



Q	Answer as per MS	Marks	NOTES
1 a	breakdown of large to small molecules ; from insoluble to soluble ;		Breakdown of large , insoluble molecules to small , soluble ones , is called chemical digestion .
b.i	<i>test-tube 1</i> 1 (less cloudy), slower break down of egg white solution / protein ;  2 (no HCl so) pH of the solution is too high ; <b>ora</b>  3 high pH denatures pepsin / enzyme ;		Test tube 1: Absence of HCL makes the pH of solution too high so pepsin becomes denatured, and breakdown of protein is slow .  Test tube 2: presence of HCL lowers pH of solution so pepsin works best .  Test tube 3 : boiled pepsin gets denatured hence becomes inactive .
ii	as a control ; to show that pepsin is responsible for the protein digestion ; to show that hydrochloric acid does not digest the protein ;		Test tube 4 : acts as control as control . it shows that it is pepsin that is responsible for breakdown protein and not HCl.
iii	stomach ;		Stomach .
c	maltose broken down ; to glucose ; on the membranes of the epithelial lining ; (acts) in the small intestine / duodenum ;		Maltase breaks down maltase to glucose on the membranes of the epithelial lining of the small intestine and duodenum .
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2	production of, small(er) / soluble / simple(r), molecules ;  (small molecules can be) absorbed / ref. to absorption ; <b>ora</b>  (moves through) cell membranes / wall of intestine / into blood / into cells ;		Chemical digestion helps to breakdown large , insoluble molecules into small , soluble ones so that they can be absorbed through the cell membranes of the intestinal wall into blood cells.
b			



function	Letter from fig 1.2	Name of structure.	function	Letter from fig 1.2	Name of structure.
Site of starch digestion	A J And E	Mouth or buccal cavity small intestine .	Site of starch digestion	A J And E	Mouth or buccal cavity small intestine .
Re absorption of water	J and E F	Small intestine colon rectum	Re absorption of water	J and E F	Small intestine colon rectum
Secretion of pepsin	C	Stomach	Secretion of pepsin	C	Stomach
Site of maltose digestion	J and E	Small intestine	Site of maltose digestion	J and E	Small intestine
Secretion of bile	K L	Liver gall bladder	Secretion of bile	K L	Liver gall bladder
Storage of faeces	F	Rectum	Storage of faeces	F	Rectum
Secretion of lipase and trypsin	D	Pancreas.	Secretion of lipase and trypsin	D	Pancreas.

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<b>3</b>	<b>A</b> dentine <b>B</b> cement <b>C</b> incisors <b>D</b> canine(s) <b>E</b> premolars <b>F</b> molars	A : dentine . B : cement C : incisors . D : canines . E : premolars . F : molars .
<b>ii</b>	Mechanical	Mechanical digestion .
<b>b.i</b>	Acids .	Acids.



