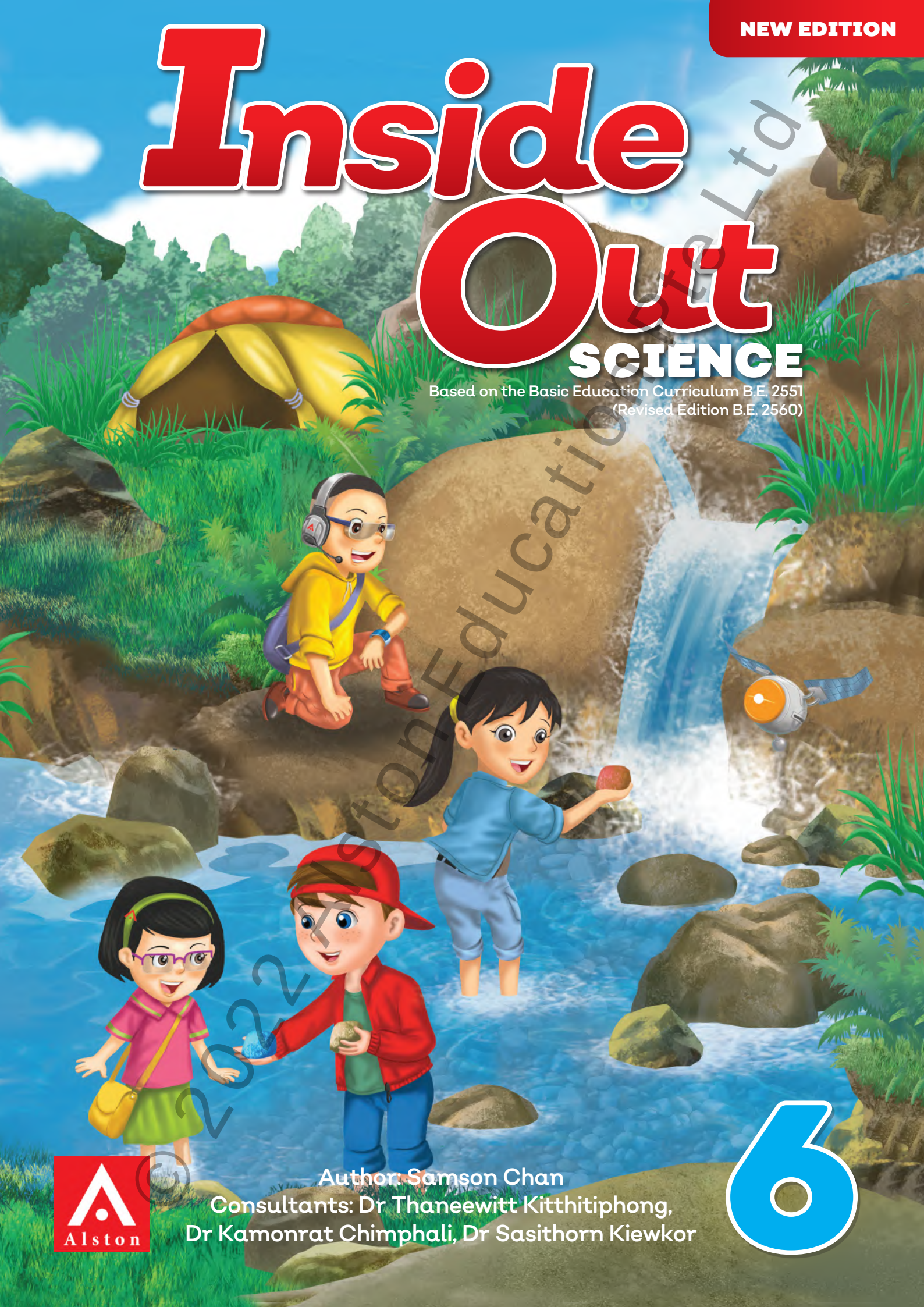
NEW EDITION

Inside Out

SCIENCE

Based on the Basic Education Curriculum B.E. 2551
(Revised Edition B.E. 2560)



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CONTENTS

Scan this for **Learners' Glossary** in Thai!

This series covers the learning objectives of the **Basic Education Curriculum B.E. 2551 (Revised Edition B.E. 2560)** in Thailand. The following table shows how the chapters in this book are aligned with the strands.

