MEDICAL PHYSIOLOGY: SECTION X (GASTROINTESTINAL PHYSIOLOGY)
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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. Gastrointestinal hormone secretion can influence:
   A. The amount of Na⁺ in biliary secretion
   B. The amount of HCO₃⁻ in pancreatic secretion
   C. Lower esophageal sphincter tone
   D. The rate of gastric motility
   E. All of the above

4. 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 most cell release of histamine
   E. Food stretching the wall of the stomach

5. Following the digestion of lipids in the small intestine, the reesterification of triglycerides within the mucosal cell takes place mainly:
   A. By the formation of mixed micelles
   B. Through the 2-monoglyceride pathway
   C. Through the action of B-lipoprotein
   D. By co-lipase and phospholipase activity from the pancreas
   E. In the terminal ileum

6. deleted

7. Motility in the esophagus is regulated by all except:
   A. Myenteric plexus nerves
   B. Vagus nerves
   C. Mass movement
   D. Acetylcholine
   E. Gastrin

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

9. deleted

10. 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
11. Which substance stimulates the pancreas to produce an alkaline juice?
   A. Trypsinogen
   B. Alpha amylase
   C. Lipase
   D. Secretin
   E. Glucagon

12. A relatively constant composition of the luminal contents of the intestine in most subjects is maintained by:
   A. A constant diet
   B. Massive death of intestinal cells
   C. Electrogenic exchange processes
   D. The presence of sodium chloride in the diet
   E. Mixing of chyme with glandular and intestinal cell secretions

13. Intestinal uptake of iron from ingested heme:
   A. Is a Na+-linked active transport process
   B. Requires a different transport process into mucosal cells than that used by free inorganic iron
   C. Requires three days
   D. Requires the liberation of the iron in the intestinal lumen
   E. Is not nutritionally useful

14. 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

15. The synthesis of calcium-binding protein in the intestinal absorbing cells:
   A. Is controlled by a vitamin, 1,25(OH)2D.
   B. Is controlled by the level of vitamin C in the diet
   C. Requires about three days to reach a maximum level
   D. Is inhibited by high levels of calcium in the diet
   E. Controls the passive diffusion of calcium from the lumen into the intestine

16. Propulsion of a bolus of material is fastest in the:
   A. Esophagus
   B. Upper stomach
   C. Lower stomach
   D. Small intestine
   E. Cecum

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

18. Defecation occurs in response to:
   A. Rhythmic segmentation
   B. Vagus nerve stimulation
   C. Sympathetic nerve stimulation
   D. Swallowing
   E. Mass movement

19. The basic electrical rhythm of the stomach is:
   A. Always slower than the rate of mechanical contractions
   B. Always faster than the rate of mechanical contractions
   C. Always equal to the rate of mechanical contractions
   D. Unrelated to the rate of mechanical contractions
   E. Never slower than the rate of mechanical contractions
20. 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

21. deleted

22. 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

23. An important component of the enterohepatic circulation of bile acids is:
   A. Passive absorption in the colon
   B. Cholesterol degrading enzymes in plasma
   C. Gastrin release
   D. Binding to dietary nutrients
   E. Active transport by the ileal mucosa

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

25. 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

26. Glycerol, an end-product of triglyceride digestion, is:
   A. Essential for mixed micelle formation
   B. Metabolized by intestinal cells
   C. Absorbed directly into the blood
   D. Further degraded by intestinal bacteria
   E. Incorporated into chylomicrons

27. The bicarbonate (HCO₃⁻) contained in bile serves to:
   A. Promote reabsorption of H₂O
   B. Keep bile acids in solution
   C. Maintain electrical neutrality in the canaliculi
   D. Complex dietary lipids
   E. Stimulate pancreatic secretion

