Chapter

16 Digestion and Absorption

TYPE A : MULTIPLE CHOICE QUESTIONS

1. Tocopherol stands for ***[1997]***
(a) Vitamin A (b) Vitamin E
(c) Vitamin C (d) Vitamin K

2. Scurvy is caused due to deficiency of vitamin
(a) A (b) B ***[1997]***
(c) E (d) C

3. The contraction of gall bladder is due to ***[1998]***
(a) gastrin (b) secretin
(c) cholecystokinin (d) enterokinase

4. The function of rennin is ***[1999]***
(a) vasodilation
(b) reduce blood pressure
(c) degradation of angiotensinogen
(d) none of the above

5. Liver in our body stores ***[1999]***
(a) Vitamin A (b) Vitamin D
(c) Vitamin B_{12} (d) All of these

6. Vitamin C is also called as ***[2000]***
(a) ascorbic acid (b) glutamic acid
(c) aspartic acid (d) enolic acid

7. Brunner's glands are present in ***[2001]***
(a) duodenum (b) oesophagus
(c) ileum (d) stomach

8. Curdling of milk in small intestine takes place due to ***[2002]***
(a) rennin (b) trypsin
(c) chymotrypsin (d) ptyalin

9. Which of the following has minimum pH? ***[2002]***
(a) Bile (b) Saliva
(c) Gastric juice (d) Pancreatic juice

10. Which of following teeth are lophodont? ***[2002]***
(a) Incisor and canine
(b) Premolar and molar
(c) Canine and premolar
(d) Premolar and incisor

11. Wharton's duct is the duct of ***[2002]***
(a) Parotid gland
(b) Sublingual gland
(c) Submaxillary gland
(d) Pancreatic gland

12. Continued consumption of a diet rich in butter, red meat and eggs for a long period may lead to
(a) vitamin A toxicity ***[2003]***
(b) kidney stones
(c) hypercholesterolemia
(d) urine laden with ketone bodies

13. Which one of the following pairs of the cells with their secretion is **correctly** matched? ***[2006]***
(a) Oxyntic cells - A secretion with pH between 2.0 and 3.0
(b) Alpha cells of Islets of Langerhans - Secretion that decreases blood sugar level.
(c) Kupffer cells - A digestive enzyme that hydrolysis nucleic acids.
(d) Sebaceous glands - A digestive enzyme that hydrolysis nucleic acids

14. Which match is true? ***[2007]***

	Vitamin deficiency disease	**Vitamin**	**Source**
(a)	Severe bleeding	Tocopherol	Milk, egg
(b)	Anaemia	Ascorbic acid	Lemon, orange
(c)	Night blindness	Retinol	Carrot, milk
(d)	Sterility	Calciferol	Milk, butter

15. A child took sugar cane and sucked its juice. Regarding this which of the following match is correct? ***[2007]***

	Substrate of enzyme	Enzyme secretion	Site of formed	Products
(a)	Proteins	Pepsin	Duodenum	Polypeptides
(b)	Starch	Amyase glands	Salivary	Glucose
(c)	Lipids	Lipase globules	Pancreas	Fat
(d)	Sucrose	Invertase	Duodenum	Glucose + Fructose

16. Which one of the following pairs of the kind of cells and their secretion are correctly matched? ***[2008]***

(a) Oxyntic cells – A secretion with pH between 2.0 and 3.0

(b) Alpha cells of (Nutrition) islets – Secretion of Langerhans that decreases blood sugar level

(c) Kupffer cells – A digestive enzyme that hydrolyses nucleic acids

(d) Sebaceous glands – A secretion that evaporates for cooling

17. Fat present below the skin surface in our body, acts as a barrier against ***[2010]***

(a) loss of heat from the body
(b) loss of essential body fluids
(c) loss of salts from the body
(d) entry of harmful micro-organisms from the environment

18. The nutritional deficiency condition that needs to be given top priority for remedial action in India today is ***[2010]***

(a) scurvy (b) rickets
(c) xerophthalmia (d) pellagra

19. What is the average fat content of buffalo milk? ***[2010]***

(a) 7.2% (b) 4.5%
(c) 9.0% (d) 10.9%

20. Consumption of fish is considered to be healthy when compared to flesh of other animals because when compared to flesh of other animals, fish contains ***[2010]***

(a) polyunsaturated fatty acids
(b) saturated fatty acids
(c) essential vitamins
(d) more carbohydrates and proteins

21. Endoscopy, a technique used to explore the stomach or other inner parts of the body, is based on the phenomenon of ***[2010]***

