



LEARNING OBJECTIVES



*By the end of
the lesson, you
will be able to:*

- name and describe the essential vitamins and minerals and their main functions in the body;
- identify locally available foods that are good sources of each of the essential vitamins and minerals;
- assess the amount and variety of vitamins and minerals in your diet.

Lesson 5

Learning about vitamins and minerals

LESSON OVERVIEW



This lesson is about the importance of eating foods that provide essential vitamins and minerals for proper growth and development and to help prevent disease. It explains that our bodies require many different vitamins and minerals, each of which has a specific function in the body and must be supplied in different, sufficient amounts. Vitamins and minerals are discussed separately and can be studied in two different sessions. The lesson describes the essential vitamins and minerals, their functions and good food sources. It pays special attention to those vitamins and minerals that are most likely to cause serious health problems when people do not get enough of them from their food: vitamins A, D, C, the B-complex vitamins and folate and the minerals calcium, iron, iodine and zinc.



Part 1

Vitamins: their functions and good food sources



READING

Vitamins and minerals in foods are necessary for the body to grow, develop and function properly. They are needed in very small (micro) but specific amounts, but they are essential for our health and well-being. These micronutrients work together with the macronutrients we eat (carbohydrates, protein and fats) to provide energy, build and maintain tissues and to regulate all of the body's processes. Vitamins and minerals are needed to help the body perform specific functions that promote growth, reproduction, and help maintain health and life. Our bodies require a number of different vitamins and minerals, each of which has a specific function in the body and must be supplied in different, sufficient amounts. During times of rapid growth, such as during pregnancy and lactation, early infant and child growth and during periods of certain illnesses, it is especially important to get enough vitamins and minerals. The best way to ensure that we get enough of each of the vitamins and minerals we need is to eat a balanced diet that includes a variety of different foods.

Vitamins are needed for essential body processes and help the body stay healthy. The word vitamin comes from “vita”, the Latin word for life, indicating their importance to the various body processes. Essential vitamins are organic compounds made by plants and animals that we cannot produce ourselves so they must be taken in through the foods we eat. Each vitamin has a very specific function and not getting enough of each one can lead to the development of serious health problems and diseases. Some vitamins help us turn the carbohydrates, protein and fats we eat into the energy our bodies use. Other vitamins help build healthy tissues and hormones, even though they are not components of those body tissues. Some vitamins are protective, helping our immune systems fight against infection and serving as antioxidants, protecting cells and tissues from damage. Vitamins are divided into two types: “fat soluble” vitamins, which dissolve in fat, and “water soluble”, which dissolve in water.

TO THINK ABOUT WHILE READING



What does the word vitamin mean to you?

Do you know why we need vitamins?

Do you know what foods are good sources of different vitamins?

Fat soluble vitamins

Fat soluble vitamins cannot dissolve in water or body fluids. Because these vitamins do not dissolve in water and are stable to heat, they are less likely to be lost in cooking and other food processing. Any excess amounts of these vitamins are stored in various tissues and organs as a reserve for future use by the body and are not lost through urine. As fat soluble vitamins are not eliminated by



the body, taking high amounts of these vitamins can cause them to build up in the body, which can be harmful. Eating normal amounts of foods rich in the fat soluble vitamins is not likely to be harmful.

The four fat soluble vitamins are Vitamin A, Vitamin D, Vitamin E and Vitamin K. They perform many functions, including the development, health and functioning of various tissues and systems, such as the eyes, skin, lungs, bone, teeth, nervous system, immune system and blood. They interact with each other and with certain minerals to perform their functions. While all of the fat soluble vitamins are important for good health, two of them – A and D – are discussed in detail below, as deficiencies of these two vitamins are more common and can lead to serious health problems.



See Fact sheet *Vitamins, their functions and good food sources* for more information on vitamins E and K.