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

29. The physiological uptake of iron into the body is:
   A. Increased immediately following the development of an iron deficiency
   B. Similar for inorganic iron and iron in heme
   C. Increased a few days following the development of an iron deficiency
   D. reduced in the presence of ascorbic acid
30. 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.
31. deleted
32. 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
33. Which of the following statements is true of the basic electrical rhythm (BER)?
   A. The BER originates in the stomach and is conducted with diminishing frequency along the small intestine and at a very reduced frequency along the colon
   B. It is normally associated with a spike which, in turn, is followed by smooth muscle contraction
   C. Its frequency is increased by gastrin
   D. Its frequency does not govern the rate of muscular contractions of the stomach
34. 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
35. 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
36. All of the following intraluminal events are required for normal intestinal absorption of dietary long-chain triglyceride EXCEPT:
   A. Na⁺,K⁺-ATPase
   B. Micelle formation
   C. Pancreatic lipase
   D. HCO₃⁻
   E. Bile acids
37. Essential components in the intracellular events of dietary long-chain triglyceride absorption are:
   A. Bile pigments
   B. Bile acids
   C. Reesterification enzymes
   D. Lipase/colipase
   E. Glycine and taurine
38. 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
39. 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
40. Inhibition of gastric acid secretion is caused by:
   A. $H_1$ receptor binding of acetylcholine
   B. $H_2$ receptor binding of acetylcholine
   C. $H_2$ receptor binding of histamine
   D. Gastrin release of histamine
   E. $H_2$ receptor binding of $H_2$ receptor blockers

41. A stimulant of parietal cell secretion of acid is:
   A. Vitamin $B_{12}$
   B. Calcium
   C. Antacid
   D. Secretin
   E. Intrinsic factor

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

43. The $Na^+$ input into the intestine is derived primarily from:
   A. Dietary products
   B. Intestinal cells that die every three days
   C. Glandular secretions
   D. Sodium chloride added to food
   E. An electrogenic exchange process

44. 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

45. The mechanisms for active transport of $Na^+$ in the jejunum and in the ileum:
   A. Are identical
   B. Differ since the jejunum exchanges $Na^+$ for $H^+$ and the ileum cannot perform this exchange
   C. Differ because the jejunum cotransports glucose plus $Na^+$ and the ileum cotransports fructose and $Na^+$
   D. Differ because the ileum exchanges $Na^+$ for $H^+$ and the jejunum does not perform this exchange
   E. Are the same because they both actively transport sugar

46. The uptake of inorganic iron into the body is:
   A. Increased when iron is part of the daily intake
   B. Increased immediately following the sudden loss of blood from the body
   C. Decreased by the addition of reducing agents to the diet
   D. Independent of the amount of iron in the diet
   E. Reduced in the presence of ascorbic acid

47. Pernicious anemia is associated with a reduction in the number of:
   A. G cells in the pyloric gland area
   B. D cells in the islets of Langerhans
   C. APUD cells in the duodenal mucosa
   D. Enterocytes in the ileum
   E. Oxyntic cells in the oxyntic gland area

48. Which substance is not released by APUD (amine precursor uptake and decarboxylation) cells of the gastrointestinal mucosa?
   A. Gastrin
   B. Secretin
   C. Cholecystokinin
   D. Insulin
   E. Gastric inhibitory peptide (GIP)
49. Intestinal absorption of glucose:
   A. Is exclusively by active transport
   B. Requires active cotransport of potassium
   C. Is exclusively by passive transport
   D. Requires active cotransport of sodium
   E. Requires active cotransport of water

50. 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

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

52. Which substance is not a peptide hormone?
   A. Secretin
   B. Insulin
   C. Glucagon
   D. Gastrin
   E. Histamine

53. Which one of the following ions is exclusively transported by passive means in the gastric mucosa?
   A. Bicarbonate
   B. Chloride
   C. Sodium
   D. Hydrogen
   E. Potassium

54. deleted

55. 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

56. 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

57. An increase in the amount of calcium being absorbed in the duodenum causes a:
   A. Decreased rate of gastric secretion of acid
   B. Decrease in duodenal secretion of chloride and, therefore, diarrhea
   C. Relaxation of the lower esophageal sphincter
   D. Decrease in acinar cell exocytosis
   E. Decrease in the release of parathyroid hormone