ii	Enamel .  Dentine .		Enamel  Dentine .
c	(named) sugar ;		Sucrose

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4	(food) is broken down into smaller pieces (without chemical change) ;  <i>sites of mechanical digestion:</i> mouth / buccal cavity (in context mechanical) ; stomach (in context of mechanical) ;  chewing / mastication ; role of a named teeth ;; <i>ref to</i> involvement of tongue ; <i>ref to</i> movement of the jaw ; churning / muscular, action of the stomach ;		Sites of mechanical digestion are the mouth and the stomach . In the mouth , mechanical digestion involves chewing or mastication by the teeth . the tongue helps to keep the food particles between the teeth and the movements of the jawbone, helps the teeth to crush the food particles. In the stomach mechanical digestion is carried out by the churning action of the muscular walls of the stomach .
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b	<table border="1"> <thead> <tr> <th>part of the alimentary canal</th> <th>enzyme</th> <th>substrate</th> <th>product(s)</th> </tr> </thead> <tbody> <tr> <td>mouth</td> <td>amylase</td> <td>starch</td> <td>maltose</td> </tr> <tr> <td>stomach</td> <td>pepsin</td> <td>protein</td> <td>peptides</td> </tr> <tr> <td>small intestine / duodenum / ileum</td> <td>lipase</td> <td>fat</td> <td>fatty acids and glycerol</td> </tr> </tbody> </table>	part of the alimentary canal	enzyme	substrate	product(s)	mouth	amylase	starch	maltose	stomach	pepsin	protein	peptides	small intestine / duodenum / ileum	lipase	fat	fatty acids and glycerol		<table border="1"> <thead> <tr> <th>Part of the alimentary canal</th> <th>enzyme</th> <th>Substrate</th> <th>Product</th> </tr> </thead> <tbody> <tr> <td>Mouth</td> <td>Amylase</td> <td>Starch</td> <td>Maltose</td> </tr> <tr> <td>Stomach</td> <td>Pepsin</td> <td>Proteins</td> <td>Peptides</td> </tr> <tr> <td>Small intestine</td> <td>lipase</td> <td>fat</td> <td>Fatty acids and glycerol</td> </tr> </tbody> </table>	Part of the alimentary canal	enzyme	Substrate	Product	Mouth	Amylase	Starch	Maltose	Stomach	Pepsin	Proteins	Peptides	Small intestine	lipase	fat	Fatty acids and glycerol
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i	Glycogen		Glycogen
ii	Antibody		Antibody
iii	( thermal) insulation		Insulation

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5	Liver		Liver
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6	emulsification ; increased surface area of fat globules ; faster, digestion / break down of fat by enzymes ; by lipase / to fatty acids and glycerol ; neutralises (stomach) acid ;		Bile helps to emulsify fats. Emulsification increase the surface area of substrate so that lipase can act .
b	the movement of small food molecules and ions ; through the wall of the intestine ; into the blood ;		The movement of small food molecule and ions through the walls of the intestine into the blood is called absorption .
c	marasmus / kwashiorkor ;		Marasmus .
d	reduces, calorie / energy intake ; reduces obesity ; reduces chances of CHD ; AVP ;;		The health benefit of a lowful diet are : a. Reduces calorie intake. b. Reduces obesity Reduces chances of coronary heart Disease.
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7	1 (for) energy / energy source / respiration ; 2 storage / stored ; (fat or vitamins or energy) 3 insulation / reduce heat loss / maintains temperature / ref to myelin ; 4 protection (against mechanical damage) / cushions organs / shock absorber ; 5 AVP ; 6 AVP ;		1. As energy sources 2. For storage of energy For insulation .
b	(i) lipase ;  (ii) fatty acids and glycerol ;  (iii) bile ; <b>1</b> (iv) gall bladder ;		(i) lipase ;  (ii) fatty acids and glycerol ;  (iii) bile ; <b>1</b> (iv) gall bladder ;



<b>c</b>	(bile) emulsifies fats ; breaks down into / changed into smaller, globules / AW ; increases surface area (to volume ratio) ; for, enzyme(s) / lipase ;		The bile from the gall bladder enters the duodenum along with pan create juice and causes emulsification chemical digestion by lipase.
<b>d</b>	<i>fatty acids / glycerol / fats, enter / AW</i> <b>1</b> (micro)villi ; <b>2</b> capillaries / blood vessels / blood / circulatory system ; <b>3</b> lacteals / lymphatic capillary ; <b>4</b> (travel via) lymph / in lymph vessels / in lymph(atic) system ; <b>5</b> lymph empties into blood ;		The products of fat digestion , fatty acids and glycerol enter the microvilli and from there to the blood capillaries some fats are absorbed into the lacerates and eventually meet the main circulation when lymph is emptied into the subclavian vein .
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<b>8</b> <b>a</b>	<b>1</b> all, nutrients / components ; <b>2</b> nutrients in correct, proportions / amounts ; <b>3</b> at least three named 'components' ; <b>4</b> to maintain health ; <b>5</b> appropriate energy requirements / AW ; <b>6</b> different requirements according to, age / sex / lifestyle / pregnancy ;		A balanced diet is one which contains all nutrients in correct proportions may change over the years to meet the enemy requirements of the individual.
<b>b</b>	<b>1</b> lack of growth / low body weight / weight loss ; <b>2</b> (described) effect on, hair / skin / nails ; <b>3</b> diarrhoea / vomiting ; <b>4</b> fatigue ; <b>5</b> muscle wasting ; <b>6</b> (more) prone to, infections / disease ;		