Vitamin A is essential for the normal growth and development of cells and is especially important for good vision, healthy skin and mucous membranes, bone formation, growth, immunity and reproduction. It is involved in many body processes and helps regulate cell growth and division. Vitamin A helps keep us healthy by promoting healthy skin and surface membranes, which help keep bacteria and viruses out of our bodies, and by strengthening the immune system to help fight infections. Vitamin A is also important for good eyesight and vision, including protecting against eye damage resulting from eye infections, and preventing night blindness. Severe vitamin A deficiency early in life can lead to permanent blindness caused by damage to the cornea, the transparent surface of the eye.

Eating a healthy, well-balanced diet containing a variety of foods rich in vitamin A can help meet the body's needs for vitamin A and can help prevent blindness, infections and other health and growth problems that can result from insufficient vitamin A. As fat is needed for the body to absorb vitamin A, it is important to include adequate fat in the diet, along with other nutrients such as iron, zinc and adequate protein. Early detection and treatment of vitamin A deficiency and of measles, malaria, diarrhoea and malnutrition is important for preventing serious health problems. In situations where foods rich in vitamin A are not available or in cases of severe deficiency, foods fortified with vitamin A and vitamin A supplementation may be recommended.

Vitamin A exists in several forms. Pre-formed vitamin A (retinol) is found in foods of animal origin and is easily absorbed by the body. Another form of vitamin A is manufactured by the body from substances (certain carotinoids) in certain plant foods.

Best sources of pre-formed vitamin A are: animal livers and other organs. Other good food sources of vitamin A are: milk and milk products (not skimmed), butter and eggs.



Best sources of carotinoids for the manufacture of vitamin A are: brightly coloured deep yellow and orange fruits and vegetables such as carrots, orange sweet potatoes and yams, pumpkins, some tree fruits such as mango and peaches, and dark green leafy vegetables, such as spinach and other leaves.



See Fact sheet *Vitamin A deficiency* for more detail on what it is, who is at risk and how to treat and prevent it.

Vitamin D works together with calcium and other minerals and vitamins to help bones grow in density and strength. Vitamin D also has other important functions, including helping the immune system, the brain and the nervous system, the skin, muscles and cartilages, the kidneys, intestines and the reproductive organs. Not enough vitamin D can cause poor bone growth (rickets) in children and soft bones in adults. Low levels of vitamin D can decrease the body's ability to fight against infections.

The best source of vitamin D is the body's own production of it through exposure of the skin to sunlight. It is the only nutrient that the body can synthesize. It is found naturally in only a few foods, including egg yolks, liver and fatty fish and their oil. Some countries add vitamin D to foods such as milk, butter and margarine.

Water soluble vitamins

Water soluble vitamins dissolve in water and are not stored by the body. Any excess of water soluble vitamins are passed out of the body through urine. Water soluble vitamins are generally more fragile than fat soluble vitamins and are easily damaged or lost in food cooking and storage. Since these vitamins are not stored in the body, they must be taken in on a regular basis to meet the body's needs. The water soluble vitamins are the eight different B-complex vitamins and vitamin C.

The B-vitamins help every cell in the body to generate energy from the carbohydrates, proteins and fats in foods and to use these nutrients to build and repair tissue. Each B-vitamin has a specific role in this process, but their functions overlap and work together, so they are often talked about as a group: the B-vitamins. Four of the B-vitamins – B₁, B₂, B₃ and folate are discussed in detail below, as they are associated with problems in human health.



See Fact sheet *Vitamins, their functions and good food sources* for more information on the B-vitamins.



Vitamin B₁ (Thiamine) works primarily with carbohydrates to produce energy. It plays a role in the transmission of nerve impulses and is needed for the muscular, cardiovascular and gastrointestinal systems. Prolonged thiamine deficiency results in a condition called beri-beri, which is associated with heart problems, muscle weakness, mental disorders and memory loss. People who have a high carbohydrate intake but low amounts of thiamine, such as people who eat a lot of highly milled or polished rice, are at particular risk. Alcoholics and breastfed infants of thiamine-deficient mothers are also at high risk.

