

# FOOD and DIGESTION



Name

ANSWERS

Your task by completing this booklet is :

- To provide a set of notes to back up your knowledge and skills on this topic
- Evaluate - review your work and highlight areas in which you may need to improve
- Assess other pupils work and make positive comments to help them

Nutritional Composition : Fresh Whole Milk ( per 100g )	
Energy	272 kJ
Carbohydrate	4.7 g
Fat	4.8 g
Protein	3.3 g
Fibre	Nil
Sodium	50 mg
Vitamin C	1.5 mg



How much protein is there in 100 g of milk ?

3.3 g

How much energy is there in a glass (200ml) of milk ?

544 kJ

How much milk do you need to drink to get the Recommended Daily Allowance (RDA) of vitamin C (30mg) ?

2000 ml  
or 2 L

Calculate what volume of milk will take you over the daily limit of 6g ?

400 000 ml  
or 400 L

What nutrient is not listed ?

Water

What is in the table that is NOT a nutrient ?

Fibre

## Summary of Food & Digestion also BBC Bitesize KS3 online and SAM Learning

We need to eat a wide variety of foods to provide our bodies with all the substances that are needed. When we do this, we are said to have a **balanced diet**.

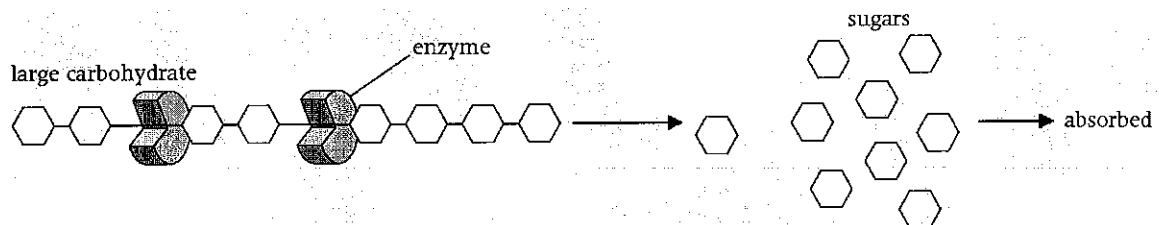
Substance needed	Examples	Why it's needed	Good sources
carbohydrate	starch, sugars	for respiration to release energy	pasta, bread
protein		for growth and repair	meat, beans
vitamins	vitamin C	for health	fruits and vegetables - oranges contain a lot vitamin C
minerals	calcium	for health	fruits, vegetables and dairy products - milk contains a lot of calcium
fibre		for health; helps to keep our intestines clean stop them getting blocked up (constipation)	wholemeal bread
water		for health; water is important solvent in the body	All foods

We can do tests to find out which substances are in foods. For example, starch makes iodine solution go a blue-black colour.

**Nutrition information** labels on foods tell us what the food contains. The labels also tell us how much chemical energy is stored in the food. The amount of energy is measured in **kilojoules (kJ)**.

Eating too much of some foods can cause problems. Too much fat may cause **heart disease**.

To make use of the food, our bodies need to break it up into smaller sized molecules. This is called **digestion**. Digestion turns large **insoluble** substances into small **soluble** ones. The organs of the **digestive system** help us digest food. Many of



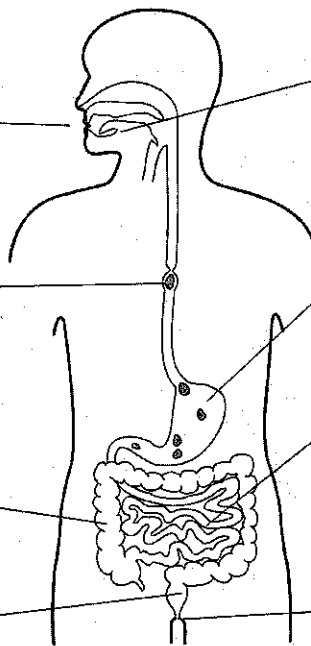
them produce **enzymes** (chemicals that break up food).