Strand 1		**Standards**
Strand 1.2	1.	Analyze types of nutrients and their benefits from own dietary intakes.
	2.	Discuss and analyze nutrient requirements in appropriate proportions considering gender, age and its effects on health.
	3.	Recognise the importance of nutrients by choosing diets with appropriate proportions of nutrients according to gender, age and its effects on health.
	4.	Create a model for digestive system and describe the functions of the organs in the digestive tract as well as explain digestion and nutrient uptake.
	5.	Recognise the importance of the digestive system and describe ways to maintain it to function properly.
Strand 2		**Standards**
Strand 2.1	1.	Gather evidence to explain and compare the separations of mixtures by picking, sifting, using magnets, pouring, filtering and precipitating and identify ways to solve problems in daily life that involve using methods to separate mixtures.
Strand 2.2	1.	Gather evidence to explain the formation and effects of electrical forces that result from rubbing objects together.
Strand 2.3	1.	Gather evidence to identify components of a simple electrical circuit and explain their functions.
	2.	Draw and connect simple electrical circuits.
	3.	Design and conduct an experiment to explain a series connection of cells and its results.
	4.	Recognise the importance of a series connection of cells and discuss its benefits to apply in daily life.
	5.	Design and conduct an experiment to explain connections of light bulbs in series and parallel.
	6.	Recognise the importance of connections of light bulbs in series and parallel and discuss their benefits, limitations and application in daily life.
	7.	Gather evidence to explain the formation of shadows.
	8.	Draw a diagram to show the path of light rays that form umbra and penumbra.
Strand 3		**Standards**
Strand 3.1	1.	Create a model to explain and compare the formation of solar and lunar eclipses.
	2.	Gather information to explain development of space technology and exemplify the use of space technology in daily life.
Strand 3.2	1.	Compare and contrast the formation of igneous, sedimentary, and metamorphic rocks and use model to explain the rock cycle.
	2.	Gather information to describe and exemplify the uses of rocks and minerals in daily life.
	3.	Create a model to explain the formation of fossils and estimate the environments in which organisms found in fossils lived long ago.
	4.	Use models to compare the formation of land breeze, sea breeze and monsoon and explain their effects to living things and environments.
	5.	Gather evidence to explain the effects of monsoon to seasons in Thailand.
	6.	Describe the characteristics and effects of floods, coastal erosions, landslides, earthquakes and tsunamis.
	7.	Recognise the effects of natural disasters by suggesting ways to stay alert and stay safe from disasters that may occur in local areas.
	8.	Create models to explain the greenhouse effect and its impacts on living things.
	9.	Recognise impacts of the greenhouse effect by suggesting ways or activities to reduce greenhouse gases.

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CHAPTER

1

Nutrition and Digestion

I will be able to:

- **identify** the different types of nutrients
- **describe** the benefits of each type of nutrients
- **understand** that gender, age, and activity level affect the amount of nutrients a person needs
- **identify** food additives found in different foods
- **identify** the organs of the digestive system and explain their functions
- **give** examples of how we can take care of our organs in our digestive system

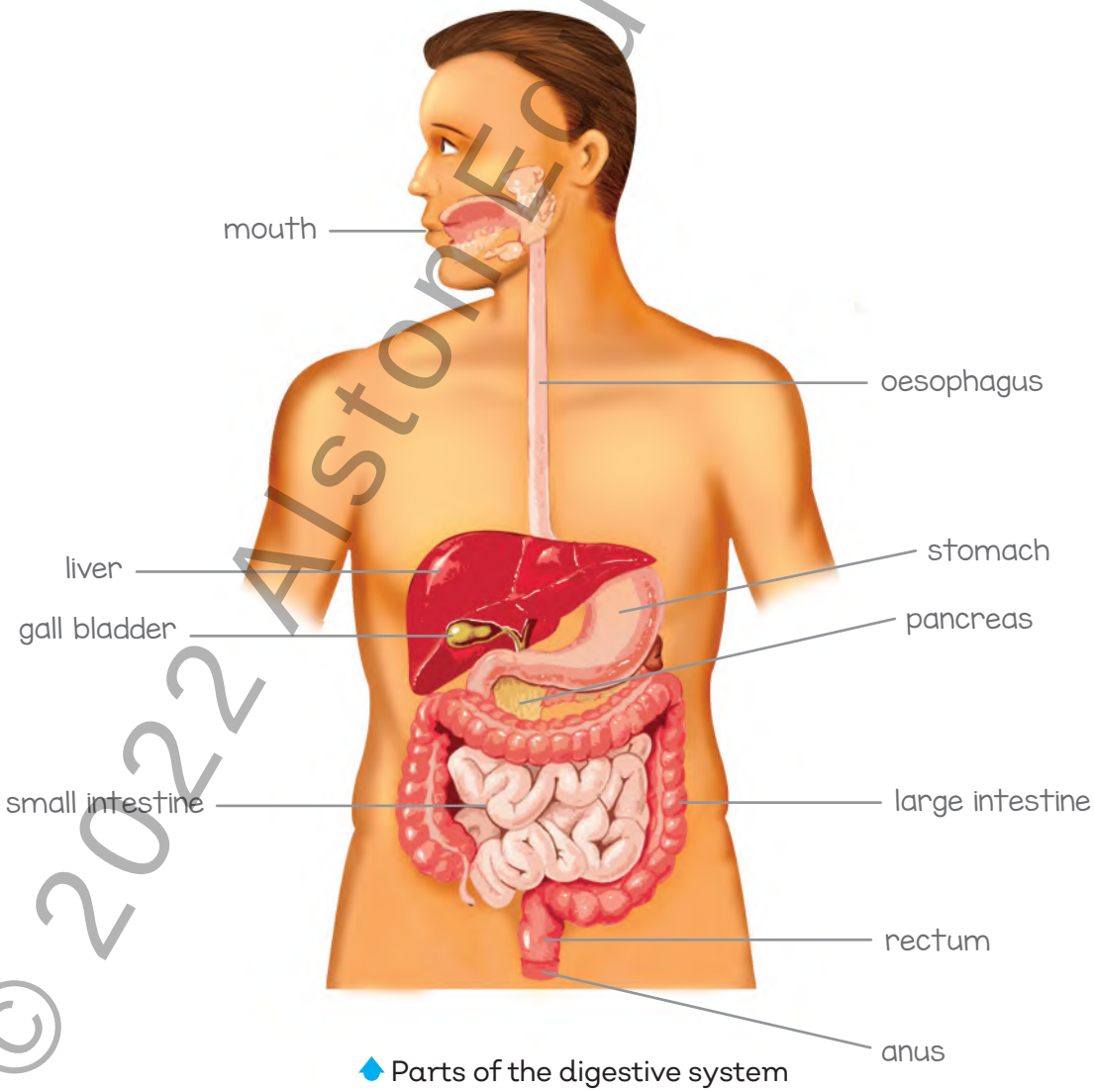
How Do We Digest the Food We Eat?