58. 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

59. deleted
60. Translocation of bile acid anions across the canalicular membrane of the hepatocyte is:
   A. Na⁺-dependent
   B. Opposed by the transmembrane potential across the canalicular membrane
   C. ATP-dependent
   D. Inhibited by ouabain
   E. Favored by the transmembrane potential across the canalicular membrane

61. In the formation of bilirubin:
   A. The chief precursors arise from the heme groups of hepatic heme-containing enzymes
   B. Heme is converted to biliverdin in the hepatocyte
   C. The conversion of biliverdin to bilirubin results in a less hydrogen bonded structure
   D. Heme is catabolized in the cells of the reticuloendothelial system
   E. Carbon dioxide is liberated in the conversion of heme to biliverdin

62. Entry of bile anions into the hepatocyte is:
   A. Chloride-dependent
   B. Favored by the transmembrane electrical potential
   C. Coupled to the movement of Na⁺
   D. An example of passive diffusion
   E. Unrelated to Na⁺K⁺-ATPase activity

63. 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

64. deleted

65. Which substance does not stimulate pancreatic exocrine secretion?
   A. Secretin
   B. Cholocystokinin (CCK)
   C. Norepinephrine
   D. Acetylcholine
   E. Little gastrin

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

67. The uptake of iron into the intestinal cell:
   A. Depends only on a single active carrier system
   B. Normally occurs through more than one pathway
   C. Increases immediately following blood loss from the body
   D. Is greater in the crypt cells than in the villus cells
   E. Requires the iron to be in the ferric (Fe³⁺) form

68. 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

69. deleted

70. Which one of the following would most likely damage the gastric mucosa?
   A. Acetylcholine
   B. Bile
   C. Cholesterol
   D. Disaccharides
   E. Enkephalins
71. 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, sodium chloride and K⁺ into the gut
   E. The major defect is increased activity of the intestinal sodium pump

72. 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

73. 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

74. Which one of the following statements concerning autonomic nerve influences on gastrointestinal motor activity is true?
   A. Extrinsic innervation is essential for intestinal peristalsis
   B. Parasympathetic stimulation causes vasoconstriction and directly inhibits smooth muscle contractions
   C. Parasympathetic (vagal) stimulation generally enhances visceral smooth muscle contractile activity
   D. Autonomic influence on the g.i. tract is only through modification of neural activity of the myenteric plexus
   E. Sympathetic stimulation of the stomach and small bowel will decrease transit time

75. The Basal Electric Rhythm (BER) of the stomach:
   A. Determines the maximal rate of peristaltic contractions
   B. Determines the slowest rate of peristaltic contractions
   C. Always causes contractions
   D. Has nothing to do with contractions
   E. Determines the force of contraction

76. 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

77. 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

78. Which substance is not transported by the gastric mucosa?
   A. Chloride
   B. Hydrogen ion
   C. Bicarbonate
   D. Sodium
   E. None of the above
79. Which substance does not inhibit gastric secretion of acid?
A. Tagamet (cimetidine)
B. Atropine
C. Secretin
D. Gastrin
E. None of the above

80. Which one of the following statements is true regarding the G.I. hormone, gastrin?
A. Gastrin is released primarily from the duodenum.
B. Antral pH below 3 stimulates gastrin release.
C. Biological active gastrin molecules must be bound to serum albumin for maximum effect.
D. Gastrin and gastric inhibitory peptide (GIP) are synergistic in their effects on acid secretion.
E. Gastrin has a trophic effect on the gastric and intestinal mucosa.

81. All of the following cause the release of G.I. hormones by direct action EXCEPT:
A. Sphincter relaxation.
B. Extrinsic nerve activity.
C. Gastric acid.
D. Luminal distension.
E. Contact of food with G.I. mucosa.

82. Gastric parietal cell secretion of HC1 involves
A. Hydrolysis of ATP.
B. K+ ion.
C. Changes in parietal cell morphology.
D. Protein phosphorylation.
E. All of the above.

83. 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.

