

Reproduction MCQs

Guyton review

1. Seven days after ovulation, pituitary secretion of luteinizing hormone (LH) decreases rapidly. What is the cause of this decrease in secretion?

- A) The anterior pituitary gland becomes unresponsive to the stimulatory effect of gonadotropin-releasing hormone (GnRH)
- B) Estrogen from the developing follicles exerts a feedback inhibition on the hypothalamus
- C) The rise in body temperature inhibits hypothalamic release of GnRH
- D) Secretion of estrogen and progesterone by the corpus luteum suppresses hypothalamic secretion of GnRH and pituitary secretion of LH
- E) None of the above

Answer: D) Estrogen and progesterone are formed in large amounts by the mature corpus luteum that has formed by 7 days following ovulation, causing negative feedback inhibition of LH secretion from the anterior pituitary.

2. Within minutes following a normal delivery, flow through the foramen ovale decreases dramatically. What is the cause of this change?

- A) Increased formation of prostaglandin E₂ in the endocardium
- B) Increased rate of flow through the pulmonary artery
- C) Increased left atrial pressure
- D) Increased right atrial pressure
- E) Increased P_{O2}

Answer: C) Following birth, systemic arterial resistance increases dramatically due to loss of the placental vasculature. Consequently, arterial pressure, left ventricular pressure, and left atrial pressure all increase. At the same time pulmonary vascular resistance decreases due to expansion of the lungs, pulmonary artery pressure, right ventricular pressure and right atrial pressure all fall. Blood flow through the foramen is a function of the pressure gradient, which after birth favors flow from the left to the right atrium, but most of the flow is blocked by the septal flap on the septal wall of the left atrium.

3. One treatment for erectile dysfunction requires the injection of a substance into the corpora cavernosa of the penis. The injection of which of the following causes an erection?

- A) Norepinephrine
- B) A substance that inhibits formation of nitric oxide
- C) Thromboxane A₂, which is a vasoconstrictor prostaglandin
- D) Angiotensin II
- E) None of the above

Answer: E) Erection requires dilation of the vascular smooth muscle of the resistance vessels leading to the corpora cavernosa. All of the substances listed are vasoconstrictors and would prevent erection.

4. A young woman is given daily injections of a substance beginning on the 16th day of her normal menstrual cycle and continuing for 3 weeks. As long as the injections continue, she does not menstruate. The injected substance could be which of the following?

- A) Testosterone
- B) FSH
- C) An inhibitor of progesterone's actions
- D) A prostaglandin E2 inhibitor
- E) HCG

Answer: E) HCG has the same stimulatory effect as LH on the corpus luteum. Administration of HCG would cause the corpus luteum to continue to secrete estrogen and progesterone, preventing degradation of the endometrium and onset of menstruation.

5. Which of the following could inhibit the initiating labor?

- A) Administration of an antagonist of the actions of progesterone
- B) Administration of luteinizing hormone
- C) Administration of an antagonist of prostaglandin E2 effects
- D) Mechanically dilating and stimulating the cervix
- E) Administration of oxytocin

Answer: C) Antagonism of progesterone's effects, dilation of the cervix, and oxytocin all increase uterine smooth muscle excitability and will facilitate contractions and onset of labor. LH would have no effect. PGE2 strongly stimulates uterine smooth muscle contraction and is formed in increasing rate by the placenta late in gestation.

6. After birth, the pressure in the pulmonary artery decreases greatly. What is the cause of this?

- A) Systemic arterial pressure increases
- B) Ductus arteriosus closes
- C) Left ventricular pressure increases
- D) Pulmonary vascular resistance decreases

Answer: D) The pulmonary vascular resistance greatly decreases as a result of expansion of the lungs. In the unexpanded fetal lungs, the blood vessels are compressed because of the small volume of the lungs. Immediately on expansion, these vessels are no longer compressed, and the resistance to blood flow decreases several-fold.

7. If a radioimmunoassay is properly conducted and the amount of radioactive hormone bound to antibody is low, this would indicate which of the following?

- A) Plasma levels of endogenous hormone are high
- B) Plasma levels of endogenous hormone are low
- C) More antibody is needed
- D) Less radioactive hormone is needed

Answer: A) In a radioimmunoassay, there is too little antibody to bind completely the radioactively tagged hormone and the hormone in the fluid (plasma) to be assayed. Thus, there is competition between the labeled and endogenous hormone for binding sites on the antibody. Consequently, if the amount of radioactive hormone bound to antibody is low, this would indicate that plasma levels of endogenous hormone are high.

