### Biology 12 - The Reproductive System!

#### Part A: Definitions

- **a)** testes: male gonads which produce sperm and testosterone
- **b)** scrotum: sac in which testes are suspended, hang underneath penis outside male’s body.
- **c)** seminiferous tubules: 3 coiled tubes within each testis in which sperm is produced.
- **d)** epididymis: tubular storage sac on top of each testis in which sperm mature.
- **e)** sperm: the male gamete, consists of head, middle piece, and tail. Released during ejaculation.
- **f)** vas deferens: tube the carries sperm from epididymis to urethra during ejaculation.
- **g)** acrosome: cap on sperm head that contains enzymes which can dissolve the outer barriers of egg.
- **h)** spermatogenesis: development of sperm: involves meiosis
- **i)** penis: cylindrical shaped organ that hangs in front of scrotum that functions in sexual intercourse. Increased blood flow causes it to become erect.
- **j)** Interstitial cells: cells that lie between the seminiferous tubules that produce testosterone
- **k)** Sertoli cells: cells in the seminiferous tubules that support, nourish, and regulate the spermatogenic cells
- **l)** Semen: thick whitish fluid ejaculated from the penis (about 3.5 ml per ejaculation). Can contain as many as 400 million sperm plus secretions from the prostat, Cowper’s and seminal vesicles.
- **m)** seminal fluid: non-sperm part of semen that nourishes (contains fructose), protects, lubricates sperm and helps it to move. Also contains prostaglandins that cause the uterus to contract.
- **n)** seminal vesicles: pair of organs that each have duct to join to each vas deferens. Produce secretion contain fructose to nourish sperm.
- **o)** prostate gland: donut shaped organ that surrounds upper part of urethra just below bladder. Secretes a milky alkaline fluid that helps sperm survive in the acidic vaginal canal.
- **p)** Cowper’s glands: pea-sized organs that lie below the prostate on either side of urethra
- **q)** urethra: tube that carries urine from bladder during urination and semen from vas deferens (though never at the same time)
- **r)** testosterone: the principal male sex hormone that is needed for the development of the primary male sexual characteristics, maturation of sperm in spermatogenesis and also causes secondary sexual characteristics. It is also responsible largely for the sex drive and aggressive behavior.
- **s)** FSH (in males): Follicle stimulating hormone. Released by the anterior pituitary in response to GnRH. Promotes spermatogenesis in the seminiferous tubules by causing the seminiferous tubules to take up testosterone. The release of FSH is stopped by the hormone inhibin, also released by seminiferous tubules.
- **t)** LH (in males): Luteinizing hormone (sometimes called ICSH (interstitial cell stimulating hormone) in males. LH stimulates the interstitial cells to release testosterone.
- **u)** ovaries: female gonads that produce eggs and the female sex hormones. About 3 cm by 1 cm in size.
- **v)** oviducts: “Fallopian tubes” Cilia-lined tubes that transport eggs from ovaries to uterus. Are the usual site of fertilization.
- **w)** uterus: thick-walled muscular organ, shaped like an upside-down pear, when fetus develops. Normally about 5 cm wide.
- **x)** cervix: opening of uterus from vagina (joins vagina at nearly right angles).
- **y)** vagina: muscular tube with mucus-secreting lining; receives penis during intercourse, and serves as a birth canal.
z) follicles sac-like structures within ovaries (about a million per ovary at time of birth -- only about 400,000 remain by puberty); each follicle contains an immature egg (oocyte). Only about 400 follicles ever mature. Oogenesis takes place in follicle.

aa) oocyte an immature egg cell

bb) zona pellucida mucoprotein that surrounds the secondary oocyte.

c) ovulation the release of a secondary oocyte (egg) from the ovary. It occurs once per month.

dd) corpus luteum a follicle that has released its egg. Corpus luteum produces estrogen and progesterone. If no pregnancy occurs, it breaks down in about 10 days. If pregnancy does occur, it breaks down in 3 - 6 months.

e) clitoris small erectile organ in females above urethral opening that has many sense receptors and functions in arousal and orgasm.

ff) hypothalamus part of brain that ultimately controls release of sex hormones. Releases GnRH

gg) FSH Hormone released by anterior pituitary. In females, causes development of follicle, in males, promotes spermatogenesis.