(a) total internal reflection
(b) interference
(c) diffraction
(d) polarization

22. Lathyrism is caused by excessive consumption of ***[2010]***

(a) khesari dal (b) mustard oil
(c) polished rice (d) mushrooms

23. The normal temperature of human body on the Kelvin scale is ***[2010]***

(a) 280 (b) 290
(c) 300 (d) 310

24. Parotid salivary glands are present ***[2012]***

(a) Below the tongue
(b) Below the cheeks
(c) In the angle between two jaws
(d) Below the eye orbits

25. If for some reason the parietal cells of the gut epithelium become partially non-funcitonal, what is likely to happen? ***[2015]***

(a) The pancreatic enzymes and specially the trypsin and lipase will not work efficiently
(b) The pH of stomach will fall abruptly
(c) Steapsin will be more effective
(d) Proteins will not be adequately hydrolysed by pepsin into proteoses and peptones

26. A healthy person eats the following diet - 5 gm raw sugar, 4 gm albumin, 10 gm pure buffalo ghee adultrated with 2 gm vegetable ghee (hydrogenated vegetable oil) and 5 gm lignin. How many calories he is likely to get? ***[2014, 2016]***

(a) 144 (b) 126
(c) 164 (d) 112

27. Which of the following statement is true ? ***[2017]***

(a) Pepsin cannot digest casein.
(b) Trypsin can digest collagen.
(c) Pepsin cannot digest collagen.
(d) Chymotrypsin can digest casein.

TYPE B : ASSERTION REASON QUESTIONS

Directions for (Q. 28) : These questions consist of two statements, each printed as Assertion and Reason. While answering these questions, you are required to choose any one of the following five responses.

(a) If both Assertion and Reason are correct and the Reason is a correct explanation of the Assertion.

(b) If both Assertion and Reason are correct but Reason is not a correct explanation of the Assertion.

(c) If the Assertion is correct but Reason is incorrect.

(d) If both the Assertion and Reason are incorrect.

(e) If the Assertion is incorrect but the Reason is correct.

28. **Assertion :** Scurvy is caused by deficiency of vitamin.

Reason : Deficiency of ascorbic acid causes scurvy. ***[2001]***

Directions for (Qs.29-35) : Each of these questions contains an Assertion followed by Reason. Read them carefully and answer the question on the basis of following options. You have to select the one that best describes the two statements.

(a) If both Assertion and Reason are correct and Reason is the correct explanation of Assertion.

(b) If both Assertion and Reason are correct, but Reason is not the correct explanation of Assertion.

(c) If Assertion is correct but Reason is incorrect.

(d) If both the Assertion and Reason are incorrect.

29. **Assertion :** In the condition of obstructive jaundice, large amounts of unabsorbed fats are eliminated out of the body.

Reason : Entry of bile into the small intestine is prevented during obstructive jaundice. ***[2009]***

30. **Assertion :** Pancreatic amylase digest starch to maltose. ***[2010]***

Reason : Pancreatic amylase breaks the peptide bond of protein.

31. **Assertion :** Trypsin helps in blood digestion of predator animals.

Reason : Trypsin hydrolyzes fibrinogen. ***[2011]***

32. **Assertion :** Lipases of bile help in the emulsification of fats.

Reason : Lipases can break large fat droplets into smaller ones. ***[2011]***

33. **Assertion :** In the condition of obstructive jaundice, large amounts of unabsorbed fats are eliminated out of the body.

Reason : Entry of bile into the small intestine is prevented during obstructive jaundice. ***[2015]***

34. **Assertion :** Starch is hydrolysed by ptyalin to maltose.

Reason : Sucrase hydrolyses sucrose to lactose. ***[2016]***

35. **Assertion** : Water and electrolytes are almost fully absorbed in the large intestine.

Reason : In large intestine, haustral contractions (slow segmenting movements) roll the forming faeces over and over, causing absorption of water and electrolytes. ***[2017]***

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Type A : Multiple Choice Questions

1. (b) Tocopherol or vitamin E is fat soluble vitamin. It is antisterility factor and antioxidant for membrane lipids, skin, and hair *etc*. It reduces atherosclerosis and inhibits oxidation of vitamin A and unsaturated fatty acid. Retinol, ascorbic acid and phylloquinone stands for vitamin A, C and K respectively.

2. (d) Deficiency of vitamin C (which is necessary for collagen production and iron absorption) causes scurvy. It is characterised by bleeding of gums, disturbance of protein metabolism and increased susceptibility to infections.

Scurvy is most frequently seen in order, malnourished adults. Scurvy commonly is associated with sailors in the 16th to 18th centuries who navigated long voyages without enough vitamin C frequently perished from the condition.

Deficiency of vitamin A, B and E results in xeropthalmia, beri-beri and miscarriage respectively.

3. (c) The contraction of gall bladder occurs due to hormone, cholecystokinin.