Carbohydrates, proteins, and fats in food are too big to be used by the body. They are broken down during a process called digestion. Digested nutrients can be used by the body to produce energy, or to grow and repair parts of the body.

Digestion breaks down food so that nutrients in the food can be absorbed by the body.

Water, vitamins, and minerals do not need to be digested. They can be easily absorbed by the body.

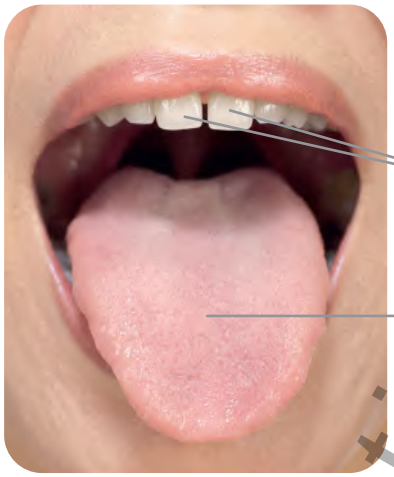
The digestive system of the human body is a group of organs that work together to break down food and to remove undigested food.



Parts of the digestive system

Mouth

Digestion begins in the mouth. Food is mixed with saliva. Saliva contains an **enzyme** that digests starch into glucose (sugar). The teeth grind food into small pieces. The tongue helps mix food with saliva. It also helps push the food into the oesophagus.



Recall Box

How do plants store glucose (sugar) produced during photosynthesis?

Oesophagus

The oesophagus is a long muscular tube that pushes the chewed food from the mouth down to the stomach.

Stomach

Stomach muscles help mix the food with gastric juice and stomach acid. The gastric juice is produced in the stomach. It contains an enzyme that digests proteins. Stomach acid helps the enzyme work. It also kills germs in the food. Food stays in the stomach for about three to four hours before entering the small intestine.

LEARNERS' GLOSSARY

Enzyme: a type of protein that speeds up chemical reactions

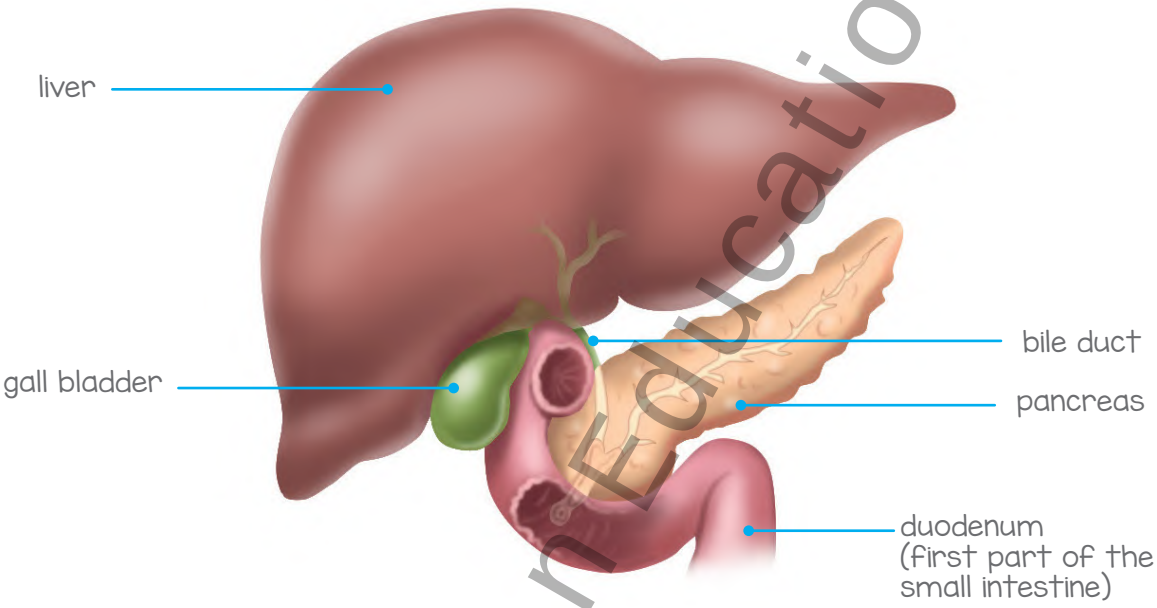
Liver

The liver produces bile, which is a greenish-yellow fluid. It breaks up fats into small droplets. This helps speed up the digestion of fats.

The liver also has many functions. It stores vitamins A, B, and D. It also stores minerals such as iron. It also turns **toxins** into harmless substances.

Gall bladder

Bile is stored in the gall bladder.



The bile duct is a tube that carries bile from the gall bladder to the small intestine.

Pancreas

The pancreas produces pancreatic juice which contains a mixture of enzymes that digests carbohydrates, proteins, and fats.

