Reproductive System: Outline/Study Questions
Text References: Chapter 28 and part of Chapter 29.

Review Lab 9—Anatomy of the Reproductive System and read Chapter 28, The Reproductive Systems. Use the following questions to help expand upon your lab study of the reproductive system and as a guide to further your study of the physiology of the reproductive systems. We'll look briefly at Chapter 29 to understand some concepts associated with pregnancy, implantation, development, and labor and parturition/delivery (as outlined here).

**General Reproductive System** (Lab 9, Text, or BIO 1 Notes)

1. What are the basic functions of the male and female reproductive systems?

2. Define/describe gonads, gametes, and germ cells and their relationship to the reproductive system.

3. Define chromosome number, diploid number, and haploid number. How do they relate to the reproductive functions? Compare germ cells and body cells.

4. Define and compare/contrast spermatogenesis and oogenesis. Briefly outline the processes. What relationship does this have to meiosis?

**Male Reproductive System**

1. Describe the external appearance of the scrotum and raphe. What is the function of the scrotum?

2. Describe the descent of the testes. What is cryptorchidism? What is the gubernaculum?

3. Describe and compare the dartos muscle and the cremaster muscle. What is the cremasteric reflex? Relate this to # 2.

4. Explain the mechanism of temperature control in the testes. How are these related to the structures and processes listed above? Why is it extremely significant?

5. Define and differentiate between spermatogenesis, spermiogenesis, and spermiation (see lab notes). Where does each occur?

6. Note: spermatogonia, primary spermatocytes, secondary spermatocytes, spermatids, and spermatozoa are various stages of sperm development. Where are they? See Fig. 28.4 and relate it to Fig. 28.5)

7. Describe the hormonal functions, control, and negative feedback mechanism involved in spermatogenesis. Include the following: GnRH, FSH, ICSH (LH), ABP, Testosterone and DHT, and inhibin. Be able to diagram this process, name target organs (tissues) and inhibitors. Note the differences between regulating spermatogenesis and testosterone levels in the blood. See Figs. 28.7 and 28.8.
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8. Describe the effects that androgens (testosterone and DHT) have on prenatal development, development of male secondary sexual characteristics, development of sexual function and libido (male and female), and on anabolic activities.

9. With #8 in mind and thinking back on skeletal muscle anatomy & physiology (remember those body building pictures), explain why it is impossible for a female to build as much muscle mass as a male. What happens if she supplements with testosterone—a very dangerous thing to do? Is it dangerous for a male to supplement with testosterone (or related products such as anabolic steroids or HGH)? Explain.

10. Review the male reproductive structures from lab 9 and your text. Describe the path of the sperm from formation in the testes until it is ejaculated.

11. Describe the secretions and the functions of the accessory glands of the male reproductive system. Describe the composition of semen. What function does it have? (Lab 9 and text)

12. Describe the physiology of erection and ejaculation. Is urine expelled with ejaculation? Relate this to the anatomy and histology of the penis (Review Lab 9 histology) and Fig. 28.10.

13. What is the glans penis and prepuce (foreskin)? Describe their relationship to circumcision. (Lab 9)

14. Describe the appearance, structures, and functions of the sperm cell. What is the acrosome? What, specifically, does it produce and what function does this substance have? What is the function of the mitochondria in the midpiece and what is the function of the tail? (Fig. 28.6) (Lab 9 histology)

15. What is the function of the stereocilia of the epididymis (Lab 9 histology)? Relate this to a question males often have who are considering having a vasectomy: “What happens to my sperm if my vas deferens are cut?”

16. Explain anatomically why a vasectomy is an extremely effective (considered permanent) means of birth control. Answer this common question: “If I have a vasectomy, will I still be able to ejaculate and have anything to ejaculate?”

17. Describe each and discuss the differences between infertility (sterility) based on sperm production/sperm count and impotence (erectile dysfunction—ED). What causes each and what can be done to modify these conditions?

18. How does Viagra (sildenafil) help to enhance erection (anatomically and physiologically speaking—remember what NO does)?
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The Female Reproductive System

1. Review female reproductive anatomy and histology from Lab 9 and your text.

2. Describe female external genitalia (also called pudendum or vulva) and relate them to the corresponding male structures. Development of the external genitals (Fig. 28.31) is interesting, especially when followed by a look at homologous structures of the female and male reproductive systems (Table 28.2—which you must know for lab and lecture).

3. Take another look at and compare the female perineum (Fig. 28.21) and the male perineum (there is not a clearly corresponding diagram of the male, so use 28.1 and your imagination as a second best alternative). While you’re looking at this—what is an episiotomy and why is it performed during delivery?