<p><b>c</b></p>	<p><b>1</b> marasmus child lower mass than healthy child, initially / AW ;  <b>2</b> initial (rapid) increase in mass of child with marasmus ;  <b>3</b> then trend almost follows increase of healthy children ;  <b>4</b> later / AW, marasmus child is similar to / heavier than, healthy child ;  <b>5</b> comparative data in children's mass with units stated at least once ;  <b>6&amp;7&amp;8</b> comparative data of milk with units stated at least once ;;;</p> <p><i>Explanation</i></p> <p><b>9</b> protein required for, new cells / muscle / repair ;  <b>10</b> carbohydrates / fats, required for, energy / respiration ;  <b>11</b> fats required for, insulation / cell membranes / protecting organs / neurones ;  <b>12</b> treatment for marasmus / AW, has more, (named) nutrients / energy ;  <b>13</b> marasmus child encouraged to drink as much as possible ;  <b>14</b> nutrients are required (for children) for, growth ;</p>	<p>Initially the body mass of the child with marasmus is much lower , 4 kg in comparison to the healthy child 7.6 kg , with fortified milk, which has a higher protein content , the body mass rises rapidly . becoming equal in a little over 16 days thereafter the marasmus inflicted child becomes heavier showing the importance of a balanced diet</p>
<p><b>d</b></p>	<p><b>1</b> emulsification ;  <b>2</b> increased surface area of fats ;  <b>3</b> for lipase ;  <b>4</b> neutralises (stomach) acid / chyme / provide suitable pH (for lipase) ;  <b>5</b> speeds up digestion (of fats) ;</p>	<p>Bile is required for emulsification of fats. Emulsification increases the surface area of fats for the enzyme lipase to act upon, and thus speeds , up the digestion of fats Bile also neutralises the stomach acid and provides suitable pH for ;lipase .</p>
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<p><b>9</b> <b>a.i</b></p>	<p>incisors ;</p>	<p>Incisors .</p>
<p><b>a.ii</b></p>	<p>bacteria use sugar / AW (on teeth as a food source) ;  bacteria respire ;  acid is produced ;  AVP ;</p>	<p>Bacteria breakdown sugars during respiration and produce acids in the process the acids attack the enamel and cause tooth decay .</p>



<b>b</b>	regular, brushing / mouthwash / flossing / wash / clean, teeth ; avoid sugary foods / diet described ; dental check-ups ; fluoride, toothpaste / in water ;		The first way is to avoid sugary foods . the second way is to observe good oral hygiene e.g. regular brushing with fluoride tooth paste, mouth , wash , flossing and regular dental check up.
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<b>10</b> <b>A.i</b>	Iron / Fe / $Fe^{2+}$ / $Fe^{3+}$ ;		Iron
<b>a.ii</b>	tired / lethargic / 'no energy' / weakness / AW ; shortness of breath ; chest pain ; fast heartbeat ; frequent infections ; headache / dizziness / light-headedness ; cold, hands / feet ; inflammation / soreness, of tongue ; brittle nails ; unusual cravings for non-nutritive substances, such as ice, dirt or starch ; poor appetite ; tingling or crawling feeling in legs ;		1. Tired , lethargic feelings.  Shortness of breath .
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<b>11</b> <b>a</b>	absorption (of digested food / water) / movement of (small) molecules (from small intestine) into blood ;		Absorption of digested food and water from the intestine and allowing them to pass on to blood.
<b>b</b>	<b>1</b> goblet cells labelled <b>P</b> ; <b>2</b> shaped described / produces mucus ; <b>3</b> lacteal / lymph vessel / lymphatic vessel, labelled <b>Q</b> ; <b>4</b> description / transports fatty acids / fats; <b>5</b> capillaries / blood vessel, labelled <b>R</b> ; <b>6</b> thin / one cell thick, walls / carries products of digestion ; <b>7</b> microvilli / epithelia labelled <b>S</b> ; <b>8</b> for <i>microvilli accept</i> – large surface area / thin, for diffusion / absorption ;		P - goblet cells, shaped like a goblet and producing mucus  Q – lacteals for transport of fatty acids .



