1. The concentration of this ion decreases in the gastric juice when the secretory rate increases:
   A. Sodium
   B. Potassium
   C. Chloride
   D. Hydrogen
   E. None of the above

2. A stimulant of gastric acid secretion is:
   A. Secretin
   B. Pepsin
   C. Pepsinogen
   D. Na+, K+-ATPase
   E. Gastrin

3. Which event leads to a reduction in the rate of gastric acid secretion?
   A. Pepsin digesting pepsinogen
   B. Pepsinogen converting into pepsin
   C. Acidic juice bathing the mucosa of the pyloric gland area (antral mucosa)
   D. Gastrin stimulating mast cell release of histamine
   E. Food stretching the wall of the stomach

4. Which substance is secreted by the parietal (oxyntic) cell?
   A. Pepsinogen
   B. Intrinsic factor
   C. Gastrin
   D. Secretin
   E. Calmodulin

5. The concentration of which one of the following substances decreases in pancreatic juice as the rate of secretion increases:
   A. Sodium
   B. Secretin
   C. Bicarbonate
   D. Potassium
   E. Chloride

6. Which substance stimulates the pancreas to produce an alkaline juice?
   A. Trypsinogen
   B. Alpha amylase
   C. Lipase
   D. Secretin
   E. Glucagon

7. The up-hill transport of glucose from the intestinal lumen into the absorbing cells:
   A. Depends on an ATP-dependent pump for glucose
   B. Depends on sodium-dependent glucose transporter
   C. Requires a standing gradient of Na+ between the lateral spaces of the epithelial cells
   D. Requires transport of water through the epithelial cells
   E. Occurs only after disaccharides are split in the brush border

8. Gastric emptying is slowed by:
   A. Acetylcholine
   B. Swallowing
   C. Cholecystokinin
   D. Heartburn
   E. Myenteric plexus

9. Defecation occurs in response to:
   A. Rhythmic segmentation
   B. Vagus nerve stimulation
   C. Sympathetic nerve stimulation
   D. Swallowing
   E. Mass movement
10. Salivary secretion can be influenced by the:
   A. Parasympathetic nervous system
   B. Hunger and satiety centers of the hypothalamus
   C. Sympathetic nervous system
   D. Cerebral cortex
   E. All of the above

11. The duct cells of the pancreatic glands are responsible for:
   A. Pepsin secretion
   B. Secretin release
   C. HCO3 secretion
   D. Taurocholic acid
   E. Phospholipase production

12. The gastric zymogen, pepsinogen, is converted to the active enzyme pepsin by:
   A. Gastric HCl
   B. Gastrin
   C. Enterokinase
   D. Acetylcholine
   E. Intrinsic factor

13. During the intestinal phase of the control of gastric secretion, acidification of the duodenum:
   A. Stimulates acetylcholine release
   B. Reduces blood levels of CCK (Cholecystokinin)
   C. Increases gastric emptying
   D. Inhibits HCl secretion
   E. All of the above

14. Cholecystokinin (CCK) stimulates pancreatic secretion of:
   A. Trypsin
   B. H2O
   C. Bilirubin
   D. Enterokinase
   E. Na+

15. A major function of the duodenum is:
   A. To store the products of gastric digestion
   B. To adjust the osmolality of the products of gastric digestion delivered to the intestine
   C. Absorb vitamin B12
   D. Protect the intestine from bacterial contaminants present in food.

16. All of the following events occur during swallowing EXCEPT:
   A. Momentary inhibition of respiration
   B. The bolus stimulates pharyngeal receptors resulting in afferent input to the swallowing center
   C. Opening of the upper esophageal sphincter
   D. Voluntary control is exerted as far as the junction of the esophageal striated and smooth muscle
   E. Opening of the lower esophageal sphincter

17. The secretion bile is:
   A. Inhibited by vagal stimulation
   B. Enhanced by sympathetic stimulation
   C. Enhanced by the enterohepatic circulation of bile pigments
   D. Inhibited by cholecystokinin (CCK)
   E. Enhanced by hepatic uptake of bile acids

18. Intestinal absorption of bile acids by specific transporters requires:
   A. Micelles and luminal sodium
   B. Monomolecular bile acid and chylomicrons
   C. Chylomicrons and luminal sodium
   D. Micelles and chylomicrons
   E. Monomolecular bile acid and luminal sodium

19. Essential components in the intracellular events of dietary long-chain triglyceride absorption are:
   A. Bile pigments
   B. Bile acids
   C. Reesterification enzymes
   D. Lipase/collipase
   E. Glycine and taurine
20. The pancreatic acinar cell secretes:
   A. Bicarbonate by active transport in exchange for chloride
   B. Insulin
   C. Pepsinogen which is converted to pepsin at pH below 5.0
   D. Procarboxypeptidase
   E. The unstirred layer

21. Excessive secretion of hydrogen ion is found as a result of:
   A. Pernicious anemia
   B. Vagotomy
   C. Sleeping
   D. Zollinger-Ellison syndrome
   E. Diabetes mellitus

22. Inhibition of gastric acid secretion is caused by:
   A. H1 receptor binding of acetylcholine
   B. H2 receptor binding of acetylcholine
   C. H2 receptor binding of histamine
   D. Gastrin release of histamine
   E. H2 receptor binding of H2 receptor blockers

23. A stimulant of parietal cell secretion of acid is:
   A. Vitamin B12
   B. Calcium
   C. Antacid
   D. Secretin
   E. Intrinsic factor

24. The hormone gastrin has a chemical structure which most resembles that of:
   A. Cholecystokinin
   B. Insulin
   C. Glucagon
   D. Histamine
   E. Acetylcholine

25. During an acute phase of a cholera infection, the large volume of liquid stool can be reduced by:
   A. Irradiation of the intestine to destroy malfunctioning mucosal cells
   B. Fasting the patient
   C. Administration of an isotonic salt solution through a gastric tube
   D. Administration of an isotonic solution containing glucose and NaCl through oral ingestion
   E. Intravenous injection of a large volume of salt solutions

26. Intestinal absorption of glucose:
   A. Is exclusively by active transport
   B. Requires cotransport of potassium
   C. Is exclusively by passive transport
   D. Requires cotransport of sodium
   E. Requires cotransport of water

27. When the rate of pancreatic exocrine secretion increases, there is an increase in the concentration
   of which ion in the juice?
   A. Sodium
   B. Potassium
   C. Bicarbonate
   D. Chloride
   E. Hydrogen

28. The rate of emptying of the stomach is increased by:
   A. Gastric inhibitory peptide (GIP)
   B. Cholecystokinin (CCK)
   C. Acetylcholine
   D. Gastrin
   E. Secretin

29. Digestion of most dietary triglycerides in the lumen of the gut:
   A. Produces 2-monoglycerides and free fatty acids
   B. Yields products which are less soluble in water than the triglycerides
   C. Requires fatty acyl-Co A before lipase can attack the triglycerides
   D. Produces only glycerol and short-chain fatty acids
   E. Is followed by active transport of the digestion products
30. As the rate of gastric secretion increases from resting values, the gastric:
   A. Concentration of sodium ion increases
   B. Proportion of juice from the non-oxyntic cells decreases
   C. Concentration of chloride decreases
   D. Concentration of potassium decreases
   E. Proportion of juice from the oxyntic cells decreases

31. Bile salts act to:
   A. Emulsify dietary lipids and form chylomicrons
   B. Aid the absorption of short-chain fatty acids
   C. Prevent resynthesis of triglycerides in the enterocyte
   D. Dissolve the unstirred layer
   E. Emulsify triglycerides and form micelles

