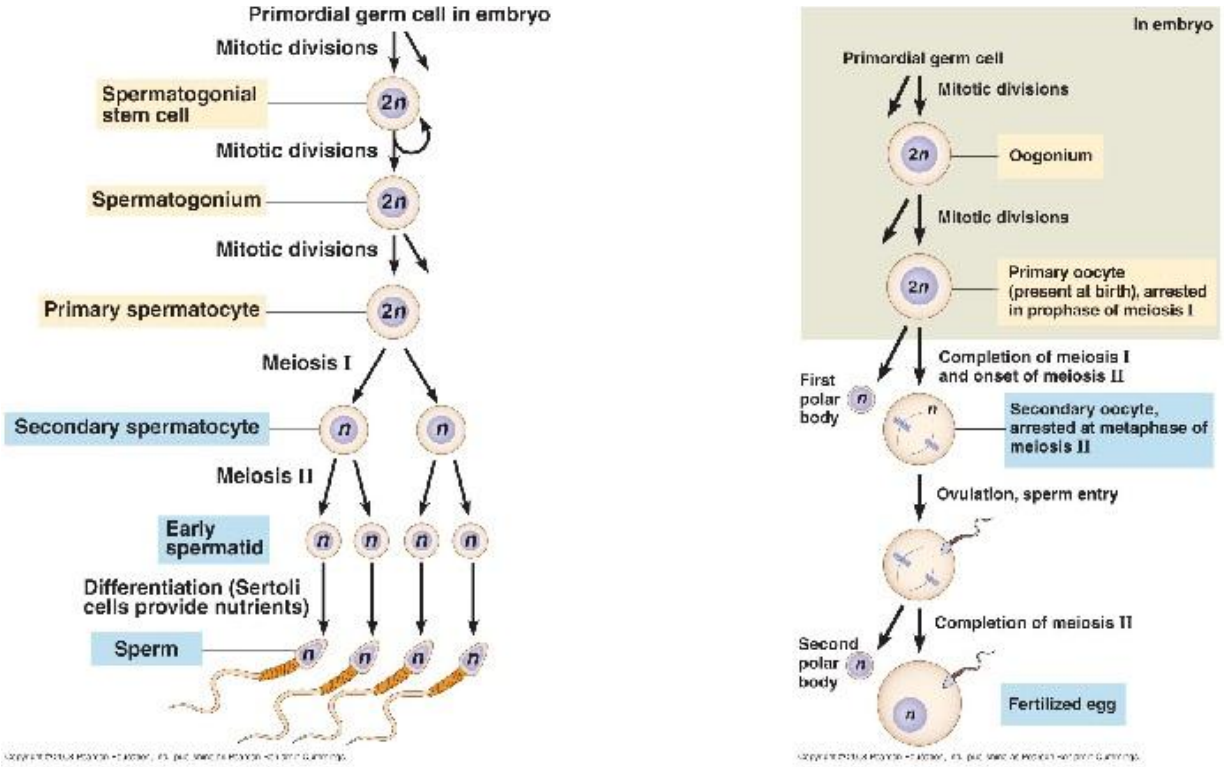
Warm-Up Questions – Fill in the Blank

1. Budding: type of asexual reproduction in which a new individual grows while attached to the parent's body
2. Pheromones: small, volatile chemicals that may act as mate attractants
3. Parthenogenesis: development of egg without fertilization
4. Hermaphrodite: individual with functioning male and female reproductive systems
5. Cloaca: common opening of digestive, excretory, and reproductive systems in non-mammalian vertebrates
6. Estrous: type of reproductive cycle in which thickened endometrium is reabsorbed
7. Urethra: common duct for urine and semen in mammalian males
8. Corpus luteum: ovary tissue that forms from the collapsed follicle after ovulation and secretes progesterone
9. Zygote: a fertilized egg (the product of fertilization)
10. Endometrium: the highly vascularized lining of the uterus that serves as the site of embryo implantation

Gametogenesis

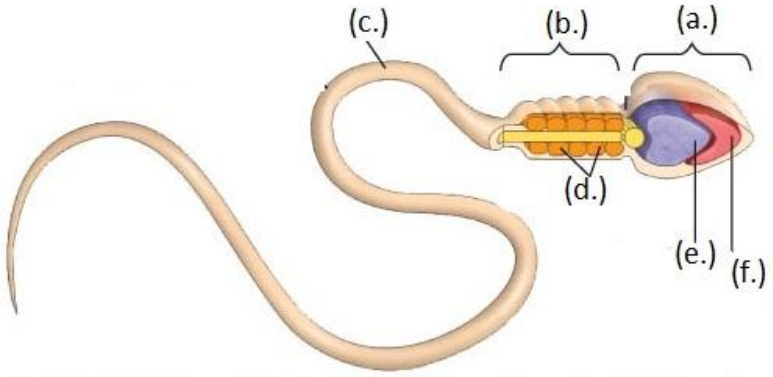
11. Can you draw a diagram that indicates the progression of spermatogenesis and oogenesis in mammals?



12. What are three important ways in which oogenesis differs from spermatogenesis?

- Infinite vs. Fixed Number of Gametes: Spermatogenesis occurs continuously over a male's lifetime, whereas a female's supply of primary oocytes is fixed at birth.
- Four vs. One Gametes per Meiotic Cycle: Each meiotic division produces four sperm in males, but only one ovum (and two polar bodies that disintegrate) in females.
- Continuous vs. Arrested Phase Meiosis: Spermatogenesis is an uninterrupted process, but oogenesis occurs in stages: Arrested at prophase I at birth; Arrested at metaphase II after puberty; Only completes meiosis after fertilization.

13. Can you label and describe the parts of the mammalian sperm?



a. Head – contains the acrosome & nucleus
b. Midpiece – contains the mitochondria
c. Tail – flagellum that propels the sperm through the female reproductive tract
d. Mitochondria – stored in the midpiece and provide ATP for movement of the flagellum
e. Nucleus – found in the sperm head and contains the male's haploid genetic information
f. Acrosome – found in the tip of the head and contains hydrolytic enzymes to aid in egg penetration

Hormone Regulation of Mammalian Reproduction

14. (a.) Gonadotropin-releasing hormone (GnRH) from the hypothalamus directs the anterior pituitary to produce (b.) Follicle-stimulating hormone (FSH) and (c.) Luteinizing hormone (LH), which are gonadotropins that regulate gametogenesis and sex hormone production in both males and females. (d.) Androgens (primarily testosterone) are the male steroid sex hormones, and (e.) Estrogens (mainly estradiol & progesterone) are the female steroid sex hormones.

15. Why are the male and female steroid sex hormones important?

- Help regulate gametogenesis
- Responsible for embryonic development of primary sex characteristics
- Direct the formation of secondary sex characteristics at puberty

16. How do GnRH, FSH, LH, Testosterone, and Inhibin control the male reproduction cycle specifically?

- GnRH (produced by hypothalamus) – regulates the release of gonadotropic hormones from the anterior pituitary
- FSH (produced by anterior pituitary)– stimulates Sertoli cells of the seminiferous tubules, which nourish sperm and promote spermatogenesis
- LH (produced by anterior pituitary) – stimulates production of androgens (testosterone) by Leydig cells
- Testosterone (produced by Leydig cells) – inhibits production of GnRH, FSH, and LH
- Inhibin (produced by Sertoli cells) – reduces FSH secretion