Putting food in the **mouth** is called feeding or **ingestion**. The teeth grind up the food and mix it with a **digestive juice** called **saliva**. Digestive juices contain **enzymes**.

Food is swallowed down the **gullet** (or **food pipe**). The muscles above the swallowed food get smaller (they **contract**) pushing the food down.

The **large intestine** removes water from the food that cannot be digested.

Food that cannot be digested forms **faeces**. Faeces are stored in the **rectum**.



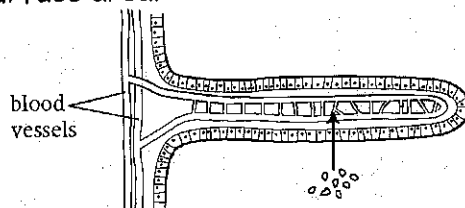
Saliva is produced by the salivary glands. Saliva breaks down starch into sugar.

In the **stomach**, strong acid is added to the food and more digestive juices are added to break down proteins into amino acids.

In the **small intestine** more digestive juices are added. Carbohydrates are digested into sugars. Sugars and amino acids are small and so can be taken into the blood stream in the small intestine. The food substances are **absorbed**.

Faeces are eventually pushed out of the **anus**. This is called elimination or **egestion**.

To help absorb the digested food, the small intestine is covered with villi. These increase the surface area.



The digested food substances are carried around the body in the **blood**. The blood travels through **blood vessels**. **Arteries** carry blood away from the heart and **veins** carry blood towards the heart. The smallest blood vessels are **capillaries**. Substances enter and leave the blood through capillaries. Cells get the substances they need from the blood in capillaries.

Cells need food substances to:

- release energy
- make new substances

Cells use a **chemical reaction** called **respiration** to release energy from a sugar called glucose.

	Statements	Cross out .....		✓
a	Carbohydrates contain a store of energy	<u>true</u>	false	
b	Proteins are used for growth and repair	<u>true</u>	false	
c	Meat contains no protein	true	<u>false</u>	
d	Fats can be used for energy	<u>true</u>	false	
e	Iodine solution can be used to test for sugar	true	<u>false</u>	
f	Two examples of nutrients are fibre and water	true	<u>false</u>	
g	Fats are found in foods like butter, milk & eggs	<u>true</u>	false	
h	It is very important to have an unbalanced diet	true	<u>false</u>	
i	Vitamins and minerals keep our bodies healthy	<u>true</u>	false	
j	Starch is a type of protein	true	<u>false</u>	

Now correct the false statements :

*meat contains protein.*

*Iodine solution can be used to test for starch.*

*Two examples of nutrients are protein and fat.*

*It is very important to have a balanced diet.*

*Starch is a type of carbohydrate.*

Unscramble these 7 food groups

1	RATEW	<i>water</i>
2	YHECRRADOTAB	<i>carbohydrate</i>
3	NAMESIRL	<i>minerals</i>
4	IPTONER	<i>protein</i>
5	SFODATNILAS	<i>fats and oils</i>
6	RIFEB	<i>fibre</i>
7	MIVATSNI	<i>vitamins</i>

## RDA - Recommended Daily Allowance

It has been known for a long time that certain foods prevent some diseases. In the 18th century, James Lind discovered that drinking lime juice could prevent scurvy. Scurvy is a disease where your gums bleed, cuts don't heal and your skin bruises easily. However, nobody knew the reason why lime juice prevented scurvy.

In 1906 things became a little clearer. In a famous experiment, Frederick Hopkins fed some rats on water and a food containing proteins, fats, carbohydrates and minerals. The rats soon died. He fed another group of rats on the same food but also gave them milk. These rats survived. He came up with a theory that there were 'accessory food factors' in some foods that were needed in the diet.