32. Bile formation is largely determined by the excretion of which of the following osmotically active substances into the canalicular lumen?
   A. Bilirubin
   B. Bile salts
   C. Sodium
   D. Amino acids
   E. Cholesterol

33. Which substance is not a pancreatic digestive enzyme?
   A. Trypsin
   B. Pepsin
   C. Alpha-amylase
   D. Lipase
   E. None of the above

34. Amino Acids are rapidly absorbed by the intestine:
   A. Only in the free amino acid form
   B. Only in the di and tripeptide forms
   C. Only in association with sodium ions
   D. With the aid of a single well-defined carrier system
   E. By several different carriers

35. In patients with cholera:
   A. The best treatment is to withhold fluids in order to stop the diarrhea
   B. The best treatment is to administer cyclic AMP into the gut
   C. The best treatment is to administer prostaglandins and VIP intravenously
   D. The best treatment is to administer a solution of glucose and sodium chloride
   E. The major defect is increased activity of the intestinal sodium pump

36. Intestinal fat absorption can be reduced by:
   A. A decrease in sympathetic tone
   B. An increase in gastrin levels in the blood
   C. A decrease in intrinsic factor production
   D. An increase in vagal tone
   E. A decrease in cholecystokinin (CCK) release

37. The major phenomenon responsible for the active transport of bile acids in the ileum is:
   A. Na⁺-K⁺ ATPase activity in the basolateral membrane of mucosal cells
   B. Bacterial modification of bile acids
   C. Increased bilirubin in the gut lumen
   D. Increased micelle formation
   E. Reduced intracellular calcium concentration

38. Lipid micelles in the intestinal lumen:
   A. Contain the enzymes which are important for breaking down fat molecules
   B. Are large structures easily visible in a suspension of intestinal contents
   C. Are a source of concentrated fatty acids and monoglycerides
   D. Are split by bacteria in the colon
   E. Inactivate pancreatic lipase
39. If a patient has an inserted nasogastric tube through which the contents of the stomach are being aspirated continuously and is being provided with intravenous dextrose, water and sodium chloride as replacement, which is the most likely imbalance to occur?
   A. Hypochloremic acidosis
   B. Hyponatremic acidosis
   C. Hypokalemic alkalosis
   D. Hyponatremic alkalosis
   E. Hypokalemic acidosis

40. Which substance does not inhibit gastric secretion of acid?
   A. Tagamet (cimetidine)
   B. Atropine
   C. Secretin
   D. Gastrin
   E. None of the above

41. All of the following inhibit gastric acid secretion EXCEPT:
   A. Fatty acids in the duodenum.
   B. Acetylcholine.
   C. Secretin.
   D. Antral pH of 2.0.
   E. Cholecystokinin.

42. Which of the following saccharides is correctly paired with its constituent simple sugars?
   A. Maltose: glucose-glucose.
   B. Sucrose: glucose-galactose.
   C. Galactose: glucose-maltose.
   D. Lactose: glucose-sucrose
   E. None of the above are correct.

43. A physiological feature common to the active transport of both glucose and amino acids is
   A. Sharing of a common carrier system.
   B. Competitive inhibition can be demonstrated between glucose and valine.
   C. A Na electrochemical gradient is required.
   D. cAMP mediates both processes.
   E. All of the above.

44. The unstirred water layer lines the luminal surface of the intestinal mucosa. Regarding this "microclimate"
   A. The highly alkaline pH of the unstirred layer prevents fatty acids from entering micelles.
   B. Crossing the unstirred layer is a rate-limiting step in fatty acid absorption.
   C. Fat-soluble vitamins do not need to be incorporated into micelles in order to traverse the unstirred layer.
   D. Uptake of fatty acids from the unstirred layer is an active, energy-consuming process.
   E. The thickness of the unstirred layer will govern the rate of micelle formation.

45. Gastrointestinal motility is directly responsible for
   A. synthesis of peptides such as VIP.
   B. transport of K+ into the oxyntic cell.
   C. digestion of maltotriose into alpha-limit dextrins.
   D. micelle formation.
   E. mixing of ingested nutrients with digestive enzymes.

46. A source of gastrointestinal peptide hormones is the
   A. mast cells in the mucosa.
   B. peptic cells in the mucosa.
   C. neck mucous cells in the mucosa.
   D. nerve cells in the mucosa.
   E. goblet cells in the mucosa.

47. When your stomach is at rest, the gastric juice contains a
   A. large volume of water.
   B. Na+ concentration greater than in the juice of the actively secreting stomach.
   C. C1- concentration greater than the plasma C1- concentration.
   D. K+ concentration greater than in the juice of the actively secreting stomach.
   E. Na+ concentration greater than the plasma Na+ concentration.

48. The only substance which does not cause diarrhea is
   A. VIP and gastrin.
   B. cholera toxin
   C. prostaglandins.
   D. glucose.
   E. E coli enterotoxin.
49. Alpha amylase converts
   A. dextrose into glucose.
   B. alpha-limit dextrins into starch.
   C. lactose into lactase.
   D. amylose into maltose and glucose.
   E. amylopectin into starch.

50. Brush border enzymes digest
   A. starch into amylopectin.
   B. amylose into maltotriose.
   C. dipeptides into amino acids.
   D. Na+, K+-ATPase (sodium pump) into the interstitial space.
   E. amylose into maltose.

51. Which is not a factor in the digestion of fat?
   A. emulsification of fat in the lumen of the gut.
   B. active transport of monoglycerides across the apical membrane of the enterocyte.
   C. the critical micellar concentration.
   D. bile salts.
   E. co-lipase.

52. Normally, the region of the hepatic lobule exposed to the highest concentrations of bile acids in sinusoidal blood is the
   A. pericentral zone.
   B. mid-zone.
   C. periportal zone.
   D. all zones are exposed to equal concentrations.
   E. none of the above.

53. Which of the following is a primary bile acid?
   A. lithocholic acid
   B. chenodeoxycholic acid
   C. ursodeoxycholic acid
   D. deoxycholic acid
   E. muricholic acid

54. There are two hormones of major importance that control pancreatic secretions. **Hormone A is the major stimulus for bicarbonate secretion**, whereas **Hormone B is the major stimulus for enzyme/protein secretion**. Which of the following choices would be the most likely candidates for Hormone A/Hormone B, respectively?
   A. Secretin/Gastrin
   B. Cholecystokinin/Secretin
   C. Gastrin/Secretin
   D. Secretin/Cholecystokinin
   E. Cholecystokinin/Gastrin

55. Gastric glands in the antrum (pyloric glands)
   A. Secrete more acid than glands in the fundus and body
   B. Secrete all their products into the gastric lumen
   C. Have secretions that are regulated by changes in luminal pH and stomach distension
   D. Are the predominant site for secretion of mucins in the stomach
   E. Are enriched, compared to glands in the fundus and body, in chief cells

56. Primary bile salts
   A. Are more hydrophobic than primary bile acids
   B. Are synthesized by colonic bacteria
   C. Are components of chylomicrons
   D. Predominantly escape reabsorption in the terminal ileum and are absorbed by the colon for enterohepatic recycling
   E. Stimulate bile secretion by the liver

57. The migrating myoelectric complex
   A. stimulates segmental as well as peristaltic contractions to mix and move food
   B. occurs predominantly in the fed state
   C. is the electrical component of a motor pattern activated by parasympathetic neurons
   D. is initiated by motilin
   E. occurs every 5-10 minutes

58. Iron overload (a condition that is expressed as both increased cellular and plasma iron levels) is predicted to cause:
   A. increased DMT1 (Divalent Metal Transporter) mRNA
   B. increased hepcidin release
   C. increased IREG1 (Iron Regulated Transporter) activity
   D. decreased ferritin protein
E. increased uptake of heme-iron