8. Spermatogenesis is regulated by a negative feedback control system in which follicle-stimulating hormone (FSH) stimulates the steps in sperm cell formation. What is the negative feedback signal associated with sperm cell production that inhibits pituitary formation of FSH?

- A) Testosterone
- B) Inhibin
- C) Estrogen
- D) Luteinizing hormone

Answer: B) The Sertoli cells of the seminiferous tubules secrete inhibin at a rate proportional to the rate of production of sperm cells. Inhibin has a direct inhibitory effect on anterior pituitary secretion of FSH. FSH binds to specific receptors on the Sertoli cells, causing the cells to grow and secrete substances that stimulate sperm cell production. The secretion of inhibin thereby provides the negative feedback control signal from the seminiferous tubules to the pituitary gland.

9. During the 12-hr period preceding ovulation, which of the following is true?

- A) The plasma concentration of estrogen is rising
- B) A surge of luteinizing hormone is secreted from the pituitary
- C) The surge occurs immediately after the formation of the corpus luteum
- D) The surge followed immediately by a fall in the plasma concentration of progesterone
- E) The number of developing follicles is increasing

Answer: B) Ovulation will not take place unless a surge of LH precedes it. Immediately prior to ovulation the number of follicles is decreasing due to normal attrition of all but one follicle, and consequently estrogen synthesis by the ovary is decreasing. Progesterone synthesis is stimulated by the LH surge.

10. When do progesterone levels rise to their highest point during the female hormonal cycle?

- A) Between ovulation and the beginning of menstruation
- B) Immediately before ovulation
- C) When the blood concentration of luteinizing hormone is at its highest point
- D) When 12 primary follicles are developing to the antral stage

Answer: A) The corpus luteum is the only source of progesterone production, except for minute quantities secreted from the follicle before ovulation. The corpus luteum is functional between ovulation and the beginning of menstruation, during which time the concentration of luteinizing hormone (LH) is suppressed below the level achieved during the preovulatory LH surge.

11. Estrogen is required for normal reproductive function in the male. Where is the principal site of estrogen synthesis in the male?

- A) Leydig cells
- B) Osteoblasts
- C) Liver cells
- D) Prostate cells

Answer: C) Large amounts of estrogen are formed from testosterone and androstenediol in the liver, accounting for as much as 80% of the total male estrogen production.

12. A professional athlete in her mid-20s has not had a menstrual cycle for 5 years, although a bone density scan revealed normal skeletal mineralization. Which of the following facts elicited during the taking of her medical history may explain these observations?

- A) She consumes a high-carbohydrate diet
- B) Her grandmother suffered a hip fracture at age 79
- C) Her blood pressure is greater than normal
- D) Her plasma estrogen concentration is very low
- E) She has been taking anabolic steroid supplements for 5 years

Answer: E) Anabolic steroids bind to testosterone receptors in the hypothalamus, providing feedback inhibition of normal ovarian cycling and preventing menstrual cycling, as well as stimulation of osteoblastic activity in the bones.

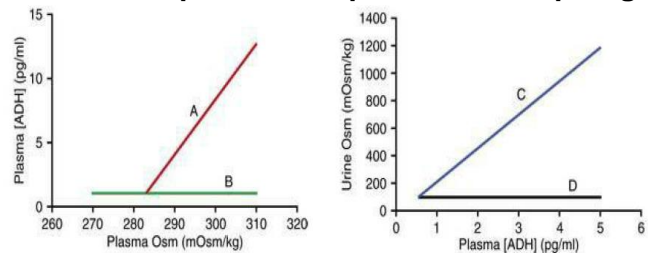
13. In the circulatory system of a fetus, which of the following is greater before birth than after birth?

- A) Arterial Po₂
- B) Right atrial pressure
- C) Aortic pressure
- D) Left ventricular pressure

Answer: B) Right atrial pressure falls dramatically after the onset of breathing due to a reduction in pulmonary vascular resistance, pulmonary arterial pressure, and right ventricular pressure.

14. In the following figure, which lines most likely reflect the responses in a patient with nephrogenic diabetes insipidus?

- A) A and C
- B) A and D
- C) B and C
- D) B and D



Answer: B) In patients with nephrogenic diabetes insipidus, the kidneys do not respond appropriately to antidiuretic hormone (ADH), and the ability to form concentrated urine is impaired. In contrast, there is a normal ADH secretory response to changes in plasma osmolality.

15. Which of the following is greater after birth than before birth?

- A) Flow through the foramen ovale
- B) Pressure in the right atrium
- C) Flow through the ductus arteriosus
- D) Aortic pressure

Answer: D) Owing to the loss of blood flow through the placenta, systemic vascular resistance doubles at birth. This increases the aortic pressure as well as the pressure in the left ventricle and left atrium.