84. The direct regulation of pancreatic secretion involves
A. Hormones from the CNS which directly modulate acinar cell function.
B. Alterations in G.I. pacemaker activity.
C. Conversion of pepsinogen to pepsin.
D. Peptide hormones of the intestinal mucosal amine precursor uptake and decarboxylation (APUD) cells.
E. Sympathetic nerves of the celiac ganglia.

85. deleted

86. Calcium uptake by intestinal mucosal cells is regulated by
A. Cyclic AMP.
B. Na, K-ATPase.
C. Acetylcholine.
D. Bile Acids.
E. An endocrine-mediated process.

87. 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.

88. 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.
89. The unstirred water layer lines the luminal surface of the intestinal mucosa. Regarding this "micro-climate"
   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.

90. deleted

91. 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.

92. Swallowing directly involves
   A. the lower esophageal sphincter.
   B. presacral parasympathetic nerves.
   C. splanchnic sympathetic nerves.
   D. pharyngeal constrictor muscles.
   E. pyloric sphincter.

93. 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.

94. When your stomach is secreting actively, the juice contains significant concentrations of
   A. bicarbonate.
   B. hydroxyl ion.
   C. taurocholate.
   D. trypsin.
   E. potassium ion.

95. 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. Cl\(^-\) concentration greater than the plasma Cl\(^-\) concentration.
   D. K\(^+\) concentration greater than in the juice of the actively secreting stomach.
   E. Na\(^+\) concentration greater than the plasma Na\(^+\) concentration.

96. Which one of the following events will not inhibit secretion of acid by the stomach?
   A. histamine acting on the oxyntic cell.
   B. acidification of the mucosal surface in the pyloric gland area to a pH below 2.0.
   C. acidification of the duodenal mucosal surface to a pH below 4.0.
   D. emptying of fat into the duodenum.
   E. emptying of a hyperosmotic solution into the duodenum.

97. Which hormone is a peptide secreted by the pancreas?
   A. secretin.
   B. cholecystokinin.
   C. gastrin.
   D. acetylcholine.
   E. bombesin.

98. Which agent does not influence the intestinal absorption of calcium?
   A. a carrier protein on the apical membrane of the enterocyte.
   B. a calcium-ATPase on the basolateral membrane of the enterocyte.
   C. parathyroid hormone.
   D. thyroid hormone.
   E. vitamin D.
99. The only substance which does not cause diarrhea is
   A. VIP and gastrin.
   B. cholera toxin
   C. prostaglandins.
   D. glucose.
   E. E. coli enterotoxin.

100. Alpha amylase converts
   A. dextrose into glucose.
   B. alpha-limit dextrans into starch.
   C. lactose into lactase.
   D. amylase into maltose and glucose.
   E. amylopectin into starch.

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

102. 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.

103. Which disease or event is least likely to cause steatorrhea?
   A. gallstones.
   B. cancer of the stomach.
   C. surgical bypass of most of the small intestine as treatment for massive obesity.
   D. genetic absence of the intestinal enzyme gluten hydrolase.
   E. viral hepatitis.

104. 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.

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

ANSWER KEY - GASTROINTESTINAL PHYSIOLOGY
85. deleted  86. E  87. A  88. C  89. B  90. deleted  91. E
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
   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 PO\(_4\).

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 T\(_3\) and T\(_4\).
   C. Stimulation of the thyroid gland by thyroid stimulating immunoglobulin (TSI).
   D. Chronic consumption of a substance which blocks T\(_3\) and T\(_4\) synthesis.
   E. Chronic consumption of exogenous T\(_4\).

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?
   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 D$_3$
   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-deoxycortisol.

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 D$_3$, 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 by 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. β-lipotropin (βLPH)
   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 β-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, β-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 hyposecretion
   B. pseudohyposecretion
   C. secondary hyposecretion
   D. autoimmune hyposecretion
   E. none of the above

51. About 60% of circulating T\(_3\) 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. T\(_3\)
   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 (I\(_2\)) 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)
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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. thyroid-releasing hormone.
   C. somatostatin.
   D. thyroxine.
   E. growth hormone-releasing hormone.