The word **vitamin** was invented by Casimir Funk in 1912. Since then many vitamins have been identified and we now know how they work. Vitamin C is needed to help wounds heal.

Vitamin	RDA
A	800 µg
B <sub>1</sub>	1.4 mg
B <sub>2</sub>	1.6 mg
B <sub>6</sub>	2 mg
B <sub>12</sub>	1 µg
C	60 mg
D	5 µg
E	10 mg

The amount of a vitamin that you need is very, very small. The amounts are measured in milligrams (1 mg = 0.001 g) or even micrograms (1 µg = 0.000001 g). Vitamins have a **Recommended Daily Allowance** (or **RDA**). This is the

amount that it is recommended for adults to take each day. The amounts are smaller for children.

It is dangerous to take too much of some vitamins. Vitamin A is poisonous if you take 10 times too much each day and your hair may start to fall out. Foods do not contain enough vitamin A to harm you, unless you eat polar bear livers!

Name a disease that is caused by a lack of a vitamin.  
The lack of which vitamin causes this?

*Scurvy - lack of vitamin C*

Name the different food substances fed to the rats in Fredrick Hopkins' first experiment and say why each is necessary in the diet

*protein - growth + repair fats + carbohydrates - energy  
minerals - body health.*

Who invented the word 'vitamin'?

*Casimir Funk*

Name one vitamin and an organ that you think it might be stored in.

*Vitamin A - liver*

Why do you think it might be dangerous to give adult vitamin tablets to young children?

*children require smaller amounts of vitamins than adults.*

Which vitamin do you think you need the most of?

*Vitamin C*

What is an RDA?

*Recommended Daily Allowance*

What are the RDAs for these vitamins, in grams:

B<sub>6</sub>

*0.002g*

B <sub>12</sub>	0.000001 g
A	0.0008 g

How much vitamin A would you have to take to cause damage to yourself?

8000 ug.

## DIFFERENT DIETS

Research these differing diets and terms on the internet and give the answers in your own words.

What does the term OMNIVORE mean?

*an animal that eats a variety of food*

What are JEWS not allowed to eat?

*meat from animals that don't chew cud, eg pork.*

What is the word used to describe the correct foods to eat for a Jew?

*Kosher*

Find out about the same things for MUSLIMS

*Do not eat pork.*

Which foods do VEGETARIANS not eat?

*meat.*

List the foods that VEGETARIANS eat that VEGANS cannot

*Vegans cannot eat anything derived from an animal. eg milk, cheese, butter, eggs.*

What is COELIAC DISEASE?

*Where immune system reacts abnormally to gluten causing small bowel damage*

What do COELIACS leave out of their diet?

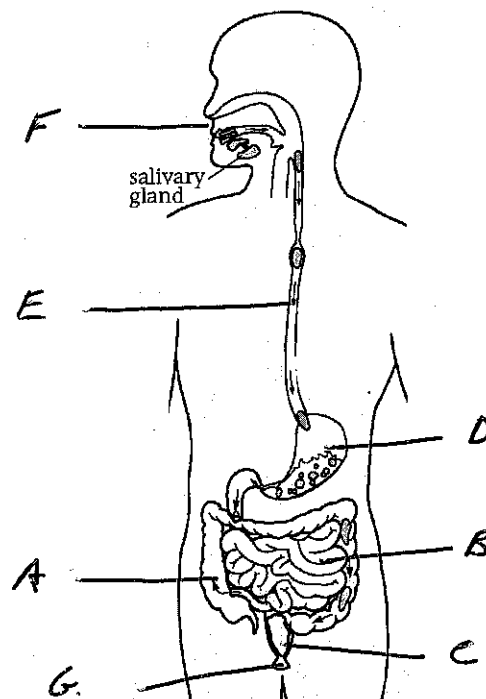
*gluten.*



## In the GUTS

- 1 Label the parts of the digestive system on the diagram below. Use these letters as your labels:

- A - the large intestine
- B - where small, soluble molecules are taken into the body (absorbed)
- C - where faeces are stored
- D - this organ contains a strong acid
- E - the gullet
- F - where feeding happens
- G - the anus



- 2 The answer to each of these questions in one of the letters in question

a Saliva is produced here.

