

# Diet and exercise



Name

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Class

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Teacher

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# L1 Healthy Diet

## Balanced diet

To keep healthy, it is vital to eat a balanced diet. This means eating the right amount from different food groups. Too much may cause obesity and too little may cause malnutrition.

The World Health Organisation recommends getting at least half of your energy intake from carbohydrates and no more than 30% from fats. The organisation also recommends 400 grams of fruit and vegetables daily.




## Nutrients

Nutrients are essential substances that the body needs. There are different types of nutrient, each with its own purpose:

- **Carbohydrates** provide energy. They are found in bread, potatoes, rice and pasta. Energy intake is measured in calories. The average adult male should eat 2500 calories a day and the average adult female should eat 2000 calories a day.
- **Lipids (fats and oils)** provide energy. Lipid-rich foods include butter and chips.
- **Proteins** provide materials to make new cells and to repair damaged tissues, such as muscles. Beans, eggs, fish, meat and milk are high in protein.
- **Vitamins** are vital in many processes. For example, vitamin K helps blood to clot and vitamin C prevents illness. Fruit and vegetables are vitamin-rich.
- There are **16 essential minerals**. These include iron, used to transport oxygen in the blood, and calcium, used in making bones and teeth.
- **Fibre** - Fibre is not a nutrient. It cannot be absorbed by the body and contains no calories or vitamins, however it is necessary for a balanced and healthy diet. Fibre adds bulk to food, and helps it to pass through the digestive system. Fibre also prevents constipation and heart disease. Fruit, vegetables and wholegrain cereals are high in fibre.
- **Water** Around 70% of human body mass is water. Chemical reactions in cells take place in water and the blood transports substances dissolved in water. Drinking water frequently replaces the water lost in urine, sweat and breathing out.

Independent practice

1. In which food groups would you place cheese, egg and pasta?
2. Why are fats needed in the diet?
3. What foods could you eat in order to try and give yourself more energy?
4. List some foods a person should avoid if they are trying to reduce their fat intake?
5. Which food group is likely to take up the most space on your dinner plate?
6. How much water should a person aim to drink per day?
7. What is water used for in the body?
8. Which food group does fish belong to?
9. What are proteins needed for in the body?
10. What is the daily recommended number of calories for an adult man and an adult woman?
11. Complete the following sentences:
  - a. Fats are needed in the diet because...
  - b. Fats are needed in the diet but...
  - c. Fats are needed in the diet so...
12. The card shows the amounts of fat and fibre in some types of food and drink from a café.

Chez Jean Café			
	fat in g	fibre in g	
<b>type of burger</b>			
single burger	17	0.8	
double burger	38	1.2	
cheeseburger	21	1.0	
<b>type of drink</b>			
strawberry milkshake	8	0	
medium cola	0	0	
medium orange juice	0	0	
<b>type of potato</b>			
regular fries	15	3	
baked potato	0	9	

- a) From the card above, choose a meal consisting of a burger, a drink and some potato, to give:
- (i) the least fat;
  - (ii) the most fibre.

Write your answers in the table below.

Food and drink	meal with the least fat	meal with the most fibre
type of burger		
type of drink		the drinks do <b>not</b> contain fibre
type of potato		

(b) A person orders a double burger, fries and a strawberry milkshake. Calculate the fat content of this meal. Give the unit

(c) Draw a line from each nutrient to the main reason why it is needed.

nutrient	main reason why the nutrient is needed
fat	to keep the intestine working properly
calcium	for healthy teeth and bones
fibre	for insulation
protein	to provide energy
sugar	for growth and repair

## L2 Food tests

Starch is a **carbohydrate** which is made of long chains of identical small sugar molecules. Long chains of repeating molecules are known as polymers. The small molecules from carbohydrates are used by the body to release **energy** to allow muscle contraction. The test for starch is always to add iodine solution. Iodine solution is normally orange-brown. It will turn blue-black if starch is present

Sugars react with Benedicts reagent to turn it from blue to orange-red. But it is a slow reaction, so needs speeding up by placing in a water bath.

**Proteins**, like carbohydrates, are made of long chains of small molecules. In proteins, these small molecules are not identical. Proteins are made up of chains of small molecules called amino acids. There are over 20 different kinds of amino acid. Proteins are used by the body for growth and repair.

**Fats** are made up of fat molecules which contain fatty acids and glycerol. Fat molecules have to be broken down by the body so that they can be used for energy storage. Fats are also used by the body to keep heat in and to make cell membranes.