Part B: Fill In The Blanks
1. The part of the male reproductive system that creates an antacid secretion is called the PROSTATE GLAND.

2. Semen is composed of SPERM, which is made in the SEMINIFEROUS tubules, and secretions from the PROSTATE gland, COWPER’S glands, and SEMINAL vesicles.

3. The seminal vesicles secrete a fluid that is rich in the monosaccharide FRUCTOSE, which serves as FOOD for the sperm.

4. Cowper’s glands secrete a fluid that acts as a LUBRICANT.

5. The INTERSTITIAL cells in the testes produce testosterone in response to the hormone LH.

6. The hormone FSH promotes spermatogenesis.

7. The male hormone testosterone is a STEROID hormone, meaning that it is LIPID-soluble. Like all steroid hormones, it is derived from the steroid hormone CHOLESTEROL.

8. SPERM is made inside the seminiferous tubules and sent from there to the EPIDIDYMIS for storage.

9. Label the diagram of the male reproductive system.

10. List the structures through which sperm passes in order, from the following list: epididymis, seminiferous tubules, urethra, penis, vas deferens.

11. Label the parts of the diagram of the sperm cell and list a function for each part:
12. List 3 function of testosterone
A. PROMOTES NORMAL DEVELOPMENT AND FUNCTION OF PRIMARY SEXUAL ORGANS
B. CAUSES DEVELOPMENT OF SECONDARY SEXUAL CHARACTERISTICS DURING PUBERTY
C. TESTOSTERONE IS NECESSARY FOR THE DEVELOPMENT OF SPERM

13. The HYPOTHALAMUS produces the hormone GnRH when testosterone and INHIBIN levels are LOW.

14. This causes the ANTERIOR pituitary gland to release FSH and LH.

15. LH causes INTERSTITIAL cells in the testes to release more TESTOSTERONE.

16. FSH causes the seminiferous tubules to absorb more TESTOSTERONE, which in turn causes them to produce more SPERM. As it makes more sperm, it also releases more of the hormone INHIBIN. High levels of this hormone feedback to the HYPOTHALAMUS and PITUITARY, causing them to release less of their hormones.

17. Label the following diagram and give a function for each labeled part.

<table>
<thead>
<tr>
<th>Name</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>W</td>
<td>HEAD</td>
</tr>
<tr>
<td>W</td>
<td>CONTAINS THE MALE’S 23 CHROMOSOMES</td>
</tr>
<tr>
<td>X</td>
<td>ACROSOME CAP</td>
</tr>
<tr>
<td>X</td>
<td>CONTAINS ENZYMES FOR ENTERING EGG</td>
</tr>
<tr>
<td>Y</td>
<td>MID-PIECE</td>
</tr>
<tr>
<td>Y</td>
<td>CONTAINS MITOCHONDRIA FOR ENERGY FOR MOVEMENT</td>
</tr>
<tr>
<td>Z</td>
<td>TAIL</td>
</tr>
<tr>
<td>Z</td>
<td>WIGGLES BACK AND FORTH TO PROPEL SPERM</td>
</tr>
</tbody>
</table>

18. List 3 functions of estrogen:
A. STIMULATES THE GROWTH OF THE UTERUS AND VAGINA, NECESSARY FOR EGG MATURATION
B. CAUSES AND MAINTAINS SECONDARY SEX CHARACTERISTICS AT PUBERTY
C. RESPONSIBLE FOR PROLIFERATIVE PHASE OF UTERINE CYCLE

19. The entrance to the uterus is called the CERVIX.

20. The female erectile organ containing many sensory nerve receptors is called the CLITORIS.

21. The menstrual cycle lasts on average 28 days. Day 1 is the first day that MENSTRUATION starts, and usually finishes by day 5.

22. During menstruation, levels of female HORMONES are low.

23. In the follicular phase (days 1 – 14), low levels of hormones are detected by the hypothalamus, which releases GnRH. This is sent to the pituitary gland, which releases FSH and LH.

