correct one) to water.

15. Explain the countercurrent mechanism:

16. Where does fine-tuning of the filtrate occur?

17. What effect does higher ADH concentration have on water permeability?

18. Explain the mechanism by which desert rats can live on seawater.

**MALE REPRODUCTIVE SYSTEM**

19. What walnut sized structure does the urethra pass through? This structure produces a thin, milky fluid of alkaline pH.

20. Sperm cells are formed in the ______ and are then stored in the ______ for final maturation.

21. What duct passes through the inguinal canal and travels up over the bladder?

22. What three things does the spermatic cord contain?

23. What structures secrete an alkaline fluid high in fructose that makes up 60% of semen?

24. Why does semen need to be alkaline?

25. Name the spongy cylinder that the urethra enters after it comes out of the prostate. This comes out and forms part of the penis.

26. What are the three cylindrical columns of tissue that make up the penis?
27. Describe the mechanism of penile erection.

28. Another name for the bulbourethral glands is_________________. These glands produce fluid; what is the function of the fluid?

29. Name the very highly coiled tubes that are found in the lobules of the testes.

30. The walls of these tubules contain two types of cells:_____________________ which give rise to mature sperm cells and_____________________ which act to protect and nourish developing sperm cells.

31. What are the cells that are found in the interstitial spaces outside of the seminiferous tubules and produce androgens?

32. List the three hormones that are involved in spermatogenesis and discuss their function.

33. Decide if each of the following are diploid or haploid:
   - primary spermatocytes
   - spermatids
   - secondary spermatocytes
   - spermatogonia
   - spermatozoa

34. What is the function of hyaluronidase in egg fertilization and where is it located on the spermatozoa?

35. Discuss the function of the Sertoli cells.
FEMALE REPRODUCTIVE SYSTEM

36. At what time do the primary oocytes begin meiosis? What happens at puberty?

37. What happens if there is fertilization of the secondary oocyte?

38. What is the fate of the polar bodies?

39. How many viable gametes are formed from one primary oocyte?

40. What is formed when the chromosomes of the pronucleus of the sperm fuse with the chromosomes of the ootid?

41. Why does the incidence of chromosomal defects increase with maternal age?

42. What hormones are involved in oogenesis and what is their function?

43. What is the corpus albicans?

44. If fertilization occurs and the corpus luteum breaks down prematurely, what are the consequences?
45. What causes postpartum depression (also called "baby blues")?

46. Describe the following terms about the menstrual cycle:
   a) endometrium:

   b) menstrual phase: discuss hormone levels

   c) follicular phase: discuss hormone levels

   d) ovulation:

   e) luteal phase:

47. Where does fertilization usually occur (be specific)?

48. The oocyte is surrounded by the ___________________________
   which is a thick layer with lots of hyaluronic acid. Outside this layer there is a layer of cells called
   ___________ _____________.

49. What happens at the instant the sperm penetrates the membrane of the egg that ensures no other sperm can enter? Describe the proposed mechanism.

50. Define the term morula:

51. Describe and draw the blastocyst, what is the trophectoderm?
52. What is the function of the trophectoderm?

53. Why does the blastocyst implant itself in the endometrium?

54. The first two months of pregnancy are called the __________ __________. The remaining months are called the __________ __________.

55. What is the function of the yolk sac?

56. Define the term amnion, what is its function?

57. What do the home pregnancy tests identify in the maternal urine? What makes this hormone?

58. The blood vessels of what structure will become the umbilical arteries and veins?

**FLUID AND ELECTROLYTE BALANCE**

59. What percent of the total body weight is due to water? What does this level depend on?

60. List at least five extracellular fluids:
61. List as many intracellular ions and tell if we have a low or high concentration:

62. What controls the intake of water?

63. How do we lose water?

64. What is the major regulator of water?

65. What two hormones control sodium and potassium ion levels?

66. What two hormones regulate calcium ion levels?

67. What is the normal pH range? _____________ If the level drops below this range what do we call this lethal condition? ________________

68. Define acid:

69. Define base:

70. Write the equation for cellular respiration:

Do you see how the product of this reaction will decrease pH?

