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GI Digestion, Enzymes & Hormonal Regulation

Study Guide — GI Physiology

High-school/pre-med-level questions on gastrointestinal digestion, key digestive enzymes, and hormonal control (gastrin, secretin, CCK, etc.).

32 items — Study Guide with Answers

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Generated February 20, 2026

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1 **Which part of the digestive system is the MAIN site where most chemical digestion and absorption of nutrients occur?**

A Mouth

B Stomach

C **Small intestine** ✓

D Large intestine

E Esophagus

▶ **Explanation:** While digestion begins in the mouth and stomach, MOST chemical digestion and almost all nutrient absorption occur in the small intestine.

2 **Salivary amylase begins the digestion of which type of nutrient?**

A Proteins

B **Starch (polysaccharides)** ✓

C Lipids (triglycerides)

D Vitamins

E Minerals

▶ **Explanation:** Salivary amylase hydrolyses starch (a polysaccharide) into shorter chains; protein and fat digestion start mainly in stomach and small intestine.

3 **Which of the following is CORRECT about salivary amylase in the stomach?**

A It continues to work best at very low pH

B **It is rapidly inactivated by the acidic pH of gastric juice** ✓

C It is converted into pepsin by hydrochloric acid

D It is responsible for most protein digestion in the stomach

E It is a hormone that regulates acid secretion

▶ **Explanation:** Salivary amylase works best around neutral pH; the very acidic environment of the stomach inactivates it.

4 Which enzyme is secreted by chief cells of the stomach as an inactive precursor?

A Pepsin

B **Pepsinogen** ✓

C Trypsinogen

D Pancreatic amylase

E Lipase

▶ **Explanation:** Chief cells secrete pepsinogen, which is activated to pepsin by gastric acid (HCl) and pepsin itself.

5 Pepsin, the active form of pepsinogen, mainly digests:

A **Proteins into smaller peptides** ✓

B Starch into maltose

C Triglycerides into fatty acids only

D Vitamins into amino acids

E Cellulose into glucose

▶ **Explanation:** Pepsin is a protease that begins protein digestion in the acidic environment of the stomach.

6 **Which pair correctly matches enzyme with its MAIN substrate?**

A Pancreatic amylase – proteins

B Pepsin – starch

C **Lactase – lactose** ✓

D Lipase – DNA

E Trypsin – triglycerides

▶ **Explanation:** Lactase, a brush-border enzyme in the small intestine, breaks down lactose (milk sugar) into glucose and galactose.

7 **Which statement about bile is TRUE?**

A Bile contains powerful digestive enzymes for breaking down proteins

B Bile is produced by the pancreas and stored in the spleen

C **Bile contains bile salts that emulsify fats but has no digestive enzymes** ✓

D Bile directly converts triglycerides into amino acids

E Bile's main role is to digest carbohydrates

▶ **Explanation:** Bile is produced by the liver, stored in the gallbladder, and contains bile salts that emulsify lipids, increasing surface area for lipase; bile itself has no enzymes.

8 **Which enzyme is MOST important for the digestion of fats in the small intestine?**

A Salivary lipase

B Gastric lipase

C **Pancreatic lipase** ✓

D Pepsin

E Pancreatic amylase

▶ **Explanation:** Pancreatic lipase acts in the small intestine (with the help of bile salts) and is responsible for most fat digestion.

9 **Which of the following enzymes is ACTIVATED in the small intestine by the brush-border enzyme enterokinase (enteropeptidase)?**

A Pepsinogen → pepsin

B **Trypsinogen → trypsin** ✓

C Pancreatic amylase → active amylase

D Lipase → colipase

E Lactase → glucose

▶ **Explanation:** Enterokinase on the intestinal mucosa converts trypsinogen to trypsin, which then activates other pancreatic proteases.

10 **Trypsin, chymotrypsin and carboxypeptidase are primarily involved in the digestion of:**

A Carbohydrates

B **Proteins** ✓

C Lipids

D Nucleic acids

E Vitamins

▶ **Explanation:** These pancreatic enzymes are proteases that break proteins into smaller peptides and amino acids.

11 **Which combination correctly matches SITE and DIGESTIVE SECRETION?**

A Stomach – pancreatic amylase

B Mouth – pepsin

C **Pancreas – bicarbonate-rich fluid and digestive enzymes** ✓

D Liver – pepsinogen

E Small intestine – bile production

▶ **Explanation:** The pancreas secretes digestive enzymes (for proteins, lipids, carbs) and bicarbonate to neutralise acidic chyme entering the duodenum.

