

CHAPTER 07

HUMAN NUTRITION

The stuff you need to know in this chapter:

7.1 Diet

Core:

- State what is meant by the term balanced diet for humans
- Explain how age, gender and activity affect the dietary needs of humans including during pregnancy and whilst breast feeding
- Describe the effects of malnutrition in relation to starvation, constipation, coronary heart disease, obesity and scurvy
- List the principal sources of, and describe the dietary importance of carbohydrates, fats, proteins, vitamins (C and D), mineral salts (calcium and iron), fibre and water

Extended:

- Explain the causes and effects of vitamin D and iron deficiencies
- Explain the causes and effects of protein-energy malnutrition, e.g. kwashiorkor and marasmus

7.2 Alimentary canal

Core:

- Define ingestion, mechanical digestion, chemical digestion, absorption, assimilation and egestion
- Describe diarrhoea as the loss of watery faeces
- Outline the treatment of diarrhoea using oral rehydration therapy
- Describe cholera as a disease caused by a bacterium
- Identify the main regions of the alimentary canal and associated organs - mouth, salivary glands, oesophagus, stomach, small intestine (duodenum and ileum), pancreas, liver, gall bladder and large intestine (colon, rectum and anus)
- Describe the functions of the regions of the alimentary canal listed above, in relation to ingestion, digestion, absorption, assimilation and egestion of food

Extended:

- Explain that the cholera bacterium produces a toxin that causes secretion of chloride ions into the small intestine, causing osmotic movement of water into the gut, causing diarrhoea, dehydration and loss of salts from the blood

7.3 Mechanical digestion

Core:

- Identify the types of human teeth (incisors, canines, premolars and molars)
- Describe the structure of human teeth, limited to enamel, dentine, pulp, nerves and cement, as well as the gums
- Describe the functions of the types of human teeth in mechanical digestion of food
- State the causes of dental decay in terms of a coating of bacteria and food on teeth, the bacteria respiring sugars in the food, producing acid which dissolves the enamel and dentine
- Describe the proper care of teeth in terms of diet and regular brushing

7.4 Chemical digestion

Core:

- State the significance of chemical digestion in the alimentary canal in producing small, soluble molecules that can be absorbed



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- State the functions of enzymes – amylase, protease, lipase
- State where, in the alimentary canal, amylase, protease, and lipase are secreted
- State the functions of the hydrochloric acid in gastric juice, limited to killing bacteria in food and giving an acid pH for enzymes

Extended:

- Describe the digestion of starch in the alimentary canal. Amylase breaking down starch to maltose, maltose broken down to maltase to glucose on the membranes of the epithelium lining of the small intestine
- Describe pepsin and trypsin as two protease enzymes that function in different parts of the alimentary canal: pepsin in the stomach, trypsin in the small intestine
- Explain the functions of hydrochloric acid in gastric juice, limited to the low pH denaturing enzymes in harmful microorganisms in food, giving optimum pH for pepsin activity
- Outline the role of bile in neutralising the acidic mixture of food and gastric juices entering the duodenum from the stomach, to provide suitable pH for enzyme action
- Outline the role of bile in emulsifying fats to increase the surface area for the chemical digestion of fat to fatty acids and glycerol by lipase

7.5 Absorption

Core:

- Identify the small intestine as the region for the absorption of digested food
- State that water is absorbed in both the small intestine and the colon, but that most absorption of water happens in the small intestine

Extended:

- Explain the significance of villi and microvilli in increasing the internal surface area of the small intestine
- Describe the structure of a villus
- Describe the roles of capillaries and lacteals in villi



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BALANCED DIET

1. Explain what is meant by the term "balanced diet" for humans

2. Complete the table below listing the components of a balanced diet as well as their function. Some boxes have been completed for you

Component/Source	Why they are important
Component: vitamins	
Source(s): vitamin C: oranges and lemons vitamin D: eggs and cheese	
Component:	
Source(s):	



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3. Look at the information about diets for the following people

Marina	Kirk	Andrea
Marina eats only fruit because doctors say fruits are good for you. She has bananas for breakfast, apples and pears for lunch, and a big mix of chopped fruit for dinner.	Kirk eats meat with dinner, but has vegetable pastas or stir-fry dishes most lunch times, and usually has a bowl of porridge for breakfast. He often drinks 3 or 4 beers in the evening	Andrea is on a "fat-free" diet to try and lose weight. She generally eats salad baguettes for lunch and for dinner she usually has meat casseroles or roast dinners with meat and vegetables. She skips breakfast to help lose weight.

a) List the people in order from the one with the healthiest diet to the one with the least healthy diet

Most healthy	←-----→	Least healthy
1.	2.	3.

b) Explain why you chose this order:



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4. Explain how the following factors may influence a person's dietary requirements. One of them has been done for you.

