**CHAPTER 5: DIGESTION**

Author1: NUNNA RATNAMRUTHA

Author2: ANNEPU REVATHI

**Mastication** : Grinding of the food particles  
  
**Deglutition** : Swallowing of partially grind food materials (Cud) from the mouth into oesophagus  
  
**Rumination** : Chewing of the cud. This occurs in four phases  
  
1. Regurgitation: Reentry of cud, the liquid portion from the reticulum in to the mouth  
  
2. Remastication: Regrinding of the cud  
  
3. Reinsalivation: Additional salivary secretion to the bolus  
  
4. Redeglutition: Reswallowing of the bolus from the mouth into oesophagus  
  
**Eructation** : Elimination of CO2 and CH4 from GI tract

|  |  |
| --- | --- |
| **Species** | **Length of body : Length of GIT** |
| Horse | 1:12 |
| Cattle | 1:20 |
| Sheep | 1:27 |
| Pig | 1:16 |
| Dog | 1:6 |
| Cat | 1:4 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Herbivore** | **Carnivore** | **Omnivore** | **Humans** |
| Facial muscles | Well developed | Reduced to allow wide mouth gap | Reduced | Well developed |
| Jaw motion | No shear; good side to side, front to back | Shearing, minimal side to side | Shearing, minimal side to side | No shear; good side to side, front to back |
| Major muscle | Masseter and terigoid | Temporalis | Temporalis | Nasster and terigoid |
| Mouth opening : head size | Small | Large | Large | Small |
| Teeth (incisors) | Broad, flattened and spade shaped | Sharp and pointed | Sharp and pointed | Broad, flattened and spade shaped |
| Teeth (canines) | Short or long (for defense) or none | Long, sharp and curved | Long, sharp and curved | Short and blunted |
| Teeth (molars) | Flattened with cusps | Sharp, jagged and blade shaped | Sharp blades and/or flattened | Flattened with nodular cusps |
| Stomach type | Simple or multiple chambers | Simple | Simple | Simple |
| Stomach acidity | Less acidic  pH 3 to 4 | Highly acidic  pH 1 | Highly acidic  pH 1 to 2 | Acidity  pH 3 to 4 |
| Length of small intestine | 12 to 27 times the body length | 4 to 6 times | 10 to 14 times | 10 to 11 times |
| Caecum | Very well developed | Reduced | Moderately developed | Less developed |
| Colon | Long complex, may be sacculated | Simple, short and smooth | Simple, short and smooth | Long, sacculated |

**Composition of Ruminant saliva**

|  |  |
| --- | --- |
| Inorganic salts | NaCl, KCl, CaCO3,NaHCO3, PO4 |
| Organic components | Mucin, ptyalin, urea, uric acid, creatinine and aminoacids |
| Suspended organic matters | Leucocytes and epithelial cells |
| Gases | CO2, O2, H2, N2 and water vapours |

**Composition of Bile**

|  |  |  |
| --- | --- | --- |
|  | **Hepatic bile** | **Gall bladder bile** |
| Water | 97.5 gm% | 92 gm% |
| Bile salts | 1.1 gm% | 6 gm% |
| Bilirubin | 0.04 gm% | 0.3 gm% |
| Cholesterol | 0.1 gm% | 0.3 - 0.9 gm% |
| Fattyacids | 0.12 gm% | 0.3 – 1.2 gm% |
| Lecithin | 0.04 gm% | 0.3 gm% |
| Na+ | 145 mEq/L | 130 mEq/L |
| K+ | 5 mEq/L | 12 mEq/L |
| Ca+ | 5 mEq/L | 23 mEq/L |
| Cl | 100 mEq/L | 25 mEq/L |
| HCO3 | 27 mEq/L | 10 mEq/L |
| pH | 7.1 -7.3 | 6.9 – 7.7 |

**Amount of bile secreted in different species**

|  |  |
| --- | --- |
| Horse | 250 – 300 mL/hour |
| Ox | 98 – 111 mL/hour |
| Sheep | 7 – 154 mL/hour |
| Pig | 70 - 140 mL/hour |
| Dog | 7 – 14 mL/hour |
| Man (adult) | 300 - 1200 mL/hour |