71. What is the product of incomplete oxidation of fatty acids?
72. List and describe the three methods of pH control:

1) 

2) 

3) 

Hints for Exam 4: Be sure you know urine formation in detail! Draw out pictures of the cells during spermatogenesis and oogenesis and write what occurs at each stage. Make flashcards of all hormones discussed in these sections and write their involvement/function on the back side.
1. 1) Remove nitrogenous wastes and excess salts  
    2) Water and electrolyte balance  
    3) Assists in pH balance

2. Hyper

3. Glomerulus, Bowman's capsule  
   Glomerular filtrate

4. Peritubular capillaries

5. Glucose

6. Na+ active transport out  
   Cl-out  H+ in  
   H₂O out  K+ in  
   HCO₃⁻ out

7. Rapid blood pressure drop  
   Especially cardiovascular shock-kidney failure

8. 125 mL/min or 180 L/day

9. 60

10. Simple cuboidal epithelium with microvilli

11. 72%

12. Simple cuboidal, simple squamous

13. NaCl, urea, water

14. Cuboidal, circle impermeable

15. Fluids flow in parallel but opposite direction. Constant cycling through the Loop of Henle is how we keep the hypertonic state in the interstitial fluid.

16. Distal tubule

17. Makes it more permeable

18. They have really long loops of Henle

19. Prostate gland
20. Testes, epididymis
21. Vas deferens (ductus deferens)
22. Vas deferens, nerves, & blood vessels
23. Seminal vesicles
24. To neutralize the vaginal fluid for the protection of sperm cells
25. Corpus spongiosum
26. Corpus cavernosum (2) & corpus spongiosum (1)
27. During sexual arousal, the artery dilates, increased blood flow into the penis, tissue begins to swell. Veins of penis are superficial, the more the penis swells, the veins are compressed, this results in an erection.
28. Cowper's gland, fluid cleanses urethra, lubricates tip of penis
29. Seminiferous tubules
30. Spermatogonia, Sertoli's cells (nurse cells)
31. Interstitial cells of Leydig
32. ICSH, testosterone, FSH, See your notes for their function
33. Primary spermatocytes-2H spermatogonia -2H
   Spermatids -1H spermatozoa -1H
   Secondary spermatocytes- 1H
34. Hyaluronic acid cements cells together, hyaluronidase is the enzyme that breaks down the outer barrier of the ovum
35. They kick out spermatids into lumen of tubule. They surround the spermatogonia and protect them from Tc cells.
36. Prior to birth (arrested in late Prophase I) at puberty, FSH level increases and Meiosis I is finished, occurs monthly
37. Rapid Meiosis II gives rise to ootid and second polar bodies
38. First polar body may divide but all polar bodies disintegrate and are reabsorbed, no function
39. one
40. Zygote
41. Older spindle fibers, they may break down and not separate a chromosome pair

42. FSH, estrogen, LH, progesterone
   See notes & text for functions

43. If the oocyte is not fertilized, the corpus luteum degenerates into the corpus albicans.

44. Spontaneous abortion

45. Serious drop in progesterone and estrogen

46. See your notes and text

47. Usually upper (proximal) 1/3 of the fallopian tube

48. Zona pellucida, corona radiata

49. The membrane becomes completely impermeable to any other sperm cells. The mechanism you need to know concerns the protein receptors on the surface of the egg cell. SEE YOUR NOTES!

50. A solid ball of cells, reaches uterus 3-4 days after fertilization.

51. Coating is the trophectoderm, hollow cavity, and an inner mass of cells. SEE YOUR NOTES FOR A DRAWING!

52. Cells secrete proteolytic enzymes

53. So it can absorb nutrients

54. Embryonic period, fetal period

55. Important in birds and reptiles, an enlargement of primitive gut, blood vessels help to absorb nutrients before placenta forms

56. Thin, tough, transparent membrane eventually completely surrounds the embryo

57. HCG (Human Chorionic Gonadotropin) the chorion secretes this hormone

58. Allantois

59. 45-75%, depends on adipose tissue, the leaner you are, the more water you're made of

60. ECF's: plasma, interstitial fluid, lymph, CSF, also serous fluids, peritoneal & pleural fluids, humors, and synovial fluid
61. ICF's: High concentration of K⁺, Mg++, PO₄³⁻, proteins
   Low concentration of Cl⁻, Na⁺, HCO₃⁻

62. The thirst center in the hypothalamus

63. Through urine, feces, sweat, evaporation through lungs

64. ADH

65. Aldosterone and ANF

66. PTH (main control) and calcitonin

67. 7.35-7.45, acidosis

68. A substance that releases H⁺, a proton donor

69. A substance that combines with H⁺, proton "sponges"

70. CO₂ + H₂O ←——→ H₂CO₃ ←——→ H⁺ + HCO₃⁻
   **REMEMBER: Increasing H⁺ concentration lowers pH.**

71. Ketones

72. 1) Buffer systems (fast regulation)
   2) Respiratory mechanism (regulation in minutes)
   3) Renal regulation (regulation in hours to days)

SEE YOUR NOTES FOR DETAILS!!