59. Which one of the following lists of compounds can be directly absorbed from intestinal lumen by \textbf{Na-dependent} transporters?
A. Glucose, fructose, some bile salts, and dipeptides
B. All amino acids, dipeptides and all sugars
C. Glucose, dipeptides, and some amino acids
D. Lactose, sucrose, dipeptides
E. Some bile salts, dipeptides, and fructose

60. Which one of the following statements regarding water in the GI tract is \textbf{correct}?
A. Out of the 8-10 liters of water entering the GI tract of a healthy individual each day, only about 500 ml are excreted in the feces
B. Out of the 8-10 liters of water entering the GI tract of a healthy individual each day, most comes from dietary intake of water
C. Out of the 8-10 liters of water entering the GI tract of a healthy individual each day, most is absorbed in the large intestine
D. The duodenum can secrete water when the chyme is hypertonic
E. Intestinal water secretion is driven by intestinal sodium absorption

61. Which one of the following statements concerning lipolysis in adults is \textbf{TRUE}?
A. lingual and gastric lipases combined will digest >50% of dietary fats
B. lipases digest fat soluble vitamins to enhance their uptake into micelles
C. pancreatic lipase digests the predominant dietary fat
D. cholesterol ester hydrolase deficiency is the major cause of steatorrhea
E. Lipolysis generates only water-soluble end products

62. Which one of the following statements is \textbf{correct}? The esophagus
A. uses segmental as well as peristaltic contractions to mix and move food
B. contains both smooth and striated muscle
C. has the disorder of achalasia when the esophageal sphincter is too loose and/or peristalsis is too strong
D. has muscle with cyclical electrical activity that leads to spontaneous contractions
E. uses the esophageal sphincters to keep bile from entering the esophagus

63. Which one of the following statements is \textbf{correct}? Intrinsic factor
A. is absorbed from the small intestinal lumen
B. is secreted by the salivary gland
C. binds haptocorrin
D. is degraded in the stomach
E. in excess causes pernicious anemia

\textbf{ANSWER KEY - GASTROINTESTINAL PHYSIOLOGY}

\textbf{MEDICAL PHYSIOLOGY: SECTION XI (ENDOCRINE PHYSIOLOGY)}
Dr. Nelson Horsemamn
Department of Molecular and Cellular Physiology
1. The primary regulatory factor governing calcium homeostasis is
A. the content of total calcium in bone mineral
B. the concentration of total calcium in plasma
C. the concentration of ionized calcium in plasma
D. the concentration of total calcium in the feces.
E. the concentration of total calcium in urine.

2. Which one of the following hormones is not bound tightly to a specific plasma carrier protein?
A. aldosterone
B. cortisol
C. testosterone
D. thyroxine
E. estradiol

3. Following an oral load of glucose, the concentration of insulin in the plasma in the majority of Type II diabetic patients compared with that of non diabetic individuals is
A. greater.
B. less.
C. not different.
4. After depletion of hepatic glycogen stores (e.g. as the result of fasting) blood glucose levels are maintained by
   A. all tissues of the body utilizing lactic acid as their major energy source rather glucose.
   B. increasing gluconeogenesis and an increased utilization of fatty acids and ketoacids by some tissues (e.g. muscle).
   C. increasing insulin secretion.
   D. by decreasing urinary excretion of glucose.
   E. by preventing protein catabolism in all tissues of the body.

5. Which one of the following statements is correct?
   A. All polypeptide hormones exert their biological actions via cAMP-dependent mechanisms.
   B. The biological response to a hormone is determined solely by changes in plasma hormone concentrations and/or
   receptor affinity for the hormone.
   C. A shift of the dose-response curve (biological response vs. increasing hormone concentration) to the left would
   indicate a decreased responsiveness of the hormonal system.
   D. Even when a given hormone is present in excessive amounts, it will bind only to its specific receptor.
   E. Polypeptide hormones may regulate their own target tissue receptor concentrations by events known as 'down-
   regulation' or 'up-regulation' which in turn may influence the biological responsiveness of the target cell to
   subsequent hormonal stimulation.

6. Severe diabetes mellitus could be readily distinguished from diabetes insipidus by measuring
   A. daily urinary output.
   B. urinary sodium.
   C. urinary glucose.
   D. plasma levels of appropriate anterior pituitary hormone.
   E. none of the above measurements could distinguish between these two disease states.

7. Internalization of insulin receptors
   A. occurs during exocytosis.
   B. will increase membrane insulin receptors.
   C. may lead to eventual destruction of insulin receptors through lysosomal degradation.
   D. decrease the cells' ability to produce cAMP.
   E. is required for hormone translocation to nuclear receptors.

8. Hypoglycemia (i.e., induced by fasting) causes
   A. increased rate of secretion of insulin.
   B. decreased rate of secretion of glucagon.
   C. decreased rate of secretion of GH.
   D. increased secretion of epinephrine.
   E. decreased secretion of ACTH.

9. Cortisol
   A. is the major circulatory C19 steroid in the human.
   B. and insulin promote an increase in protein synthesis by their synergistic actions.
   C. stimulates pituitary ACTH secretion.
   D. stimulates hepatic glucose production.
   E. does not bind to any known protein carrier in the blood.

10. Parathyroid hormone (PTH)
    A. decreases plasma Ca++ levels by direct action on the bone, kidney, and gut.
    B. increases 1-hydroxylase activity in the kidney which elevates circulating levels of the active form of Vit D3.
    C. exerts its action by first binding to a cytoplasmic receptor.
    D. is much less active in the adult than in the young individual.
    E. secretion is stimulated by low plasma PO4.

11. Which of the following would not result in thyroid gland enlargement (goiter)?
    A. Inadequate iodine intake.
    B. Hyperthyroidism due to a loss in pituitary negative feedback sensitivity to T3 and T4.
    C. Stimulation of the thyroid gland by thyroid stimulating immunoglobulin (TSI).
    D. Chronic consumption of a substance which blocks T3 and T4 synthesis.
    E. Chronic consumption of exogenous T4.

12. Insulin-induced hypoglycemia:
    A. Results from an increased hepatic glucose production.
    B. Is associated with a decreased peripheral glucose utilization.
    C. Results in a suppression of epinephrine secretion.
    D. Is associated with an increased peripheral glucose utilization.
    E. Cannot occur in normal individuals.
13. A normal person fasts for two weeks. You would correctly expect
   A. the liver to stop producing glucose due to the depletion of its glycogen stores.
   B. blood insulin to be increased.
   C. the major source of energy to be derived from hepatic glycogen stores.
   D. an increased hepatic production of ketoacids.
   E. the person to be dead because at this time he would have depleted all of his body's energy stores.

14. Which one of the following processes is directly associated with the metabolic effects of glucagon?
   A. decreased hepatic glucose production.
   B. increased protein synthesis.
   C. increased hepatic glucose production.
   D. lipogenesis.
   E. decreased hepatic ketogenesis.

15. The major metabolic effect associated with growth hormone secretion is:
   A. increased glucose uptake by muscle.
   B. decreased glycogenolysis.
   C. increased amino acid transport and protein synthesis.
   D. decreased lipolysis.
   E. increased blood urea nitrogen levels.

16. Shortly after consumption of a high protein meal in normally fed individuals, blood levels of
   A. insulin would increase and glucagon would decrease.
   B. glucagon would increase and GH would decrease.
   C. insulin would decrease and glucose would increase.
   D. cortisol and epinephrine would increase.
   E. insulin and glucagon would increase with little change in glucose.

