TOPIC : Digestion and Absorption

(1) Match Column-I with Column-II and select the correct option from the codes given below.

<table>
<thead>
<tr>
<th>Column-I</th>
<th>Column-II</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Van Kupffer cells</td>
<td>(i) Isolets of langerhans</td>
</tr>
<tr>
<td>B β- cells</td>
<td>(ii) Liver sinusoids</td>
</tr>
<tr>
<td>C Oxytic cells</td>
<td>(iii) Thyroid gland</td>
</tr>
<tr>
<td>D Paneth cells</td>
<td>(iv) Stomach</td>
</tr>
<tr>
<td></td>
<td>(v) Small intestine</td>
</tr>
</tbody>
</table>

(a) A-(iv), B-(v), C-(i), D-(ii)
(b) A-(iii), B-(i), C-(iv), D-(ii)
(c) A-(iv), B-(v), C-(iii), D-(i)
(d) A-(ii), B-(i), C-(iv), D-(v)

(2) What will happen if the secretion of parietal cells of gastric glands is blocked with an inhibitor?
(a) In the absence of HCl secretion, inactive pepsinogen is not converted into the active enzyme pepsin
(b) Enterokinase will not be released from the duodenal mucosa and so trypsinogen is not converted to trypsin
(c) Gastric juice will be deficient in chymosin
(d) Gastric juice will be deficient in pepsinogen

(3) Match Column-I with Column-II and select the correct option from the codes given below.

<table>
<thead>
<tr>
<th>Column-I</th>
<th>Column-II</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Crypts of Lieberkuhn</td>
<td>i Loop of duodenum</td>
</tr>
<tr>
<td>B Pancreas</td>
<td>ii Stomach</td>
</tr>
<tr>
<td>C Adrenal gland</td>
<td>iii Intestine</td>
</tr>
<tr>
<td>D Gastric gland</td>
<td>iv Kidney</td>
</tr>
</tbody>
</table>

(a) A-(iii), B-(i), C-(ii), D-(iv)
(b) A-(iii), B-(i), C-(iv), D-(ii)
(c) A-(i), B-(iii), C-(iv), D-(ii)
(d) A-(iv), B-(ii), C-(iii), D-(i)

(4) The diagram given below represents a section of small intestinal mucosa showing villi. Identify A, B, C and D.

(a) A- Villi,       B- Lacteal,       C- Capillaries,    D- Crypts
(b) A- Lacteal,     B- Villi,        C- Capillaries,    D- Crypts
(c) A-Villii,       B- Lacteal,       C- Crypts,        D- Capillaries
(d) A- Crypts,      B- Lacteal,       C- Capillaries,    D- Villi
(5) Match Column-I with Column-II and select the correct option from the codes given below.

<table>
<thead>
<tr>
<th>Column-I (Sphincter)</th>
<th>Column-II (Location)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Sphincter of ani internus</td>
<td>i Opening of hepatopancreatic ampulla into duodenum</td>
</tr>
<tr>
<td>B Cardiac sphincter</td>
<td>ii Between duodenum and posterior stomach</td>
</tr>
<tr>
<td>C Ileocaecal sphincter</td>
<td>iii Guarding the terminal part of alimentary canal</td>
</tr>
<tr>
<td>D Sphincter of Oddi</td>
<td>iv Between oesophagus</td>
</tr>
<tr>
<td>E Pyloric Sphincter</td>
<td>v Between small intestine and large intestine</td>
</tr>
</tbody>
</table>

(a) A-(iii), B-(ii), C-(iv), D-(i), E-(v)
(b) A-(ii), B-(v), C-(iv), D-(iv), E-(iii)
(c) A-(iii), B-(iv), C-(i), D-(v), E-(ii)
(d) A-(iv), B-(iii), C-(i), D-(ii), E-(v)

(6) Match Column-I with Column-II and select the correct option from the codes given below.

<table>
<thead>
<tr>
<th>Column-I</th>
<th>Column-II</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Goblet cells</td>
<td>i Antibacterial agent</td>
</tr>
<tr>
<td>B Lysozyme</td>
<td>ii Mucus</td>
</tr>
<tr>
<td>C Saliva</td>
<td>iii HCl</td>
</tr>
<tr>
<td>D Oxyntic cells</td>
<td>iv Sublingual gland</td>
</tr>
</tbody>
</table>

(a) A-(iii), B-(i), C-(iv), D-(ii)
(b) A-(i), B-(iii), C-(iv), D-(ii)
(c) A-(ii), B-(iii), C-(i), D-(iv)
(d) A-(ii), B-(i), C-(iv), D-(iii)

(7) The given figure represents the human digestive system. Identify A, B, C, D and E.