3. FSH
   A. secretion is not affected by gonadotropin-releasing hormone.
   B. regulates progesterone secretion from 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. an 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 levels of estrogen and progesterone and low prolactin.
   B. Withdrawal of placental steroids in the face of elevated prolactin levels.
   C. A postpartum increase in estradiol concentrations in the plasma.
   D. An increase in prolactin levels in combination with an increase in the placental sex steroids.
   E. The decision by the mother whether or not to nurse her baby.

6. During the normal human menstrual cycle
   A. estradiol secreted during the follicular phase of the cycle exerts both negative and positive feedback actions on LH secretion.
   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 a follicle destined to release an ovum (i.e. ovulate) will have high levels of androgens and low levels of estradiol.

7. The placenta
   A. is responsible for maintaining pregnancy by its de novo synthesis and secretion of progesterone during the first 10 weeks of gestation.
   B. derives its precursors for progesterone synthesis and secretion from the C₁₉ steroids produced by the fetal adrenal gland.
   C. produces large quantities of prolactin throughout pregnancy.
   D. secretes estriol which is synthesized from the C₁₉ steroids produced by the fetus.
   E. hormone, HPL (human placental lactogen), is important for prolonging the life span of the corpus luteum due to its LH-like activity.
8. Progesterone  
   A. action in the endometrium is enhanced by previous exposure of the endometrium to estrogen.  
   B. administration during the early follicular phase of the menstrual cycle will induce a LH surge.  
   C. administration increases estradiol action 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 spermatogonia available for spermatogenesis.  
   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. inhibits LH secretion.  
    D. stimulates growth of the endometrium, secretion of large amounts of watery cervical mucus fluid, growth of the vaginal epithelium and induces a LH surge.  
    E. binds to the androgen receptor.

11. Sex steroid binding globulin  
    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 hormone metabolism and degradation.  
    E. transmits biologically active glucocorticoids.

12. Which one of the following 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 subjects, prolactin:  
    A. Promotes the growth and function of the mammary gland in the presence of ovarian and adrenal hormones.  
    B. Stimulates the secretory activity of the corpus luteum (luteotrophic effect).  
    C. Facilitates the release of FSH.  
    D. Competes for the progesterone receptor in mammary tissue.  
    E. Activate 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 Gn RH (LHRH) 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. Stimulated growth 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 C_{19} steroid.
   C. Is not an intermediate in estrogen biosynthesis in the developing follicle.
   D. Stimulates estrogen receptor synthesis.
   E. Is most effective in target tissues previously exposed to estradiol.

18. Estrogen 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 C_{21} 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, which one of the following hormone levels in the maternal blood would provide an index of fetal well-being?
   A. progesterone
   B. estradiol
   C. human placental lactogen
   D. estriol
   E. C_{19} 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 the suckling 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 the pituitary  

28.  A developing follicle destined for ovulation  
   A. has been shown to have high intrafollicular concentrations of androgens and low concentrations of estradiol  
   B. is responsible for the elevated plasma levels of estradiol during the late follicular stage of the cycle  
   C. will form a corpus luteum in the absence of a preovulatory surge of LH  
   D. requires FSH for its development  
   E. requires a significant rise in plasma LH and FSH levels to initiate its development  

29.  Which of the following is NOT true of human chorionic somatomammotropin (human placental lactogen):  
   A. its concentration in plasma corresponds to placental size  
   B. it promotes linear 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  

30.  Abnormally low plasma estriol levels in late pregnancy can be caused by  
   A. Fetal jeopardy (dying fetus)  
   B. an anencephalic fetus  
   C. Fetal 16 alpha-hydroxylase deficiency  
   D. Placental sulfatase deficiency  
   E. All of the above  

31.  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.  

32.  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.  

33.  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.  