4. Review the structures of the ovary. Describe follicular development. Look at histology of ovary (Lab 10).

5. Define oogenesis and compare oogonium, primary oocyte, secondary oocyte (and ovum if fertilization occurred). Include diploid and haploid number where appropriate. Where are these found?

6. Describe the journey an “ovum” (actually, it’s a secondary oocyte) takes as it leaves the ovary and finally passes out of the body. (This looks short and sweet, but it isn’t).

7. What happens if fertilization occurs—where does it occur and describe what happens? See Lab 10 handout and check it out in Chpt. 29 (Fig. 29.3). Where does implantation usually occur? We’ll do the hormones and physiology in lecture.

8. What is an ectopic pregnancy? Where does it occur? Describe the connection with smoking (and loss of cilia trachea—now that’s a stretch to connect! Or is it?)

9. Review the uterine structures and layers and their functions (histology lab 10). This will be important for the physiology that’s about to happen.

10. What is meant by anteflexion (normal) and retroflexion (abnormal-sort of) when talking about the uterus?

11. Describe hysterectomy (strictly speaking by definition, are the ovaries removed? What would be the difference—physiologically speaking?)

12. The mucosal cells of the vagina contribute to the acid environment of the vagina. What are the pros and cons here?
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13. Review the anatomy of the female breasts. Go back to chapter 18 and review the hormone, oxytocin (produced in the __________ and stored and released from the ________________), and describe the milk let-down reflex.

14. Describe other functions associated with oxytocin (i.e.: uterine contractions of labor and delivery; faster recovery by the uterus if breast feeding—what’s the connection?).

15. Describe disorders associated with breast tissue:
   A. Fibrocystic disease
   B. Breast cancer—see pp.1095-1096.

16. Describe other female reproductive system disorders as listed below:
   A. Premenstrual syndrome (PMS)—what is it? Signs and symptoms? We’ll make a connection when we do the physiology of the menstrual/ovarian cycle in lecture.
   B. Endometriosis—what is it, where is it, and what makes it worse?
   C. Cervical cancer and PAP smear
   D. Vulvovaginal candidiasis (yeast infection)—what’s the connection with antibiotics?

17. Describe in DETAIL the menstrual/ovarian cycles. You should consider them separately as well as together. Explain hormonal control and effects. Include associated events resulting in an unfertilized secondary oöcyte as well as a fertilized “ovum” and pregnancy. Continue your study of pregnancy with hormones of pregnancy and delivery, then hormones of lactation (milk production and letdown). See supplemental handout: Hormones of Pregnancy

This is the heart of the lecture for female physiology. Do the following in preparation for lecture (this means before you come to lecture!!!!!!).

A. You must know female reproductive system: gross anatomy, ovarian histology and what’s happening (Fig. 28.13) and you must know the histology of the uterus before you can go any further.

B. Briefly describe the ovarian and menstrual (uterine) cycles—notice that there are two cycles happening simultaneously and they work in conjunction with each other.

C. What is meant by “ovarian hormones” as opposed to hormones of the hypothalamus and hormones of the anterior pituitary?
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D. Describe the female secondary sex characteristics and which hormones are responsible for stimulating their development and then maintaining them? What are synergistic hormones?

E. Describe the following hormones associated with the normal menstrual and ovarian cycles (not resulting in fertilization and pregnancy). Where are they produced—are they from the hypothalamus, anterior pituitary, ovary (specify developing follicle, mature follicle, corpus luteum), or from somewhere else. What do they do? Chapter 18 may also be helpful. (See Figs. 28.23 and 28.25—must know diagrams and information).

1. Gonadotropin releasing hormone (GnRH)
2. Follicle stimulating hormone (FSH)
3. Luteinizing hormone (LH)
4. Estrogens
5. Progesterone
6. Relaxin
7. Inhibin

F. Copy Figure 28.24. Study it carefully. Outline each of the phases of the female reproductive cycle, noting what is happening in the ovary and what is happening simultaneously in the uterus. What are the key hormones in each phase and what are the minor hormones in each phase? We’ll go over this very thoroughly in lecture, but you need to review it very carefully before lecture and have a copy ready to use in class.

1. Menstrual phase
2. Preovulatory phase (follicular phase, proliferative phase)
3. Ovulation
4. Postovulatory phase (luteal phase, secretory phase)

G. Review again Fig. 28.26—Summary of hormonal interactions in the ovarian and uterine cycles.
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Pregnancy: We will just briefly look at specific sections of chapter 29. You might find it interesting to read the whole chapter when you have more time. For now, just answer these questions using your text and information from lecture.