To test for protein, add some food to a test tube and add a few drops of biuret reagent. If the biuret reagent changes from blue to lilac/purple, that is a positive result, meaning there is protein present in the food. If the biuret reagent stays blue, there is no protein present.

To test for fats, add ground food to a test tube, add 2cm<sup>3</sup> of ethanol and shake gently, covering the end of the test tube with your thumb, then add 2cm<sup>3</sup> of water and gently shake again. Fats will make the clear ethanol turn a cloudy, milky white if they are present.

Independent practice

1. State some examples of some foods that contain starch
2. State some examples of some foods that contain sugar
3. State the foods that you tested contained starch
4. Describe what carbohydrates are used for in the body
5. State the liquid you added to the foods to test for starch
6. What colour did that liquid turn when starch was present?
7. Name the liquid you added to the foods to test for sugar
8. What colour did that liquid turn when sugar was present?
9. Describe why might a water bath used when testing for sugar
10. m) What colour is iodine normally (before a reaction)?
11. State some examples of foods that contain fats?
12. State some examples of foods that contain protein?
13. Describe what fats are used for in the body?
14. Name the liquid you added to the foods to test for Protein?
15. Name the liquid you added to the foods to test for Fats?
16. What do Fat molecules contain?
17. What colour does biuret reagent turn in the presence of protein?
18. Describe how the colour of Ethanol changes in the presence of fats?
19. What are proteins used for in the body

## L3 Deficiency diseases

There are many diseases linked with poor diet. Some of these are deficiency diseases. This means disease is caused when there is not enough of a nutrient in the diet. Deficiency diseases can lead to symptoms and changes will need to be made to the diet to manage/treat the disease and stop it from reoccurring.

A **goitre** (sometimes spelled "goiter") is a swelling of the thyroid gland that causes a lump in the front of the neck. The lump will move up and down when you swallow.

**Scurvy** is a disease resulting from a lack of vitamin C (ascorbic acid). Early symptoms of deficiency include weakness, feeling tired, and sore arms and legs. Without treatment, decreased red blood cells, gum disease, changes to hair, and bleeding from the skin may occur. Scurvy is easily treated by adding some vitamin C to your diet, such as fresh fruit and vegetables. A GP may also recommend taking vitamin C supplements until you feel better

**Rickets** is a condition that affects bone development in children. It causes bone pain, poor growth and soft, weak bones that can lead to bone deformities. A lack of vitamin D or calcium is the most common cause of rickets. Vitamin D largely comes from exposing the skin to sunlight, but it's also found in some foods such as oily fish and eggs. Vitamin D is essential for the formation of strong and healthy bones in children.

**Iron deficiency anaemia** is caused by a lack of iron, often because of blood loss or pregnancy. It is treated with iron tablets prescribed by a GP and by eating iron rich foods. Foods that contain iron include red meat, eggs, quinoa, pumpkin seeds and green vegetables. Symptoms of anaemia include tiredness and lack of energy, shortness of breath, pale skin.

The term **Obesity** describes someone who is very overweight and has a high percentage of body fat. Obesity is generally caused by consuming more calories, particularly those in fatty and sugary foods, than you burn off through physical activity. The excess energy is stored by the body as fat. The best way to treat obesity is to eat a healthy, reduced-calorie diet and exercise regularly.

**Coronary heart disease (CHD)** is a major cause of death both in the UK and worldwide. Coronary heart disease is the term that describes what happens when your heart's blood supply is blocked or interrupted by a build up of fatty substances in the coronary arteries. Over time, the walls of your arteries can become furred up with fatty deposits. Heart disease can be caused by lifestyle factors and other conditions such as: smoking, high cholesterol, high blood pressure, diabetes. Treatment can include lifestyle changes such as regular exercise and stopping smoking, medication and surgery.

Independent practice

1. Which disease often occurs in people who spend a lot of time indoors? Why?
2. What foods could someone eat to try and increase the amount of vitamin D in their diet?
3. What are the symptoms of scurvy?
4. What vitamin is found in sunlight?
5. What builds up in the arteries of someone suffering with coronary heart disease?
6. What are the symptoms of Rickets?
7. What food group is someone suffering with obesity likely to eat a lot of?
8. How could someone avoid getting anaemia?
9. How could someone avoid getting coronary heart disease?
10. What is an alternative name for vitamin C?
11. How can coronary heart disease be treated?
12. Jennie has been diagnosed with anaemia – What symptoms is Jennie Likely to show?
13. The doctor has advised Jennie to make some changes to her diet - What foods should Jennie introduce to her diet? Suggest a one-day breakfast, lunch and dinner meal plan for Jennie.
14. Sam has Ricketts, Sam's grandmother explains that he should drink plenty of orange juice. Is this good advice for Sam? Explain why/why not.
15. In the 18th century, men working on Navy ships used to regularly be affected by Scurvy, why do you think this was? Explain?
16. James Lindt is famous for finding a simple cure for Navy men suffering with Scurvy,
17. Suggest what Mr Lindt might have advised for the Navy men to do?
18. Laura is 5 years old. Her dad has just been diagnosed with coronary heart disease. What advice would you give to Laura, regarding lifestyle choices, to help her avoid also getting CHD when she is older?
19. Read the magazine cutting about research into heart disease.