**Principal digestive enzymes**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Source | Enzyme | Activator | Substrate | Catalytic Function or Products |
| Salivary glands | Salivary α-amylase | Cl- | Starch | Hydrolyzes 1:4 α linkages, producing α-limit dextrins, maltotriose, and maltose |
| Lingual glands | Lingual lipase |  | Triglycerides | Fatty acids plus 1,2-diacylglycerols |
| Stomach | Pepsins (pepsinogens) | HCI | Proteins and polypeptides | Cleave peptide bonds adjacent to aromatic amino acids |
|  | Gastric lipase |  | Triglycerides | Fatty acids and glycerol |
|  | Trypsin (trypsinogen) | Enteropeptidase | Proteins and polypeptides | Cleave peptide bonds on carboxyl side of basic amino acids (arginine or lysine) |
|  | Chymotrypsins  (chymotrypsinogen) | Trypsin | Proteins and polypeptides | Cleaves peptide bonds on carboxyl side of aromatic amino acids |
|  | Elastase (proelastase) | Trypsin | Elastin, some other proteins | Cleaves bonds on carboxyl side of aliphatic amino acids |
|  | Carboxypeptidase A (procarboxy-peptidase A) | Trypsin | Proteins and polypeptides | Cleaves carboxy-terminal amino acids that have aromatic or branched aliphatic side chains |
| Exocrine pancreas | Carboxypeptidase B (procarboxy-peptidase B) | Trypsin | Proteins and polypeptides | Cleaves carboxy-terminal amino acids that have basic side chains |
|  | Colipase (procolipase) | Trypsin | Fat droplets | Facilitates exposure of active site of pancreatic lipase |
|  | Pancreatic lipase |  | Triglycerides | Monoglycerides and fatty acids |
|  | Cholesteryl ester hydrolase |  | Cholesteryl esters | Cholesterol |
|  | Pancreatic α-amylase | Cl- | Starch | Same as salivary α-amylase |
|  | Ribonuclease |  | RNA | Nucleotides |
|  | Deoxyribonuclease |  | DNA | Nucleotides |
|  | Phospholipase A2 (prophospholipase A2) | Trypsin | Phospholipids | Fatty acids, lysophospholipids |
| Intestinal mucosa | Enteropeptidase |  | Trypsinogen | Trypsin |
|  | Aminopeptidases |  | Polypeptides | Cleave N-terminal amino acid from peptide |
|  | Carboxypeptidases |  | Polypeptides | Cleave C-terminal amino acid from peptide |
|  | Endopeptidases |  | Polypeptides | Cleave between residues in midportion of peptide |
|  | Dipeptidases |  | Dipeptides | Two amino acids |
|  | Maltase |  | Maltose, maltotriose, α- dextrins | Glucose |
|  | Lactase |  | Lactose | Galactose and glucose |
|  | Sucrase |  | Sucrose; also maltotriose and maltose | Fructose and glucose |
|  | α-Dextrinase |  | α-Dextrins, maltose, maltotriose | Glucose |
|  | Trehalase |  | Trehalase | Glucose |
|  | Nuclease and related enzymes |  | Nucleic acids | Pentoses and purine and pyrimidine bases |
| Cytoplasm of mucosal cells | Various peptidases |  | Di, tri, and tetrapeptides | Amino acids |

1. Match the following
2. Mucosa a. Plexus of Aurebach
3. Sub mucosa b. MALT
4. Muscalaris c. Meissners plexus

Ans. 1.b 2.c 3.a

1. Basic electrical rhythm (BER)
2. Spontaneous rhythmic fluctuations of the smooth muscle of GIT
3. Initiated by interstitial cells of Cajal
4. Does not takes place in the oesophagus and proximal portion of stomach
5. All of the above

Ans. d

1. Pacemaker of GIT motility
2. Consists of Interstitial cells of Cajal
3. Characterised by slow wave activity, gap junctions tight synapses with enteric nerves
4. Both a and b
5. Only b

Ans. c

1. The enteric nervous system constitutes
2. Myenteric plexus
3. Submucous plexus
4. Both a and b
5. None of the above

Ans. c

* Myentric plexus is primarily concerned with motor control and the submucous plexus is involved in control of intestinal secretion

1. Parasympathetic stimulation of GIT causes
2. Contraction of GIT musculature
3. Relaxation of sphincters
4. Increased secretions from stomach
5. All of the above

Ans. d

1. Sympathetic stimulation of GIT causes
2. Relaxation of GIT muscles
3. Decreased motility and tone
4. Contraction of sphincters
5. All of the above

Ans. d

1. Splanchnic circulation
2. Blood flow through gut, spleen, pancreas and liver
3. Gut, spleen, pancreas portal vein liver liver sinusoids hepatic veins venacava
4. Counter current mechanism of the blood flow observed in villi
5. All of the above

Ans. d

1. Gastrin
2. Produced by G cells present in gastric mucosa
3. Stimualate pancreas to secrete bicarbonate
4. Increases gastric acid secretion
5. All of the above

Ans. d

1. Cholecystokinin- Pancreozymin
2. Secreted by I cells in the duodenum and jejunum
3. Acts on gall bladder and pancreas to release bile and digestive enzymes
4. Acts on vagal neurons leads to medulla oblongata and gives satiety signal
5. All of the above

Ans. d

1. Motilin is secreted by enterochromaffin cells and M0 cells in the stomach, small intestine and colon that control gastrointestinal motility between meals
2. Which of the following statements are related to incretins
3. Increasing insulin secretion and decreasing glucagon secretion
4. Decreasing insulin secretion and increasing glucagon secretion
5. Prevention of sharp rise in blood glucose when consuming sugar rich meal
6. Both a and c

Ans. d

1. Neurotensin
2. Polypeptide and its release is stimulated by fatty acids
3. Lipopolysaccharide and its release is stimulated by carbohydrates
4. Inhibits gastrointestinal motility and increases ileal blood flow
5. Both a and c
6. Both b and c

Ans. d

1. Which of the following statements are correct
2. Neurotensin- inhibits GI motility ; substance P- increases GI motility
3. Neurotensin- increases GI motility ; substance P- increases GI motility
4. Neurotensin release is stimulated by fatty acids
5. Both a and c
6. Both b and c

Ans. d

1. Which harmone is secreted by crypts of Lieberkuhn in response to chyme entering in the small intestine

Ans. vasoactive intestinal peptide

1. Match the following
2. Cholecystyokinin – pancreozymin a. glucagon like peptide
3. Ghrelin b. potent feeding stimulant
4. Neuropeptide Y c. potent feeding inhibitor
5. PYY3-36 d. harmone of satiety
6. Incretins e. harmone of hunger