Best sources of thiamine are: liver, pork, whole unrefined grains and some fruits. Thiamine is water soluble and fragile and is easily destroyed in cooking.

Vitamin B₂ (Riboflavin) is required to release energy from carbohydrates, protein and fats in body cells. It promotes growth, good vision and healthy skin, and is important for foetal bone, muscle and nerve development. An infant born to a mother with Vitamin B₂ deficiency is at risk of anaemia, poor digestive function, poor bone formation, and a suppressed immune system. Riboflavin may be deficient when food intake is low and is usually seen together with other nutrient deficiency problems. Signs of lack of riboflavin include dryness and swelling around the corners of the mouth and eyes, red, itchy eyes and sensitivity to light.

The best sources of riboflavin are: milk and dairy products such as cheese and yoghurt; liver is also a very high source of riboflavin. Grains and some vegetables are fair to good sources.

Vitamin B₃ (Niacin) is similar to thiamine and riboflavin in its importance in getting energy from carbohydrates, protein and fats in all cells. Niacin helps maintain a healthy skin, digestive tract and nervous system. Diets poor in niacin can result in pellegra, a disease often referred to as “The Three D’s”, because it can cause Dermatitis (flaky skin), Dementia (anxiety, delirium) and Diarrhoea. The risk of pellagra is increased in diets based almost entirely on maize, with little variety and low protein. However, soaking maize in lye (caustic soda) before cooking helps make niacin in maize more available for absorption (as in the traditional home preparation of tortillas).

Best sources of niacin are: chicken, beef, tuna and other fish, mushrooms, bran, enriched grains and cereals, groundnuts (peanuts), asparagus and green leafy vegetables. Niacin can also be made in the body from an amino acid in protein foods (tryptophan), so diets rich in protein from animal origin and legumes are usually sufficient in niacin.

Folate (Folic acid) is essential for helping cells multiply and for building and repairing body tissues. It works with other micronutrients to help the body break down, use and create new proteins and produce nucleic acids (DNA), the genetic



material required by all cells. Rapidly dividing cells are particularly vulnerable to folate deficiency. Maintaining adequate folate intake is essential for a healthy supply of red blood cells and the normal growth and development of a baby during pregnancy.

A folate deficiency before and during pregnancy can result in very serious birth defects of the brain and spinal cord (neural tube defects, or NTDs) in the developing baby. Because this damage occurs in the first few weeks of pregnancy, it is recommended that women who could become pregnant increase their consumption of folate before and during pregnancy. The need for folate in preparation for and during pregnancy can be met by consuming at least 5 servings a day of vegetables and fruits rich in folate. Women who are not able to meet their need for folate through their diet and women who have another child with NTDs are advised to eat foods fortified with folate or take folate supplements, in addition to eating folate-rich foods. Folate deficiency can lead to anaemia at any stage of life.

The best sources of folate: Folate gets its name from the Latin word, folium, which means “leaf”, as leafy green vegetables such as spinach and broccoli are excellent sources of folate. Liver, dried beans and peas, lentils and other legumes, and other vegetables and fruits, especially citrus, are also excellent sources. Meats, milk and milk products are fair sources of folate. Cereals and breads that have been fortified with folate are also good sources.

Vitamin C is important for the health of tissues and acts like the “cement” to hold cells and tissues together. It helps form collagen, the structural protein of connective tissues, which is necessary for forming bones and teeth and for forming scars on wounds (“gluing” wounded tissues together). In the cells and body fluids, vitamin C protects tissues from stress and may help reduce the risk of chronic disease. It also helps the body absorb iron and may strengthen some components of the immune system that help fight infections. Prolonged vitamin C deficiency can lead to scurvy, which is characterized by loose teeth, leaking of fluids from the tissues, failure to form healthy scar tissues, difficulties in bone rebuilding and bleeding in internal organs. If treated in time, these conditions can be reversed through consuming vitamin C-rich foods; it can be fatal if not treated in time.