<b>c.i</b>	watery faeces / AW ; dehydration / described ; loss of, salts / ions / electrolytes ; cramps / stomach pain ; death ;		Diarrhoea is characterized by watery faeces. There is dehydration accompanied by loss of electrolytes , cramps or stomach pain could develop of unchecked , diarrhoea can lead to death .
<b>ii</b>	oral rehydration therapy ;		Oral rehydration therapy.

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<b>12</b>	small intestine / duodenum / ileum ;		Small intestine .
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<b>13</b>	(stomach / hydrochloric / gastric) acid / HCl / mucus ;		Acid (HCl) and mucus .
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<b>14</b>	Mineral ion	Function in plants	Effect of lack mineral ion on plants
	Nitrate	To make amino acids, proteins, DNA , RNA , enzymes and chlorophyll.	Poor growth , lower leaves die early.
	Magnesium	For making chlorophyll	Yellow leaves; chlorosis .
	Phosphate	Used for making DNA .	Poor root growth .

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<b>15</b> <b>a</b>	canine piercing / tearing the food ;  molar chewing / grinding the food ;		Canines for piercing , tearing food. Molars for chewing and grinding .
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<b>b.i</b>	<p>1 tiger has more pointed incisors / rabbit has less pointed incisors ;  2 tiger has canines / rabbit has no canines ;  3 tiger has jagged, premolars / molars ;  4 tiger has fewer molars / rabbits have more molars ;  5 rabbit has a diastema / (larger) gap between incisors and pre molars ;</p>		<p>Tiger has more pointed incisors , rabbit has less pointed incisors tiger has canines rabbits do not have canines.</p>
<b>ii</b>	<p>canines ;  jagged, premolars / molars ;  eyes positioned at the front of the skull ;  pointed ridge / crest, on skull ;</p>		<p>The presence of prominent canines indicates that the tiger is a carnivore .</p>
<b>c.i</b>	<p><math>12 / 44 \times 100</math>   27 ;;</p>		<p><math>\frac{12}{44} \times 100 = 27 \%</math></p>
<b>ii</b>	<p>arguments for carnivore:</p> <p>1 has same number of incisors as, other carnivores / 5 / 6 ;  2 has same number of canines as, other carnivores 5 / 6 ;  3 has same number of molars as, 6 / a carnivore ;</p> <p>arguments against carnivore:</p> <p>4 same number of premolars as, herbivores / 3 / 4;  5 1 / 2 / 3 / some herbivores / omnivores, also have 12 incisors ;  6 1 / 2 / 3 / some herbivores / omnivores, also have 4 canines ;</p>		<p>1. has the same number of incisors as other carnivores .</p> <p>2. has the same number of canines as other carnivores.</p> <p>3. has the same number of molars as other carnivores.</p> <p>In case the animal is not a carnivore.</p> <p>1. has same number of premolars as herbivores.</p> <p>2. has the same number of incisors and molars as herbivores.</p>



<b>d</b>	1 denatures enzymes in microorganisms ; 2 kills, microorganisms / (named) pathogens ; 3 optimum pH for pepsin activity ; 4 proteins are digested / broken down, to (poly)peptides / amino acids ;	The acid denatures enzymes present in microorganisms and kills pathogens that may have been ingested. The low pH is essential for pepsin activity for digestion of proteins.
<b>e</b>	1 villi lining / epithelium, only one cell thick / thin ; 2 good blood supply / many capillaries ; 3 microvilli ; 4 large surface area ; 5 lacteal for fats / fatty acid, absorption ; 6 protein channels ; 7 mitochondria for active transport ;	Villi are found on the lining of the small intestine. Each villus is covered with cells which have even smaller projections on them, called microvilli, villi contain blood capillaries for absorption of monosaccharides, amino acids , water , minerals and vitamins some fats pass into the blood some are absorbed into the lacteals Villi have walls only one cell thick, and along with microvilli increase the absorption area .