34.  Testosterone  
   A. is the only natural biologically active androgen in the male.  
   B. enhances GnRH-stimulated LH release.  
   C. and FSH are necessary for initiating spermatogenesis at the time of puberty.  
   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.
35. 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

36. Which hormone is necessary for the maintenance of normal lactation?
   A. estradiol
   B. prolactin
   C. progesterone
   D. GH
   E. FSH (follicle-stimulating hormone)

37. Plasma prolactin concentrations are increased when
   A. hypothalamic dopamine concentrations decrease in the hypophyseal portal blood.
   B. plasma estrogen concentrations decrease.
   C. thyroid releasing hormone binds to pituitary thyrotrophs.
   D. plasma glucose levels are low.
   E. none of the above.

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

39. Human placental lactogen
   A. is secreted by luteal cells.
   B. reaches maximum levels by the second month of pregnancy.
   C. can act as an insulin antagonist.
   D. inhibits the release of the hormone relaxin from the placenta.
   E. can stimulate the release of prolactin from the pituitary.

40. 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.

41. 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.

42. 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.

43. 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.

44. 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 hypothalamic-pituitary unit 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.
45. FSH
   A. induces the enzyme to aromatize testosterone to estradiol 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.

46. Secretion of LH by the pituitary gonadotropes in the female is
   A. limited by the rate of synthesis of the alpha subunit of LH.
   B. decreased by inhibin.
   C. enhanced by estrogen 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.

47. 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.

48. 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.

49. 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.

50. Removal of both maternal ovaries during the 5th 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.

51. 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.

52. 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. Androgen levels are decreased markedly over premenopausal levels.
   D. Pulsatile secretion of gonadotropins is not present.
   E. all of the above.

53. In postmenopausal women
   A. increased bone resorption is present.
   B. the genitalia undergo atrophic changes because of decreased androgen secretion.
   C. the ovary is completely nonfunctional.
   D. cardiovascular disease is not a problem.
   E. none of the above.
54. 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.

55. 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.

56. 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.

57. 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.

58. 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 differentiation of the lobuloalveolar system of the breasts
   D. increases the secretory activity of the uterine endometrium previously conditioned by estrogen
   E. all of the above.

59. 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.

60. 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 placenta is inhibited by dopamine
   E. all of the above.

61. The most important procedure in the clinical evaluation of the amenorrheic woman is the
   A. measurement of plasma follicle-stimulating hormone (FSH)
   B. examination of the internal genitalia
   C. taking of the history
   D. measurement of plasma estradiol levels
   E. determination of how plasma prolactin levels change when thyrotropin-releasing hormone (TRH) is administered
62. 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 ovulation
   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.

Directions: For each of the questions or incomplete statements below ONE or MORE of the answers or completions given are correct. On the answer sheet, fill in the circle containing
   A if only 1,2 and 3 are correct
   B if only 1 and 3 are correct
   C if only 2 and 4 are correct
   D if only 4 is correct
   E if ALL are correct

63. In an infant with a XY genotype, female-appearing genitalia could result from
   1. excessive Mullerian inhibitory factor (hormone)
   2. 17α-hydroxylase deficiency
   3. 11β-hydroxylase deficiency
   4. androgen receptor deficiency

64. 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 testis.
   2. failure of the Sertoli cells to produce the Mullerian inhibitory factor (hormone).
   3. the presence of the H-Y antigen.
   4. a nonfunctional androgen receptor.

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

66. 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 blood estrogen levels.
   4. A decrease in blood progesterone levels.

67. 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.

68. 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.

69. 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.

70. A genotypic male with a congenital lack of androgen receptors would:
   1. develop female 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

71. GnRH (LHRH, luteinizing hormone-releasing hormone) analogs could be used
   1. to induce ovulation.
   2. to inhibit ovulation.
   3. to clinically evaluate hypothalamic-pituitary function.
   4. to inhibit spermatogenesis.
72. 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.
73. A male fetus will develop a normal 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.
74. 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.
75. The frequency of GnRH secretion
   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.
76. 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.
77. 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.
78. 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
79. 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
80. 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
81. 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
82. Estrogens
   1. are formed in the ovary from androgens by the action of aromatase
   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
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

Answer Key - Reproduction