LEARNERS' GLOSSARY

Toxin: a harmful substance

Small intestine

In the small intestine, the food is mixed with bile, pancreatic juice, and intestinal juice. Intestinal juice from the small intestine contains enzymes that digest carbohydrates, proteins, and fats.

Digested nutrients move out of the small intestine and enter the blood. Vitamins and minerals in the small intestine are also absorbed into the blood. Nutrients are brought to the liver where they are stored or sent to different parts of the body that need them.

The small intestine is very long and narrow. This allows time for the nutrients to be digested and absorbed into the blood.

Let's Learn More

When stretched out, an adult's small intestine is about 6 metres long!

Large intestine

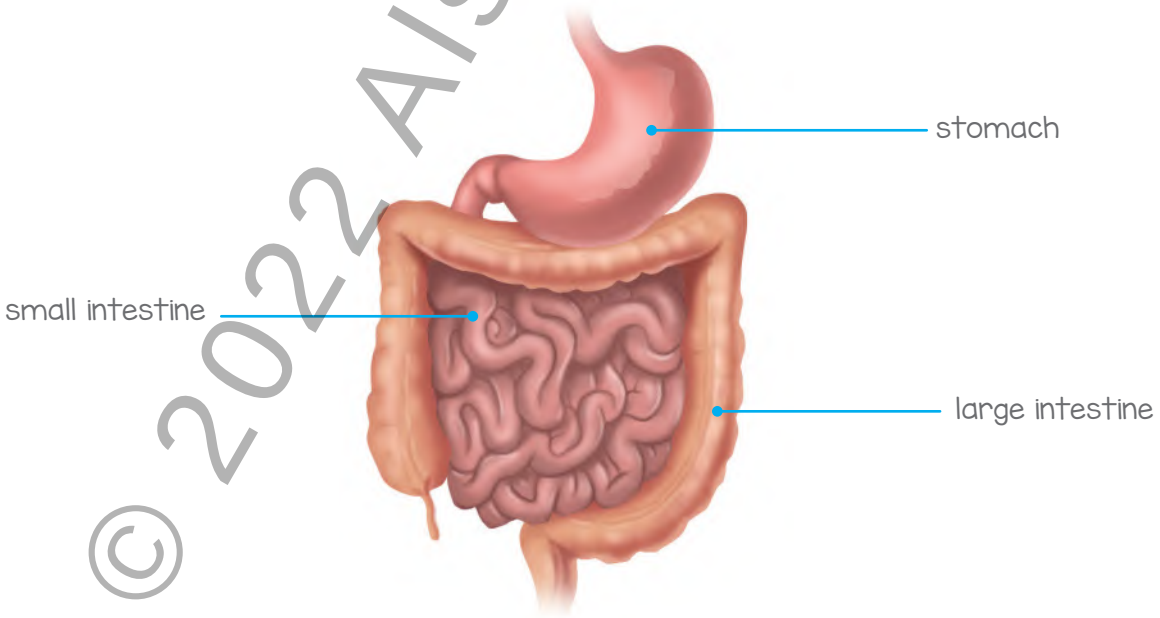
Undigested food enters the large intestine.
The large intestine absorbs water and minerals from the undigested food.

Rectum

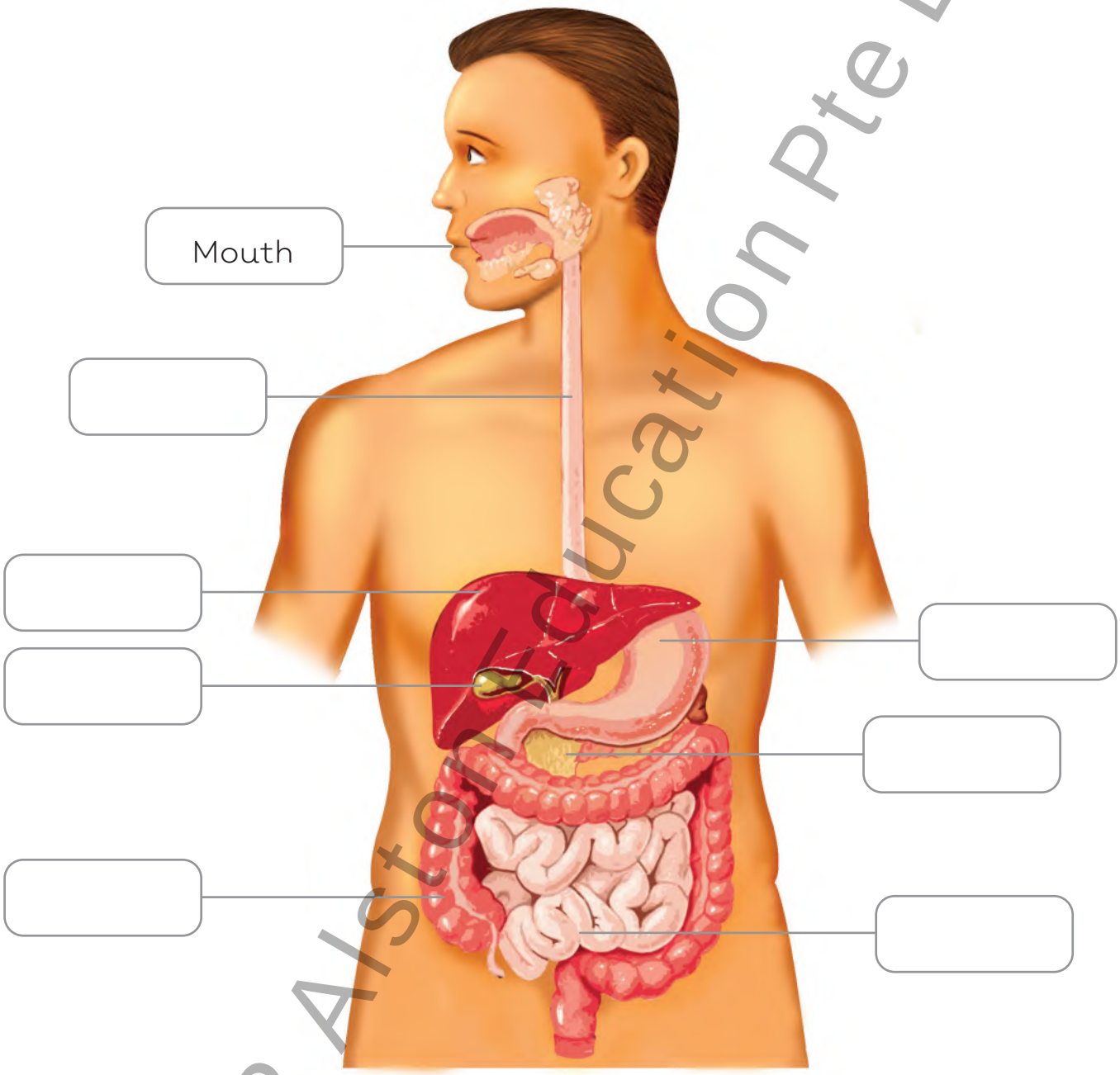
Undigested food hardens and become faeces, which are stored in the rectum.