24. FSH causes several immature EGGS, along with their surrounding FOLLICLE cells, in the ovaries to begin to develop. The developing follicle cells release increasing amounts of ESTROGEN.
25. This hormone is responsible for the **PROLIFERATIVE** phase of the uterine cycle. In the uterus, **BLOOD** vessels and **GLANDS** proliferate.

26. Rising levels of estrogen cause the release of a large amount of **LH** on about day 13 which causes **OVULATION**.

27. Ovulation normally occurs on day 14. In ovulation, the **EGG** is released from the ovary, leaving behind the **FOLLICLE** cells, which go on to form the **CORPUS LUTEUM**. This structure continues to release the hormones estrogen and progesterone. Of these two hormones, **PROGESTERONE** is most important for the luteal phase of the ovarian cycle. This hormone causes the **SECRETORY** phase of the uterine cycle. The uterine glands mature and release a thick mucus, and the endometrium **DOUBLES** in thickness.

28. High levels of **PROGESTERONE** cause **NEGATIVE** feedback to the anterior pituitary, shutting down the release of **LH**. Lower levels of LH cause the **CORPUS LUTEUM** to disintegrate. Since it is breaking down, it can no longer release estrogen and progesterone.

29. Low levels of female **HORMONES** by day 28 will cause the uterine **LINING** to be shed, and the cycle will start anew.

30. However, if fertilization happens, the **MENSTRUAL** cycle will be interrupted. Fertilization usually occurs in the upper **OVIDUCT**. The fertilized egg is first called a **ZYGOTE** and then an **EMBRYO** as it divides through mitosis.

31. The embryo, upon reaching the **UTERUS**, will embed itself into the endometrium. This is called **IMPLANTATION**.

32. A shared set of membranes called the placenta forms around the embryo. This will begin to secrete the hormone HCG, which temporarily maintains the corpus luteum.

33. As the placenta develops and matures, it makes its own **ESTROGEN** and **PROGESTERONE**. This will maintain the uterine lining so that **MENSTRUATION** does not occur during pregnancy.

34. After 9 months, the fetus is ready to be born. The pressure of the baby’s head against the cervix causes a nerve impulse to be sent to the hypothalamus. This causes the hypothalamus to release the hormone **OXYTOCIN** to the pituitary, which releases it into the blood. This hormone causes **LABOUR**. It operates on a **POSITIVE** feedback loop. The hormone causes the uterine muscles to **CONTRACT** with ever greater intensity until the baby is pushed out of the uterus through the **VAGINA**, which serves as the birth canal.

35. | COLUMN A                  | COLUMN B                      |
<table>
<thead>
<tr>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>prostate gland</td>
<td></td>
</tr>
<tr>
<td>ovary</td>
<td>a) location for spermatogenesis</td>
</tr>
<tr>
<td>epididymis</td>
<td>b) has enzymes used to penetrate egg</td>
</tr>
<tr>
<td>seminiferous tubule</td>
<td>c) sperm mature here</td>
</tr>
<tr>
<td>uterus</td>
<td>d) secretes progesterone</td>
</tr>
<tr>
<td>fallopian tube</td>
<td>e) location of the developing fetus</td>
</tr>
<tr>
<td>ductus (vas) deferens</td>
<td>f) provides nutrients for sperm</td>
</tr>
<tr>
<td>acrosome</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>COLUMN A</th>
<th>COLUMN B</th>
</tr>
</thead>
<tbody>
<tr>
<td>acrosome</td>
<td>a) stimulates secretions from the corpus luteum</td>
</tr>
<tr>
<td>corpus luteum</td>
<td>b) causes the endometrium to thicken</td>
</tr>
<tr>
<td>luteinizing hormone</td>
<td>c) an organ of copulation</td>
</tr>
<tr>
<td>estrogen</td>
<td>d) contains enzymes necessary to penetrate egg</td>
</tr>
<tr>
<td>vagina</td>
<td>e) area for maturation of sperm</td>
</tr>
<tr>
<td>urethra</td>
<td>f) secretes testosterone</td>
</tr>
<tr>
<td>epididymis</td>
<td></td>
</tr>
<tr>
<td>interstitial cell</td>
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