17. Hormones that are secreted in excess quantities can bind to alternate receptors (receptor spillover). This phenomenon usually occurs among hormones that share structural similarities. Which one of the following would most likely not show receptor spillover under conditions of excess hormone secretion?
   A. TSH and LH
   B. hydrocortisone and aldosterone
   C. growth hormone and prolactin
   D. somatostatin and somatomedin
   E. oxytocin and antidiuretic hormone

18. The secretion of which one of the following adrenal steroids would be least affected by hypophysectomy (removal of the pituitary gland)?
   A. Aldosterone
   B. cortisol
   C. corticosterone
   D. progesterone
   E. dehydroepiandrosterone

19. Which one of the following hormones would not be elevated during periods of stress?
   A. luteinizing hormone
   B. ß-endorphin
   C. prolactin
   D. cortisol
   E. epinephrine

20. The basic mechanism of action of thyroid hormones on their target cells involves
   A. binding to plasma membrane receptors.
   B. acceleration of specific messenger RNA synthesis.
   C. acceleration of cAMP production.
   D. a decrease in Na, K ATPase activity.
   E. an increase in glucose uptake.

21. A hormone that promotes bone resorption is
   A. estrogen
   B. 24, 25 (OH)2 Vit D3
   C. calcitonin
   D. insulin
   E. parathyroid hormone
22. Parathyroid hormone concentrations in the blood are
   A. increased when ionized calcium concentrations are elevated.
   B. decreased when ionized calcium concentrations are elevated.
   C. decreased during hypocalcemia.
   D. directly responsible for increased intestinal absorption of calcium.
   E. increased during primary hypoparathyroidism.

23. The primary rate limiting step in stimulation of the synthesis of steroid hormones in the adrenals and gonads by ACTH and LH, respectively, is:
   A. conversion of Cl9 steroids to Cl8 steroids.
   B. the conversion of cholesterol to pregnenolone.
   C. the conversion of pregnenolone to progesterone.
   D. 17-hydroxylation of progesterone.
   E. 11-hydroxylation of 11-deoxycorticisol.

24. Which of the following would be stimulated by insulin?
   A. gluconeogenesis
   B. glycogen breakdown
   C. lipogenesis
   D. a decrease in peripheral glucose uptake
   E. ketogenesis

25. Hormones that exert their effect through the activation of "second messengers" are
   A. secreted by the ovary, testis, adrenal cortex and placenta.
   B. initially bound to cytoplasmic hormone receptors.
   C. excreted after conjugation with glucuronic acid and sulfate.
   D. usually water soluble proteins and amines.
   E. must be lipophilic.

26. Growth hormone secretion is stimulated by
   A. an increase in somatostatin secretion.
   B. low blood glucose concentrations.
   C. an increase in somatomedin release.
   D. a high carbohydrate meal.
   E. an increase in cortisol secretion.

27. Which of the following would suppress aldosterone secretion in a normal person?
   A. Place the person on a low Na+ diet
   B. Give a bolus injection of ACTH
   C. Administer an aldosterone antagonist (e.g., spironolactone), which blocks the action of aldosterone
   D. Administer deoxycorticosterone or deoxycortisol
   E. Administer angiotensin II

28. Vitamin D3
   A. is metabolized to 1,25 (OH)2-Vit D3, which is the biologically active form of the vitamin.
   B. administered chronically would result in a hypocalcemic state.
   C. must be obtained in the diet since it cannot be synthesized in vivo.
   D. is a protein.
   E. acts primarily on the skeletal muscle.

29. Corticotropin-releasing hormone increases secretion of pituitary
   A. GH (growth hormone)
   B. PRL (prolactin)
   C. ß-lipotropin (ßLPH)
   D. TSH (thyroid stimulating hormone)
   E. LH (luteinizing hormone)

30. Which one of the following hormones would not increase during primary hyperthyroidism?
   A. thyroxine
   B. triiodothyroine
   C. reverse triiodothyronine
   D. TSH
   E. none of the above

31. Administration of thyroid stimulating hormone would
   A. enhance iodide trapping.
   B. increase thyroid peroxidase activity.
   C. elevate tyrosyl coupling.
   D. elevate thyroglobulin endocytosis.
   E. all of the above.
32. A target tissue that has lost 50% of its membrane receptors
   A. could respond normally when exposed to higher concentrations of hormone.
   B. would be more sensitive to hormone stimulation.
   C. must increase the receptors’ affinity constant in order to compensate.
   D. would always produce a hormone-deficiency syndrome.
   E. all of the above.

33. Measurement in the systemic blood of which of the following would most closely reflect the secretion rate of insulin directly from the beta cells of the Islets of Langerhans:
   A. glucagon
   B. proinsulin
   C. "C-peptide"
   D. glucose
   E. none of the above

34. Which one of the following conditions would tend to decrease basal plasma insulin levels?
   A. prolonged starvation
   B. obesity
   C. excess growth hormone secretion
   D. excess cortisol secretion
   E. pregnancy

35. During radioimmunoassay, high concentrations of hormone in the test sample would
   A. lower the amount of antibody in the assay.
   B. reduce the amount of radioactive label associated with the antibody.
   C. decrease the amount of free hormone in the assay tube.
   D. reduce the amount of unbound radioactive label in the assay.
   E. increase hormone receptor complexes in the assay.

36. Which of the following would decrease GH secretion
   A. insulin
   B. somatostatin
   C. growth hormone releasing hormone
   D. estrogen
   E. hypoglycemia

37. The primary site of aldosterone production is the
   A. zona reticularis
   B. zona fasiculata
   C. zona glomerulosa
   D. adrenal medulla
   E. ovary

38. In the absence of 11-hydroxylase, the adrenal would be unable to synthesize
   A. pregnenolone
   B. androstenedione
   C. estradiol
   D. 17-OH progesterone
   E. cortisol

39. Insulin lowers circulating glucose levels by
   A. stimulating glucose transport into muscle.
   B. increasing lipolysis.
   C. decreasing hepatic glucose uptake.
   D. inhibiting intestinal glucose absorption.
   E. stimulating hepatic glycogenolysis.

40. Negative feedback regulation of growth hormone (GH) secretion by insulin-like growth factor-I (IGF-I, somatomedin C) is primarily brought about by:
   A. suppression of hypothalamic growth hormone releasing hormone (GHRH)
   B. suppression of hypothalamic somatostatin (SRIF)
   C. stimulation of hypothalamic GHRH
   D. stimulation of hypothalamic SRIF
   E. direct inhibition of pituitary growth hormone (GH) release
41. An injury that interrupted the hypophyseal portal blood system would be expected to result in increased secretion of
   A. ACTH.
   B. FSH.
   C. Growth hormone.
   D. Prolactin.
   E. Beta-lipotropin.