F

b This is called the small intestine.

B

c Faeces are eliminated (or egested) here.

G

d Food travels from the mouth to the stomach here.

E

e Water is removed from undigested food here.

A

f This is called the stomach.

D

g This is called the rectum.

C

- 3 Enzymes are chemicals that chop up large molecules into smaller ones. There are enzymes in the small intestine. Explain why these are needed.

*Enzymes in the small intestine break up carbohydrates, proteins and fats into smaller units so they can be absorbed from the small intestine into the bloodstream.*

# Digestion

absorbed	anus	enzymes	intestine
juices	mouth	insoluble	soluble

Digestion makes insoluble substances into soluble ones.

This process starts in the mouth. During digestion, digestive juices are added to the food. These contain enzymes.

When the food that can be digested has been broken down, it is absorbed by the small intestine. Food that cannot be broken down is passed out of the body through the anus.

For each of the things below, say what it does to help with digestion:

The stomach	physically churns food chemically breaks down food - <sup>and</sup> enzymes.
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Teeth	physically breaks down food into smaller pieces
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Some food cannot be digested. This is called fibre.

Write the names of the organs listed in the box in the order that a piece of fibre would go through them.

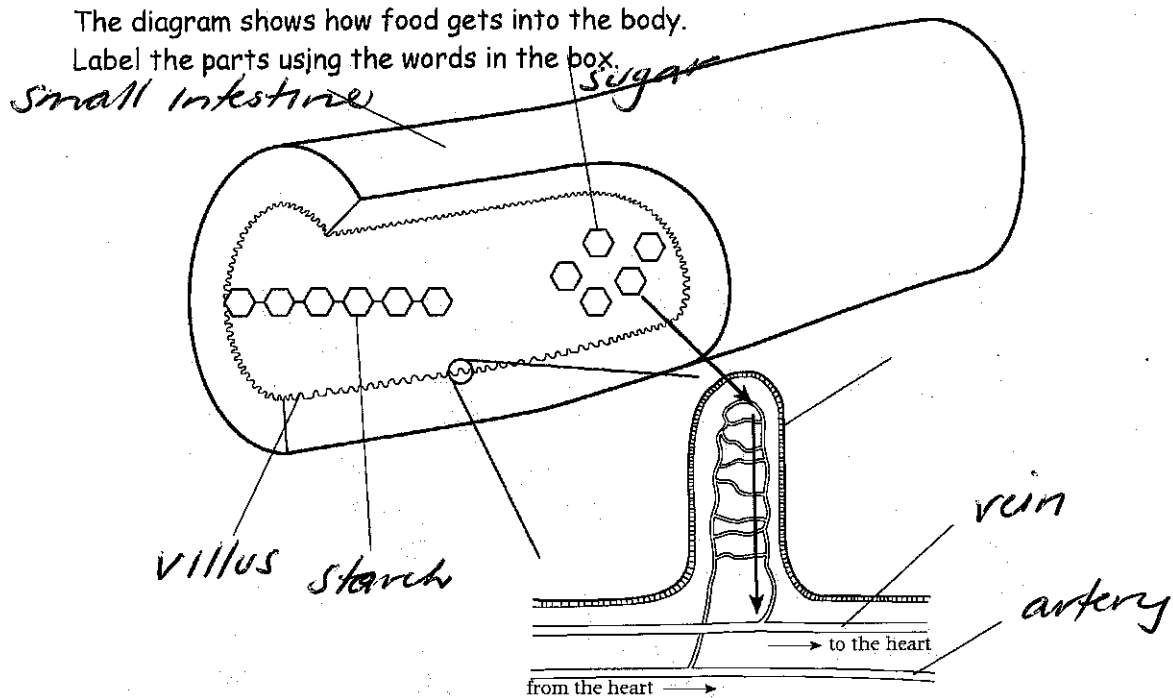
- i mouth      ii gullet      iii stomach  
 iv small int.      v large int.      vi rectum  
 vii anus.

large intestine	anus	gullet	mouth
small intestine	rectum	stomach	

## Food absorption

The diagram shows how food gets into the body.