Cholecystokinin is a gastrointestinal hormone that is secreted by cells in the duodenum. Its release is stimulated by the presence of fatty acids and amino acids in the small intestine. It stimulates the release of bile into the intestine by contracting gall bladder and the secretion of pancreatic enzymes. Gastrin and secretin are polypeptide hormones. Gastrin, secreted by certain cells of the pyloric glands, stimulates secretion of gastric juice into the bloodstream and churning movement of stomach. Secretin is secreted by the mucosa of the duodenum and jejunum. It stimulates secretion of water and bicarbonates in bile and activates pancreas to secrete pancreatic juice. Enterokinase of enteropeptidase is an enzyme, secreted from dudonum's glands, called the crypts of Lieberkuhn, it converts inactive trypsinogen into active trypsin.

4. (d) Rennin (also called rennet or chymosin) is an coagulating enzyme produced from stomach of human body. It catalyzes the coagulation of milk by converting milk with soluble protein caesin into insoluble semi fluid calcium paracaesinate. This is called curdling of milk. Rennin produced in the infants immediately after birth. As the child grows, rennin production goes down and is replaced by pepsin digestive enzymes.

Renin is an enzyme which acts as hormone secreted by juxtaglomerular cells. It converts angiotensinogen into angiotensin.

5. (d) Liver is the largest organ in the body. It helps in digestion and removes waste products and worn-out cells from the blood. Liver performs many functions, like it forms and secretes bile that contains bile acids to aid in the intestinal absorption (taking in) of fats and the fat-soluble vitamins as A, D, E, K and B_{12}. Hence, it stores vitamins as A, D, E, K and B_{12}.

6. (a) Vitamin C (also called as ascorbic acid) is a water soluble vitamin. It helps the body to make collagen, an important protein used to make skin, cartilage, tendons, ligaments and blood vessels. Vitamin C is essential for healing wounds, and for repairing and maintaining bones and teeth.

7. (a) Brunner's glands are compound tubular glands found only in the sub-mucosa of duodenum. They produce mucoid fluid which protects the duodenal mucosa from acidic chyme coming from the stomach.

8. (a) Trypsin changes chymotrypsinogen to chymotrypsin and procarboxypeptidase to carboxypeptidase. Chymotrypsin changes caesin of milk into paracaesin. Ptyalin or salivary amylase converts starch and glycogen into limit dextrins, maltose and isomaltose.

9. (c) pH of bile is 8; pH of saliva is 6.7, pH of pancreatic juice is 8.8 and that of stomach is 2.

10. (b) Premolar and molar are lophodont teeths. Lophodont teeth with the cusps elongated to form narrow ridges. The molars in elephants and horses have cusps fused by means of intermediate masses of dentine to form ridges or lophs.

11. (c) Wharton's duct is the duct of the submaxillary or submandibular gland that occurs in the mouth on a papilla at the side of the frenulum of the tongue. The purpose of this duct is to drain the saliva.

12. (c) Continued consumption of fat rich diet causes hypercholesterolemia. Hypercholesterolemia is the presence of high levels of cholesterol in the blood. High cholesterol raises your risk for heart disease, heart attack, and stroke. Kidney stones are solid mass made up of tiny crystals. There are different types of kidney stones. The exact cause depends on the type of stone like, calcium stones, uric acid stone *etc*. Vitamin A toxicity or hypervitaminosis A is having too much of vitamin A in the body. Ketonuria is condition in which ketone bodies are present in urine. Body productes excess ketone bodies as an alternate source of energy during starvation or diabetes mellitus (type 1).

13. (a) Oxyntic cells or Parietal cells, are the stomach epithelium cells that secrete gastric acid intrinsic factor. These cells secrete hydrochloric acid (HCl) which makes the gastric juice acidic.(pH = 2.0-3.0).

Alpha cells of islets of Langerhans secretes glucagon hormone which increase the glucose level in the blood by converting glycogen to glucose in liver cells. Kupffer's cells are specialized cells in the liver that destroy bacteria, foreign proteins, and worn-out blood cells. Sebaceous glands and microscopic glands in the skin that secrete an oily/waxy matter (called sebum) to lubricate the skin and hair of mammals.

14. (c) Retinol is the chemical name of the vitamin A, which is mostly found in carrots, milk, cheese, fish etc. Retinol is well adapted for light absorption in animals where it is converted into the light-absorbing molecule called retinal. Deficiency of vitamin A mostly affects the rods containing retinal and leads to a disease called as night blindness or poor night vision. Tocopherol is the chemical name of vitamin E, found mostly in wheat germ oil, brown flour etc. Its deficiency causes sterility in rats. Vitamin C, also called as ascorbic acid, is found mostly in citrus fruits, potatoes, tomatoes etc. Its deficiency causes painful disease of the joints and gums called scurvy.