Vitamin C is not stored in the body, so foods containing vitamin C should be eaten very often. It is also destroyed by heat and air, so foods need to be fresh and eaten with the shortest amount of cooking or other processing.

The best sources of vitamin C are: fruits and most vegetables, including potatoes (with skin). Oranges, lemons, limes, tangerines, grapefruits (citrus fruits), guavas, strawberries, kiwis, tomatoes, sweet peppers, broccoli and leafy greens are especially high in vitamin C.



MATERIALS



Fact sheet *Vitamins, their functions and good food sources*



Ask yourself work sheet *Vitamins in my diet*



Answer work sheet *Vitamins in my diet*



Match it work sheet *Vitamins matching game*



Quiz work sheet *Vitamins: Who am I?*



ACTIVITIES

Vitamins in my diet



Go to the work sheet *Vitamins in my diet* and fill in what you know about vitamins and the importance of vitamins in your foods and in your diet.



Tip: Look for more information on vitamins on the Fact sheet *Vitamins, their functions and good food sources*.

Vitamins matching game



Go to the Match it work sheet *Vitamins matching game*. Can you match the vitamins with their functions and food sources?



Tip: Look for more information on vitamins on the Fact sheet *Vitamins, their functions and good food sources*.

Vitamins: Who am I?



If you are working individually, use the *Who am I?* questions to test what you have learned about vitamins.



If working as a class:



1. Write the questions one at a time on the classroom board or a large sheet of paper.
2. Read out the question and ask for volunteers to answer it.
3. Discuss whether the answer is the correct one and write the correct answer on the board or paper next to the question.



If working in teams:



1. Write each of the Who am I? questions on individual strips of paper or cards.
2. Divide into two or more groups, depending on the size of the class.
3. Distribute randomly to each team the Who am I? questions until all questions have been given out.



4. Allow the teams enough time to read their questions among themselves and agree on the answers. In turn, each team reads out loud one question and the answer the team has agreed on. The other team or teams judge whether the answer is correct or not. This continues until all of the questions have been read out and answered by the teams. Points can be given for correct answers and subtracted for incorrect answers.

Tip: Additional Who am I? questions can be created using the tables and fact sheets provided in the lesson.

Vitamins collage



Look at the Fact sheet *Vitamins, their functions and good food sources* and make a list of all vitamin-rich foods available in your local markets and diets. Discuss which of these foods you eat and how often you eat them.

Collect as many pictures of these foods as possible. You can either draw local foods, take photos of them or cut out the illustrations from food labels, packages, newspapers or magazines.

Divide into two teams, show the images of foods to each other and try to guess which vitamins are highest in which foods. The teams get a score for each correct guess and lose a point for each wrong answer.

After the game, work all together or in two groups and create a poster or a collage “Main sources of vitamins”. Divide your poster in two parts: Fat-soluble vitamins; Water-soluble vitamins. Display the poster in your school for every student, teacher and parent to consult.



KEY POINTS

Review these five key points to remember about vitamins, their functions in the body and good food sources. See if your knowledge has improved and how you can apply it to your own diet and that of your family.

Vitamins

- Vitamins are vitally important for our health and life and must be supplied in small but sufficient amounts through the foods we eat. Lack of any vitamin in a diet can cause serious health problems and diseases.
- Vitamin A is important for eyesight, the immune system, reproduction and growth. Foods rich in vitamin A are orange and yellow fruits and vegetables, green leafy vegetables, milk, eggs, liver and other organs.
- Vitamin D helps the bones, immune system, brain, nervous system, skin, muscles, and reproductive organs. Its best source is the body’s own production through exposure to sunlight.
- The eight B-vitamins are important in processing energy, regulating body functions, building and repairing tissues. Folate is essential in preventing serious birth defects. Foods rich in B-vitamins are all meats, liver, fish, eggs, nuts, seeds, legumes and green leafy vegetables.
- Vitamin C is important for the health of tissues and acts like the “cement” to hold cells and tissues together and may reduce the risk of disease. Foods rich in vitamin C are fruits and most vegetables.