Label the parts using the words in the box.



artery	small intestine	starch	sugar	vein	villus
--------	-----------------	--------	-------	------	--------

Explain how the small intestine is adapted to get food into the blood very quickly

*Villi increase the surface area of the small intestine. Each villus has its own blood supply for easy transfer of nutrients from small intestine to blood.*

In which liquid is food transported around the body?

*blood.*

Name the process that food is needed for, in every cell in the body

*respiration*

What do cells get from this process?

*energy*

## Not the CORRECT AMOUNT

Too MUCH or too LITTLE of certain foods can lead to problems in the body. Complete the table using the words in the box.

NUTRIENT		PROBLEM	description
PROTEIN	Not enough	KWASHIORKOR	poor growth and a swollen abdomen. May lead to death if not treated
FIBRE	Not enough	CONSTIPATION	also can cause haemorrhoids (piles) and possibly bowel cancer
IRON	Not enough	ANAEMIA	blood disease where not there are not enough red blood cells to carry oxygen
VITAMIN C	Not enough	SCURVY	a disease where the gums bleed
VITAMIN D	Not enough	RICKETS	a disease where the bones are not formed properly & this leads to them deforming
FAT	Too much	HEART DISEASE	Fatty deposits in the blood vessels cause blockages & can lead to poor circulation & heart attacks
ENERGY (all food)	Too much	OBESITY (over eating)	This can cause many problems in the body: heart & joint diseases
ENERGY (all food)	Not enough	ANOREXIA (starvation by choice)	The body uses its own tissues eventually & could lead to death

VITAMIN C	FIBRE	RICKETS	OBESITY
ANOREXIA	FAT	KWASHIORKOR	ANAEMIA

Sailors used to suffer from an illness called scurvy caused by a poor diet on long journeys. James Lind was a doctor who tested treatments for scurvy. He predicted that all acids cure scurvy.



I think that all acids will cure scurvy.

He gave 6 pairs of sailors with scurvy exactly the same meals but he also gave each pair a different addition to their diet.

sailors	addition to their diet	effect after one week
1	some apple cider	beginning to recover
2	25 drops of very dilute sulphuric acid to gargle with	still had scurvy
3	2 teaspoons of vinegar	still had scurvy
4	half a pint of sea water	still had scurvy
5	2 oranges and 1 lemon	recovered
6	herbs & spices and acidified barley water	still had scurvy

(a) Does the evidence in the table support the prediction that all acids cure scurvy?

Tick the correct box.

yes

no

Use the table to explain your answer.

*..... sulphuric acid and vinegar  
..... did not cure scurvy.*

1 mark

- (b) (i) Give the **one** factor James Lind **changed** in this experiment.  
(This is called the independent variable.)

*What was added to the diet*

1 mark

- (ii) Give the factor James Lind **examined** in this experiment.  
(This is called the dependent variable.)

*Scurvy or not.*

1 mark

- (c) James Lind's evidence suggested that oranges and lemons cured scurvy. At a later time, other scientists did the following:

- They separated citric acid from the fruit.
- They predicted that citric acid would cure scurvy.
- They tested their prediction by giving pure citric acid as an addition to the diet of sailors with scurvy.
- They found it did **not** cure scurvy.

The scientists had to make a different prediction.

Suggest a new prediction about a cure for scurvy that is consistent with the evidence collected.

*Something else in oranges and lemons cured scurvy - vitamin C*

1 mark

- (d) Explain why it is necessary to investigate the effects of changes in diet over a period of more than one week.