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<b>16</b>	(small) intestine	Small intestine .
<b>i</b>	oral rehydration (therapy / salts / treatment / solution) ; drink mixture of, sugar / nutrients and, salt / ions ; replace lost, water / fluids ; water must be, uncontaminated / boiled / sterilised / clean / AW ; antibiotics ;	Treatments for cholera consists of oral rehydration therapy, uncontaminated water and antibiotics
<b>17</b>	V stomach  W large intestine / colon / rectum ;	V : stomach W : large intestine .
<b>b</b>	breaks up food into small(er) pieces ; without chemical change ; by teeth / muscles ; to mix (with digestive juice) ; increases surface area ; for enzyme action ; speeds up chemical digestion ; easier to swallow ;	Mechanical digestion involves the breakdown of food into smaller pieces without any chemical change . the breakdown increases the surface area for optimum activity of enzyme mechanical digestion occurs in the mouth and the stomach .
<b>c</b>	for: positive correlation / as (relative) body mass increases, time in digestive system increases ;	For : the figures shows positive correlation for body masses to time in digestive system. As the body mass increases , time in digestive system increases . for body mass 1.7 au the



	<p>any two or more figures from the graph ;</p> <p>against: max 3 from two / one / few / some (species), are outliers / anomalies ;</p> <p>any figure(s) from the graph ;</p> <p>(description of) some mammals do not fit the, pattern / trend ;</p> <p>any example from the graph ;</p> <p>only information about 26 species of mammal / small sample size ;</p> <p>idea about unknown validity ;</p>		<p>time for D.4 hrs increases to 92 hrs. For bm 5.2 au .</p> <p>AGAINST : some animals are anomalies . animal having bm 3.4 au the food stays 148 hrs. Some animals do not fit the trend e.g. for bm of 5.3 au . food stays only for 24 hrs. The information is only for 26 species making the sample size too small for conclusive study .</p>
<b>18.</b>	amino acids;		Amino acids
<b>i</b>	stomach;		Stomach
<b>19</b>	<p>lack of sun(light) / dark skin AW;</p> <p>lack of fish (oils) / egg (yolk) / liver;</p> <p>unbalanced diet;</p> <p>kidney / liver / digestive, disease;</p>		<p>Cause of vitamin D . deficiency is lack of exposure to sunlight , diets lacking in fish oils, egg yolk , liver etc .</p>
<b>ii</b>	<p>muscle cramps;</p> <p>soft / bent, bones / rickets;</p> <p>stunted growth;</p> <p>prone to infections;</p> <p>fatigue;</p> <p>reduced ability to absorb calcium (ions);</p>		<p>Humans show muscle cramps , bent , bones rickets , stunted growth and reduced activity</p> <p>To absorb calcium ions ,</p>
<b>b</b>	<p>lack of vitamin D leads to more cases of type 1 diabetes in mice / rats;</p> <p>there is no difference in cases / same number of cases (wrt normal mice) until after 50 days;</p> <p>at 100 days there are more cases (in vitamin D mice);</p> <p>(vitamin D mice) levels off before normal mice / levels off after 150 days;</p> <p>comparative data use ;e.g. 20% more cases at day 200 <b>or</b> at</p>		<p>For the first 50 days there are no marked differences . there is marked difference after 100 days when the number of vitamin D deficient mice having type 1 . diabetic are 62% against normal mice at 34, thereafter , the number of vitamin D . deficient mice levels off.</p>