More heart disease in older women.

Heart disease amongst British women in the 60-79 age group is more common than previous research suggested. A recent study of 4,286 British women in that age group indicated that one in five showed signs of heart disease.

- (a) Why can the results of this research not be used to draw any conclusions about heart disease amongst women across the world?
- (b) Give one reason why the data collected in this study is likely to be reliable.

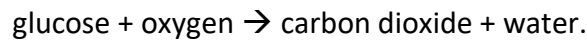


## L4 Energy requirements

All organisms need energy to survive. The sun provides the energy for all life on earth and then organisms like plants convert this into energy which can be stored and used by themselves and other organisms when they need it. Energy naturally spreads out around our universe and when it does this it is no longer useful. All organisms have evolved to store energy and stop it from spreading out until it is needed to do work.

Energy is used in organisms for movement, growth, repair and to keep them warm. It is stored in plants by photosynthesis. This special chemical reaction makes chemicals (molecules) which store the energy. When energy is needed plants can then release the energy using a chemical reaction called respiration.

Respiration is a chemical reaction that happens in all living cells, including plant cells and animal cells. It takes place in the mitochondria. It is the way that energy is released from glucose so that all the other chemical processes needed for life can happen. Do not confuse respiration with breathing (which is properly called ventilation). The respiration equation is:



Energy is measured in Joules or kilojoules. Different organisms require different amounts of energy due to their size and the different activities they do. An Oak tree requires 836J of energy per day to survive. An average adult human male requires 10,460KJ of energy to survive, a female human - 8368KJ. An adult female Lion needs to consume 20920KJ of energy per day.

The energy an organism needs is also based upon the activities done by the organism. Here are the average energy values needed for different types of activities in humans:

Sleeping **300**  
kJ per hour

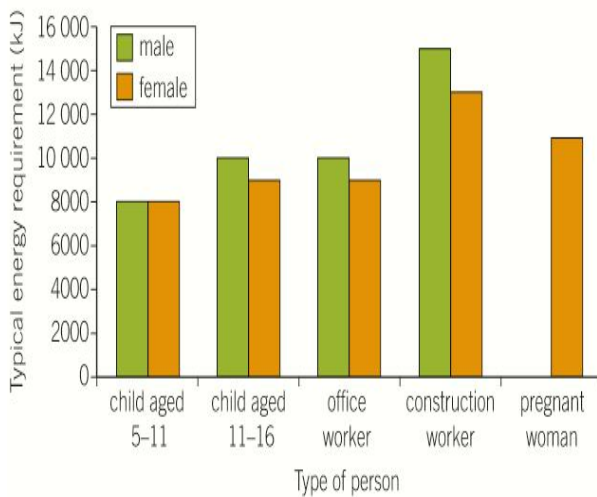
Working in  
class **600** kJ  
per hour

Playing  
football **3600**  
kJ per hour

Relaxing **360**  
kJ per hour

Independent practice

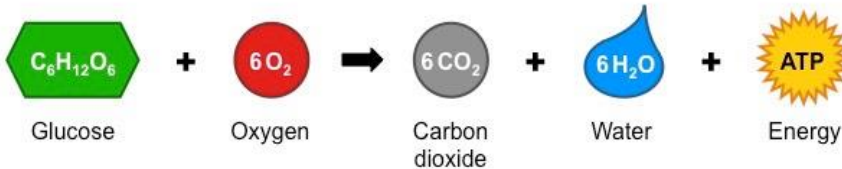
1. Where do we as humans get our energy from?
2. Suggest some reasons why your body needs energy?
3. What is respiration?
4. Respiration takes place in the mitochondria, which is present in both plant and animal cells. Name 3 other organelles which are present in both animal and plant cells.
5. Which product in food is energy released from during respiration?
6. What is the respiration equation?
7. What are the products of respiration?
8. What are the reactants of respiration?
9. Complete the following sentences:
10. Respiration is similar to breathing because...
11. Respiration is similar to breathing but...
12. Respiration is NOT the same as breathing so...
13. Look at the graph for different people energy needs



- a) What type of worker needs the most energy
- b) What gender generally needs more energy?
- c) Why we need more energy as we get older
- d) What is the energy requirement for a 5-11 yr old?
14. Compare the energy required by an elephant and a human. Discuss which needs more energy and why they might need this energy due to the activities they do and the number of cells they have.
15. Staphylococcus Aureus is a bacterium which is only one cell big. Compared to humans they only need to be next to a little glucose to survive. Explain why this is the case.