16. In order for male differentiation to occur during embryonic development, testosterone must be secreted from the testes. What stimulates the secretion of testosterone during embryonic development?

- A) Luteinizing hormone from the maternal pituitary gland
- B) Human chorionic gonadotropin
- C) Inhibin from the corpus luteum
- D) Gonadotropin-releasing hormone from the embryo's hypothalamus

Answer: B) Human chorionic gonadotropin also binds to luteinizing hormone receptors on the interstitial cells of the testes of the male fetus, resulting in the production of testosterone in male fetuses up to the time of birth. This small secretion of testosterone is what causes the fetus to develop male sex organs instead of female sex organs.

17. As menstruation ends estrogen levels in the blood rise rapidly. What is the source of the estrogen?

- A) Corpus luteum
- B) Developing follicles
- C) Endometrium
- D) Stromal cells of the ovaries
- E) Anterior pituitary gland

Answer: B) In the non-pregnant female, the only significant source of estrogen is ovarian follicles or corpus luteae. Menstruation begins when the corpus luteum degenerates. Menstruation ends when developing follicles secrete estrogen sufficiently to raise circulating concentration to a level that stimulates regrowth of the endometrium.

18. A female athlete who took testosterone-like steroids for several months stopped having normal menstrual cycles. What is the best explanation for this observation?

- A) Testosterone stimulates inhibin production from the corpus luteum
- B) Testosterone binds to receptors in the endometrium, resulting in the endometrium's failure to develop during the normal cycle
- C) Testosterone binds to receptors in the anterior pituitary that stimulate the secretion of folliclestimulating hormone (FSH) and luteinizing hormone (LH)
- D) Testosterone inhibits the hypothalamic secretion of gonadotropin-releasing hormone and the pituitary secretion of LH and FSH

Answer: D) The cells of the anterior pituitary that secrete LH and FSH, and the cells of the hypothalamus that secrete gonadotropin-releasing hormone, are inhibited by both estrogen and testosterone. The steroids taken by the woman caused sufficient inhibition to result in cessation of the monthly menstrual cycle.

19. Which of the following decreases the resistance in the arteries leading to the sinuses of the penis?

- A) Stimulation of the sympathetic nerves innervating the arteries
- B) Nitric oxide
- C) Inhibition of activity of the parasympathetic nerves leading to the arteries
- D) All of the above

Answer: B) Nitric oxide is the vasodilator that is normally released, causing vasodilatation in these arteries.

20. A man is taking a number of medications, one of which appears to be interfering with the emission phase of the sexual act. Which of the following medications could cause this problem?

- A) A medication that prolongs the duration of action of nitric oxide
- B) A medication that blocks the smooth muscle receptors for nitric oxide
- C) A medication that increases the release of nitric oxide
- D) A testosterone-like androgen compound
- E) An inhibitor of beta-adrenergic nervous system receptors

Answer: E) Emission is elicited by reflexes mediated by the beta-adrenergic nervous system. Beta adrenergic antagonists interfere with the reflex. None of the other choices is involved.

21. Giving prostaglandin E2 (PGE2) to a pregnant woman may result in an abortion. What is the best explanation for this finding?

- A) PGE2 strongly stimulates uterine contraction
- B) PGE2 causes constriction of the arteries leading to the placenta
- C) PGE2 stimulates the release of oxytocin from the posterior pituitary
- D) PGE2 increases the secretion of progesterone from the corpus luteum

Answer: A) The fetal portion of the placenta releases prostaglandins in high concentrations at the time of labor. This release is associated with deterioration of the placenta. Prostaglandins, especially PGE2, strongly stimulate uterine smooth muscle.

22. During the first few years after menopause, follicle-stimulating hormone (FSH) levels are normally extremely high. A 56-year-old woman completed menopause 3 years ago. However, she is found to have low levels of FSH in her blood. Which of the following is the best explanation for this finding?

- A) She has been receiving hormone replacement therapy with estrogen and progesterone since she completed menopause
- B) Her adrenal glands continue to produce estrogen
- C) Her ovaries continue to secrete estrogen
- D) She took birth control pills for 20 years before menopause

Answer: A) After menopause, the absence of feedback inhibition by estrogen and progesterone results in extremely high rates of FSH secretion. Women taking estrogen as part of hormone replacement therapy for symptoms associated with postmenopausal conditions have suppressed levels of FSH owing to the inhibitory effect of estrogen.

