

**NCERT Exemplar Solutions of Class 11 Biology – Chapter 16: Digestion and Absorption**  
**VERY SHORT ANSWER TYPE QUESTIONS**

**1. The food mixes thoroughly with the acidic gastric juice of the stomach by the churning movements of its muscular wall. What do we call the food then?**

**Solution:** The food mixed with acidic gastric juice is called **chyme**.

**Enhanced Explanation:** Chyme is the semi-liquid, acidic mixture of partially digested food, gastric juice, and enzymes formed in the stomach. It has a pH of about 1.5-3.5 and is gradually released into the duodenum through the pyloric sphincter.

**2. Trypsinogen is an inactive enzyme of pancreatic juice. An enzyme, enterokinase, activates it. Which tissue/cells secrete this enzyme? How is it activated?**

**Solution:** Enterokinase is secreted by the **intestinal mucosa**. Trypsinogen is activated by enterokinase into active **trypsin**.

**Enhanced Explanation:**

- Enterokinase (also called enteropeptidase) is secreted by the duodenal mucosa
- Activation: Trypsinogen + Enterokinase → **Trypsin** + inactive peptide
- This activation is crucial as trypsin then activates other pancreatic zymogens

**3. In which part of the alimentary canal does absorption of water, simple sugars and alcohol take place?**

**Solution:** Absorption of water, simple sugars, and alcohol takes place in the **stomach**.

**Enhanced Explanation:** While the stomach can absorb these substances, the **primary site** of absorption is the small intestine. The stomach absorbs:

- Small amounts of water
- Simple sugars (glucose, fructose)
- Alcohol
- Some drugs and vitamins

**4. Name the enzymes involved in the breakdown of nucleotides into sugars and bases.**

**Solution:** **Nucleotidases** and **Nucleosidases** are the enzymes involved in nucleotide breakdown.

**Enhanced Explanation:**

- **Nucleotidases:** Nucleotides → Nucleosides + Phosphate
- **Nucleosidases:** Nucleosides → Nitrogenous bases + Pentose sugars
- These enzymes complete the digestion of nucleic acids (DNA/RNA)

**5. Define digestion in one sentence.**

**Solution:** Digestion is the process of conversion of complex food substances to simple absorbable forms.

**Enhanced Explanation:** Digestion involves both mechanical breakdown (chewing, churning) and chemical breakdown (enzymatic hydrolysis) of macromolecules into their constituent monomers that can be absorbed by the intestinal wall.

**6. What do we call the type of teeth attached to jawbones in which each tooth is embedded in a socket of jaw bones?**

**Solution:** Thecodont is the type of teeth where each tooth is embedded in a socket of jaw bones.

**Enhanced Explanation:** Thecodont dentition is characterized by:

- Each tooth sits in a separate socket (alveolus)
- Strong attachment via periodontal ligaments
- Found in mammals, including humans
- Provides firm anchorage for efficient chewing

**7. The stomach is located in the upper-left portion of the abdominal cavity and has three major parts. Name these three parts.**

**Solution:** The three major parts are **Cardiac portion**, **Fundic region**, and **Pyloric portion**.

**Enhanced Explanation:**

- **Cardiac portion:** Near the heart, where esophagus enters
- **Fundic region:** Upper curved part, stores food temporarily
- **Pyloric portion:** Lower part leading to duodenum, includes pyloric antrum and canal

**8. Does gall bladder make bile?**

**Solution:** No, gall bladder does **not** produce bile. Gall bladder only **stores and concentrates** bile.

**Enhanced Explanation:**

- **Bile production:** Done by hepatocytes in the liver
- **Bile storage:** Gall bladder stores and concentrates bile up to 10-fold
- **Bile release:** Released when stimulated by cholecystokinin (CCK)

**9. Correct the following statements by deleting one of the entries (given in bold):**

- Goblet cells secrete chymotrypsin/**mucus**
- Fats are broken down with the help of amylase/**lipases**
- Oxyntic cells**/chief cells secrete HCl
- Saliva digests **starch**/protein

**Solution:** a. Goblet cells secrete **mucus**

- Fats are broken down with the help of **lipases**
- Oxyntic cells** secrete HCl
- Saliva digests **starch**

## SHORT ANSWER TYPE QUESTIONS

**1. What is the pancreas? Mention the major secretions of the pancreas that are helpful in digestion.**

**Solution:** The pancreas is a compound elongated organ located between the limbs of the U-shaped duodenum.

**Enhanced Explanation: Structure:** Mixed gland with both exocrine and endocrine functions

**Digestive Secretions (Exocrine):**

- **Pancreatic juice:** Alkaline (pH 8.5) containing:
  - **Enzymes:** Trypsinogen, chymotrypsinogen, procarboxypeptidases, pancreatic amylase, pancreatic lipase, nucleases
  - **Bicarbonates:** Neutralize acidic chyme

**Endocrine Secretions:** Insulin and glucagon (for glucose regulation)

**2. Name the part of the alimentary canal where major absorption of digested food takes place. What are the absorbed forms of different kinds of food materials?**

**Solution:** The **small intestine** is where major absorption occurs.

**Enhanced Explanation:**

**Absorbed Forms:**

- **Carbohydrates:** Glucose, fructose, galactose (monosaccharides)
- **Proteins:** Amino acids, dipeptides, tripeptides
- **Lipids:** Fatty acids, glycerol, monoglycerides (form micelles)
- **Vitamins:** Fat-soluble (A,D,E,K) and water-soluble (B,C)
- **Minerals:**  $\text{Na}^+$ ,  $\text{K}^+$ ,  $\text{Ca}^{2+}$ ,  $\text{Fe}^{2+}$ , etc.
- **Water:** ~8-10 liters daily