# L5 Effects of exercise

Respiration is a chemical reaction that occurs inside the mitochondria of all living cells, it releases energy from the food you've eaten. Aerobic respiration uses oxygen:



Used for:

- Muscle contraction
  - Internal organs
  - Muscles that bring about movement
- Maintaining body temperature (mammals & birds)
- Building up larger molecules from small ones
- In plants to build up sugars, nitrates and others into amino acids, then into proteins

When the body cannot supply the cells with the oxygen needed to break down glucose, then it must carry out anaerobic respiration. Energy is released without oxygen:

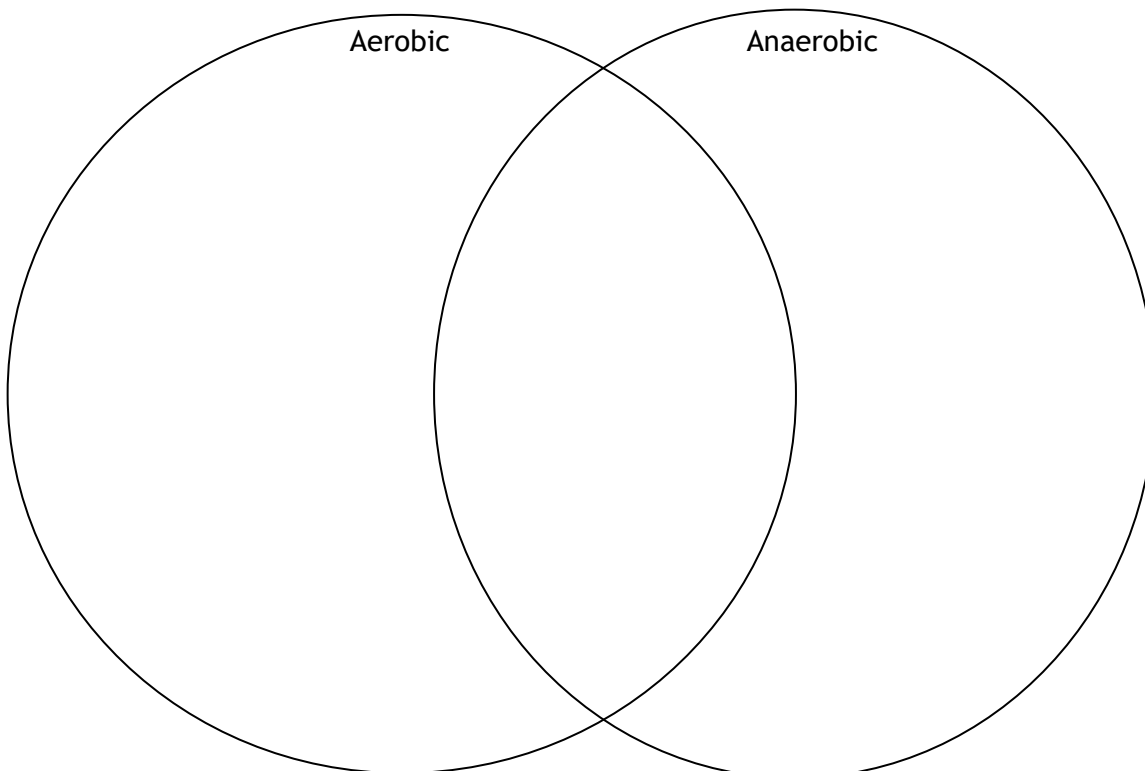


This would generally only take place in animal cells when there is an insufficient supply of oxygen – e.g. during sprinting or intense exercise when you can't breathe fast enough to get enough oxygen in.

Lactic acid can build up, causing cramp. Less energy is released, causing muscle fatigue.

Put the following words/phrases into the correct area in the Venn diagram

1. Requires oxygen
2. Produces lactic acid
3. Doesn't need oxygen
4. Requires glucose
5. Releases a lot of energy
6. Releases a little energy
7. Carbon dioxide and water produced
8. Energy released



## Effect of exercise

Condition	Description of change	Explanation
Heart rate		
How hard the heart beats		
Breathing rate		
Breathing depth		
Blood flow to muscles		

Independent practice

- a) What do we need oxygen for?
- b) What do we need respiration for?
- c) Where does respiration happen?
- d) What type of cells have lots of these?
- e) How do the cells get all the things they need for respiration?
- f) Describe the difference between anaerobic and aerobic respiration
- g) When does the body respire anaerobically?