Part 2

Minerals: their functions and good food sources



READING

Minerals are needed to form body structures and regulate chemical reactions. They are taken up from the soil into plants and used by animals and people when they eat the plants. Like vitamins, minerals are needed in small amounts and do not provide energy. Also much like vitamins, minerals are required to regulate many body processes, such as heartbeat, nerve response and reactions, blood clotting, fluid regulation and energy metabolism (release of energy from food). Minerals form part of the structure of bones, teeth, nails, muscles and red blood cells. Minerals cannot be broken down or changed by our bodies and are not destroyed by heat or air.

Each essential mineral is important and although some are needed in only very small amounts, the body does not function properly unless all are supplied in sufficient quantities. Eating a varied and balanced diet is the best way to be sure to have a diet sufficient in required minerals. The minerals currently known to be essential in human nutrition are: calcium, iron, iodine, phosphorus, potassium, sodium, chlorine, magnesium, sulphur, fluoride, zinc, manganese, chromium, cobalt, molybdenum, copper and selenium. While all of these minerals are important for good health, four of them – calcium, iron, iodine and zinc – are discussed in detail below, as deficiencies of these four essential minerals are more common and can lead to serious health problems.

TO THINK ABOUT WHILE READING



What does the word mineral mean to you?

Do you know why we need minerals?

Do you know what foods are good sources of different minerals?



See Fact sheet *Minerals, their functions and good food sources* for more information on the functions and good food sources of the essential minerals.



See Fact sheet *Problems of poor nutrition and their signs and effects* for more information on nutritional problems resulting from a lack of some of these minerals.

Calcium

Calcium is essential for healthy bone growth and for nerve and muscle functions; it may protect against high blood pressure. Calcium is the most abundant mineral in the body. Most of the calcium in the



body is located in the bones, providing a “storage bank” to maintain maximum calcium storage throughout life. Stored calcium is released into the body when needed to maintain a constant level in the blood for important body functions such as muscle movements (contract and relax) and transmitting nerve impulses. Without an exact level of calcium in the blood, our heart would not be able to beat and we would not be able to breath or move.

Adequate calcium intake is important at all stages of life. In childhood and adolescence, it is particularly important to eat and drink calcium-rich foods to ensure maximum calcium storage and strong bones. This is because calcium is most easily absorbed into the bones until late adolescence, after which the ability to store calcium slows down and becomes more difficult. Calcium needs are high during pregnancy, when the infant’s bones are developing, and even more so in breastfeeding, when high levels of calcium are passed to the baby through the breastmilk. Later in life, when storage levels are low, it is also important to increase calcium in the diet in order to protect bones from further calcium loss and to prevent osteoporosis, a disease resulting from lack of calcium, in which bones become weak and brittle and can easily break.

The best sources of calcium are: milk, cheese and yoghurt; small fresh or dried fishes with the bones and fish sauces containing the fish bones; white beans; tofu (soybean); almonds and sesame seeds. Some vegetables and leafy greens, such as broccoli and spinach, contain calcium, but large quantities of these foods must be eaten to ensure sufficient calcium.

Iron

Iron is needed in the blood and muscles as part of the system that carries oxygen throughout the body to be used for energy production in the cells. Iron is also involved in getting energy from carbohydrates, protein and fats and is needed for making amino acids and body tissues. Iron needs are greatest during periods of growth and development, so infants, children and pregnant women have the highest needs. Iron deficiency anaemia, which occurs when iron is low, contributes to deaths in pregnancy and childbirth and can result in poor growth and development, low resistance to disease, poor reproductive functions and lower resistance to infections leading to increased illness.



See Fact sheet *Iron deficiency anaemia* for more information on what it is, who is at risk and how to prevent and treat it.