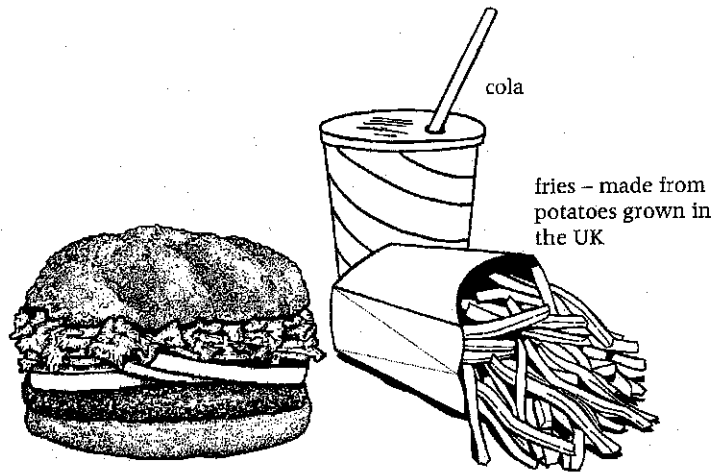
*takes a period of time to show effect.*

1 mark

Maximum 5 marks

## The 7 FOOD GROUPS

NUTRIENT	USED FOR	Foods rich in this
CARBOHYDRATE - STARCH	Energy	rice, pasta, bread
CARBOHYDRATE - SUGAR	Energy	biscuits, cakes honey, jam
FAT	Energy	butter, oil,
PROTEIN	Growth + Repair	meat, eggs, milk, cheese
VITAMINS	General health	Fruit and Vegetables
MINERALS	General health	Fruit and Vegetables.
FIBRE	Intestinal health	Plant material eg fruit
WATER	Hydration	



Name one type of food substance that might be found in each part of the Big Burger meal and say why the body needs it.

Bread roll	Food substance	carbohydrate
	Why the body needs it	energy

Beef	Food substance	protein
	Why the body needs it	growth + repair

Tomato	Food substance	Vitamins + minerals
	Why the body needs it	General health.

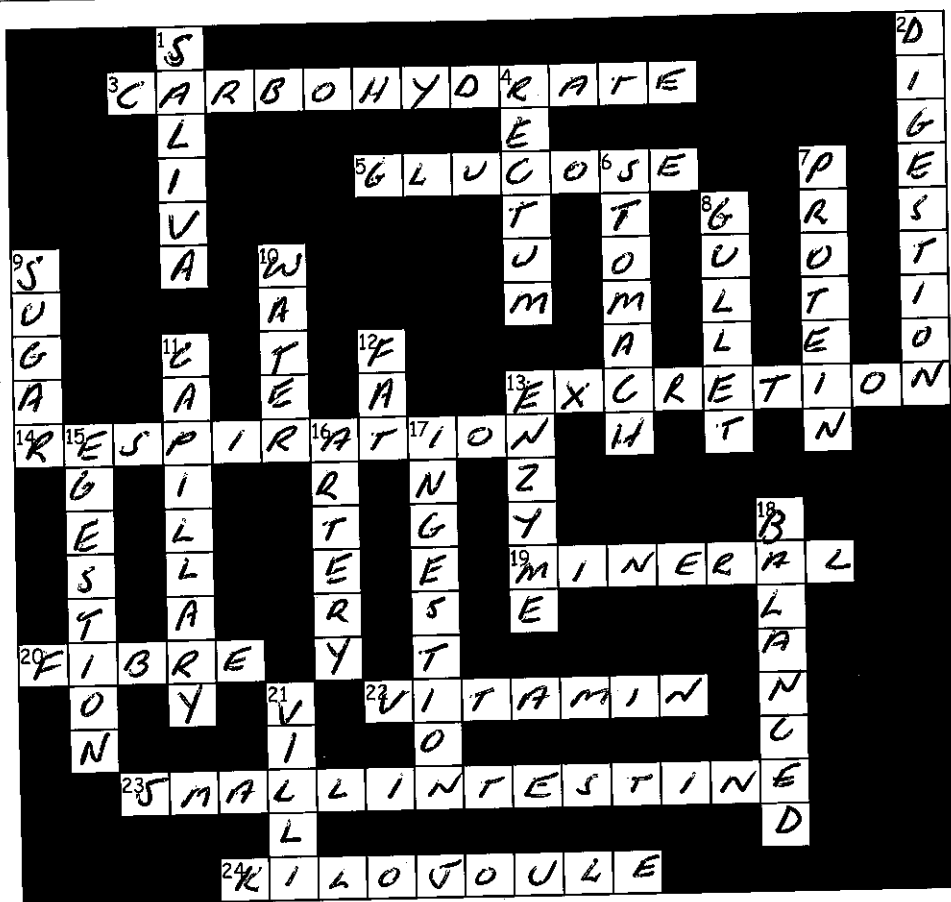
The fries are cooked in oil. What food substance does oil contain?	Fat
What does the body use this for?	Energy