23. Delayed breathing at birth is a common danger faced by newborn infants. What is a frequent cause of delayed breathing?

- A) Fetal hypoxia during the birth process
- B) Maternal hypoxia during the birth process
- C) Fetal hypercapnia
- D) Maternal hypercapnia

Answer: A) Prolonged fetal hypoxia during delivery can cause serious depression of the respiratory center. Hypoxia may occur during delivery because of compression of the umbilical cord, premature separation of the placenta, excessive contraction of the uterus, or excessive anesthesia of the mother.

24. Why is milk produced only after delivery, not before?

- A) Levels of luteinizing hormone and follicle-stimulating hormone are too low during pregnancy to support milk production
- B) High levels of progesterone and estrogen during pregnancy suppress milk production
- C) The alveolar cells of the breast do not reach maturity until after delivery
- D) High levels of oxytocin are required for milk production to begin, and oxytocin is not secreted until the baby stimulates the nipple

Answer: B) Although estrogen and progesterone are essential for the physical development of the breast during pregnancy, a specific effect of both these hormones is to inhibit the actual secretion of milk. Even though prolactin levels are increased 10- to 20-fold at the end of pregnancy, the suppressive effects of estrogen and progesterone prevent milk production until after the baby is born. Immediately after birth, the sudden loss of both estrogen and progesterone secretion from the placenta allows the lactogenic effect of prolactin to promote milk production.

25. If a woman has a tumor secreting large amounts of estrogen from the adrenal gland, which of the following will occur?

- A) Progesterone levels in the blood will be very low
- B) Her luteinizing hormone secretion rate will be totally suppressed
- C) She will not have normal menstrual cycles
- D) Her bones will be normally calcified
- E) All of the above

Answer: E) Choices A to D are true: LH secretion will be suppressed (B) by the negative feedback effect of the estrogen from the tumor; consequently, she will not have menstrual cycles (C); since she will not have normal cycles, no corpus lutea will develop so no progesterone will be formed (A). The high levels of estrogen produced by the tumor will provide stimulation of osteoblastic activity to maintain normal bone activity (D).

26. Which of the following changes would be expected to occur with increased binding of a hormone to plasma proteins?

- A) Increase in plasma clearance of the hormone
- B) Decrease in half-life of the hormone
- C) Increase in hormone activity
- D) Increase in degree of negative feedback exerted by the hormone
- E) Increase in plasma reservoir for rapid replenishment of free hormone

Answer: E) Protein-bound hormones are biologically inactive and cannot be metabolized. Thus, an increase in protein binding would tend to decrease hormone activity and plasma clearance and increase the half-life of the hormone. Free hormone is also responsible for negative feedback inhibition of hormone secretion. Therefore, a sudden increase in hormone binding to plasma proteins would decrease negative feedback. Protein binding of hormones does, however, provide a reservoir for the rapid replacement of free hormone.

27. A 30-year-old woman is breast-feeding her infant. During suckling, which of the following hormonal responses is expected?

- A) Increased secretion of antidiuretic hormone (ADH) from the supraoptic nuclei
- B) Increased secretion of ADH from the paraventricular nuclei
- C) Increased secretion of oxytocin from the paraventricular nuclei
- D) Decreased secretion of neurophysin
- E) Increased plasma levels of both oxytocin and ADH

Answer: C) During suckling, stimulation of receptors on the nipples increases neural input to both the supraoptic and paraventricular nuclei. Activation of these nuclei leads to the release of oxytocin and neurophysin from secretion granules in the posterior pituitary gland. Suckling does not stimulate the secretion of appreciable amounts of ADH.

28. Why is it important to feed newborn infants every few hours?

- A) The hepatic capacity to store and synthesize glycogen and glucose is not adequate to maintain the plasma glucose concentration in a normal range for more than a few hours after feeding
- B) If adequate fluid is not ingested frequently, the plasma protein concentration will rise to greater than normal levels within a few hours
- C) The function of the gastrointestinal system is poorly developed and can be improved by keeping food in the stomach at all times
- D) The hepatic capacity to form plasma proteins is minimal and requires the constant availability of amino acids from food to avoid hypoproteinemic edema

Answer: A) Because the liver functions imperfectly during the first weeks of life, the glucose concentration in the blood is unstable and falls to very low levels within a few hours after feeding.