Anus

Faeces are pushed out of the body through the anus.

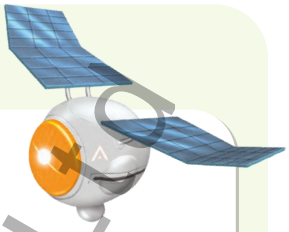


Label the parts of the digestive system. One has been done for you.



Go To WB Exercise 4

STEM Activity



Medicines help us get better when we fall sick. But when some medicines dissolve in stomach acid, they can cause stomach pain. To prevent this, engineers coat pills with substances that can protect the pills from acids.

Create a coating that can protect a candy from dissolving in acid.

Plan

a What do you need to make your coated candy?

Design

b How did you coat your candy? Write down or draw the steps to coat the candy.

Test

c Fill half of a cup with white vinegar. Drop an uncoated candy into the cup. Stir the candy in the cup.

How long did it take for the uncoated candy to dissolve?

Fill half of another cup with white vinegar. Drop your coated candy into the cup. Stir the candy in the cup.

How long did it take for the coated candy to dissolve?

Improve

d Improve your coated candy such that it takes a longer time to dissolve in the vinegar. Redraw your design.

e Fill half of another cup with white vinegar. Drop your improved coated candy into the cup. Stir the candy in the cup.

How long did it take for your improved coated candy to dissolve?

Fill in the blanks with the words provided in the box below.

carbohydrates	proteins	fats	aspartame
stomach	large intestine	small intestine	sulphur dioxide
minerals	vitamins	liver	pancreas

1. Fibre is a type of _____ that is not digested by the human body.

2. When we do not take in enough carbohydrates and fats, our body can use _____ as another source of energy.

3. Food preservatives such as _____ allow food to be stored for a longer time without going bad.

4. The _____ produces bile which helps in the digestion of fats in the small intestine.

5. The acid in the _____ helps to kill germs in the food.

6 The table below shows some information about Ann, Ben, Clare, and Danny.

	Gender	Age	Time spent jogging daily
Ann	Female	20	20 minutes
Ben	Male	50	15 minutes
Clare	Female	20	2 hours
Danny	Male	18	2 hours and 30 minutes

a Who may need the highest daily energy requirement?
Give two reasons for your answer.

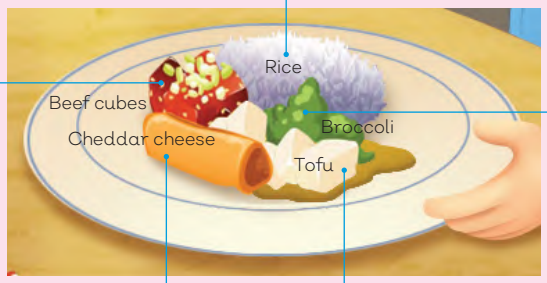
b Who may need the least daily energy requirement?
Give two reasons for your answer.

c The children need to keep their bones strong and healthy.

i What vitamin do they need?

ii What mineral do they need?

7 The picture below shows a dinner plate filled with food.



a Label the different types of nutrients in the food on the dinner plate. Use the helping words below.