What substance does the cola drink mainly contain?	Water
What other substance does it contain?	Sugar
Suggest why this substance might be bad for you if you had too much	Obesity, poor teeth

If you only ate this meal, do you think you would get enough vitamins?	No.
Explain your answer.	Limited fruit and vegetables.



## DIGESTION CROSSWORD



### ACROSS

- 3 Food substance used for energy.
- 5 The substance that is used in all cells to release energy from.
- 13 Breathing out carbon dioxide is an example of this life process.
- 14 Process that cells use to release energy.
- 19 Calcium is one of these.
- 20 Food substance that helps clean your intestines.
- 22 Food substance that is needed for good health.
- 23 Food is absorbed here.
- 24 Unit of energy found on food packets.

### DOWN

- 1 Name of a digestive juice.
- 2 Process used to break apart food.
- 4 Faeces are stored here.
- 6 Organ containing a strong acid.

- 7 Food substance used for growth and repair.
- 8 Tube carrying food from the mouth to the stomach.
- 9 Food substance that makes things taste sweet.
- 10 A product of respiration.
- 11 Very small tube that carries blood.
- 12 Food substance stored in the body to provide energy in the future.
- 13 Substance used to break down food.
- 15 Getting rid of waste food that cannot be digested.
- 16 Tube that carries blood away from the heart.
- 17 Putting food into your mouth.
- 18 We need to eat a wide variety of foods to get a diet that is \_\_\_\_\_.
- 21 The small intestine is lined with these.

## CHEMICAL SCISSORS

Some nutrients that we have in our diet are particles that are too large to pass through the gut, in other words be **ABSORBED** by our digestive system. These have to be broken down into smaller and **SOLUBLE** particles and this is done by chemical scissors called **ENZYMES**.

Fill in the table below :

Nutrient	Enzyme used	Breaks down to ...	Where in the Gut this happens
STARCH	AMYLASE	GLUCOSE	MOUTH AND SMALL INTESTINE
FAT*	LIPASE + BILE FROM LIVER	FATTY ACIDS + GLYCEROL	SMALL INTESTINE
PROTEIN	PROTEINASE	AMINO ACIDS	STOMACH + SMALL INTESTINE

\* Include any other substance that may help and where this is made & stored

### Quick Quiz

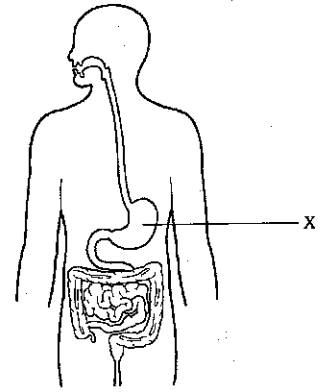
- 1 A food substance found in many foods is:  
 A carbohydrate.      B chalk.  
C energy.      D carbon dioxide.
- 2 What is used to test a food for starch?  
 A iodine solution  
B potatoes  
C Benedict's solution  
D Fehling's solution
- 3 One of the ways in which water is used by the body is as:  
A a source of fibre.  
B a source of energy.  
C a solid.  
 D a solvent.
- 4 Fibre in your diet helps to stop:  
A you lying.  
B scurvy.  
 C constipation.  
D digestion.