	250 days normal mice is 46% , deficient mice is 65%;		
<b>c</b>	frequent urination; thirst / AW; hunger; fatigue; weight loss; itchy skin; wounds heal slowly / more susceptible to infection; blurred vision / AW; vomiting; glucose in urine; high blood, glucose/sugar;		Symptoms shown would be frequent urination , thirst , hunger , fatigue and weight loss. Wounds would heal slowly and the mice would have itchy skin along with blurred vision . the glucose content in urine and blood would be high .
<b>20 a</b>	1 enzymes are, biological / protein, catalysts / speed up reactions; 2 ref to specificity; 3 active site; 4 substrate / protein, fits into / AW, enzyme / active site; 5 ref to, complementary shape of molecules; 6 enzyme-substrate complex / ESC; 7 enzymes, lower energy needed for reaction; 8 enzymes are, unchanged (at end of reaction) / reused; 9 (enzymes) carry out, chemical digestion / hydrolysis / catabolic reactions; 10 break down, large / insoluble, molecules into, small(er) / soluble, molecules; 11 protein broken down to, polypeptides / peptides / amino acids; 12 pepsin, active in stomach; 13 trypsin, active in, small intestine / duodenum / ileum; <i>ref. to conditions in alimentary canal</i> 14 low pH / pH 1–3 / (hydrochloric) acid, in stomach; 15 high pH / alkaline / neutral / non-acidic / pH 7–9, in, small intestine / duodenum / ileum; 16 ref. to denaturation; 17 temperature is 37 °C; 18 ref. to successful collisions;		Enzyme are bio catalysts and breakdown larger insoluble molecules to smaller ones without undergoing change themselves. Enzymes lock on to substrate molecules forming enzyme substrate complex, and break them . in humans , protein breakdown begins in the stomach with the enzyme pepsin operating at a low pH . breakdown is completed in the small intestine with enzyme trypsin operating at high pH .



<b>b.i</b>	no enzyme to, digest / break down, lactose; lactose (molecule) is (too) large / complex; cannot pass through, (cell) membrane(s); no carrier protein for it ;		Lactose cannot be absorbed by the small intestine as the molecules are too large to pass through the cell membrane , besides , there are no carriers proteins for it .
<b>ii</b>	1 dehydration / loss of water; 2 loss of, (named) salt(s) / ions / minerals / vitamins; 3 decrease in, volume of blood / blood pressure; 4 increase in blood concentration / decrease in water potential; 5 any effect on cells ; 6 AVP; e.g. less efficient reactions / slower metabolism / kidney failure / ref to effect on brain cells / coma / death		Untreated diarrhoea leads to dehydration and loss of mineral ions. There is increases in blood concentration leading to slow metabolism , kidney failure , damage to brain cells, coma and ultimately death .
<b>21 a</b>	human / largest mammal, has the longest / bat has the shortest (small intestine); (small intestine of) rat and cat are very similar in length; comparative data, quote / calculation with units at least once; negative correlation between length and length relative to body mass;		Human intestine are longest and the insect eating bat has the shortest . the domestic cat and rat have some what similar lengths. Negative correlation between length . and length relative to body mass is observed e.g. humans having the longest intestine of 552 cm. Have the shortest length of 0.01 em . relative to body mass .
<b>b</b>	movement into / out of / through, (epithelial) cells / villi; into, capillaries; across cell membranes; by active transport; through protein carriers; against a concentration gradient; using energy;		The molecule of glucose is observed by the Villi and passes across cell membrane of cabillaries by active transport active transport take place through protein carriers which transport the molecule against concentration gradient using energy .
<b>c.i</b>	(insect-eating) bat;		Insect eating bat .
<b>ii</b>	ratios are higher in the duodenum; higher (inner) surface area (than ileum); data comparison (for any one animal); more villi; more microvilli;		The duodenum show a higher inner surface pared the inner surface area of ileum , 54, in case of insect villi are present on the wall of duodenum villi and micro villi are present on the wall of duodenum than that of ileum , hence absorption is more.



<b>d</b>	emulsification; increased surface area of fat (globules); faster, digestion / break down (of fat by enzymes); by lipase / to fatty acids and glycerol; neutralises (stomach) acid / chyme; provides alkaline medium for, pancreatic enzymes / lipase; denatures, pepsin / stomach, enzymes; AVP;		Bile
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