29. RU486 causes abortion if it is administered before or soon after implantation. What is the specific effect of RU486?

- A) It binds to luteinizing hormone receptors, stimulating the secretion of progesterone from the corpus luteum
- B) It blocks progesterone receptors so that progesterone has no effect within the body
- C) It blocks the secretion of follicle-stimulating hormone by the pituitary
- D) It blocks the effects of oxytocin receptors in the uterine muscle

Answer: B) Progesterone is required to maintain the decidual cells of the endometrium. If progesterone levels fall, as they do during the last days of a nonpregnant menstrual cycle, menstruation will follow within a few days, with loss of pregnancy. Administration of a compound that blocks the progesterone receptor during the first few days after conception will terminate the pregnancy.

30. Following ejaculation, arterial blood flow into the corpora cavernosa decreases back to the normal resting level resulting in the flaccid state. What is the best explanation for this decrease in blood flow?

- A) Systemic arterial pressure decreases due to absence of sexual stimulation
- B) The level of sympathetic stimulation to the arterioles supplying the corpora cavernosa decreases
- C) Resistance of the arterioles supplying the corpora cavernosa increases
- D) Formation of nitric oxide in the endothelial cells of the arterioles supplying the corpora cavernosa is stimulated by the increase in parasympathetic nervous system activity
- E) Resistance of the venules draining the sinuses of the corpora cavernosa increases

Answer: C) The only true choice is the increase in arteriolar resistance in the vasculature supplying the corpora (C). The others will tend to maintain erection (B, D, E). (A), reduction in arterial pressure, will have a negligible effect.

31. During pregnancy, the uterine smooth muscle is quiescent. During the 9th month of gestation the uterine muscle becomes progressively more excitable. What factors contribute to the increase in excitability?

- A) Placental estrogen synthesis rises to high rates
- B) Progesterone synthesis by the placenta decreases
- C) Uterine blood flow reaches its highest rate
- D) Prostaglandin E2 synthesis by the placenta decreases
- E) Activity of the fetus falls to low levels

Answer: B) Very high plasma concentration of progesterone maintains the uterine muscle in a quiescent state during pregnancy. In the final month of gestation the concentration of progesterone begins to decline, increasing the excitability of the muscle.

32. A 20-year-old woman is not having menstrual cycles. Her plasma progesterone concentration is found to be minimal. What is the explanation for the low level of progesterone?

- A) LH secretion rate is elevated
- B) LH secretion rate is suppressed
- C) FSH secretion rate is suppressed
- D) No corpus luteum is present
- E) High inhibin concentration in the plasma has suppressed progesterone synthesis

Answer: D) The corpus luteum is the only source of progesterone, and if she is not having menstrual cycles no corpus luteum is present.

33. Before the preovulatory surge in luteinizing hormone, granulosa cells of the follicle secrete which of the following?

- A) Testosterone
- B) Progesterone
- C) Estrogen
- D) Inhibin

Answer: C) Follicle-stimulating hormone stimulates the granulosa cells of the follicle to secrete estrogen.

34. Neonates that are kept in 100% oxygen incubators for several days become blind when they are removed from the incubator, a condition referred to as retrolental fibroplasia. What is the explanation for the loss of sight?

- A) The high concentration of oxygen stimulates the growth of fibrous tissue into the retina
- B) The high concentration of oxygen causes rupture of blood vessels in the retina, resulting in fibrous infiltration of the vitreous humor
- C) The high concentration of oxygen retards the growth of blood vessels in the retina, but when the oxygen therapy is stopped, the fall in oxygen concentration stimulates an overgrowth of blood vessels in the retina and vitreous humor, which later become densely fibrous and block the light from the pupil
- D) The high concentration of oxygen destroys the retinal neurons

Answer: C) Too much oxygen in the incubator stops the growth of new blood vessels in the retina. Then when oxygen therapy is stopped, an overgrowth of blood vessels occurs, with a great mass of vessels growing all through the vitreous humor. Later the vessels are replaced by a mass of fibrous tissue, causing permanent blindness.

35. Which of the following is produced by the trophoblast cells during the first 3 weeks of pregnancy?

- A) Estrogen
- B) Luteinizing hormone
- C) Oxytocin
- D) Human chorionic gonadotropin
- E) None of the above

Answer: D) Human chorionic gonadotropin is secreted from the trophoblast cells beginning shortly after the blastocyst implants in the endometrium.

36. Before intercourse, a woman irrigates her vagina with a solution that lowers the pH of the vaginal fluid to 4.5. What will be the effect on sperm cells in the vagina?

- A) Metabolic rate will increase
- B) Rate of movement will decrease
- C) Formation of prostaglandin E₂ will increase
- D) Rate of oxygen consumption will increase

Answer: B) Sperm cell motility decreases as pH is reduced below 6.8. At a pH of 4.5, sperm cell motility is significantly reduced. However, the buffering effect of sodium bicarbonate in the prostatic fluid raises the pH somewhat, allowing the sperm cells to regain some mobility.