42. The glucose transporter that facilitates the pancreatic b-cell uptake of glucose is
   A. GLUT1
   B. GLUT4
   C. glucokinase
   D. glucagon
   E. GLUT2

43. The most highly conserved region of steroid/thyroid receptor molecules is the:
   A. ligand-binding domain
   B. DNA-binding domain
   C. hormone response element
   D. transactivation domain
   E. none of the above

44. A circadian rhythm is one which peaks once:
   A. during nighttime
   B. during each month
   C. approximately each 24 hours
   D. each year
   E. during each daytime

45. To treat hypothyroidism, thyroxin (T4) is generally used rather than T3. The reason is that:
   A. T4 is more potent than T3
   B. T4 doesn't inhibit TRH secretion
   C. T4 has a longer biological half-life than T3
   D. T4 does not bind to TBG
   E. Thyroid-stimulating immunoglobulin (TSI) doesn't effect T4

46. What feature of G-proteins is most important for hormone signal amplification?
   A. specific G-proteins couple with specific effector molecules.
   B. G-protein dissociates to form 3 subunits, alpha, beta, and gamma.
   C. G-protein, beta-subunits are localized to the plasma membrane
   D. alpha-subunit's GTPase has a slow rate constant
   E. adenylyl cyclase is stimulated by a G-protein

47. Most steroid hormone metabolites are excreted via the:
   A. urine
   B. liver
   C. gut
   D. all of the above
   E. none of the above

48. Which of the following hormones is derived from the same precursor as, ß-endorphin?
   A. ACTH (adrenal corticotrophic hormone)
   B. GH (growth hormone)
   C. Prolactin
   D. Epinephrine
   E. THS (thyroid stimulating hormone)

49. Circulating IGF-I is secreted primarily from:
   A. bone
   B. the pituitary
   C. the liver
   D. all of the above
   E. none of the above

50. Type II diabetes mellitus is an example of:
   A. primary hypossecretion
   B. pseudohypossecretion
   C. secondary hypossecretion
   D. autoimmune hypossecretion
   E. none of the above
51. About 60% of circulating T4 is bound to thyroxin-binding globulin (TBG); most of the remainder is:
   A. bound to albumin
   B. bound to thyroxine-binding prealbumin (TBPA)
   C. free in solution
   D. T3
   E. none of the above

52. All of the following are known effects of GH except:
   A. growth of bone and cartilage cells
   B. increased gluconeogenesis
   C. increased lipolysis
   D. increased IGF-I secretion
   E. elevated fatty acid oxidation

53. Which of the following is not characteristic of all hormone receptors? They
   A. are all proteins
   B. are only located in the plasma membrane
   C. are ligand specific
   D. are 'saturable' (finite capacity)
   E. mediate biological functions of hormones

54. Whereas ionic iodide could be found in many parts of the body, oxidized iodine (Io) or iodinium (I+) is found only in:
   A. thyroid C cells
   B. thyroid follicular cells and/or colloid
   C. gut epithelium
   D. liver
   E. kidney

55. Which of the following growth hormone abnormalities might be expected to cause ketoacidosis in an individual who
   would otherwise be a borderline diabetic?
   A. Laron dwarfism
   B. A growth-hormone-secreting adenoma
   C. GH autoantibodies
   D. A mutant GH that has an apparent molecular weight of 85,000 daltons
   E. Excess GH binding protein in the serum

56. In a euthyroid individual the daily intake of iodine was increased from 450 to 500 mg/day. The daily flux of hormone-bound
   iodine was 75 mg/day (steady-state) and biliary excretion was 18 mg/day. Following the change in iodine intake you
   should expect:
   A. intestinal absorption of iodine to decrease proportionately
   B. fecal iodine to increase from 18 to 68 mg/day
   C. circulating hormone-bound iodine to be 125 mg/day
   D. urinary iodine to increase by 50 mg/day
   E. thyroid iodine to increase from 8000 to 8500 mg/day over a period of 10 days

57. Which of the following molecules is an insulin-regulated glucose transporter?
   A. GLUT1
   B. Glucokinase
   C. Glucagon
   D. GLUT4
   E. Glucose-ATPase

ANSWERS TO ENDOCRINE QUESTIONS

MEDICAL PHYSIOLOGY: SECTION XII (REPRODUCTIVE PHYSIOLOGY)
Dr. Andrew LaBarbera
Departments of Obstetrics and Gynecology and Molecular and Cellular Physiology
1. The action of oxytocin on the breast involves
   A. stimulation of growth of glandular epithelium.
   B. stimulation of milk protein synthesis.
   C. movement of milk from mammary alveoli to larger collecting ducts.
   D. activation of a cytoplasmic receptor.
   E. none of the above.
2. Which one of the following hormones stimulates prolactin secretion?
   A. dopamine.
   B. thyrotropin-releasing hormone (TRH).
   C. somatostatin (SRIF).
   D. thyroxine.
   E. growth hormone-releasing hormone (GHRH).

3. FSH
   A. secretion is not affected by gonadotropin-releasing hormone (GnRH).
   B. stimulates progesterone synthesis in the corpus luteum.
   C. negative feedback regulation in both the male and female involves gonadal steroids and a non-steroidal inhibitor substance, inhibin.
   D. and human chorionic gonadotropin (HCG) have similar biological activities due to their similarities in biochemical structure.
   E. none of the above.

4. Which one of the following would be associated with the postmenopausal state?
   A. a copious secretion of watery cervical fluid.
   B. increased urinary concentrations of LH and FSH.
   C. proliferation of the endometrium.
   D. presence of a functional corpus luteum.
   E. inability of estradiol administration to exert a negative feedback effect on LH secretion.

5. Which one of the following is necessary for the initiation of postpartum lactation in the female?
   A. High maternal plasma levels of estrogen and progesterone and low maternal plasma levels of prolactin.
   B. Decreased maternal plasma levels of estradiol and progesterone in the face of elevated maternal prolactin levels.
   C. A postpartum increase in estradiol concentrations in maternal plasma.
   D. An increase in prolactin levels in combination with an increase in maternal plasma levels of estradiol and progesterone.
   E. The decision by the mother whether or not to nurse her baby.

6. During the normal human menstrual cycle
   A. estradiol synthesized during the follicular phase of the cycle exerts both negative and positive feedback actions on LH and FSH production.
   B. progesterone secreted during the early follicular phase is responsible for proliferation of the uterine endometrium.
   C. menses occurs within 2-3 days after ovulation.
   D. breast development is inhibited by the high levels of progesterone during the luteal phase of the cycle.
   E. the follicular fluid of the dominant follicle destined to ovulate will contain high levels of androgens and low levels of estradiol.

7. The chorion of the placenta
   A. is responsible for maintaining pregnancy by its de novo synthesis of progesterone during the first 8 weeks of gestation.
   B. derives its precursors for progesterone synthesis from the C19 steroids produced by the fetus.
   C. produces large quantities of prolactin throughout pregnancy.
   D. synthesizes estriol which is synthesized from the C19 steroids produced by the fetus.
   E. prolongs the life span of the corpus luteum by producing placental lactogen (hPL), which has LH-like activity.

8. Progesterone
   A. action in the endometrium is enhanced by previous exposure of the endometrium to estradiol.
   B. administration during the early follicular phase of the menstrual cycle will induce a LH surge.
   C. administration increases estradiol responsiveness by stimulating an increased estradiol receptor concentration.
   D. is a C18 steroid.
   E. has no known function during pregnancy.
9. Chronic administration of pharmacologic concentrations of testosterone to a normal adult male might be expected to
   A. decrease sexual drive.
   B. decrease the number of sperm produced.
   C. result in a negative nitrogen balance.
   D. increase testicular size.
   E. none of the above.

10. A synthetic compound may be considered to have estrogenic activity if it
    A. stimulates facial hair growth and clitoral enlargement.
    B. contains 19 carbon atoms.
    C. stimulates GnRH synthesis and secretion.
    D. stimulates growth of the endometrium, secretion of large amounts of watery cervical mucous fluid, growth of the
        vaginal epithelium and induces a LH surge.
    E. binds to the androgen receptor.

11. Sex steroid binding globulin (SHBG), also known as testosterone estradiol-binding globulin (TeBG),
    A. increases the biological activity of hormones by activating membrane receptors.
    B. is a blood protein which binds both androgens and estrogens.
    C. is a cytosolic receptor protein for androgens in Sertoli cells.
    D. facilitates sex steroid metabolism and degradation.
    E. transports biologically active glucocorticoids in plasma.