12 **Which of the following BEST explains why the pancreas secretes bicarbonate into the duodenum?**

A To lower the pH of the stomach contents

B **To neutralise acidic chyme from the stomach and provide a suitable pH for pancreatic enzymes** ✓

C To activate pepsin in the small intestine

D To emulsify fats

E To digest starch directly

▶ **Explanation:** Pancreatic enzymes work best at a near-neutral pH; bicarbonate neutralises the acidic chyme arriving from the stomach.

13 **Which GI hormone is primarily released by the stomach in response to peptides and stomach distension, and stimulates gastric acid secretion?**

A Secretin

B Cholecystokinin (CCK)

C **Gastrin** ✓

D Insulin

E Glucagon

▶ **Explanation:** Gastrin, released by G cells in the stomach, stimulates gastric acid secretion and motility.

14 **Secretin is released from the duodenum mainly in response to:**

A Fats in the duodenum

B Carbohydrates in the stomach

C **Acidic chyme entering the duodenum from the stomach** ✓

D High blood glucose levels

E Stretch of the sigmoid colon

▶ **Explanation:** Secretin is released when acid enters the duodenum; it stimulates bicarbonate secretion from the pancreas and bile ducts, and reduces gastric acid and motility.

15 **Cholecystokinin (CCK) is released from the small intestine primarily in response to:**

- A **Fats and amino acids in the duodenum** ✓
- B Low blood calcium
- C High blood glucose
- D Gas in the large intestine
- E Water in the stomach

▶ **Explanation:** CCK is secreted by I cells of the duodenum/jejunum when fats and amino acids are present; it stimulates gallbladder contraction, pancreatic enzyme secretion, and slows gastric emptying.

16 **Which hormone stimulates the gallbladder to contract and release bile into the duodenum?**

- A Gastrin
- B Secretin
- C **Cholecystokinin (CCK)** ✓
- D Insulin
- E Adrenaline

▶ **Explanation:** CCK causes gallbladder contraction and relaxation of the sphincter of Oddi, allowing bile to enter the small intestine.

17 **Which of the following is a correct MATCH between hormone and its MAIN effect on the stomach?**

- A **Gastrin – increases gastric acid secretion and motility** ✓

B Secretin – strongly increases gastric acid secretion

C CCK – speeds up gastric emptying

D Insulin – increases gastric acid secretion

E Glucagon – opens the lower esophageal sphincter

▶ **Explanation:** Gastrin enhances acid secretion and gastric motility; secretin and CCK generally slow gastric emptying and acid output.

18 **Secretin's effect on the STOMACH is mainly to:**

A Increase acid secretion and speed up gastric emptying

B **Decrease gastric acid secretion and slow gastric emptying** ✓

C Increase gastric mucus secretion only

D Convert pepsinogen into pepsin

E Stimulate ghrelin secretion

▶ **Explanation:** Secretin reduces gastric acid secretion and slows gastric emptying, giving the duodenum time to neutralise acid.

19 **Which statement best describes the overall COORDINATED action of secretin and CCK on the pancreas?**

A **Secretin stimulates bicarbonate; CCK stimulates enzyme-rich pancreatic juice** ✓

B Both only stimulate bicarbonate secretion

C Both only stimulate insulin release

D Secretin stimulates enzyme release; CCK stimulates bicarbonate

E Both hormones inhibit the pancreas completely

▶ **Explanation:** Secretin → bicarbonate-rich fluid; CCK → enzyme-rich secretion. Together they optimise conditions for digestion in the duodenum.

20 **Most carbohydrates are finally absorbed from the small intestine into the blood in which form?**

A Polysaccharides

B Disaccharides

C **Monosaccharides (mainly glucose, galactose, fructose)** ✓

D Amino acids

E Fatty acids

▶ **Explanation:** Brush-border enzymes break disaccharides into monosaccharides, which are the absorbable forms.

21 **Glucose and galactose are absorbed into intestinal epithelial cells mainly by:**

A Simple diffusion across the lipid bilayer

B **Sodium-dependent cotransport (SGLT1) on the luminal membrane** ✓

C Exocytosis from the intestinal lumen

D Endocytosis via chylomicrons

E A Na^+/glucose antiporter

▶ **Explanation:** SGLT1 uses the Na^+ gradient (secondary active transport) to bring glucose/galactose into enterocytes from the lumen.

22 **After glucose enters an intestinal epithelial cell via SGLT1, it leaves the cell into the blood mainly by:**

- A **Facilitated diffusion via GLUT2 on the basolateral membrane** ✓
- B Simple diffusion
- C Active transport using ATP on the luminal side
- D Endocytosis into lymphatic vessels
- E Conversion to triglycerides first

▶ **Explanation:** Glucose exits enterocytes through GLUT transporters (mainly GLUT2) by facilitated diffusion into blood.