Ans. 1. d 2. e 3. b 4. c 5. a

1. Match the following related to prehensile organs
2. Primates a. lower lip
3. Dogs b. unclefted upper lip
4. Horse c. tongue and incisor teeth of lower jaw
5. Sheep d. hands
6. Cattle e. upper lip, tongue and incisor teeth
7. Goat f. forelimbs
8. Swine g. clefted upper lip

Ans. 1. d 2. f 3. e 4. g 5. c 6. b 7. a

1. Which of the following statements are correct
2. Traditional grazers – sheep, cattle
3. Browser ruminants – deer, giraffe and moose
4. Intermediary – goat
5. a,b and c
6. a and b

Ans. d

1. Mastication reflex which involves lowering of mandible due to extension of tongue mainly seen in bovines is known as

Ans. Linguo mandibular reflex.

1. Muscles of mastication
2. Temporalis and massetor- shearing
3. Massetor and pterygoid - grinding
4. Temporalis and pterygoid- grinding
5. a and b
6. a and c

ans. c

1. correct statement regarding stages of swallowing
2. voluntary stage – voluntary act
3. pharyngeal stage and oesophageal stage- voluntary act
4. pharyngeal and oesophageal stage- reflex mechanism
5. a and b
6. a and c

ans. e

1. the reflex mechanism which leads to opening of lower oesophageal sphincter during oesophageal stage of swallowing is mediated by

ans. vagus nerve

1. swallowing centre is located in

ans. Medulla oblongata

1. the muscular layer of oesophagus is striated throughout the length of oesophagus in which species

Ans. dog, cattle, sheep

1. the muscular layer of oesophagus is striated at the beginning but becomes smooth at caudal oesophaghus in which species

ans. pigs and horse

1. the muscular layer of oesophagus is entirely made of smooth muscles in which species

ans. poultry

1. which of the following events are responsible for movement of food bolus through oesophagus
2. peristaltic waves
3. bucco pharyngeal pressure
4. gravity
5. all of the above

ans. d

1. which of the following events are important for the passage of liquids
2. peristaltic waves
3. bucco pharyngeal pressure
4. gravity
5. reverse peristalsis

ans. b

1. the main motor nerve which regulates the motility of oesophagus is

ans. vagus nerve

1. cardiac sphincter is well developed and powerful in which species

ans. Horse

1. statements regarding the functions of stomach, Choose the correct options
2. reservoir of food
3. produces intrinisic factor for absorption of vitamin B12
4. formation of chyme
5. peristalsis
6. a,b and c
7. a,b ,c and d

ans. e

1. statement A: In horse oesophageal region of the stomach is extensive upto 1/3 to 1/5 surface area of stomach

statement B: In dogs the oesophageal region of the stomach is absent

1. Both A and B are correct
2. A is correct but B is incorrect
3. A is incorrect and B is correct
4. Both A and B are incorrect

Ans. a

1. Statement A : the movements of small intestine are divided into mixing contractions and propulsive contractions

Statement B: mixing contractions are known as segmentation contractions and propulsive movements are peristalsis in the small intestine.

1. Both A and B are correct
2. A is correct but B is incorrect
3. A is incorrect and B is correct
4. Both A and B are incorrect

Ans. a

1. Which of the following harmones inhibit small intestine motility
2. Gastrin and CCK
3. Insulin and motilin
4. Serotonin and CCK
5. Secretin and glucagon

Ans. d

1. Generally peristalsis in small intestine is weak but during infectious diarrhoea due to intense irritation of the mucosa there was powerful and rapid peristalsis which is known as

Ans. peristaltic rush

1. Match the following

1.Small intestine a. haustrations and mass movements

2. oesophagus b. peristaltic rush

3. colon c. mixed and propulsive contractions

4. infectious diarrhoea d. primary and secondary pertistaltic waves

Ans. 1. c 2. d 3. a 4. b

1. Which of the following reflexes are affecting the mass movements of colon
2. Gastrocolioc reflex
3. Duodenocolic reflex
4. Irritation in the colon
5. All the above

Ans. d

1. Statements regarding absorption of food in GIT
2. Small intestine is the chief site of absorption in carnivores and omnivores
3. Large intestine is the chief organ of absorption in all herbivores
4. In herbivores especially in equines the large intestine absorbs volatile fatty acids and ammonia
5. In monogastric animal most of the absorption takes place in stomach

Find out the correct statements

1. 1,2,3 b. 1,2,3 &4
2. 1,2 d. 3,4

Ans. a

1. Match the following regarding the process of absorption of several compounds
2. Fatty acids a. active transport
3. Glucose and aminoacids b. facilitated diffusion
4. Intact proteins and triglycerides c. diffusion
5. Fructose d. pinocytosis

Ans. 1. c 2. a 3. d 4. b

1. Glycerides, long chain fatty acids, cholesterol and the immunoglobulins during the first 24 hours of life are absorbed by
2. Lymphatic system
3. Blood
4. Bile
5. Chyle

Ans. a

1. Statements regarding absorption of carbohydrates
2. In luminal phase of digestion alpha amylase and pancreatic amylase hydrolyses starch to yield oligosaccharides.
3. In the membtranepus phase of digestion oligosaccharides are hydrolysed to monosaccharides
4. Both 1 and 2 are correct
5. 1 is correct and 2 is incorrect
6. 1 is incoprrect and 2 is correct
7. Both 1 and 2 are incorrect

