CONTENTS

2 Feeding and Digestion

aims

In this chapter you need to learn:

1. The six constituents of a balanced diet and the source and function of each constituent.
2. The food pyramid.
3. Mandatory experiments to test for (a) starch (b) reducing sugars (c) protein (d) fat.
4. Mandatory experiment: Investigate the conversion of chemical energy in food to heat energy.
5. The processes involved in human nutrition.
6. The digestive system.
7. Enzymes.
8. Mandatory experiment: To investigate the action of amylase on starch.
9. Types of teeth and their structure.

All living things need food for energy, growth and repair, movement and protection from disease.

key point

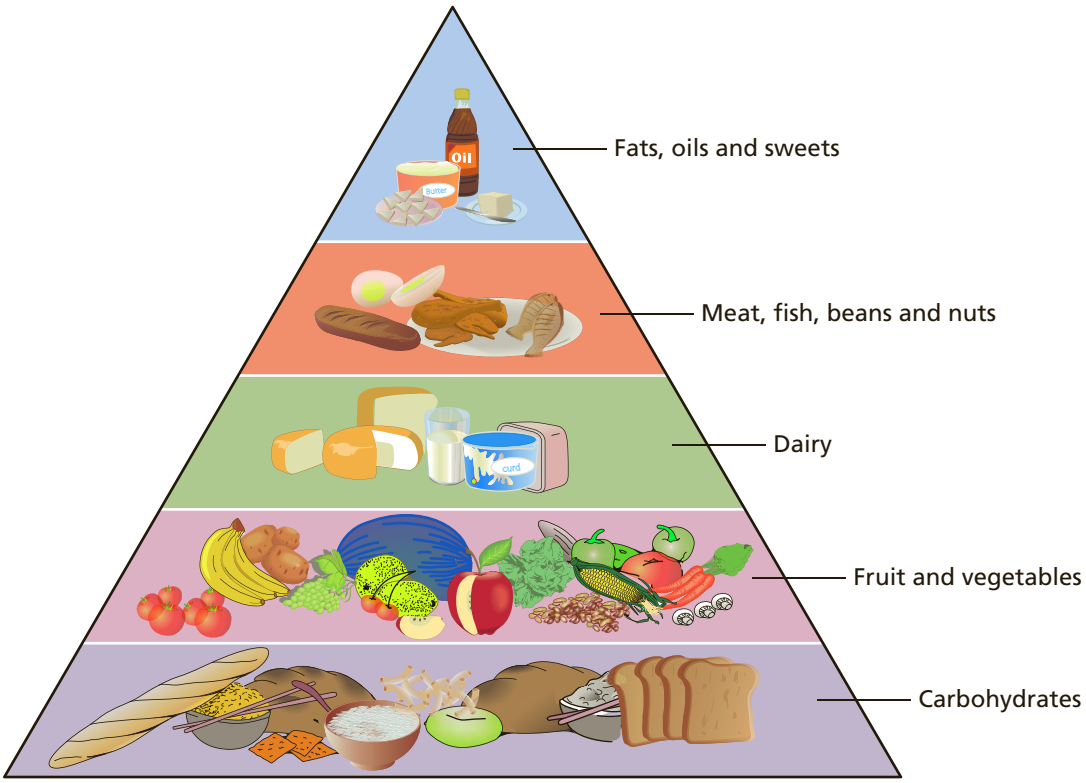
A **balanced diet** contains the right amount of the food types essential for healthy living.

Balanced diet

In order to stay healthy, humans need a balanced diet. A balanced diet contains six constituents: carbohydrates (including fibre), fats, proteins, vitamins, minerals and water.

Type	Source	Function
Carbohydrate	Bread, potatoes and sugar	Quick release of energy
Protein	Meat, fish and vegetables	Growth and repair
Fat	Butter, oils and margarine	Slow release of energy
Vitamins	Vitamin C from oranges Vitamin D from milk	Vitamin C for healthy skin and gums Vitamin D for strong bones and teeth
Minerals	Calcium from milk and eggs Iron from spinach and liver	Calcium for strong bones and teeth Iron for making red blood cells
Water	Drinks and vegetables	Prevents dehydration
Fibre	Cereals and vegetables	Prevents constipation