12. Which one of the following in a healthy adult female would most definitely indicate that ovulation had occurred at some
    time in the past?
    A. Increased body temperature.
    B. Elevated urinary 17-keto steroids.
    C. Elevated urinary HCG levels.
    D. Vaginal smear pattern.
    E. Elevated plasma estradiol levels.

13. In normal human females, prolactin:
    A. Stimulates synthesis of milk proteins in conjunction with ovarian estrogens.
    B. Shares structural homology with growth hormone.
    C. Facilitates the release of FSH.
    D. Competes for the progesterone receptor in mammary tissue.
    E. Activates the myoepithelial cells of the mammary gland.

14. After fertilization of a mature human ovum, the successful development of a mature, full term fetus depends on:
    A. The maintenance of the corpus luteum for 9 months.
    B. Implantation of the fertilized ovum in the fallopian tube.
    C. The release of chorionic gonadotropin by the developing placenta during the first trimester of pregnancy.
    D. The direct transfer of blood from the mother to the fetus by way of the placenta.
    E. The maintenance of elevated pituitary LH and FSH levels throughout the full term of pregnancy.

15. Ovulation:
    A. Ceases 35-40 years after puberty due to a decreased secretion of LH and FSH.
    B. Always occurs 14 days after the first day of menses.
    C. Is dependent upon GnRH stimulation of the anterior pituitary gland.
    D. Can be induced by administering human placental lactogen (HPL) since this hormone has structural
        similarities to human LH.
    E. Always occurs after the basal body temperature has increased thus explaining the effectiveness of the
        rhythm method of contraception.

16. Which of the following would NOT be associated with the postmenopausal state:
    A. Elevated plasma LH levels.
    B. Uterine atrophy.
    C. Increased proliferation of the vaginal epithelium.
    D. Low plasma progesterone.
    E. Depletion of ovarian follicles.

17. Progesterone:
    A. Secretion decreases during the luteal phase of the reproductive cycle due to decreased LH secretion.
    B. Is a C19 steroid.
    C. Is not an intermediate in estrogen biosynthesis in the developing follicle.
    D. Stimulates estrogen receptor synthesis.
    E. In the uterus is most effective after the tissue has been exposed to estradiol.
18. Estradiol formation from testosterone involves:
   A. Conversion of delta 5 to delta 4.
   B. Elimination of two (2) carbons.
   C. Formation of an aromatic ring A.
   D. Reduction of a double bond.
   E. Action of a steroid sulfatase.

19. Diethylstilbestrol (DES) is estrogenic because:
   A. It is derived from an androgen.
   B. It mimics FSH in its action.
   C. It mimics LH in its actions.
   D. It binds to estrogen receptors.
   E. It contains 18 carbon atoms.

20. An increase in which one of the following hormones would precede the preovulatory LH surge during the normal menstrual cycle.
   A. progesterone
   B. FSH
   C. prolactin
   D. estradiol
   E. a C21 steroid

21. At which stage of the human reproductive cycle would the pituitary responsiveness to GnRH (i.e. gonadotropin secretion) be greatest?
   A. early follicular phase
   B. late follicular phase
   C. mid-luteal phase
   D. secretory phase
   E. none of the above since GnRH responsiveness does not change at any stage of the cycle.

22. The administration of estradiol to a postmenopausal woman would
   A. initially decrease circulating gonadotropin levels.
   B. induce ovulation resulting in a resumption of normal menstrual cycles.
   C. suppress endometrial and vaginal epithelial growth.
   D. increase plasma testosterone levels due to an increased conversion of estradiol to testosterone.
   E. induce vasomotor instability resulting in hot flushes (flashes).

23. During a normal pregnancy, increasing levels of which one of the following hormone levels in the maternal blood or urine would indicate viability of the fetus?
   A. progesterone
   B. estradiol
   C. human placental lactogen
   D. estriol
   E. C19 steroids

24. The maintenance of lactation requires:
   A. the presence of estradiol and progesterone
   B. continued secretion of human placental lactogen (HPL)
   C. only the release of oxytocin in response to the suckling stimulus
   D. repeated stimulation of the mammary glands by prolactin in response to nipple stimulation.
   E. the secretion of human chorionic gonadotropin (HCG).

25. Which of the following would selectively decrease FSH secretion rather than LH secretion?
   A. testicular or follicular inhibin
   B. a single injection of GnRH
   C. testosterone
   D. estradiol
   E. dopamine

26. Sertoli cells
   A. form the blood-testis barrier
   B. secrete androgen binding protein
   C. secrete inhibin
   D. secrete mullerian inhibiting hormone
   E. all of the above
27. The preovulatory (or preovulatory-like) surge of LH
   A. occurs only during the deep stages of sleep
   B. can be induced by estradiol during the luteal phase of the cycle
   C. is due to the positive feedback actions of estradiol on the hypothalamus only
   D. is induced by the removal of the negative feedback effects of progesterone
   E. is due to the positive feedback actions of estradiol on pituitary gonadotropes

28. Which of the following is NOT true of human chorionic somatomammotropin (human placental lactogen):
   A. its concentration in maternal plasma corresponds approximately to placental size
   B. it promotes growth
   C. it assumes an insulin-like role in late pregnancy
   D. it is produced in gram quantities per day in late pregnancy
   E. it possesses lactogenic activity

29. Abnormally low maternal plasma estriol levels in late pregnancy can be caused by
   A. Fetal jeopardy (dying fetus)
   B. An anencephalic fetus
   C. Fetal 16α-hydroxylase deficiency
   D. Placental sulfatase deficiency
   E. Any of the above

30. Increased maternal plasma levels of which one of these hormones would indicate that early pregnancy has been established.
   A. progesterone
   B. hCG (human chorionic gonadotropin)
   C. estriol
   D. prolactin
   E. 17alpha-OH progesterone.

31. In the human, removal of both ovaries during the last trimester of pregnancy (last 3 months) would
   A. prevent the maintenance of a normal pregnancy.
   B. prevent sufficient development of the mammary gland for full lactation.
   C. prevent the elevation of prolactin normally observed in late pregnancy.
   D. not have any major effect on normal pregnancy maintenance.
   E. significantly lower estriol production.

32. Which statement is correct:
   A. Development of the Wolffian duct system is independent of hormonal regulation.
   B. If the genetic sex is XO, the phenotypic sex will be that of a male.
   C. Fetal testicular androgens stimulate the development of the Wolffian duct system and cause the Mullerian duct system to regress.
   D. A genetic male (XY) with female external genitalia (phenotypic female) would result if there were not functional androgen receptors in the fetal tissues.
   E. The phenotypic sex is always consistent with the genetic sex.

33. Testosterone
   A. is the only natural biologically active androgen in the male.
   B. enhances GnRH secretion in the hypothalamus.
   C. is required for initiation and maintenance of spermatogenesis.
   D. in the female is due mainly to the peripheral conversion of estradiol to testosterone by the aromatase enzyme found in a variety of tissues.
   E. and inhibin are important for regulating LH secretion.

34. A well developed "secretory" endometrium is consistent with which stage of the menstrual cycle
   A. early follicular
   B. late follicular
   C. ovulatory
   D. mid-luteal
   E. last day of menses

35. Which hormone is necessary for the maintenance of normal lactation?
   A. estradiol
   B. prolactin
   C. progesterone
   D. GH
   E. FSH (follicle-stimulating hormone)
36. Plasma prolactin concentrations are increased when
   A. hypothalamic dopamine concentrations decrease in the hypophyseal portal blood.
   B. plasma estrogen concentrations decrease.
   C. thyrotropin-releasing hormone binds to pituitary thyrotrophs.
   D. plasma glucose levels are low.
   E. none of the above.