15. (d) Sugarcane and sugarbeet are the richest sources of sucrose, a disaccharide. It is most commonly found in plants, where it is transported in large quantity by phloem tissue. In humans, enzyme invertase (sucrase) present in duodenum of the small intestine hydrolyses sucrose into one molecule of glucose and one molecule of fructose. Pepsin is proteolytic enzyme that hydrolyses many proteins into smaller molecules of peptones. Saliva of humans contains salivary amylase (ptyalin) that hydrolyses starch into maltose, isomaltose and small dextrins. Lipases hydrolyse triglyceride fat into diglycerides, and then into monoglycerides alongwith fatty acids at each step.

16. (a) Parietal cells also called oxyntic cells are the stomach epithelium cells that secrete gastric acid and intrinsic factor. A cell of the gastric glands that secretes hydrochloric acid.

17. (a) Fats present below the skin surface in our body, is called subcutaneous fat deposition. It acts as insulator of body and prevent loss of heat from the body.

18. (c) Xerophthalmia is caused by vitamin A deficiency. This generally occurs in poorer section of the society because often they do not have adequate amount of fruits in diet.

19. (a) The average fat content in buffalo milk is 7.2% which is higher than human milk. Lactose is higher in human milk than cow and buffalo's milk.

20. (a) Fish has more polyunsaturated fatty acids which act as natural antioxidant.

21. (a) Endoscopy, a technique used to explore the stomach or other inner parts of the body, is based on total internal reflection.

22. (a) Lathyrism is caused by excessive consumption of khesari dal.

23. (d) Normal body temperature is 37 degree centigrade but in Kelvin scale 0ºC = 0ºC + 273 = 273ºK. When we convert 37ºC into Kelvin, it becomes 37 + 273 = 310ºK.

24. (b) There are three pairs of salivary glands. These are parotids (below the cheeks), sub maxillary/ or sub mandibular (lower jaw) and the sublinguals (below the tongue)

25. (d)

26. (a) Physiological value of carbohydrates is 4.0 kcal/g, proteins 4.0 kcal/g and of fats is 9.0 kcal/g. Hence,

5 g raw sugar will yield

$5 \times 4.0 = 20.0$ kcal

4 g albumin (protein) will yield

$4 \times 4.0 = 16.0$ kcal

10 + 2 g of fat will yield

$12 \times 9.0 = 108.0$ kcal

Total yield = 144 kcal.

27. (d) Milk protein can be digested by pepsin and chymotrypsin

Type B : Assertion Reason Questions

28. (a) Deficiency of ascorbic acid/vitamin C causes scurvy.

29. (a) In the condition of obstructive jaundice the entry of bile into the small intestine is prevented due to an obstruction in the bile duct. As we know that bile salts helps in the digestion of fats by emulsification and also in their absorption by the formation of water soluble droplets called micelles from whom fatty acids, glycerides, sterols and fat soluble vitamins are absorbed into the intestinal cells. Therefore, in the absence of bile, the fats remain unabsorbed and consequently are eliminated out of the body in the faeces.

30. (c) Pancreatic amylase is a starch splitting enzymes similar to ptyalin by hydrolysing starch and glycogen to maltose, isomaltose and limit dixtrins.

31. (a) Trypsin is protein digesting enzyme present in the intestine of animals. Though it cannot digest casein (a milk protein), in predator animals drinking the blood of their prey, trypsin hydrolyses fibriongen of blood into fibrin, leading to blood coagulation thus help in blood digestion. It also activates other pancreatic proteases.

32. (d) It is not lipases but the bile salts which are responsible for the emulsification of fats. Bile salts are steroids secreted by the liver in the bile. In the intestinal lumen, they reduce the surface tension of fat dropletes, causing their breakdown into many smaller ones. A stable fine emulsion of fat is thereby formed. On the other hand, lipases are the enzymes which hydrolyse fats and oils. Lipases can digest fat in significant amounts only when large fat droplets are broken into tiny droplets to form a fine emulsion. Emulsificaion of fats by bile salts thus, increases the lipase action on fats.

33. (a) In the condition of obstructive jaundice the entry of bile into the small intestine is prevented due to an obstruction in the bile duct. As we know that bile salts help in the digestion of fats by emulsification and also in their absorption by the formation of water soluble droplets called micelles from whom fatty acids, glycerides, sterols and fat soluble vitamins are absorbed into the intestinal cells. Therefore, in the absence of bile, the fats remain unabsorbed and consequently are eliminated out of the body in the faeces.

34. (c) Sucrase hydrolyses sucrose to glucose and fructose.

35. (a)