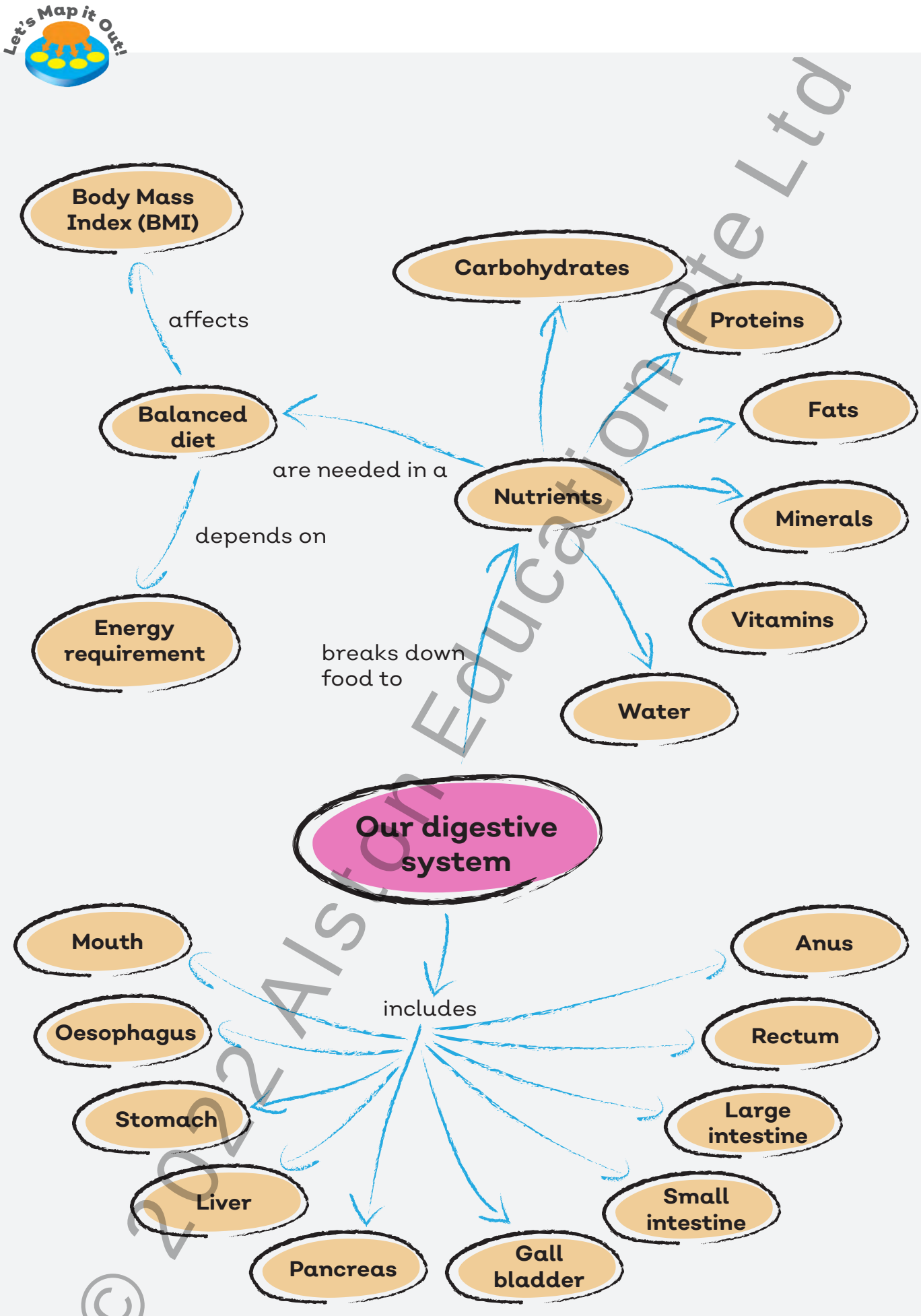
Carbohydrates | Proteins | Fats | Vitamins | Minerals

b What happens to the nutrients in food after they are digested in the small intestine?

c The liver produces a substance that helps speed up the digestion of fats in the body digestive system. Name this substance.

d Vegetables can contain fibre which cannot be digested by the body. How does the body remove the fibre in the vegetables that we eat?

Go To WB Mastery Practice



CHAPTER 1

Nutrition and Digestion

Let's Review

Types of nutrients

Carbohydrates

- Main source of energy
- Main types: Sugar and starch
- Rice, potatoes, bread, and noodles are high in starch
- Excess carbohydrates in the body are stored as fats
- Fibre is a carbohydrate:
  - Cannot be broken down by the body
  - Is passed out of the body
  - Prevents constipation
  - Fruits and vegetables are rich in fibre


potato


rice


bread

Fats

- Another source of energy
- Layers of fats in our skin keep us warm
- Act as a cushion to protect body organs from injury


butter


Cheese

Proteins

- For growth and repair
- To build muscles
- Can be used to produce energy if the body lacks carbohydrates and fats


potato


rice

Water

- Makes up 70% of the human body
- Needed by the body to transport nutrients to different parts of the body
- Helps to remove waste from the body
- Important part of sweat that helps to cool down the body
- We need to drink 2 litres of water every day

3 Food Additives and Preservatives

Fill in the blanks.

1. Most soft drinks contain _____ which is a food flavouring.

2. Food _____ give canned fruits their colours.

3. Dried fruits are able to last a long time without going bad. This is because _____, such as sulphur dioxide, are added to dried fruits.

Objective questions

Write down the correct answers.

1 _____ are our main source of energy.