37. Men who take large doses of testosterone-like androgenic steroids for long periods are sterile in the reproductive sense of the word. What is the explanation for this finding?

- A) High levels of androgens bind to testosterone receptors in the Sertoli cells, resulting in
- A) overstimulation of inhibin formation
- B) Overstimulation of sperm cell production results in the formation of defective sperm cells
- C) High levels of androgen compounds inhibit the secretion of gonadotropin-releasing hormone by the hypothalamus, resulting in the inhibition of luteinizing hormone and follicle-stimulating hormone release by the anterior pituitary
- D) High levels of androgen compounds produce hypertrophic dysfunction of the prostate gland

Answer: C) Testosterone secreted by the testes in response to luteinizing hormone (LH) inhibits hypothalamic secretion of gonadotropin-releasing hormone (GnRH), thereby inhibiting anterior pituitary secretion of LH and follicle-stimulating hormone. Taking large doses of testosterone-like steroids also suppresses the secretion of GnRH and the pituitary gonadotropic hormones, resulting in sterility.

38. Which of the following statements about peptide or protein hormones is usually true?

- A) They have longer half-lives than steroid hormones
- B) They have receptors on the cell membrane
- C) They have a slower onset of action than both steroid and thyroid hormones
- D) They are not stored in endocrine-producing glands

Answer: B) In general, peptide hormones produce biological effects by binding to receptors on the cell membrane. Peptide hormones are stored in secretion granules in their endocrine-producing cells and have relatively short half-lives because they are not highly bound to plasma proteins. Protein hormones often have a rapid onset of action because, unlike steroid and thyroid hormones, protein synthesis is usually not a prerequisite to produce biological effects.

39. Infants of mothers who had adequate nutrition during pregnancy do not require iron supplements or a diet rich in iron until about 3 months of age. Why is this?

- A) Growth of the infant does not require iron until after the 3rd month
- B) The fetal liver stores enough iron to meet the infant's needs until the third month
- C) Synthesis of new red blood cells begins after 3 months
- D) Muscle cells that develop before the 3rd month do not contain myoglobin

Answer: B) If the mother has had adequate amounts of iron in her diet, the infant's liver usually has enough stored iron to form blood cells for 4 to 6 months after birth. However, if the mother has had insufficient iron, the infant may develop severe anemia after about 3 months of life.

40. Where does fertilization normally take place?

- A) Uterus
- B) Cervix
- C) Ovary
- D) Ampulla of the fallopian tubes

Answer: D) Fertilization of the ovum normally takes place in the ampulla of one of the fallopian tubes.

41. Two days before the onset of menstruation, secretions of follicle-stimulating hormone (FSH) and luteinizing hormone (LH) reach their lowest levels. What is the cause of this low level of secretion?

- A) The anterior pituitary gland becomes unresponsive to the stimulatory effect of gonadotropin-releasing hormone (GnRH)
- B) Estrogen from the developing follicles exerts a feedback inhibition on the hypothalamus
- C) The rise in body temperature inhibits hypothalamic release of GnRH
- D) Secretion of estrogen, progesterone, and inhibin by the corpus luteum suppresses hypothalamic secretion of GnRH and pituitary secretion of FSH

Answer: D) Estrogen and, to a lesser extent, progesterone secreted by the corpus luteum during the luteal phase have strong feedback effects on the anterior pituitary gland to maintain low secretory rates of both FSH and LH. In addition, the corpus luteum secretes inhibin, which inhibits the secretion of FSH.

42. A baby is born with a penis, a scrotum with no testes, no vagina, and XX chromosomes. This condition is referred to as hermaphroditism. Which of the following could cause this abnormality?

- A) Abnormally high levels of human chorionic gonadotropin production by the trophoblast cells
- B) Abnormally low rates of estrogen production by the placenta
- C) Abnormally high levels of luteinizing hormone in the maternal blood
- D) Abnormally high levels of testosterone in the maternal blood

Answer: D) If a pregnant woman bearing a female child has high blood levels of androgenic hormones early in pregnancy, the child will be born with male genitalia, resulting in a type of hermaphroditism.

43. A scientist studying developmental physiology performs an experiment in which a substance is given to pregnant rats that give birth to pups that have XY chromosomes but female genital organs. What was the substance given to the rats?