The food pyramid



Level	Quantity eaten	Examples
Top	Smallest	Fats, sugars and confectionary
Second	Small	Meat, fish, beans and nuts
Third	Medium	Milk, butter, cheese and milk products
Fourth	Large	Fruit and vegetables
Bottom	Largest	Bread, pasta, cereals, rice and potatoes

exam focus

Mandatory experiments

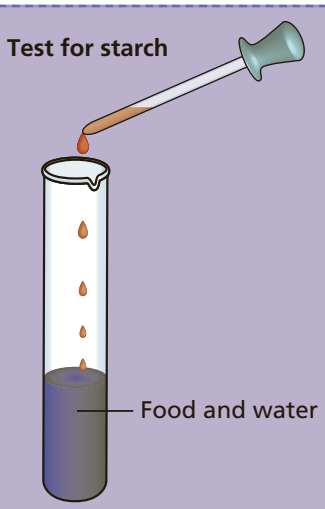
(a) To test for starch

Procedure

1. Add some water to the food and mash it up into a paste.
2. Add iodine to the food.

Result

The food turns blue-black in colour.



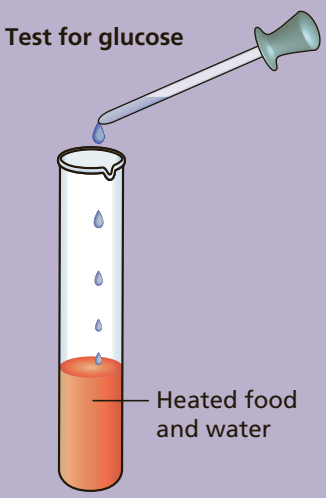
(b) To test for reducing sugars

Procedure

1. Add some water to the food and mash it up into a paste.
2. Add Benedict's solution to the food.
3. Heat gently in a water bath.

Result

The food turns green and then orange-red.



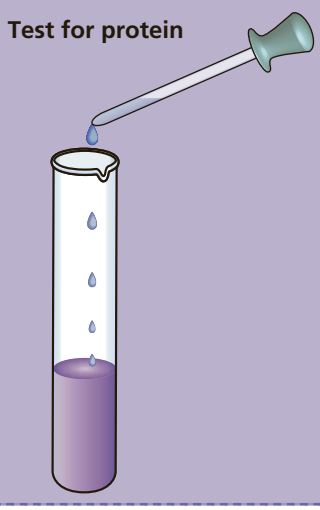
(c) To test for proteins (Biuret test)

Procedure

1. Add some water to the food and mash it up into a paste.
2. Add some 10 per cent sodium hydroxide solution.
3. Add some drops of copper (II) sulphate solution.
4. Heat gently.

Result

The food turns violet in colour.



Sample questions and answers

1. *Tests were carried out on three foods by a pupil in a school laboratory. The results are given in the table below. A + sign means a positive test and a – means a negative test. (Junior Cert 2006, Q3a (iii))*

Food tested	Food tests			
	Starch	Reducing sugar	Protein	Fat
Food A	+	–	–	+
Food B	–	–	+	+
Food C	+	–	+	+

(a) *Which of the foods A, B or C would most likely be cheese, meat or fish?*

Answer

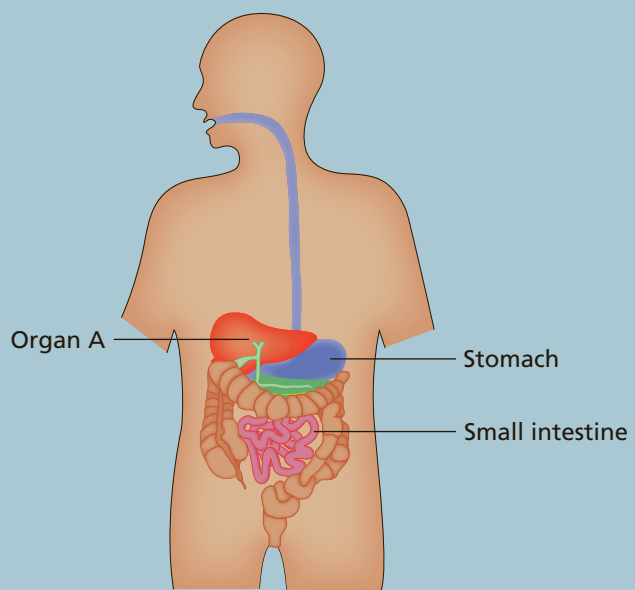
Food B: Cheese, meat and fish contain protein and fat.