(a) A-Parotid gland  B-Liver  C-Pancreas  D-Caecum  E-Vermiform appendix
(b) A-Pancreas  B-Liver  C-Pancreas  D-Caecum  E-Vermiform appendix
(c) A-Parotid  B-Caecum  C-Pancreas  D-Liver  E-Vermiform appendix
(d) A-Parotid gland  B-Liver  C-Caecum  D-Pancreas  E-Vermiform appendix
(8) Match Column-I with Column-II and select the correct option from the codes given below

<table>
<thead>
<tr>
<th>Column-I</th>
<th>Column-II</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Hepatic lobule</td>
<td>i Base of villi</td>
</tr>
<tr>
<td>B Crypts of lieberkuhn</td>
<td>ii Glisson’s capsule</td>
</tr>
<tr>
<td>C Sphincter of Oddi</td>
<td>iii Gall bladder</td>
</tr>
<tr>
<td>D Cystic duct</td>
<td>iv Hepato-pancreatic duct</td>
</tr>
</tbody>
</table>

(a) A-(ii), B-(i), C-(iv), D-(iii)
(b) A-(i), B-(ii), C-(iv), D-(iii)
(c) A-(i), B-(ii), C-(iii), D-(iv)
(d) A-(iv), B-(i), C-(ii), D-(i)

(9) Match Column-I with Column-II and select the correct option from the codes given below

<table>
<thead>
<tr>
<th>Column-I</th>
<th>Column-II</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Beta cells</td>
<td>i Lysozyme</td>
</tr>
<tr>
<td>B Mast cells</td>
<td>ii Mucus</td>
</tr>
<tr>
<td>C Paneth cells</td>
<td>iii Histamines</td>
</tr>
<tr>
<td>D Acinar cells</td>
<td>iv Insulin</td>
</tr>
<tr>
<td></td>
<td>v Pancreatic enzymes</td>
</tr>
</tbody>
</table>

(a) A-(iv), B-(ii), C-(i), D-(v)
(b) A-(v), B-(ii), C-(iii), D-(iv)
(c) A-(iv), B-(iii), C-(i), D-(v)
(d) A-(ii), B-(iii), C-(ii), D-(v)

(10) Which of the following statements is incorrect?
(a) Brunner’s glands are submucosal
(b) Irregular folds of gastric mucosa are rugae
(c) Glisson’s capsule is the connective tissue sheath of hepatic lobule
(d) Mesothelium or serosa lies in close proximity to the circular layer of muscularis

(11) Refer the given flow chart

\[ \text{Milk casein} \xrightarrow{Y} \text{Paracasein} \xrightarrow{Z} \text{Calcium paracaseinate (Curdling of milk)} \]

In it, letters ‘Y’ and ‘Z’ denote
(a) rennin and Ca\(^{++}\)  (b) Ca\(^{++}\) and rennin
(c) rennin, HCl and Ca\(^{++}\)  (d) rennin and Ca\(^{++}\)

(12) Secretin
(a) stimulates enzymes secretion by pancreas, inhibits acid secretion in stomach, stimulates gall bladder
(b) stimulates bicarbonate secretion by pancreas, inhibits acid secretion in stomach, stimulates bicarbonate secretion in liver
(c) stimulates acid secretion in stomach, potentiates action of CCK, inhibits intestinal movement
(d) stimulates gall bladder, inhibits acid secretion in stomach, stimulates bicarbonate secretion by pancreas
(13) Fill in the blanks in the following table by selecting the correct option.