Sources of iron: Iron is found in both animal and plant foods, but the iron in animal foods is in a form that is very easy for the body to absorb and use, while iron from plant foods is not as easily absorbed or used by the body. Good animal sources of iron are: meat, especially red meat, liver, eggs, fish and



poultry. Plant sources of iron include beans, soybeans and tofu, leafy green vegetables, dried fruits and foods fortified with extra iron, such as enriched bread. Vitamin C can help the body's ability to absorb iron, so eating iron-rich foods together with foods such as lemons, limes, oranges, grapefruits, tomatoes and strawberries will increase the iron we get from foods. Other food components, such as phytates in bran and tannins in teas, can inhibit the absorption of iron and other minerals.

Iodine

Iodine is necessary for the body to make the thyroid hormone which regulates many body systems, including: temperature, growth, blood cell production, nerve and muscle development. Iodine is essential for the normal growth, development and functioning of the brain and body. When iodine is low in the diet, the thyroid gland works hard to try to produce enough thyroid hormone. This results in the gland becoming enlarged, a condition called goitre. Lack of sufficient iodine is the most common cause of preventable mental retardation and brain damage in the world. Severe iodine deficiency during pregnancy can result in permanent mental and physical defects in the baby and increased risk of stillbirths (babies born dead) and infant deaths.

Iodine occurs naturally in the soil and in plants in many parts of the world, especially in coastal areas, but is absent in many other places. Because iodine cannot be stored in the body for very long, some amount of iodine must be consumed regularly. While many people can meet their iodine needs from food, people who live in areas where food is grown in soil that does not contain sufficient iodine, or who do not have access to seafood which is high in iodine, are at risk of being iodine-deficient. In areas where the food supply is deficient in iodine, it is often added to salt. Many countries require all salt to be iodized in order to prevent the serious and permanent problems caused by iodine deficiency.

The best sources of iodine are: seafood and saltwater fish, seaweed and iodized salt. Good vegetable sources, if they are grown in iodine-rich soil are garlic, soybeans, spinach and turnip greens.



See Fact sheet *Iodine deficiency* for more information on what it is, who is at risk and how to prevent and treat it.

Zinc

Zinc is involved in over 100 chemical reactions in the body. It works with proteins in the body, helps keep cells strong, assists the immune system to keep us free from illness and is necessary for normal growth and development. It is needed to produce the active form of vitamin A in the eye and is important for healing cuts and wounds and for a normal sense of taste. Lack of sufficient zinc



can interfere with the proper functioning of many organ systems, including the central nervous system and the brain, especially when it occurs during infancy, childhood and pregnancy.

The best sources of zinc are: fish and shellfish (oysters, crab, shrimp), red meats and liver. Good sources are poultry, eggs. Whole grains and legumes can be good sources if eaten in large quantities.



See Lesson 3 for information on problems caused by lack of essential vitamins and minerals.

Fortified foods and dietary supplements

The vitamin and mineral needs of most people can be met through a good, varied diet. In circumstances in which people do not have a sufficiently varied diet, or are not able to digest and absorb nutrients adequately because of illness, or during periods of increased need, such as pregnancy, breastfeeding and early childhood, fortified foods or dietary supplements may be recommended. In the case of severe deficiencies, supplements (in the form of a pill, tablet or liquid) are usually recommended, in addition to increasing consumption of foods rich in micronutrients. For example, among populations with high levels of vitamin A deficiency or during a measles outbreak, a vitamin A supplement may be given to infants and children and to women after the birth of a baby. Vitamin A can be added to milk and some vegetable oils. Iodine is added to salt in many countries to prevent iodine deficiency, and the B-vitamins and iron are often added to flour, bread and other cereal products. While low consumption and absorption of essential vitamins and minerals can result in deficiencies and undesirable health conditions, excessively high intakes through excess supplements can also have adverse health effects. Before taking dietary supplements, the overall intake of a specific vitamin or mineral from all food sources needs to be considered and a doctor or other health care provider should be consulted.