18. Briefly describe fertilization, cleavage, and formation of the morula then blastocyst (see Fig. 29.1 and Fig. 29.2).

19. Describe implantation of the blastocyst in the endometrium where it will burrow and will be nourished by the endometrium. Note: the outer cells of the blastocyst, called the trophoblast, attach to the endometrium and continue to proliferate and change. Some of these trophoblastic cells will become part of the chorion, an embryonic membrane that produces human chorionic gonadotropin (hCG). (see Fig. 29.3 and 29.4)

20. What is the function of hCG—what is it’s target in the mother’s ovary? What role does it play in pregnancy? What role does it play in early pregnancy testing?

21. The chorion, a fetal membrane, along with some of the maternal endometrial tissue, forms the placenta. List and describe the functions of the placenta?

22. The hormones of pregnancy: where are they produced (note: this may vary depending if it is during the first 3 months of the pregnancy or later), when are they produced and are at their highest levels, and what are their functions? See Fig. 29.16 and next study guide—Hormones of Pregnancy.
   A. human chorionic gonadotropin (hCG)
   B. human chorionic somatomammotroin (hCS) or human placental lactogen (hPL)
   C. progesterone
   D. estrogens
   E. relaxin
   F. corticotropin-releasing hormone (CRH)
   G. cortisol

23. Define labor and parturition.

24. What hormones are particularly associated with labor and parturition and what are their functions? Compare these to pregnancy levels and non-pregnant people.
   A. corticotropin releasing hormone
   B. cortisol
   C. estrogen
   D. progesterone—what happened to it?
   E. oxytocin

25. How do we “induce labor with Pitocin” (synthetic oxytocin)—why does it work? (It’s the pits!!!)
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26. Step back to the respiratory system and IRDS. What is not yet developed in these premature infants? What role does cortisol play? Why was beta-methasone used to treat this disorder (see the connection?).

27. Define lactation.

28. Outline the physiology of lactation and describe associated hormones. Differentiate between milk secretion (making milk, milk production) and milk ejection (milk let-down reflex). What hormones are involved and what are their functions?
   A. prolactin (PRL)
   B. oxytocin (OT)

29. What is the connection between oxytocin and expulsion of the placenta and oxytocin (via breast feeding) and getting the uterus back in shape after delivery?

30. What is colostrum and describe why it is critical that a newborn get its mother’s colostrum.

31. List and describe the benefits of breast-feeding.

32. What are the risks of cigarette smoking during pregnancy and breast-feeding? What are the risks of second-hand smoke to pregnant mothers and their babies?

Birth Control Methods

Describe each of the following methods of birth control. Include their effectiveness, how they work, other benefits, and risks or side effects—if any. Are these used by males or by females as a means of birth control?

1. Describe the two most common surgical sterilization procedures: vasectomy and tubal ligation. Why are they considered the most effective method of birth control? Are they reversible? —Explain.

   A. Oral contraceptives (the pill)
   B. Emergency contraception (the morning after pill)
   C. Norplant
   D. Depo-provera
   E. Vaginal ring

3. Describe how intrauterine devices (IUD) work.
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4. Describe **spermocides**—what are they? What would make them more effective?

5. Describe the following **barrier methods** of birth control. Which may play a role in preventing sexually transmitted diseases? Explain.
   A. Condom
   B. Vaginal pouch
   C. Diaphragm

6. **Periodic abstinence**—why are people who use this method frequently referred to as *parents*?
   A. Rhythm method
   B. Sympto-thermal method—can you simultaneously predict and protect? Explain how this method can actually be used in some infertility situations (this means it helps people get pregnant.)

7. **Coitus interruptus**—a good way to get pregnant.

8. **Induced abortion**—although this is discussed in your text along with birth control, it certainly is not a means of *pregnancy prevention* as are the others—explain. Describe the difference between this induced abortion and miscarriage. Compare surgical abortions (vacuum aspiration, saline infusion, surgical evacuation) to nonsurgical abortion using RU486 (mifepristone). Relate RU486 to hormonal control of pregnancy and progesterone (from lecture and previous reading in the chapter).

**Sexually Transmitted Diseases** have declined over the past 25 years in most developed countries such as the European Community, Japan, Australia, and New Zealand. However, they are reaching epidemic levels in the USA, especially in urban communities. They continue to increase in developing countries.

Describe each of the following STDs. Include mechanisms, symptoms, and long-term effects. Indicate which are treatable (how and how effective) and/or curable or incurable. How can they can be prevented?

**What is “safe sex” and how can it be insured? What is “unprotected sex”?**

**Remember**—there is a significant and direct relationship between STDs and HIV and **Hepatitis B** (review these as needed). Explain.

1. Chlamydia
2. Gonorrhea
3. Syphilis

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4. Genital herpes

5. Hepatitis B (Chpt. 24, pg. 942)

6. HIV/AIDS (Chpt. 22, pg. 838)