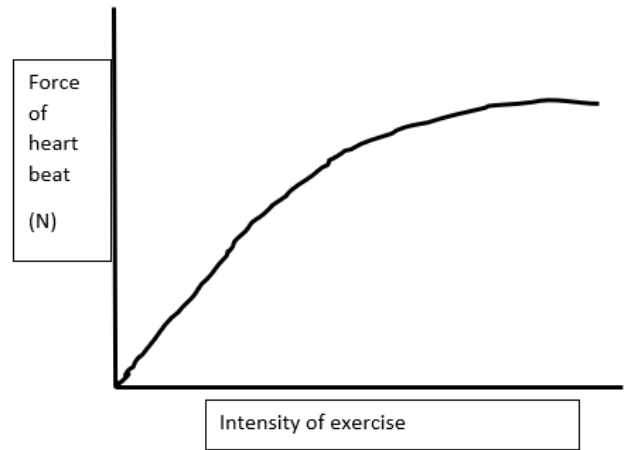
8. Look at the three pieces of evidence below and use these to complete the table. Use the data to back up your statements. Be careful with language. Remember – respiration is already happening in all cells before any exercise starts. The word ‘more’ or ‘increased’ needs to feature in your explanations

The effect of exercise – Evidence piece 1

The table below shows typical effects of heart and breathing rates during exercise.

WORK RATE (J/s)	HEART RATE (beats/min.)	BREATHING RATE (breaths/min.)
0	86	9.6
60	106	10.0
80	112	10.4
100	122	10.4
120	135	11.4
140	143	14.5
160	156	15.8
200	174	30.5

The effect of exercise – Evidence Piece 2



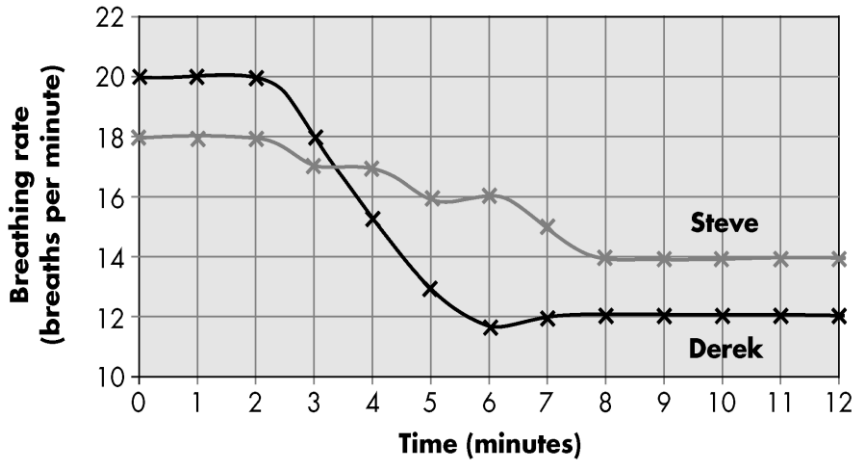
The sketch graph above shows the effect of exercise on how hard the heart beats.

The effects of exercise - evidence piece 3

The table shows the volume of blood flowing through different organs at three levels of exercise.

Organ(s)	Volume of blood flowing through organ(s) in cm <sup>3</sup> per minute		
	Light exercise	Moderate exercise	Heavy exercise
Gut	1 100	600	300
Kidneys	900	600	250
Brain	750	750	750
Heart muscles	350	750	1 000
Skeletal muscles	4 500	12 500	22 000
Skin	1 500	1 900	600
Other	400	500	100
<b>Total</b>	<b>9 500</b>	<b>17 600</b>	<b>25 000</b>

- h) a. Who is the fittest? Steve and Derek wanted to find out which of them was the fittest. They both did some exercise which made them breathe faster. They then stopped exercising and timed how long it took for their breathing rates to return to normal again. The graph shows the results.



- After how many minutes did Steve and Derek stop exercising?
- Derek said that the faster a person's breathing rate returned to a steady resting rate, the fitter the person was.
- From the information in the graph, state who was the fittest person and explain why?
- Suggest how this investigation may not have been fair.
- What else could you measure after exercise as an indication of fitness?
- Outline a plan for you and a partner to compare fitness levels.