- A) An antibody that blocked the effect of human chorionic gonadotropin in the embryo and fetus
- B) A large quantity of estrogen-like compounds
- C) Follicle-stimulating hormone
- D) Testosterone

Answer: A) In order for a male embryo to develop male genitalia, testosterone must be present in the embryo. Normally, human chorionic gonadotropin (HCG) secreted by the trophoblast cells stimulates testosterone secretion from the testes. Giving an antibody that blocks HCG would prevent testosterone secretion, resulting in the development of female genitalia in a male fetus.

44. A man suffers from a disease that destroyed only the motor neurons of the spinal cord below the thoracic region. Which aspect of sexual function would not be possible?

- A) Arousal
- B) Erection
- C) Lubrication
- D) Ejaculation

Answer: D) The motor neurons of the spinal cord of the thoracic and lumbar regions are the sources of innervation for the skeletal muscles of the perineum involved in ejaculation.

45. Levels of transcortin are elevated in a pregnant woman. Which of the following laboratory findings would be expected in this patient?

- A) Increased total (protein-bound plus free) plasma cortisol concentration
- B) Increased free (non-protein-bound) plasma cortisol concentration
- C) Decreased total plasma cortisol concentration
- D) Decreased free plasma cortisol concentration
- E) Little or no change in total plasma cortisol concentration

Answer: A) Cortisol is highly bound to plasma proteins, particularly transcortin. Increased plasma levels of transcortin, such as occur during pregnancy, tend to decrease free cortisol concentration, but feedback results in increased adrenocorticotropic hormone secretion, which stimulates cortisol secretion until free plasma levels of the steroid return to normal levels. Thus, in a steady state, total plasma cortisol concentration (bound plus free) is elevated, but free cortisol concentration is normal.

46. Birth control pills containing combinations of synthetic estrogen and progesterone compounds given for the first 21 days of the menstrual cycle are effective in preventing pregnancy. What is the explanation for their efficacy?

- A) Prevention of the preovulatory surge of luteinizing hormone secretion from the pituitary gland
- B) Prevention of development of the ovarian follicles
- C) Suppressing function of the corpus luteum soon after it forms
- D) Prevention of normal development of the endometrium

Answer: A) Administration of either estrogen or progesterone in appropriate quantities during the first half of the menstrual cycle can inhibit ovulation by preventing the preovulatory surge of luteinizing hormone secretion by the anterior pituitary gland, which is essential for ovulation.

47. A "birth control" compound for men has been sought for several decades. Which of the following would provide effective sterility?

- A) Substance that mimics the actions of luteinizing hormone
- B) Substance that blocks the actions of inhibin
- C) Substance that blocks the actions of follicle-stimulating hormone
- D) Substance that mimics the actions of gonadotropin-releasing hormone

Answer: C) Blocking the action of follicle-stimulating hormone on the Sertoli cells of the seminiferous tubules interrupts the production of sperm. Choice C is the only option that is certain to provide sterility.

48. In order for milk to flow from the nipple of the mother into the mouth of the nursing infant, which of the following must occur?

- A) Myoepithelial cells must relax
- B) Prolactin levels must fall
- C) Oxytocin secretion from the posterior pituitary must take place
- D) The baby's mouth must develop a strong negative pressure over the nipple
- E) All of the above

Answer: C) Oxytocin is secreted from the posterior pituitary gland and carried in the blood to the breast, where it causes the cells that surround the outer walls of the alveoli and ductile system to contract. Contraction of these cells raises the hydrostatic pressure of the milk in the ducts to 10 to 20 mm Hg. Consequently, milk flows from the nipple into the baby's mouth.

49. Failure of the ductus arteriosus to close is a common developmental defect. Which of the following would likely be present in a 12-month-old infant with patent ductus arteriosus?

- A) Below-normal arterial PO₂
- B) Below-normal arterial PCO₂
- C) Greater than normal arterial blood pressure
- D) Lower than normal pulmonary arterial pressure

Answer: A) If the ductus arteriosus remains patent, poorly oxygenated blood from the pulmonary artery flows into the aorta, giving the arterial blood an oxygen level that is below normal.

50. The placenta does which of the following?

- A) Develops from the granulosa cells
- B) Secretes luteinizing hormone
- C) Secretes estrogen
- D) Allows direct mixing of maternal and fetal blood
- E) None of the above

Answer: C) The placenta secretes both estrogen and progesterone from the trophoblast cells.