23 **In a person who completely lacks the enzyme lactase, which of the following is most likely to occur after drinking milk?**

- A Lactose is efficiently digested into glucose and galactose
- B **Lactose passes undigested into the large intestine and is fermented by bacteria** ✓
- C Lactose is absorbed directly as a disaccharide
- D Lactose is digested only by pepsin
- E Lactose is converted into fatty acids by bile

▶ **Explanation:** Without lactase, lactose is not split into absorbable monosaccharides and instead is fermented by colonic bacteria, causing gas and diarrhea.

24 **Which of the following is a TRUE statement about protein digestion?**

- A Protein digestion occurs only in the stomach

B **Pepsin in the stomach and pancreatic proteases in the small intestine both contribute to protein digestion** ✓

C Brush-border enzymes do not participate in protein digestion

D Proteins are absorbed intact without digestion

E Only pancreatic enzymes digest proteins; the stomach plays no role

▶ **Explanation:** Protein digestion starts with pepsin in the stomach and continues with pancreatic proteases and brush-border peptidases in the small intestine.

25 **Which combination correctly pairs a GI hormone with its PRIMARY stimulus for release?**

A Gastrin – low pH in the stomach (very acidic)

B **Secretin – acidic chyme in the duodenum** ✓

C CCK – low blood pressure

D Gastrin – high blood glucose

E Secretin – presence of fat in the colon

▶ **Explanation:** Secretin is released when acidic chyme enters the duodenum; gastrin is stimulated by peptides and stomach distension, but inhibited by very low pH.

26 **Which of the following is a CORRECT statement about the effect of VERY low pH (high acidity) in the stomach on gastrin secretion?**

A Very low pH strongly stimulates gastrin secretion

B **Very low pH inhibits gastrin secretion (negative feedback)** ✓

C Gastrin secretion is unaffected by pH

D Very low pH converts gastrin into pepsin

E Very low pH stimulates CCK only

▶ **Explanation:** Gastrin is stimulated by peptides and moderate pH; when acid becomes very high (pH very low), gastrin secretion is inhibited to avoid excessive acidity.

27 Which statement about the LARGE intestine is CORRECT regarding digestion and absorption?

A It is the main site of enzymatic protein digestion

B It plays a major role in water and electrolyte absorption ✓

C It secretes large amounts of pancreatic enzymes

D It absorbs most fats in the diet

E It produces bile for fat emulsification

▶ **Explanation:** The large intestine mainly absorbs water and electrolytes; most enzymatic digestion occurs earlier, in the small intestine.

28 Which statement describes the MAIN role of brush-border enzymes in the small intestine?

A They are secreted into the lumen by the pancreas

B They are membrane-bound enzymes that complete the final steps of digestion at the surface of enterocytes ✓

C They are hormones that regulate appetite

D They digest only fats and not carbohydrates or peptides

E They neutralise stomach acid

▶ **Explanation:** Brush-border enzymes (e.g. disaccharidases and peptidases) are attached to the microvilli and complete digestion just before absorption.

29 **A patient with severe chronic pancreatitis has greatly reduced secretion of pancreatic enzymes. Which nutrient's digestion is MOST severely affected?**

A Carbohydrates only

B Proteins only

C **Fats (lipids) most severely, but also proteins and carbohydrates** ✓

D Vitamins only

E Minerals only

▶ **Explanation:** All macronutrients are affected, but fat digestion depends most critically on pancreatic lipase, so steatorrhea (fatty stools) is typical.

30 **Which of the following BEST explains why bile salts are important for fat absorption?**

A They directly break peptide bonds in proteins

B **They emulsify fat, forming small droplets and micelles that increase the surface area for pancreatic lipase and aid absorption** ✓

C They convert triglycerides into amino acids

D They are the only source of lipase

E They are hormones that stimulate lipase production in the brain

▶ **Explanation:** Bile salts emulsify lipids and form micelles that facilitate the diffusion of fatty acids and monoglycerides to the intestinal epithelium.

31 **Which statement correctly links a GI hormone to its EFFECT on gastric emptying?**

- A **CCK slows gastric emptying when fat is present in the duodenum** ✓
- B Gastrin strongly slows gastric emptying
- C Secretin speeds up gastric emptying to move acid quickly
- D No hormone affects gastric emptying
- E Insulin directly controls gastric emptying

▶ **Explanation:** Both CCK and secretin tend to slow gastric emptying; CCK responds especially to fat in the duodenum.

32 **Which of the following is NOT a digestive enzyme?**

- A Pepsin
- B Pancreatic lipase
- C **Bile salts** ✓
- D Trypsin
- E Lactase

▶ **Explanation:** Bile salts are NOT enzymes; they are detergents that emulsify fats. Pepsin, lipase, trypsin and lactase are all enzymes.