**3. List the organs of the human alimentary canal and name the major digestive glands with their location.**

**Solution:**

**Alimentary Canal Organs:** Mouth → Oral cavity → Pharynx → Esophagus → Stomach → Small intestine (duodenum, jejunum, ileum) → Large intestine (cecum, colon, rectum) → Anus

**Major Digestive Glands:**

- **Salivary glands:** Mouth region (parotid, submandibular, sublingual)
- **Gastric glands:** Stomach wall
- **Liver:** Abdominal cavity, below diaphragm (right side)
- **Pancreas:** Between limbs of C-shaped duodenum
- **Intestinal glands:** Small intestine wall (crypts of Lieberkühn)

**4. What is the role of the gall bladder? What may happen if it stops functioning or is removed?**

**Solution:**

**Role of Gall Bladder:**

- **Storage:** Stores bile produced by liver
- **Concentration:** Concentrates bile up to 10-fold by removing water
- **Release:** Releases bile when stimulated by CCK

**Enhanced Explanation: If removed or non-functional:**

- Bile flows directly from liver to small intestine

- **Consequences:**

- Difficulty digesting large fatty meals
- Possible fat malabsorption initially
- Body eventually adapts
- May require dietary modifications (smaller, frequent meals)

**5. Correct the following statements:**

- Absorption of amino acids and glycerol takes place in the (small intestine/large intestine)
- The feces initiate a (neural/hormonal) reflex
- Skin and eyes turn yellow in (liver/stomach) infection
- Rennin is found in gastric juice in (infants/adults)
- Pancreatic juice and bile are released through (intestinal pancreatic/hepatopancreatic) duct
- Breakdown occurs in the (jejunum/duodenum) region

**Solution:** a. **small intestine**

b. **neural** reflex

c. **liver** infection

d. **infants**

e. **hepatopancreatic** duct

f. **jejunum** region

**6. What are the three major types of cells found in the gastric glands? Name their secretions.**

**Solution:**

**Enhanced Explanation:**

Cell Type	Location	Secretions	Function
<b>Mucous neck cells</b>	Neck region	Mucus	Protect stomach lining
<b>Peptic/Chief cells</b>	Body of gland	Pepsinogen, Prorennin, Gastric lipase	Protein digestion
<b>Parietal/Oxyntic cells</b>	Body of gland	HCl, Intrinsic factor	Acidification, B <sub>12</sub> absorption

**7. How is the intestinal mucosa protected from the acidic food entering from the stomach?**

**Solution:** The intestinal mucosa is protected by:

- **Mucus secretion:** Forms protective barrier
- **Bicarbonate ions:** Neutralize acid (from pancreas and intestinal glands)
- **Alkaline pancreatic juice:** Raises pH from ~2 to ~8

**Enhanced Explanation: Protection Mechanisms:**

1. **Brunner's glands** in duodenum secrete alkaline mucus
2. **Pancreatic bicarbonates** neutralize acid

3. **Rapid epithelial renewal** (every 3-5 days)
4. **Tight junctions** between epithelial cells

**8. How are the activities of the gastro-intestinal tract regulated?**

**Solution:** GI tract activities are regulated by:

- **Neural regulation:** Intrinsic (enteric nervous system) and extrinsic nerves
- **Hormonal regulation:** GI hormones

**Enhanced Explanation:**

**Neural Regulation:**

- **Parasympathetic:** Stimulates secretion and motility
- **Sympathetic:** Inhibits secretion and motility
- **Enteric nervous system:** Local reflexes

**Hormonal Regulation:**

- **Gastrin:** Stimulates gastric acid secretion
- **CCK:** Stimulates pancreatic enzymes and bile release
- **Secretin:** Stimulates pancreatic bicarbonate secretion
- **GIP:** Inhibits gastric secretion

**9. Distinguish between constipation and indigestion. Mention their major causes.**

**Solution:**

Aspect	Constipation	Indigestion
Definition	Difficulty in bowel movement, hard feces	Improper digestion causing discomfort
Symptoms	Infrequent, hard stools	Bloating, nausea, heartburn
Causes	Low water/fiber intake, lack of exercise	Inadequate enzymes, stress, overeating

**Enhanced Explanation:**

**Constipation Causes:**

- Inadequate fiber and water intake
- Sedentary lifestyle
- Certain medications
- Hormonal changes

**Indigestion Causes:**

- Enzyme deficiencies
- Rapid eating
- Stress and anxiety
- Spicy/fatty foods
- H. pylori infection

**10. Describe the enzymatic action on fats in the duodenum.**

**Solution:**

**Enhanced Explanation:**

**Step-by-step Fat Digestion:**

1. **Emulsification:** Bile salts break large fat droplets into smaller ones
  - Triglycerides → Emulsified droplets
2. **Pancreatic Lipase Action:**
  - Triglycerides → Diglycerides + Fatty acids
  - Diglycerides → Monoglycerides + Fatty acids
3. **Intestinal Lipase Action:**
  - Monoglycerides → Glycerol + Fatty acids
4. **Micelle Formation:** Products form micelles for absorption

**Overall Equation:** Triglycerides → Diglycerides → Monoglycerides → Glycerol + Fatty acids