- A Carbohydrates
- B Proteins
- C Minerals
- D Vitamins

2 To build muscles, we should take in more _____.

- A carbohydrates
- B proteins
- C minerals
- D vitamins

3 What of the following is **not** a food additive?

- A Monosodium glutamate
- B Calcium
- C Aspartame
- D Sulphur dioxide

4 Where does digestion start in the human body?

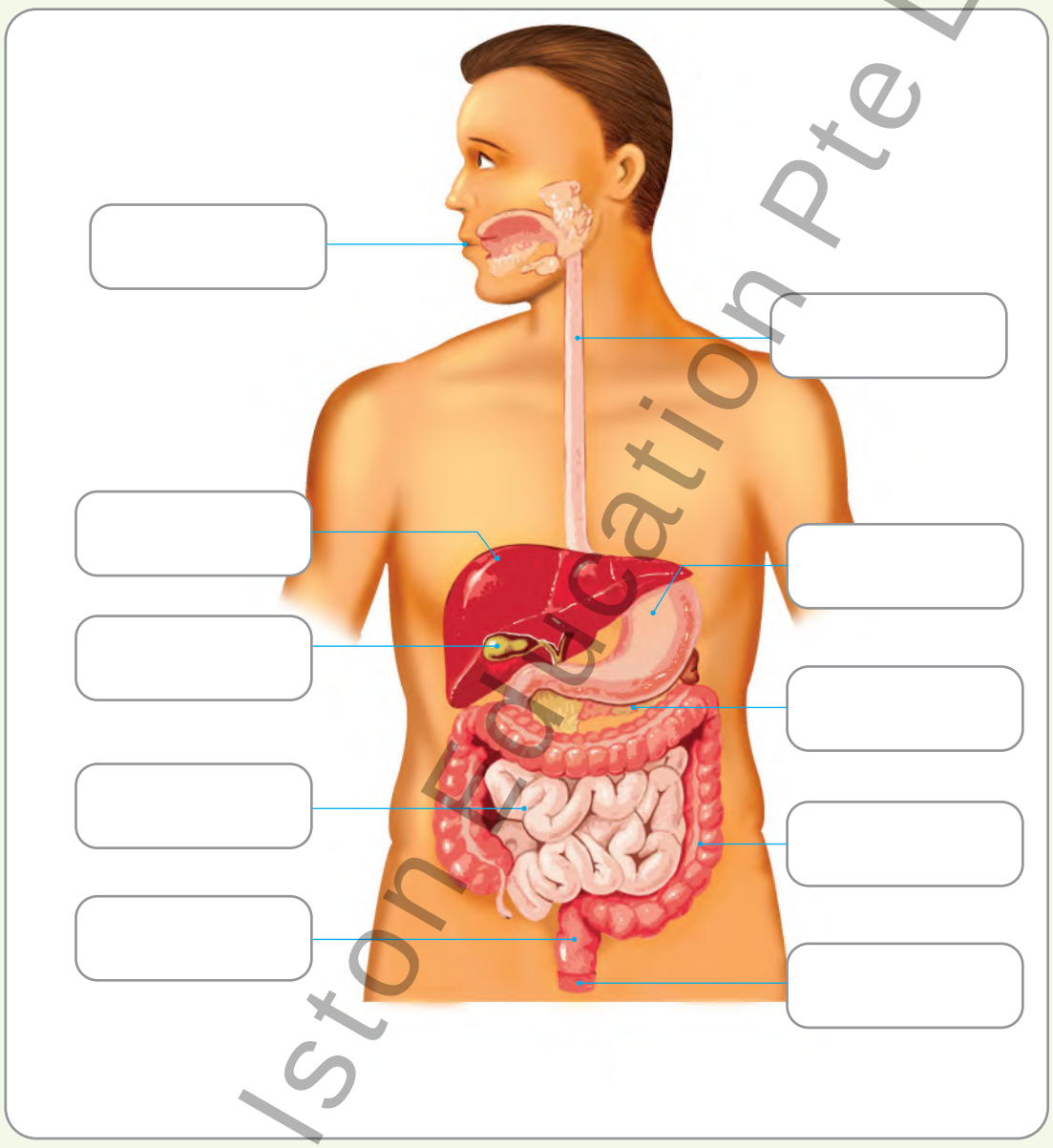
- A Mouth
- B Liver
- C Stomach
- D Large intestine

5 What is the function of bile in the digestion process?

- A It helps to break carbohydrates into smaller droplets.
- B It helps to break proteins into smaller droplets.
- C It helps to break fats into smaller droplets.
- D It helps to break vitamins into smaller droplets.

Subjective questions

19 Study the diagram of the human digestive system below and answer the questions that follow.



a In the diagram above, label the parts of the digestive system.

b What is the function of the large intestine?

_____

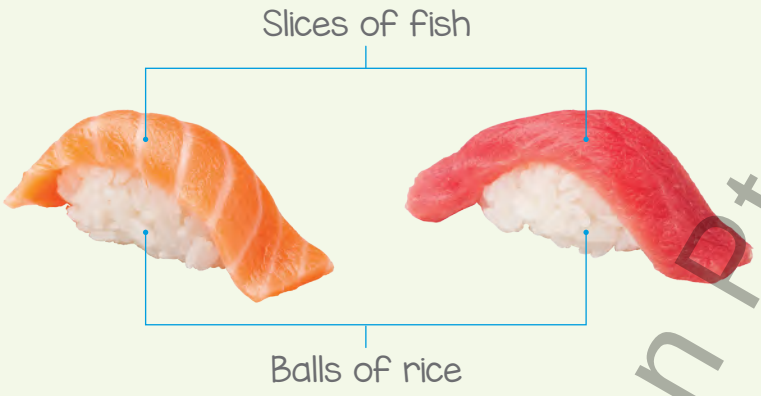
_____

c How do the teeth help in digestion?