### 8Ab

- 1 You have a balanced diet when:  
A the mass of all the food you eat in a day adds up to 100 kg.  
B the mass of all the food you eat one day is equal to the mass you eat the next day.  
 C you eat a wide range of different foods to give your body all the things it needs.  
D you only eat fish on Fridays.
- 2 Which of these people will need to eat the most food in a day?  
A a 3-year-old child  
B an 85-year-old woman  
 C a 35-year-old man, who works outside cutting down trees  
D a 25-year-old woman, who works in an office using a word processor
- 3 Meats are a good source of which food substance?  
A fibre       B protein  
C oxygen      D vitamins
- 4 Why do we need protein in our food?  
A It is a good source of energy.  
 B It is used for growth and repair.  
C It is full of vitamins.  
D It helps food to pass through the gut smoothly.

8Ac

1 Which organ is labelled X in the drawing below?



- A small intestine       B stomach  
C liver                      D mouth

2 In the diagram above what does the organ labelled X do?

- A It mixes up food with acid and breaks down proteins.  
B It adds vitamins to the food.  
C It takes the water out of the food.  
D It stores waste food until it can be got rid of.

3 In digestion:

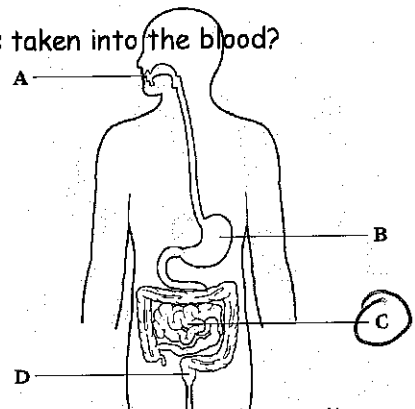
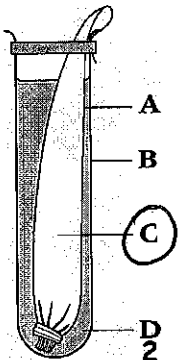
- A soluble food substances are made into insoluble ones.  
 B insoluble food substances are broken up into soluble ones.  
C food is stored inside the body until it is needed.  
D waste food is removed from the body.

4 The main chemicals used to digest foods are:

- A vitamins.                      B salivas.  
C digestifs.                       D enzymes.

8Ad

1 Which label shows the place where digested food is taken into the blood?



2 The drawing shows a model gut. Which part represents the inside of the small intestine?

3 The enzymes in humans work best at body temperature. What temperature is this?

- A 37 °C                      B 0 °C  
C 100 °C                      D 98 °C

4 The pH of the mouth is about pH7. The conditions that enzymes in the mouth work best at are:

- A neutral.                      B acidic.  
C alkaline.                      D basic.

8Ae

- 1 When digested food is taken into the blood it is said to be:  
A egested.                      B ingested.  
 C absorbed.                      D insoluble.
  
- 2 Digested food is carried around the body in the:  
A digestive system.  
 B circulatory system.  
C breathing system.  
D nervous system.
  
- 3 What is the digested food used for inside our bodies?  
A to provide energy only  
 B to provide energy and chemicals to make new substances  
C to help us go to the toilet more easily  
D to provide substances to make sure that the blood does not become too runny
  
- 4 What job does an artery do?  
A carries water to be mixed with blood  
B carries blood to the heart  
 C carries blood away from the heart  
D carries blood to the brain only