Job type	<hr/> <hr/> <hr/>
Age	<ul style="list-style-type: none">• Young people require energy for growth• A young child needs less than an adult because they are smaller• older people have a slower metabolism so need less energy
Breastfeeding	<hr/> <hr/> <hr/>
Pregnancy	<hr/> <hr/> <hr/>
Gender	<hr/> <hr/> <hr/>

5. Explain what is meant by the term "malnutrition".



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6. Complete the table below describing the consequences of an un-balanced diet:

Dietary imbalance	Consequence
A lack of -----	<ul style="list-style-type: none">• This aids movement of food through the alimentary canal and this becomes more difficult when this component is not present in large amounts• It leads to constipation• A possible long-term effect is colon cancer
A high intake of fat	<hr/> <hr/> <hr/> <hr/>

7. Explain how a high intake of saturated fat can result in coronary heart disease.



DEFICIENCY DISEASES

1. Explain what is meant by the term "malnutrition".

2. Complete the table summarizing the causes and results of deficiency diseases

Rickets	Caused by a lack of _____
	Symptoms: _____ _____
Scurvy	Caused by a lack of _____
	Symptoms: _____ _____
Anaemia	Caused by a lack of _____
	Symptoms: _____ _____
Kwashiorkor	Caused by a lack of _____
	Symptoms: _____ _____
Marasmus	Caused by a lack of _____
	Symptoms: _____ _____



THE ALIMENTARY CANAL

1. Make a labeled drawing of the alimentary canal.

2. List the body parts, in order, through which food passes from between the plate and the toilet



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3. Use the information sheets and summarise the role of each section of the alimentary canal and other associated organs. Summarising means you should not just copy everything down, but instead select the important information (you can copy some sentences if you want to). You should probably use bullet points.

	Function
Mouth	<hr/> <hr/>
Stomach	<hr/> <hr/>
Small Intestine	<hr/> <hr/>
Large Intestine	<hr/> <hr/>
Gall Bladder	<hr/> <hr/>
Pancreas	<hr/> <hr/>
Liver	<hr/> <hr/>



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4. Define the following terms relating to digestion:

Ingestion	<hr/> <hr/> <hr/>
Mechanical Digestion	<hr/> <hr/> <hr/>
Chemical Digestion	<hr/> <hr/> <hr/>
Absorption	<hr/> <hr/> <hr/>
Assimilation	<hr/> <hr/> <hr/>
Egestion	<hr/> <hr/> <hr/>

5. Describe what is meant by "diarrhea"



CHEMICAL DIGESTION

1. Complete the sentences about chemical digestion

Chemical digestion in the alimentary canal involves producing small, _____ molecules that can be _____

Chemical digestion involves the use of _____ to catalyse the breakdown of larger molecules.

2. Complete the table below summarizing some of the main enzymes involved in chemical digestion

Enzyme	Where enzyme is secreted in the alimentary canal	Molecule broken down	Product
			Amino acids
		Lipids	
Amylase			Simpler sugars



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3. Fill in the blanks in the following sentences:

Starch:

Starch is first broken down in _____ by the enzyme _____, producing maltose. Maltose is then broken down to _____ with the help of the enzyme _____, a break-down which takes place on the membranes of the _____ lining of the small intestine.

Protein:

_____ and _____ are examples of protease enzymes, though they work in different parts of the alimentary canal. _____ works in the stomach, but _____ works in the small intestine.

Stomach acid

_____ acid is found in gastric juice in the stomach. It has two main functions: firstly, it kills _____ by denaturing the _____ present in the microorganisms. Secondly, it lowers the _____, creating ideal conditions for the enzyme _____ to work.



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4. Bile is secreted by the liver. Outline the following uses of bile:

Neutralisation

Emulsification



CHOLERA

1. Cholera is a bacterium cell. Choose a word that best describes the cell:

- A. Prokaryote
- B. Eukaryote
- C. Fungi
- D. Virus

2. What effect does Cholera have on the small intestine?

- A. It causes causes chlorine ions to precipitate as a solid in the small intestine
- B. It causes an increase in the secretion of chloride ions in the small intestine
- C. It causes a decrease in the secretion of chloride ions in the small intestine
- D. It causes the Choleronius virus to multiply and secrete chlorine ions into the small intestine

3. Which of the following happen as a result of your answer to question 2? (You may select one or more than one)

- A. Diarrhoea
- B. Dehydration
- C. Loss of salts from the blood
- D. A net movement of water out of the small intestine to the blood

4. Explain how cholera causes the effect(s) stated in question 3:



MECHANICAL DIGESTION

1. Define mechanical digestion

2. Draw a simple sketch of a mouth below, labeling incisors, canines, premolars and molars.

3. State the function of teeth:

Teeth	Function
Canines	<hr/> <hr/>
Incisors	<hr/> <hr/>
Premolars	<hr/> <hr/>
Molars	<hr/> <hr/>



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4. Draw a labeled sketch of a single tooth, with the following things labeled: enamel, dentine, pulp, nerves, cement.

5. Describe how bacteria cause tooth decay. Use as much detail as you can.
(Your answer should include reference to the bacteria respiring).

6. Describe how to keep your teeth healthy in terms of your diet.

7. Describe how to keep a high standard of dental hygiene