37. During spermatogenesis,
   A. one spermatogonium produces no more than four mature sperm each containing 23 chromosomes and the N quantity of DNA.
   B. one secondary spermatocyte produces four mature sperm each containing 23 chromosomes and the N quantity of DNA.
   C. one primary spermatocyte eventually yields four mature sperm each containing 23 chromosomes and the N quantity of DNA.
   D. mature sperm are found in the basal compartment of the seminiferous tubule.
   E. spermatids divide to form mature sperm.

38. Human placental lactogen
   A. is secreted by luteal cells.
   B. reaches maximum levels by the second month of pregnancy.
   C. can antagonize the actions of insulin in the mother.
   D. inhibits the release of the hormone relaxin from the placenta.
   E. can stimulate the release of prolactin from the pituitary.

39. Synthesis of estrogens by the follicle is dependent on
   A. the conversion of cholesterol to androgens under the control of FSH in the theca cell.
   B. the conversion of androgen to estrogen under the control of FSH in the theca cell.
   C. the conversion of progesterone to androgen under the control of FSH in the granulosa cell.
   D. the conversion of androgen to estrogen under the control of FSH in the granulosa cell.
   E. the conversion of cholesterol to estrogen under the control of LH in the theca cells.

40. Days 6-13 in the female cycle are called the
   A. proliferative phase with respect to the ovary.
   B. follicular phase with respect to the uterus.
   C. luteal phase with respect to the uterus.
   D. proliferative phase with respect to the uterus.
   E. ovulatory phase with respect to the ovary.

41. Mullerian-inhibiting hormone (factor, substance)
   A. is required for differentiation of the wolffian (mesonephric) ducts.
   B. is synthesized and secreted by Sertoli (sustentacular) cells.
   C. is synthesized and secreted by interstitial cells of Leydig.
   D. is secreted in response to human chorionic gonadotropin.
   E. none of the above.

42. During meiosis in female germ cells
   A. one secondary oocyte will give rise to two mature ova.
   B. primary oocytes continually form from oogonia throughout gestation and childhood.
   C. one primary oocyte will give rise to four mature ova.
   D. one primary oocyte will give rise to one mature ovum and two polar bodies.
   E. none of the above.

43. LH and FSH in the fetal circulation increase around the middle of pregnancy because
   A. the hypothalamus of the mother secretes increased amounts of GnRH.
   B. the fetal pituitary develops the ability to synthesize gonadotropins but the fetal hypothalamus is not yet sensitive to the negative feedback effects of steroid hormones.
   C. the fetal pituitary is sensitive to the positive feedback effects of steroid hormones.
   D. the placenta has acquired the capacity to synthesize LH and FSH.
   E. all of the above.

44. FSH
   A. induces the enzyme to aromatize androstenedione to estrone in granulosa cells.
   B. stimulates ovarian granulosa cells to secrete inhibin.
   C. stimulates cells of the functional corpus luteum to secrete estradiol.
   D. is secreted in pulses by gonadotropes of the anterior pituitary in response to pulses of GnRH.
   E. all of the above.
45. Secretion of LH by the pituitary gonadotropes in the female is
   A. limited by the rate of synthesis of the α subunit of LH.
   B. decreased by inhibin.
   C. enhanced by estradiol in the late follicular phase of the female menstrual cycle.
   D. responsible for the demise of the corpus luteum (luteolysis) in the late luteal phase.
   E. none of the above.

46. During the middle of the luteal phase of the menstrual cycle
   A. plasma concentrations of both progesterone and estradiol are elevated relative to the early follicular phase.
   B. plasma concentrations of progesterone are elevated while plasma concentrations of estradiol are low relative to the early follicular phase.
   C. the uterine endometrium is undergoing active proliferation of stromal cells, glands and blood vessels.
   D. contractility of the uterine myometrium is increased relative to the follicular phase resulting in spastic contractions of the uterus.
   E. none of the above.

47. Estradiol
   A. is synthesized in equal amounts in both the theca-interstitial cells and the granulosa cells of the ovarian follicle.
   B. stimulates proliferative thickening of the uterine endometrium.
   C. inhibits pituitary secretion of prolactin.
   D. stimulates cells of the cervical epithelium to secrete a thick, sparse mucus.
   E. all of the above.

48. In the male, FSH
   A. binds to receptors on primary spermatocytes causing them to enter meiosis.
   B. concentrations in plasma are independent of hypothalamic GnRH secretion.
   C. stimulates Sertoli cells to synthesize inhibin and androgen-binding protein.
   D. concentrations in plasma would decrease after removal of the testes (castration).
   E. all of the above.

49. Removal of both maternal ovaries during the 4th week of pregnancy in the human would lead to
   A. an increase in plasma concentrations of progesterone.
   B. an increase in plasma concentrations of human chorionic gonadotropin.
   C. a decrease in myometrial contractility.
   D. termination of pregnancy.
   E. none of the above.

50. Which of the following hormones enhance uterine contractions at parturition?
   A. oxytocin, prostaglandins, estrogen
   B. relaxin, oxytocin, prostaglandins
   C. prostaglandins, estrogen, relaxin
   D. estrogen, progesterone, prolactin
   E. all of the above.

51. Which of the following statements about circulating hormone levels in postmenopausal women is true?
   A. FSH levels are markedly elevated but LH levels are not.
   B. Pulsatile secretion of LH occurs together with hot flashes.
   C. Androstenedione levels decline progressively.
   D. Pulsatile secretion of gonadotropins is not present.
   E. all of the above.

52. In postmenopausal women
   A. increased bone resorption is present.
   B. the genitalia undergo atrophic changes because of decreased androstenedione synthesis.
   C. the ovary is completely nonfunctional.
   D. cardiovascular disease is not a problem.
   E. none of the above.

53. Human chorionic gonadotropin secreted by the placenta during the first trimester of pregnancy increases production of which hormone that causes differentiation of the wolffian ducts to form the male reproductive tract?
   A. mullerian-inhibiting hormone
   B. estradiol
   C. testosterone
   D. progesterone
   E. all of the above.
54. Before puberty, the reproductive system of the female remains dormant because
   A. the anterior pituitary is not able to respond to gonadotropin-releasing hormone by secreting gonadotropins
   B. the hypothalamus does not secrete gonadotropin-releasing hormone (GnRH) in the pulsatile manner or at levels characteristic of the adult
   C. the hypothalamic -pituitary unit is not sensitive to the negative feedback effects of estrogen
   D. the hypothalamic-hypophyseal portal blood vessels have not yet developed
   E. none of the above.

55. During the late follicular phase of the menstrual cycle
   A. gonadotropes of the anterior pituitary are relatively insensitive to gonadotropin-releasing hormone (GnRH)
   B. plasma concentrations of both progesterone and estradiol are elevated relative to the midluteal phase
   C. contractility of the myometrium is at its lowest level
   D. plasma concentrations of estradiol are elevated relative to the early follicular phase
   E. none of the above.

56. Removal of the testes from a normal, sexually mature and sexually functioning man would result in which changes in plasma concentrations of the following hormones
   A. decreased testosterone, decreased inhibin and decreased luteinizing hormone (LH)
   B. decreased testosterone, increased inhibin and decreased luteinizing hormone (LH)
   C. decreased testosterone, decreased inhibin and increased luteinizing hormone (LH)
   D. increased testosterone, increased inhibin and decreased luteinizing hormone (LH)
   E. none of the above.