Ans. a

1. Which transport proteins helps in the absorption of glucose

Ans. SGLT ( sodium dependent glucose transporter)

1. Find out the correct statements
2. Galactose absorbed more rapidly than glucose
3. Fructose absorbed more rapidly than glucose
4. Fructose absorption is slower than glucose
5. Galactose absorption is slower than glucose
6. 1 and 2 b. 2 and 4
7. 1 and 3 d. 2 and 3

Ans. c

1. Autocatalytic activity was seen in which enzymes during absorption of proteins in the GIT
2. Pepsin b. trypsin

c. both and b d. rennin

ans. c

1. Immediately after birth immunoglobulins from colostrum are absorbed by which process
2. Pinocytosis
3. Active transport
4. Passive diffusion
5. Facilitated diffusion

Ans. a

1. Liver maintains the normal concentration of bile acids in systemic blood by a process known as

Ans. enterohepatic circulation of bile

1. Match the following
2. Triglycerides a. calcitriol
3. Chylomicrons b. ferric (Fe+3) form
4. Dietary iron c. ferrous (Fe+2) form
5. Absorptive iron d. major dietary lipid
6. Calcium absorption e. reverse pinocytosis

Ans. 1. d 2. e 3. b 4. c 5. A

1. Match the following related to site of absorption of various dietary compounds
2. Vitamin B12 a. caecum
3. Water and electrolytes b. caecum and colon
4. Iron c. ileum
5. SCFA in sheep and horse d. large intestine
6. SCFA in pig e. duodenum

Ans. 1. c 2. d 3. e 4. b 5. a

1. Match the following
2. Monosaccharides a. α-1,4 glycosidic linkage
3. Disaccharides b. α-1,6 glycosidic linkage
4. Fibrous carbohydrates c. glucose
5. Oligosaccharides d. maltose
6. Amylose e. cellulose
7. Amylopectin f. lactose

ans. 1. c 2. f 3. e 4. d 5. a 6. b

1. Match the following related to activator of enzymes
2. Cl- a. chymotrypsins
3. HCl b. α- amylase
4. Enteropeptidase c. trypsinogen
5. Trypsin d. pepsinogen

Ans. 1. b 2. d 3. c 4. a

1. Match the following
2. Rumination a. additional salivary secretion
3. Regurgitation b. reswallowing of bolus
4. Remastication c. reentry of cud into mouth
5. Reinsalivation d. regrinding of cud
6. Redeglutition e. chewing of cud

Ans. 1. e 2. c 3. d 4. a 5. b

51. Which of the following is/are correct regarding ruminant stomach.  
A. It favours retention of bulky fibrous plant for soaking and mixing  
B. Capacity of stomach varies with age and size of the animal  
C. It provides space for microbial fermentation  
D. All the above  
Ans. D   
52. Which of the following statement is incorrect  
A. Abomasum is the largest compartment in new born ruminants  
B. Only abomasum secretes gastric enzymes and HCl  
C. In adults, Abomasum grows at a faster rate than rumen and reticulum  
D. None of above  
Ans. C   
53.Which of the following statement is/are correct  
1. Oesophageal groove is also called  reticular groove  
2. It extends from cardia to reticulo- omasal orifice.  
3. It is more functional in adult ruminants.  
4. It acts as a bypass route for passage of milk directly from the oesophagus into the omasum and abomasum  
A. Only 1, 2, 3, 4  
B. Only 1, 2, 3  
C. Only 2, 3, 4  
D. Only 1, 2, 4  
Ans. D  
54. Administration of following chemical solutions causes reflex close of oesophageal groove.  
A. NaCl  
B. NaHCO3  
C. CuSO4  
D. All the above  
Ans. D  
55. A: Oesophageal groove acts as a bypass route for the passage of milk directly from the oesophagus into omasum and abomasum  
R: Receptors in the pharynx and mouth gets stimulated and causes reflex closure of groove during suckling.  
A. Both statements are correct and R is correct explanation  
B. Both statements are correct and R is not a correct explanation  
C. Only statement A is correct  
D. Only statement R is correct  
Ans. A   
56. A: Ruminants does not depends on metabolic activities of gut microbes to utilize the fibrous food  
R: Ruminants produce enzymes degrading cellulose and other plant polymers.  
A. Both statements are correct and R is correct explanation  
B. Both statements are correct and R is not a correct explanation  
C. Both statements are incorrect  
D. Only statement A is correct  
Ans. C   
57. Which of the following order/sequence is correct  
A. Mastication, Deglutition, Regurgitation, Reinsalivation, Remastication, Redeglutition, Eructation  
B. Mastication, Deglutition, Regurgitation, Remastication, Reinsalivation, Redeglutition, Eructation  
C. Mastication, Deglutition,Reinsalivation,   Regurgitation, Remastication, Redeglutition, Eructation  
D. Mastication, Deglutition, Regurgitation, Reinsalivation, Remastication, Eructation, Redeglutition  
Ans. B   
58. Which of the following statement is/are incorrect regarding rumination  
A. Average daily duration for rumination in cattle is 10 hours on hay diet  
B. Peak rumination occurs during afternoon and in the middle of the night  
C. The type of ration has no influence on rumination time  
D. None of the above  
C   
59. Volume of gas produced in rumen of a dairy cow is .  
Ans. ½ to 1 litre/minute  
60. Bacterial number is about ---------per ml of rumen fluid.  
Ans. 10¹⁰ to 10¹¹   
61. Which of the following are functions of rumen microorganisms  
1. Produces short chain fatty acids which are major energy source of ruminants  
2. Synthesize  vitamin K and B complex vitamins  
3. Dietary proteins are broken down into ammonia and branched chain volatile fatty acids  
4. Ferment dietary carbohydrates  
A. Only 1, 2, 3, 4  
B. Only 1, 2, 3  
C. Only 2, 3, 4  
D. Only 1, 2, 4  
Ans. A   
62. A: Cellulose and hemi-cellulose are slowly fermented  
R: Soluble sugars are rapidly fermented  
A. Both statements are correct and R is correct explanation  
B. Both statements are correct and R is not a correct explanation  
C. Only statement A is correct  
D. Only statement R is correct  
Ans. A   
63. Which of the following linkage in carbohydrates can be digested only by microbial enzymes, but not by mammalian enzymes  
A. Alpha  
B. Beta  
C. Both  
D. None  
Ans. B   
64. Which of the following is/are endproducts  of carbohydrate fermentation  
A.  Short chain fattyacids likeAcetic acid, Propionic acid,Butyric acid  
B. Isoacids like valeric, isovaleric, isobutyric, 2-methylbutyric acids  
C. Gases like CO2, CH4 and H2  
D. All  
Ans. D   
65. The total VFA content of rumen ranges from    
Ans. 60 to 120mEq/L  
66. Which of the following is not a ketogenic acid in ruminants  
A. Acetate  
B. Butyrate  
C. Propionate  
D. All  
Ans. C   
67. The end product of carbohydrate fermentation which acts as the precursor for milk fat synthesis  
A. Acetate  
B. Butyrate  
C. Propionate  
D. All  
Ans. A   
68. A: The rumen undegradable protein (UDP) reaches the small intestine for enzymatic digestion by the animal  
R: About 20 to 100% of total proteins entering the rumen will be degraded  
  