<table>
<thead>
<tr>
<th>Hormone</th>
<th>Source</th>
<th>Target organ</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gastrin</td>
<td>Mucosa of pyloric stomach</td>
<td>(i)</td>
<td>1. Stimulates secretion of gastric juice 2. Constricts cardiac sphincter</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(ii)</td>
</tr>
<tr>
<td></td>
<td>Duodenal epithelium</td>
<td>Stomach</td>
<td>1. Slows gastric contraction to delay its emptying 2. Stops secretion of gastric juice</td>
</tr>
<tr>
<td>Cholecystokinin</td>
<td>(iii)</td>
<td>Pancreas, gall bladder</td>
<td>1. release of enzymes in pancreatic juice 2. Release of bile from gall bladder</td>
</tr>
<tr>
<td>Enterocrinin</td>
<td>Intestinal epithelium</td>
<td>Intestine</td>
<td>(iv)</td>
</tr>
</tbody>
</table>

(i) (ii) (iii) (iv)
(a) Small intestine Ducrinin Intestinal epithelium Release of mucus from Brunner’s gland
(b) Stomach Villikinin Mucosa of pyloric stomach duodenal epithelium Accelerates movements of villi
(c) Stomach Enterogastrone duodenal epithelium release of enzymes from crypts of Liberkuhn
(d) gall bladder Secretin Duodenal epithelium Release of enzymes in pancreatic juice

(14) Match Column-I with Column-II and select the correct option from the codes given below.

<table>
<thead>
<tr>
<th>Column-I</th>
<th>Column-II</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Salivary amylase</td>
<td>i Proteins</td>
</tr>
<tr>
<td>B Bile salts</td>
<td>ii Milk proteins</td>
</tr>
<tr>
<td>C Rennin</td>
<td>iii Starch</td>
</tr>
<tr>
<td>D Pepsin</td>
<td>iv Lipids</td>
</tr>
</tbody>
</table>

(a) A-(iii), B-(iv), C-(ii), D-(i)
(b) A-(iii), B-(iv), C-(i), D-(ii)
(c) A-(iv), B-(iii), C-(ii), D-(i)
(d) A-(i), B-(ii), C-(iii), D-(iv)
(15) Consider the following four statements and select the correct option stating which ones are true (T) and which ones are false (F).

(i) Amylase hydrolyzes proteins to amino acids
(ii) Pancreatic amylase hydrolyses polysaccharides to disaccharides
(iii) Enteropeptidase activates pepsinogen to pepsin
(iv) Trypsin coagulates the milk protein casein

<table>
<thead>
<tr>
<th></th>
<th>(i)</th>
<th>(ii)</th>
<th>(iii)</th>
<th>(iv)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>T</td>
<td>T</td>
<td>F</td>
<td>F</td>
</tr>
<tr>
<td>b</td>
<td>F</td>
<td>T</td>
<td>F</td>
<td>T</td>
</tr>
<tr>
<td>c</td>
<td>F</td>
<td>T</td>
<td>F</td>
<td>F</td>
</tr>
<tr>
<td>d</td>
<td>F</td>
<td>T</td>
<td>T</td>
<td>F</td>
</tr>
</tbody>
</table>

(16) Fill in the blanks with appropriate enzymes that bring the required changes in the following:

(i) Trypsinogen $\rightarrow$ Trypsin
(ii) Caesin $\rightarrow$ Paracasein + Whey proteins
(iii) RNA $\rightarrow$ Ribonucleotides
(iv) Triglycerides $\rightarrow$ Fatty acids + Glycerol

<table>
<thead>
<tr>
<th>(i)</th>
<th>(ii)</th>
<th>(iii)</th>
<th>(iv)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>Enterocinin</td>
<td>Pepsin</td>
<td>Trypsin</td>
</tr>
<tr>
<td>b</td>
<td>Rennin</td>
<td>Enterokinase</td>
<td>Deoxyribonuclease</td>
</tr>
<tr>
<td>c</td>
<td>Carboxypeptidase</td>
<td>Pepsin</td>
<td>Chymotrypsin</td>
</tr>
<tr>
<td>d</td>
<td>Enterokinase</td>
<td>Rennin</td>
<td>Ribonuclease</td>
</tr>
</tbody>
</table>

(17) Consider the following statements each with (1) or (2) blanks.

(i) Release of pancreatic juice is caused by two hormones (1) and (2)
(ii) Trypsinogen is activated to trypsin by (3)
(iii) Fatty acids and glycerol are absorbed into (4) but glucose and amino acids are absorbed into (5)

Which one of the following options, give the correct fill ups for the respective blanks from (1) to (5) in the statements?