(b) *Which of the foods A, B or C would most likely be crisps or chips?*

Answer

Food A: Crisps and chips contain starch and fat.

2. *The diagram shows the human digestive system. (Junior Cert 2007, Q2b)*



24 Speed, Velocity and Acceleration

aims

In this chapter you need to learn:

1. The difference between speed and velocity.
2. The definitions of speed, velocity and acceleration.
3. How to draw and use distance/time graphs and velocity/time graphs.

Speed

The world's fastest athletes can run 100 m in less than 10 seconds. The average speed of the athlete is found by dividing the distance travelled by the time taken.

$$\text{speed} = \frac{\text{distance}}{\text{time}} = \frac{100\text{ m}}{10\text{ s}} = 10\text{ m/s (or } 10\text{ m s}^{-1}\text{)}$$

key point

Speed is the rate of change of distance with time.

HL Velocity

Like speed, velocity is measured in metres per second (m/s or m s^{-1}). It tells us the speed that something is travelling at, but it also tells us the direction in which it is travelling. For example, an athlete is running with a velocity of 17 m s^{-1} due south.

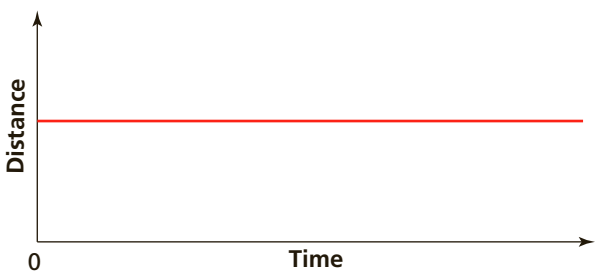
key point

Velocity is speed in a given direction.

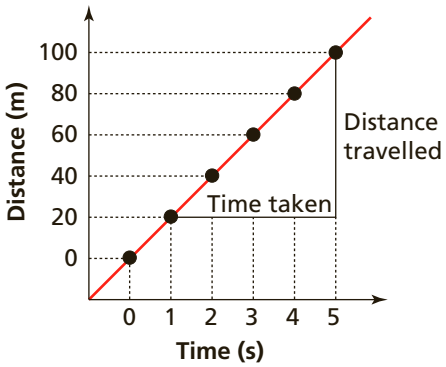
Distance/time graphs

Distance/time graphs are used to calculate velocity.

When an object is **stationary**, the distance travelled does not change with time. Therefore, velocity = 0 m s^{-1}.



Time (s)	0	1	2	3	4	5
Distance (m)	0	20	40	60	80	100



When an object is moving at **constant velocity**, the speed remains the same.

$$\text{velocity} = \frac{\text{distance}}{\text{time}} = \frac{100\text{ m}}{5\text{ s}} = 20\text{ m s}^{-1}\text{ (or 20 m/s)}$$

Acceleration

$$\text{acceleration} = \frac{\text{change in velocity}}{\text{time taken}}$$

When an object increases its velocity, it is accelerating. When it decreases its velocity, it is decelerating.

key point

Acceleration is the change in velocity divided by the time taken.

Example

A car takes 10 seconds to change its velocity from 20 m s^{-1} to 50 m s^{-1}. What is its acceleration?

$$\text{acceleration} = \frac{\text{change in velocity}}{\text{time taken}} = \frac{50\text{ m s}^{-1} - 20\text{ m s}^{-1}}{10\text{ s}} = \frac{30\text{ m s}^{-1}}{10\text{ s}} = 3\text{ m s}^{-2}$$

We say that the car has an acceleration of 3 metres per second per second (3 m/s/s). This is usually written as 3 m/s^2 or as 3 m s^{-2}.

Example

A car starts from rest with a constant acceleration of 5 m s^{-2}. How long will it take to reach a speed of 30 m s^{-1}?

$$\text{acceleration} = \frac{\text{change in velocity}}{\text{time taken}}$$

$$5\text{ m s}^{-2} = \frac{30\text{ m s}^{-1} - 0}{t}$$

$$t = \frac{30\text{ m s}^{-1}}{5\text{ m s}^{-2}} = 6\text{ seconds}$$

Velocity/time graphs are used to calculate acceleration.

Time (s)	0	1	2	3	4	5
Velocity (m/s)	0	5	10	15	20	25