A. Both statements are correct and R is correct explanation  
B. Both statements are correct and R is not a correct explanation  
C. Both statements are incorrect  
D. Only statement A is correct  
Ans. B   
69. Protein breakdown in the rumen is proportional to  
1. Solubility  
2. Degree of secondary and tertiary structures  
3. Cross linking between aminoacid  
4. Concentration of ammonia in rumen fluid  
5. Cleavage of dusulphide bonds  
  
A. Only 1, 2, 3, 4  
B. Only 1, 2, 3, 4, 5  
C. Only 2, 3, 4, 5  
D. Only 1, 2, 3  
Ans. B   
70. A: vomiting is very common in horses  
R: in horses, cardiac sphincter is well developed and powerful and stomach is in distant position from the abdominal walls  
  
A. Both statements are correct and R is correct explanation  
B. Both statements are correct and R is not a correct explanation  
C. Only statement A is correct  
D. Only statement R is correct  
Ans. D   
71. Which of the following statements is incorrect  
A. In carnivores and omnivores, vomiting is common  
B. Herbivores and rodents never vomit  
C. Vomiting centre is located in the lateral reticular formation of the medulla  
D. None of above  
Ans. D   
72. A: In Ruminants and pigs, bile flows continuously in the duodenum  
R: Sphincter of oddi is less defined.  
  
A. Both statements are correct and R is correct explanation  
B. Both statements are correct and R is not a correct explanation  
C. Only statement A is correct  
D. Only statement R is correct  
Ans. A   
73. Which of the following is/are incorrect regarding fermentative digestion  
A. Utilising of bulky fibrous plant materials  
B. Synthesis of high biological value microbial proteins.  
C. Unable to break down cellulose

D. All of the above  
Ans. C   
74. Which of the following are disadvantages of fermentative digestion  
A. Require large quantities of alkaline saliva

B. Powerful mixing movements

C. Elimination of gases

D. All the above  
Ans. D   
75. Which of the following is not a function of gall bladder  
A. Storage of bile and concentrating the bile upto 20 to 30 times  
B. Prevents excess absorption of bile  
C. Assisting stabilization of fat emulsion in the intestine  
D. None of above  
Ans. D   
76. A: Gall bladder prevents excess absorption of bile salts from intestines  
R: Gall bladder adds mucin to the bile  
  
A. Both statements are correct and R is correct explanation  
B. Both statements are correct and R is not a correct explanation  
C. Only statement A is correct  
D. Only statement R is correct  
Ans. A   
77. Which of the following statement is/are true  
1. Mucin and pseudomucin in the bile act as a stabilizers of fat emulsion in the intestine.  
2.  Bile has a marked antiseptic property  
3. Bile has a mild laxative effect  
4. In the presence of bile in the intestine, fat absorption is reduced  
  
A. Only 1, 2, 3, 4  
B. Only 1, 2, 3  
C. Only 2, 3, 4  
D. Only 1, 2, 4  
Ans. B   
78. A: Villi increase the surface area of small intestine by 10 to 14 fold.  
R: Gland like structure at the base of villi is called crypts of lieberkuhn.  
  