_____

_____

21 Helen ate some sushi for lunch. A piece of sushi is made of a slice of raw fish and a ball of rice.



a What nutrient(s) are found in the following?

i Slices of fish

_____

ii Balls of rice

_____

b Explain how the nutrients in **a i** and **a ii** are important for the body.

_____

_____

_____

_____

c What else should Helen eat or drink for lunch to make her meal a balanced meal?

_____

_____

Challenge Yourself

Process skills: Inferring, Predicting

1 Chan carries out an experiment to find out how the size of food pieces affects digestion. He prepares two experimental set-ups, A and B, as shown below.

Set-up A

50 ml of vinegar
A whole gummy sweet

Set-up B

50 ml of vinegar
A gummy sweet cut into quarters

He records the time taken for the gummy sweet to dissolve in the table below.

	Set-up A	Set-up B
Time taken for the gummy sweet to dissove (min)	60	25

a What can you conclude from Chan's observations?

_____

_____

b What does this experiment tell you about the size of food pieces and the rate of digestion?

_____

_____

c Chan cuts the gummy sweet into halves and places them in 50 ml of vinegar. Predict how long it will take the gummy sweet to dissolve completely.

_____

Test 3

100

Objective questions [60 marks]

Write down the correct answers. Each question is 2 marks.

1 A breeze blows from the sea towards the land. What is the name of the breeze?

A Land breeze
B Sea breeze
C Sea-land breeze
D Land-sea breeze

2 During the day, hot air rises from the _____ and cold air above the _____ rushes in to replace the rising hot air.

A land; sea
B sea; land
C clouds; land
D sea; clouds

3 Which of the following is true about the land breeze?

A Sea cools down faster than land
B Blows from the sea to land
C Land cools down faster than sea
D Blows from the sea to the sky

4 Which of the following is an effect of monsoons?

A Coastal erosion
B Earthquake
C Flooding
D Tsunami

5 What is similar between a wet and dry monsoon?

A Brings heavy rain to the country
B Strong wind blows from sea to land
C Caused by the temperature difference between the land and the sea
D Both types of monsoon cause flooding

Subjective questions [40 marks]

Write down the correct answers.

31 Air heats a box of soil and a box of water to exactly 30 °C. They were then placed in a dark room. Their temperatures were measured at two timings.

Time (minutes)	Temperature of soil	Temperature of water
0	30°C	30°C
20	?	?

a Which is likely to have a cooler temperature after 20 minutes? [1]

b Describe how a dry monsoon is formed. [3]

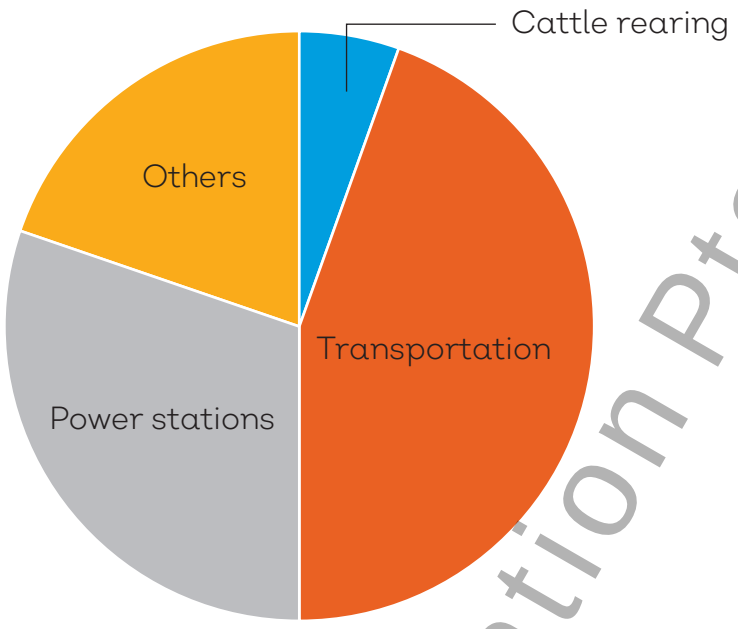
c What is a gale? [1]

32 a What monsoon season takes place between mid-October to mid-February? [1]

b Describe the weather in most parts of Thailand during the season mentioned in a. [2]

c State two harmful effects of monsoon winds. [2]

37 The chart below shows the amount of greenhouse gases that are released from different sectors in Country X.



a From the chart, which sector produces the most amount of greenhouse gases? [1]

b Name one of the greenhouse gases produced by the sector stated in a. [1]

c Explain the source of greenhouse gases in the sector stated in a. [2]

d Explain how cattle rearing contributes to the release of greenhouse gases. [2]

38 A scientist fills three bottles, each with a specific type of gas. Bottle A is filled with oxygen. Bottle B is filled with carbon dioxide. Bottle C is filled with methane. He then places the three bottles in front of a heater.

a Which bottle is most likely to have the highest temperature after 1 hour? Explain your answer. [2]

_____

_____

b State a source of methane gas. [1]

_____

_____

c Suggest two ways we can reduce the amount of greenhouse gases released into the air. [2]

_____

_____