57. Progesterone
   A. decreases myometrial contractility during pregnancy to prevent expulsion of the fetus
   B. decreases LH pulse frequency, presumably due to a decrease in gonadotropin-releasing hormone (GnRH) pulse frequency, during the luteal phase of the menstrual cycle
   C. acts in conjunction with estrogen, glucocorticoids, prolactin and growth hormone to cause full differentiation of the lobuloalveolar system of the breasts during pregnancy
   D. increases the secretory activity of the uterine endometrium previously conditioned by estrogen
   E. all of the above.

58. Which of the following is NOT an effect of follicle-stimulating hormone (FSH)?
   A. stimulation of androstenedione biosynthesis in theca/interstitial cells
   B. induction of the aromatase enzyme in granulosa cells
   C. stimulation of inhibin synthesis in Sertoli cells
   D. induction of receptors for luteinizing hormone (LH) in granulosa cells
   E. none of the above.

59. Prolactin
   A. synthesis in the anterior pituitary is inhibited by estrogen (negative feedback)
   B. secretion increases during suckling in response to stimulation of the nipples
   C. increases synthesis of casein and lactalbumin in the mammary glands during the third trimester of pregnancy
   D. synthesis in the decidua of the placenta is inhibited by dopamine
   E. all of the above.

60. The first procedure in the clinical evaluation of the amenorrheic woman is the
   A. measurement of plasma follicle-stimulating hormone (FSH)
   B. radiographic examination of the internal reproductive tract
   C. history and physical examination
   D. measurement of plasma estradiol levels
   E. determination of how plasma prolactin levels change when thyrotropin-releasing hormone (TRH) is administered

61. The effectiveness of oral contraceptive preparations (the "pill") is due primarily to their ability to
   A. prevent implantation of the blastocyst in the wall of the uterus
   B. prevent development and ovulation of ovarian follicles
   C. increase plasma levels of luteinizing hormone (LH) and follicle-stimulating hormone (FSH) to supraphysiologic levels
   D. increase the volume of cervical mucus, making it thin and watery
   E. all of the above.
62. In an infant with a XY genotype, female-appearing external genitalia could result from
   1. excessive Mullerian inhibitory factor (hormone)
   2. 17-hydroxylase (P450c17) deficiency
   3. 11-hydroxylase (P450c11) deficiency
   4. nonfunctional androgen receptor

63. Which of the following conditions in a genetic male (XY) would result in the development of female-like, external genitalia?
   1. excessive androgen secretion by the fetal testes.
   2. failure of the Sertoli cells to produce the Mullerian-inhibiting hormone.
   3. the presence of the H-Y antigen.
   4. nonfunctional androgen receptor.

64. Which of the following hormones increase in the human maternal blood during pregnancy?
   1. prolactin.
   2. estradiol.
   3. progesterone.
   4. cortisol.

65. Milk synthesis by the mammary gland occurs following:
   1. Oxytocin action on the myoepithelial cells.
   2. Prolactin release from the anterior pituitary.
   3. An increase in plasma estrogen levels.
   4. A decrease in plasma levels of estradiol and progesterone.

66. Progesterone
   1. decreases the response of the uterus to oxytocin.
   2. is an intermediate in the synthesis of androgens in the ovary.
   3. inhibits milk synthesis during pregnancy.
   4. synthesis during the placental phase of pregnancy is dependent upon fetal steroid precursors.

67. A complete loss of Sertoli cells after puberty would
   1. lead to sterility.
   2. increase androgen binding protein (ABP) production.
   3. increase FSH secretion.
   4. increase testicular testosterone secretion.

68. The early follicular phase of the human menstrual cycle would be associated with:
   1. low plasma concentrations of LH and FSH relative to the preovulatory phase.
   2. low plasma concentrations of progesterone relative to the midluteal phase.
   3. low plasma concentrations of estradiol relative to the late follicular phase.
   4. a secretory endometrium.

69. A genotypic male with a congenital lack of functional androgen receptors would:
   1. develop female breasts and external genitalia
   2. have no evidence of development of the Mullerian duct system
   3. have male gonads
   4. not develop structures related to the Wolffian duct system

70. GnRH analogs could be used
   1. to induce ovulation.
   2. to inhibit ovulation.
   3. to clinically evaluate hypothalamic-pituitary function.
   4. to inhibit spermatogenesis.

71. In the female, FSH secretion from the pituitary is
   1. stimulated by progesterone.
   2. inhibited by ovarian inhibin.
   3. stimulated by human chorionic gonadotropin (hCG).
   4. inhibited by estradiol.
72. A male fetus will develop a normal male reproductive system if
   1. androgenic hormones are secreted by the fetal gonads and the tissues of the reproductive tract have androgen receptors.
   2. mullerian-inhibiting hormone is secreted by the fetus.
   3. the fetus has a normal XY sex chromosomal complement.
   4. the testis -determining genes are inactivated by human chorionic gonadotropin.

73. At puberty
   1. oocytes resume mitosis and proliferate in the ovary.
   2. increased secretion of estrogen and progesterone causes the breasts to grow and develop in females.
   3. the testes descend out of the abdomen through the inguinal canal
   4. GnRH begins to be secreted at adult levels in a pulsatile manner.

74. The frequency of GnRH pulses
   1. is greater in the luteal phase of the menstrual cycle than in the follicular phase.
   2. is increased by estrogen.
   3. is increased by progesterone.
   4. is greater in the follicular phase of the menstrual cycle than in the luteal phase.

75. A complete loss of Leydig cells in a sexually mature male would result in
   1. cessation of spermatogenesis
   2. decreased production of androgen-binding protein.
   3. increased rate of secretion of both GnRH and LH.
   4. hypertrophy of the prostate.

76. Stimulation of the nipples of a nursing mother during the first month postpartum will lead to
   1. an increase in plasma concentrations of prolactin.
   2. secretion of oxytocin.
   3. maintenance of milk synthesis.
   4. contraction of the myoepithelial cells around the alveoli and small ducts of the mammary glands.

77. In a postmenopausal woman
   1. circulating levels of FSH and LH are greatly increased
   2. the ovaries cease all production of steroid hormones
   3. increased bone resorption can lead to osteoporosis
   4. administration of gonadotropins will alleviate hot flushes

78. Meiosis in female germ cells
   1. yields four mature ova from a single primary oocyte
   2. is arrested during childhood
   3. is completed before birth
   4. yields one mature ovum from a single primary oocyte

79. Secretion of follicle-stimulating (FSH) by gonadotropes of the anterior pituitary
   1. is decreased by inhibin
   2. is enhanced by estrogen in the late follicular phase of the menstrual cycle
   3. occurs in response to gonadotropin-releasing hormone (GnRH)
   4. increases the number of spermatogonia for spermatogenesis

80. Synthesis of androgen-binding protein (ABP) in the testes
   1. occurs in the Sertoli (sustentacular) cells
   2. is increased by follicle-stimulating hormone (FSH)
   3. is required for spermatogenesis
   4. occurs in the interstitial cells of Leydig

81. Estrogens
   1. are formed in the ovary from androgens by the action of the aromatase enzyme (P450arom)
   2. increase the frequency of LH pulses during the menstrual cycle, presumably reflecting an increase in the frequency of GnRH pulses
   3. increase the sensitivity of the myometrium to oxytocin to promote contractility at parturition
   4. decrease contractility of the uterine myometrium during the menstrual cycle

82. In a lactating mother during the first two months after delivery of the infant
   1. oxytocin stimulates cells of the alveoli of the mammary gland to synthesize milk proteins
   2. plasma levels of estrogen and progesterone are similar to levels in the middle of the third trimester of pregnancy
   3. menstrual cyclicity is the same as before pregnancy and ovulation occurs at regular intervals
   4. stimulation of the nipples will result in an increase in plasma concentrations of oxytocin
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