A. Both statements are correct and R is correct explanation  
B. Both statements are correct and R is not a correct explanation  
C. Only statement A is correct  
D. Only statement R is correct  
Ans. B   
79. A: Luminal phase of digestion results in incomplete hydrolysis of nutrients  
R: Luminal phase of digestion is followed by membranous phase   
A. Both statements are correct and R is correct explanation  
B. Both statements are correct and R is not a correct explanation  
C. Only statement A is correct  
D. Only statement R is correct  
Ans. B   
80. Which of the following is/are not a function of liver  
1. Formation and storage of glycogen  
2. Synthesis of fatty acids from carbohydrates and proteins  
3. Metabolism of hormones  
4. Synthesis of estrogen  
5. Formation of fibrinogen and other plasma factors  
  
A. Only 1  
B. Only 3, 4  
C. Only 4  
D. Only 2, 5  
Ans. C   
81. Gall bladder is absent in  
A. Horses and deer  
B. Elephant and giraffe  
C. Camel and pigeon  
D. All the above  
Ans. D   
82. Match the following related to amount of bile secreted in different species

1. Horse A. 7 – 14 mL/Hour

2.Ox B. 7 – 154 mL/Hour

3. Sheep C. 250 - 300 mL/Hour

4.Pig D. 98 - 111 mL/Hour

5.Dog E. 70 – 140 mL/Hour

Ans. 1-C 2-D 3-B 4-E 5-A  
83. The volume of bile secretion depends on  
A. Blood flow to liver  
B. Digestive state of the animal  
C. Composition of food  
D. All the above  
Ans. D   
84. A: In sheep and goat, the mixture of pancreatic and bile juice enters the duodenum.  
R: In all animals, pancreatic and bile juices enter as a mixture into the duodenum  
  
A. Both statements are correct and R is correct explanation  
B. Both statements are correct and R is not a correct explanation  
C. Only statement A is correct  
D. Only statement R is correct  
Ans. C   
85. Which of the following statement is correct  
A. In sheep and goat, the pancreatic duct empties directly into the common bile ducts  
B. In dogs, cats and horses, the bile and pancreatic ducts open closely together into the duodenum  
C. In pigs and cows  bile and pancreatic ducts lie some distance apart  
D. All the above  
Ans. D   
86. A: Bile is secreted continuously in all species  
R: The gall bladder bile differs in composition as that of hepatic bile  
  
A. Both statements are correct and R is correct explanation  
B. Both statements are correct and R is not a correct explanation  
C. Only statement A is correct  
D. Only statement R is correct

Ans. B   
87. A: In horses, there is continuous and large flow of hepatic bile to the duodenum  
R: In horses, gallbladder is absent  
A. Both statements are correct and R is correct explanation  
B. Both statements are correct and R is not a correct explanation  
C. Only statement A is correct  
D. Only statement R is correct  
Ans. A   
88. Which of the following is primary bile acid  
A. Cholic acid  
B. Deoxycholic acid  
C. Lithocholic acid  
D. Both A and B  
Ans. A   
89. Which of the following is secondary bile acid  
A. Cholic acid  
B. Deoxycholic acid  
C. Lithocholic acid  
D. Both A and B

Ans. D   
90. Which of the following is true  
1. Bile salts act as strong emulsifying agent  
2. Bile salts activates pancreatic lipase  
3. Bile salts deactivates cholesterol esterases.  
4. Bile salts helps in absorption of fat soluble vitamins.  
  
A. Only 1, 2, 3, 4  
B. Only 1, 2, 3  
C. Only 1, 2, 4  
D. Only 2, 3, 4  
Ans. C  
91. A: In carnivores,  man, goat, sheep and birds, taurocholic acid predominates  
R: In pigs and rabbit, glycocholic acid predominates.  
  
A. Both statements are correct and R is correct explanation  
B. Both statements are correct and R is not a correct explanation  
C. Only statement A is correct  
D. Only statement R is correct  
Ans. B   
92. A: In enterohepatic circulation, about 94% of bile salts are lost in the faeces.  
R: Loss of bile salts is replaced by the liver.  
  
A. Both statements are correct and R is correct explanation  
B. Both statements are correct and R is not a correct explanation  
C. Only statement A is correct  
D. Only statement R is correct  
Ans. D   
93. Which of the following will give green color to the bile of herbivores.  
A. Bilirubin  
B. Biliverdin  
C. Both  
D. None of the above  
Ans. B   
94.Match the following

1. Alpha cells A. Somatostatin

2. beta cells B. Enzymes of pancreatic juice

3. delta cells C. Insulin

4. Acinar cells D. Glucagon  
Ans: 1-D 2-C 3-A 4-B  
95. A: The exocrine portion of pancreas is called Islets of langerhans.  
R: The major portion of pancreas is endocrine in function  
  
A. Both statements are correct and R is correct explanation  
B. Both statements are correct and R is not a correct explanation  
C. Both the statements are incorrect  
D. Only statement R is correct  
Ans. C   
96. Which of the following statement is/are true  
1. Pancreatic is a clear and acidic fluid made up of the secretions of aqueous and organic phases  
2. Aqueous phase causes a higher concentration of HCO3  
3. The organic phase produces more of pancreatic enzymes  
4. The amount of pancreatic juice secreted in horses is 10-12L/100kg body weight  
A. Only 1, 2, 3, 4  
B. Only 1, 2, 3  
C. Only 1, 2, 4  
D. Only 2, 3, 4  
Ans. D   
97. Which of the following is not an endopeptidase  
A. Carboxypeptidaae  
B. Chymotrpsin  
C. Trypsin  
D. Elastase  
Ans. A   
98. Which of the following is secreted as inactive form  
A. Amylopsin  
B. Steapsin  
C. Trypsin  
D. Both A and B  
Ans. C   
99. Which of the following statement is correct  
A. Secretin and cholecystokinin are the important hormones regulate the pancreatic secretion  
B. Secretin causes increased secretion of thin watery pancreatic juice with high concentration of HCO3  
C.  Cholecystokinin stimulates the pancreatic secretions rich in enzymes.  
D. All the above  
Ans. D   
100. Which of the following inhibit the secretion of pancreatic HCO3 and enzymes  
A. Vasoactive intestinal peptide  
B. Pancreatic polypeptide  
C. Secretin  
D. All the above  
Ans. B   
101.Which of the following statements regarding volatile fatty acids (VFAs) is incorrect?  
A. VFAs contribute 60-80% of the ruminant's energy requirements.  
B. Acetate is the primary VFA generated in the rumen.  
C. VFAs are absorbed by pinocytosis in the rumen epithelium.  
D. Nearly all of butyrate is transformed into β-hydroxybutyrate before absorption  
Ans. C   
102. Rumination:  
A. Accelerates with the provision of finely ground diets.  
B. Encompasses triphasic contractions of the rumen.  
C. Lacks coordination with respiration.  
D. Initiates cycles through stimulation by chemoreceptors in the rumen wall.  
Ans. B   
103. Match the following