(a) (3)- cholecystokinin, (4)- blood vessels, (5)-lacteals
(b) (1)-secretin (2)- cholecystokinin, (4)- lacteals (5)- blood capillaries
(c) (1)-duocrin (2)- enterokinase (3)- secretin
(d) (1)-villakin (2)- secretin (3)- enterokinase

(18) Which of the following statements is incorrect

(a) Faecal accumulation in the rectum initiates a neural reflex causing an urge for its removal
(b) Irregular bowel movements cause constipation
(c) In diarrhoea absorption of food is increased
(d) All of these

(19) If for some reason the parietal cells of the gut epithelium come partially non-functional, what is likely to happen?

(a) the pancreatic enzymes and specially the trypsin and lipase will not work efficiently
(b) The pH of stomach will fall abruptly
(c) Stepsin will be more effective
(d) Proteins will not be adequately hydrolysed by pepsin into proteoses and peptones
(20) Which of the following statements is incorrect?
(a) Mucosal epithelium has goblet cells which secrete mucus for lubrication
(b) Mucosa forms gastric glands in the stomach and crypts in between the bases of villi in intestine
(c) cells lining in the villi has brush border or microvilli
(d) All the four basic layers in the wall of gut never show modifications in different parts of the alimentary canal.

(21) Which of the following statements about pancreas is incorrect?
(a) It is a compound gland as it has both exocrine and endocrine
(b) Exocrine part secretes like alkaline pancreatic juice having enzymes
(c) Endocrine part secretes hormones like insulin and glucagon
(d) It is surrounded by Glisson’s capsule

(22) Crypts of Lieberkuhn are present in
(a) pancreas and secrete pancreatic juice
(b) small intestine and secrete digestive enzymes
(c) Stomach and secret dilute HCl
(d) stomach and secrete trypsin

(23) During prolonged fasting, in what sequence are the organic compounds used up by the body?
(a) First carbohydrates, next fats and last proteins
(b) First fats, next carbohydrates and last proteins
(c) First carbohydrates, next proteins and last fats
(d) First proteins, next lipids and last carbohydrates

(24) A child took sugarcane and sucked up all the juice. Regarding this which of the following match is correct?

<table>
<thead>
<tr>
<th>Substrate</th>
<th>Enzyme</th>
<th>Site of secretion of enzyme</th>
<th>Products formed</th>
</tr>
</thead>
<tbody>
<tr>
<td>a Proteins</td>
<td>Pepsin</td>
<td>Duodenum</td>
<td>Polypeptides</td>
</tr>
<tr>
<td>b Starch</td>
<td>Amylase</td>
<td>Salivary glands</td>
<td>Glucose</td>
</tr>
<tr>
<td>c Lipids</td>
<td>Lipase</td>
<td>Pancreas</td>
<td>Fat globules</td>
</tr>
<tr>
<td>d sucrose</td>
<td>invertase</td>
<td>Duodenum</td>
<td>Glucose + fructose</td>
</tr>
</tbody>
</table>

(25) 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?
(a) Bolus (b) Chyme (c) succus entericus (d) chylomicrons

(26) Major utility of breaking up of food into small bits during chewing is
(a) to reduce surface area of the food eaten up
(b) to increase surface area of the food eaten up
(c) to make the food soluble
(d) to enjoy taste of food

(27) Which category of compound is most concentrated energy source?
(a) Lipids (b) Carbohydrates (c) Proteins (d) Vitamins

(28) Which of the following statements is false?
(a) Intrinsic factor is essential for absorption of vitamin B\textsubscript{12}
(b) Gastric gland never secretes even a small amount of lipase
(c) Renni, a proteolytic enzyme is found in gastric juice of infants
(d) All of these
(29) Which of the following is not the function of the large intestine?
(a) Absorption of water
(b) Nutrient absorption
(c) Secretion of mucus to lubricate faeces
(d) Temporary storage of faeces in rectum

(30) Anxiety and eating spicy food together in an otherwise normal human, may lead to
(a) Indigestion       (b) jaundice       (c) diarrhoea       (d) vomiting
1. (d) The parietal cells of gastric glands secrete HCl. Pepsinogen (proenzyme) is converted into pepsin enzyme (active form), in the presence of HCl. This enzyme acts on proteins in the stomach. Therefore, if the secretion of parietal cells is blocked, HCl acid will not be secreted and thus inactive pepsinogen will not be converted into active pepsin. As a result, proteins will not be hydrolysed to proteoses and peptones.