51. Why is osteoporosis much more common in elderly women than in elderly men?

- A) Men continue to produce testosterone throughout their lifetime, whereas women cease estrogen production after menopause
- B) Women consume less dietary calcium than men
- C) Gastrointestinal absorption of calcium is more effective in men than in women
- D) The bones of women contain less calcium than those of men even before menopause

Answer: A) Testosterone stimulates the cellular functions of bone that lead to bone formation. Testosterone secretion from the interstitial cells declines with age, but it continues at sufficient levels to stimulate bone formation throughout a man's lifetime. Conversely, estrogen production in women falls to zero after menopause, leaving the bones without the stimulatory effect of estrogen. As a result, osteoporosis is common in women after menopause.

52. Which blood vessel in the fetus has the highest Po₂?

- A) Ductus arteriosus
- B) Ductus venosus
- C) Ascending aorta
- D) Left atrium

Answer: B) Blood returning from the placenta through the umbilical vein passes through the ductus venosus. The blood coming from the placenta has the highest concentration of oxygen found in the fetus.

53. During the latter stages of pregnancy, many women experience an increase in body hair growth in a masculine pattern. What is the explanation for this?

- A) The ovaries secrete some testosterone along with the large amounts of estrogen produced late in pregnancy
- B) The fetal ovaries and testes secrete androgenic steroids
- C) The maternal and fetal adrenal glands secrete large amounts of androgenic steroids that are used by the placenta to form estrogen
- D) The placenta secretes large amounts of estrogen, some of which is metabolized to testosterone

Answer: C) Estrogen secreted by the placenta is not synthesized from basic substrates in the placenta. Instead, it is formed almost entirely from androgenic steroid compounds that are formed in both the mother's and the fetus's adrenal glands. These androgenic compounds are transported by the blood to the placenta and converted by the trophoblast cells to estrogen compounds. Their concentration in the maternal blood may also stimulate hair growth on the body.

54. What is the cause of menopause?

- A) Reduced levels of gonadotropic hormones secreted from the anterior pituitary gland
- B) Reduced responsiveness of the follicles to the stimulatory effects of gonadotropic hormones
- C) Reduced rate of secretion of progesterone from the corpus luteum
- D) Reduced numbers of follicles available in the ovary for stimulation by gonadotropic hormones

Answer: D) By age 45 years, only a few primordial follicles remain in the ovaries to be stimulated by gonadotropic hormones, and the production of estrogen decreases as the number of follicles approaches zero. When estrogen production falls below a critical value, it can no longer inhibit the production of gonadotropic hormones from the anterior pituitary. Follicle-stimulating hormone and luteinizing hormone are produced in large quantities, but as the remaining follicles become atretic, production by the ovaries falls to zero.

55. During the week following ovulation, the endometrium increases in thickness to 5 to 6 millimeters.

What stimulates this increase in thickness?

- A) Luteinizing hormone
- B) Estrogen from the corpus luteum
- C) Progesterone from the corpus luteum
- D) Follicle-stimulating hormone

Answer: C) Progesterone secreted in large quantities from the corpus luteum causes marked swelling and secretory development of the endometrium.

56. Before implantation, the blastocyst obtains its nutrition from the uterine endometrial secretions. How does the blastocyst obtain nutrition during the first week after implantation?

- A) It continues to derive nutrition from endometrial secretions
- B) The cells of the blastocyst contain stored nutrients that are metabolized for nutritional support
- C) The placenta provides nutrition derived from maternal blood
- D) The trophoblast cells digest the nutrient-rich endometrial cells and then absorb their contents for use by the blastocyst

Answer: D) As the blastocyst implants, the trophoblast cells invade the decidua, digesting and imbibing it. The stored nutrients in the decidual cells are used by the embryo for growth and development. During the 1st week after implantation, this is the only means by which the embryo can obtain nutrients. The embryo continues to obtain at least some of its nutrition in this way for up to 8 weeks, although the placenta begins to provide nutrition after about the 16th day beyond fertilization (a little more than 1 week after implantation).

57. A man who has been exposed to high levels of gamma radiation is sterile due to destruction of the germinal epithelium of the seminiferous tubules, although he has normal levels of testosterone. Which of the following would be found in this patient?

- A) Normal secretory pattern of gonadotropin-releasing hormone
- B) Normal levels of inhibin
- C) Suppressed levels of follicle-stimulating hormone
- D) Absence of Leydig cells

Answer: A) Gamma radiation destroys the cells undergoing the most rapid rates of mitosis and meiosis, the germinal epithelium of the testes. The man described is said to have normal testosterone levels, suggesting that the secretory patterns of gonadotropin-releasing hormone and luteinizing hormone are normal and that his interstitial cells are functional. Because he is not producing sperm, the levels of inhibin secreted by the Sertoli cells would be maximally suppressed, and his levels of follicle-stimulating hormone would be strongly elevated.

Good luck!