1. cardiac glands A. HCl

2. pyloric gland B. Rennin

3. fundic chief cells C. Mucus

4. fundic oxyntic cells D. Intrinsic factor

5. fundic neck chief cells E. Gastrin  
Ans. 1-C 2-E 3-B 4-A 5-D  
104. A: High concentrations of carbonic anhydrase is present in parietal cells  
R: Formation of carbonic acid occurs in the neck chief cells of fundic glands  
  
A. Both statements are correct and R is correct explanation  
B. Both statements are correct and R is not a correct explanation  
C. Only statement A is correct  
D. Only statement R is correct  
Ans. C   
105. The stimulatory impact of gastrin on HCl secretion involves, in part, the gastrin-induced release of:  
A. Acetylcholine  
B. Amino acids  
C. Gastrin-releasing peptide  
D. Histamine  
Ans. D   
106. Which of the following statement is/are correct regarding functions of HCl  
1. Activates pepsinogen into pepsin  
2. Slight hydrolysis of sucrose  
3. As antiseptic in the stomach  
A. Only 1, 2  
B. Only 2, 3  
C. Only 3, 1  
D. All  
Ans. D  
107.Match the following related to optimum pH required for their activity

1. Amylotic bacteria A. <2.5

2. pepsin B. >5.2  
3. Gastric lipase C. 1.5 - 3

4. inhibition of HCl production D. 5.5 -7.5

Ans. 1-B 2-C 3-D 4-A  
108. A: Rennin delays the passage of milk in stomach  
R: Calcium paracaseinate formed by Rennin, prolonged the action of pepsin on  
casein  
  
A. Both statements are correct and R is correct explanation  
B. Both statements are correct and R is not a correct explanation  
C. Only statement A is correct  
D. Only statement R is correct  
Ans. A   
109. Contact of the food bolus with the receptors of stomach mucus membrane and distention of stomach results in release of  
A. Acetylcholine  
B. GIP  
C. Noradrenaline  
D. SubstanceP  
Ans. A   
110. Which of the following secretions from the duodenum inhibits gastric secretion  
A. Secretin  
B. Cholecystokinin  
C. Both  
D. None  
Ans. C   
111. Which of the following each phases of gastric secretion contributes least to gastric secretion.  
A. Cephalic phase  
B. Gastric phase  
C. Intestinal phase  
D. Both A and B  
Ans. C   
112. Excess H+ions produced in the rumen during fermentation are removed by  
A. Formation of CH4  
B. Propionate formation  
C. Saturation of fattyacids  
D. All oftheabove  
Ans. D   
113. Which of the following would not be produced by total pancreatectomy?  
A. Hyperglycaemia  
B. Metabolic acidosis  
C. Weight gain  
D. Decreased absorption of amino acids  
Ans. C   
114. Which of the following statement is/are true regarding secondary cycle of rumenoreticular motility  
A. Also known as eructation cycle  
B.  Contraction starts from caudodorsal sac of rumen  
C. Occurs between every 2-3 primary cycles  
D. All the above  
Ans. D   
115. Which of the following statement is/are incorrect  
1. Renin is a gastric hormone  
2. Secretin is secreted from S cells of duodenum and jejunum  
3. Ghrelin is known as apetite hormone secreted from chief cells of stomach  
4. Secretin causes contraction of gallbladder to release bile.  
  
A. Only 1, 2, 3  
B. Only 2, 3, 4  
C. Only 1, 3, 4  
D. Only 1, 2, 4  
Ans. C   
116. Mixing movements in small intestine is called \_\_\_\_\_\_\_\_\_\_\_\_\_  
Ans. Segmentation  
117. Mixing movements in large intestine is called \_\_\_\_\_\_\_\_\_\_\_\_\_  
Ans. Haustration   
118. Type of histamine receptors present in parietal cells of stomach\_\_\_\_\_\_\_\_

Ans. H2  
119. \_\_\_\_\_\_\_\_ is the functional salivary unit.  
Ans. Salivon  
120. A: Submaxillary and sublingual salivary glands are mixed in dog, cat and ox  
R: They are serous and mucus respectively in rodents  
  
A. Both statements are correct and R is correct explanation  
B. Both statements are correct and R is not a correct explanation  
C. Only statement A is correct  
D. Only statement R is correct  
Ans. B   
121. Which of the following are alkaligenic salivary glands  
1. Parotid  
2. Inferior molar  
3. Buccal  
4. Palatine  
  