2. (a) The parietal cells of gastric glands secrete HCl. Pepsinogen (proenzyme) is converted into pepsin enzyme (active form), in the presence of HCl. This enzyme acts on proteins in the stomach. Therefore, if the secretion of parietal cells is blocked, HCl acid will not be secreted and thus inactive pepsinogen will not be converted into active pepsin. As a result, proteins will not be hydrolysed to proteoses and peptones.

3. (b)

4. (a)

5. (c)

6. (d)

7. (a)

8. (a) The structural and functional units of liver are hepatic lobules containing hepatic cells. Each lobule is covered by a thin connective tissue sheath called the Glisson’s capsule. Crypts of Lieberkuhn are simple tubular glands which occur throughout the small intestine between the villi. Cystic duct is the duct that arises from the gall bladder. Hepatopancreatic duct is formed by the joining of bile duct and the main pancreatic duct, it opens into the duodenum through an opening guarded by sphincter Oddi.

9. (c)

10. (d) Serosa is the outermost layer of alimentary canal and its made up of a thin mesothelium that lies in close proximity to the longitudinal layer of musclaris.

11. (a) HCl of the stomach converts proenin (proenzyme) into its active form from rennin. In the stomach, rennin acts on casein (milk protein) and converts it into paracasein. In the presence of calcium ions, paracasein is converted into calcium paracaseinate, ultimately leading to milk coagulation.

\[
\text{Casein} \xrightarrow{\text{Rennin}} \text{Paracasein} \xrightarrow{\text{Ca}^{2+}} \text{Calcium paracaseinate} \\
\text{(Milk coagulation)}
\]

12. (d) Secretin is a hormone secreted by the epithelium of duodenum. It stimulates gall bladder to secrete bile, inhibits acid secretion in stomach and stimulates the pancreas to secrete bicarbonate.

13. (c)

14. (a)

15. (c) Amylase hydrolyzes starch to maltose, isomaltose and α-dextrins. Hydrochloric acid activates pepsinogen to pepsin. Rennin coagulates the milk protein casein.

16. (d)

17. (b)

18. (c) In diarrhoea, the absorption of food is reduced. Diarrhoea is abnormal frequency of bowel movement and increased liquidity of the faecal discharge.

19. (d) The parietal cells of gastric glands secrete HCl. Pepsinogen (proenzyme) is converted into pepsin enzyme (active form), in the presence of HCl. This enzyme acts on proteins in the stomach. Therefore, if the secretion of parietal cells is blocked, HCl acid will not be secreted and thus inactive pepsinogen will not be converted into active pepsin. As a result, proteins will not be hydrolysed to proteoses and peptones.

20. (d) All the four basic layers (serosa, muscularis, sub-mucosa and mucosa) in the wall of gut show modifications in different parts of the alimentary canal. EG., mucosal epithelium has goblet cells which secrete mucus. Mucosa also forms glands in the stomach and crypts in between the bases of villi in the intestine.
21. (d): Livers lobules are surrounded by Glisson’s capsule.
22. (b): The crypts of Lieberkuhn are simple tubular glands that occur throughout the small intestine between the velli. They secrete enzymes and mucus.
23. (a): During prolonged fasting, the organic compounds will be used by the body in the following sequence: Carbohydrates → Fats → Protein
24. (d): Sugarcane contains sucrose (disaccharide). In the duodenum, sucrose is acted upon by enzyme invertase which breaks down it into glucose and fructose.
25. (b): Bolus is the collection of food formed with chewing and mixing with saliva. Chyme is that collection of food which is mixed thoroughly with acidic gastric juice.
26. (b)
27. (a): Fats act as concentrated fuel, Their caloric value is 9.45 kcal/g and physiological fuel value is 9 kcal/g. They are more suitable as stored food.
28. (b): The chief cells of gastric glands secrete a small amount of gastric lipase that contributes little to digestion of fat.
29. (b): The main function of large intestine is absorption of water and elimination of solid wastes. The breakdown of all biomacromolecules like carbohydrates, proteins, fats and nucleic acids takes place in duodenum. A major part of all absorption of digested food takes place in jejunum and ileum. Undigested and unabsorbed substances are passes on to the large intestine for egestion.
30. (a): Indigestion is a disorder in which the food is not properly digested in the body leading to a feeling of fullness. The causes of this are inadequate enzyme secretion, anxiety, food poisoning, over eating and spicy food.