A. Only 1, 2, 3, 4  
B. Only 1, 2, 3  
C. Only 2, 3, 4  
D. Only 1, 3, 4  
Ans. A   
122. Which of the following statement is incorrect about mucogenic salivary glands  
A. Submaxillary, sublingual and pharyngeal are mucogenic glands  
B. They secret more of Mucin  
C. They secret high concentration of HCO3  
D. None of above  
Ans. C   
123. Which of the following statement is false regarding saliva  
A. Saliva of domestic animals is slightly alkaline  
B. Saliva of ruminants is distinctly alkaline  
C. Saliva of ruminants contain urea  
D. None of the above  
Ans. D   
124. Stimulation of the following efferent fibers results in copious secretion of saliva  
A. Parasympathetic  
B. Sympathetic  
C. Both  
D. None  
Ans. A   
125. \_\_\_\_\_\_\_ is a salivary protein, required for the growth and maturation of gustatory buds.  
Ans. Ghrelin   
126. Which of the following are functions of saliva  
1. Taste  
2. Protection and lubrication  
3. Dilution and cleaning  
4. Integrity of tooth enamel  
5. Digestion  
  
A. Only 1, 2, 5  
B. Only 1, 3, 4, 5  
C. Only 2, 3, 4  
D. Only 1, 2, 3, 4, 5  
Ans. D   
127. Which of the following enzyme is considered to be a good indicator of properly functioning salivary glands in dogs  
A. Salivary amylase  
B. Lingual lipase  
C. Ptyalin  
D. All the above  
Ans. C   
128. In which of the following species saliva plays a major in thermoregulation  
A. Cattle  
B. Pigs  
C. Rats  
D. Dogs  
Ans. C   
129. Which of the following is not a function of saliva  
A. Tissue repair  
B. Antibacterial properties  
C. Thermoregulation  
D. None of the above  
Ans. D   
130. \_\_\_\_\_\_\_ is a non protein in saliva that provides nitrogen for bacterial growth and microbial protein synthesis  
Ans. Urea   
131. Part of gastrointestinal secretion that donot contain enzymes is\_\_\_\_\_\_\_\_\_\_\_\_  
Ans. Gall bladder  
132. Rate of passage of \_\_\_\_\_\_\_ fluids is fastest from stomach to duodenum  
Ans. Isotonic   
133. For animals not requiring extensive fermentation of their food, most of the digestion and absorption takes place in \_\_\_\_\_\_\_\_  
Ans. Small intestine  
134. \_\_\_\_\_\_\_\_ VFA is least likely to cause ketosis in ruminants  
Ans. Butyric acid  
135. Reabsorption of electrolytes and water and microbial digestion are characteristics of \_\_\_\_\_\_\_ part of GIT  
Ans. Large intestine   
136. Exopeptidase enzyme present in pancreas is \_\_\_\_\_\_  
Ans. Carboxypeptidase  
137. \_\_\_\_\_\_\_ VFA contributes maximum percentage of VFA in ruminants  
Ans. Acetic acid   
138. \_\_\_\_\_\_ VFA is glucogenic in function  
Ans. Propionic acid  
139. In \_\_\_\_\_\_\_ species post gastric fermentation occurs.  
Ans. Horses  
140. In horses, microbial digestion occurs in \_\_\_\_\_\_\_\_\_  
Ans. Large intestine  
141. Ptyalin is present in the saliva of \_\_\_\_  
Ans. Pigs  
142. \_\_\_\_\_\_ hormone that increases the bicarbonate and water in pancreatic juice  
Ans. Secretin  
143. Glycerol is fermented in rumen to  
A. Acetic acid  
B. Butyric acid  
C. Propionic acid  
D. None  
Ans. C   
144. Which of the following salivary function is insignificant in ruminants  
A. Enzyme digestion  
B. Chemical buffer  
C. Media for bacterial growth  
D. Prevention of froth  
Ans. A   
145. The parotid salivary secretion in most of the mammals is \_\_\_\_\_\_\_\_\_  
Ans. Serous  
146. Digestion is enzymatic in nature in  
A. Cattle  
B. Pig  
C. Goat  
D. Herbivores birds  
Ans. B   
147. Which of the following ions are absorbed from the intestine by diffusion  
A. Ca++  
B. Fe++  
C. Chloride ion  
D. Phosphate ion  
Ans. C   
148. Satiety hormone is  
A. Ptyalin  
B. Gastrin  
C. Secretin  
D. Leptin  
Ans. D  
149. \_\_\_\_\_\_\_\_\_ converts trypsinogen into trypsin  
Ans. Enterokinase  
150. The type of calcium absorption where calcium is endocytosed at luminal end and sent out at basolateral membrane by exocytosis is known as ----

Ans. Transcaltachia

151. Match the following related to their proportions produced during carbohydrate fermentation

1. Acetate A. 30 – 40%

2. propionate B. 50 – 60%

3.butyrate C. 60 – 65%

4. methane D. 10 – 15 %

5.CO2 E. 15 – 20%

Ans. 1-C 2-E 3-D 4-A 5-B

152. Match the following related to their count in rumen

1. Protozoa A. 10 - 1011 /mL of rumen fluid

2. Fungi B. 105 -106/mL of rumen fluid

3. Bacteria C. 105 – 107/gm of rumen contents

Ans. 1-B 2-C 3-A