MATERIALS



Fact sheet *Minerals, their functions and good food sources*



Ask yourself work sheet *Minerals in my diet*



Answer work sheet *Minerals in my diet*



Match it work sheet *Minerals matching game*



Quiz work sheet *Minerals: Who am I?*



ACTIVITIES

Minerals in my diet



Go to the Work sheet *Minerals in my diet* and fill in what you know about minerals and the importance of minerals in your foods and in your diet.



Tip: Look for more information on vitamins on the Fact sheet *Minerals, their functions and good food sources*.

Minerals matching game



Go to the Match it work sheet *Minerals matching game*. Can you match the minerals with their functions and food sources?



Tip: Look for more information on minerals on the Fact sheet *Minerals, their functions and good food sources*.

Minerals: Who am I?



If you are working individually, use the *Minerals Who am I?* questions to test what you have learned about minerals.

If working as a class:

1. Write the questions one at a time on the classroom board or a large sheet of paper.
2. Read out the question and ask for volunteers to answer it.
3. Discuss whether the answer is the correct one and write the correct answer on the board or paper next to the question.



If working in teams:

1. Write each of the Who am I? questions on individual strips of paper or cards.
2. Divide into two or more groups, depending on the size of the class.
3. Distribute randomly to each team the Who am I? questions until all questions have been given out.
4. Allow the teams enough time to read their questions among themselves and agree on the answers. In turn, each team reads out loud one question and the answer the team has agreed on. The other team or teams judge whether the answer is correct or not. This continues until all of the questions have been read out and answered by the teams. Points can be given for correct answers and subtracted for incorrect answers.



Tip: Additional Who am I? questions can be created using the tables and fact sheets provided in the lesson.

Minerals collage



Look at the Fact sheet *Minerals, their functions and good food sources* and make a list of all foods rich in calcium, iron, zinc and iodine available in your local



markets and diets. Discuss which of these foods you eat and how often you eat them.

Collect as many pictures of these foods as possible. You can draw local foods, take photos of them or cut out the illustrations from food labels, packages, newspapers or magazines.

Divide into two teams, show the images of foods to each other and try to guess which minerals are in which foods. The teams get a score for each correct guess and lose a point for each wrong answer.

After the game, work all together or in two groups and create a poster or a collage “Main sources of minerals”. Display the poster in your school for every student, teacher and parent to look at.



KEY POINTS

Review these five key points to remember about minerals, their functions in the body and good food sources. See if you feel that your knowledge has improved and how you can apply it to your own diet and that of your family.

Minerals

- Each essential mineral is important and although some are needed in only small amounts, the body does not function properly unless all are supplied in sufficient amounts. Lack of any essential mineral can cause serious health problems and diseases.
- Calcium is essential for strong bones and teeth and is necessary for nerve and muscle functions. Foods rich in calcium are milk, yoghurt, cheeses, some small fishes with bones and leafy green vegetables.
- Iron carries oxygen through the body and is important for proper growth and development and resistance to infections. It is especially important for women during pregnancy and childbirth, and for infants and children. Food rich in iron are red meats, liver, fish, poultry and eggs.
- Iodine is essential for normal growth, development and functioning of the brain and body. It is especially important for preventing mental retardation, brain damage and serious defects during pregnancy. Best sources of iodine are seafood, saltwater fish, seaweed and iodized salt.
- Zinc helps keep cells strong, assists the immune system and is critical for normal growth and development. It is important for the proper functioning of the central nervous system and the brain, especially during infancy, childhood and pregnancy. Best sources of zinc are fish and shellfish, red meats and liver.



Vitamins, their functions and good food sources

“Vitamins are needed to enable the body processes to work properly and to help the body stay healthy.”

Fat soluble vitamins are stored by the body in fat cells; they do not dissolve in water or body fluids.

Function

Vitamin A

Essential for good eyesight, skin, reproduction and growth, tissues of the respiratory and digestive tracts and proper function of the immune system in fighting infections. Aids in the growth and reproduction of hair, bones and teeth. May help in protecting the body against certain forms of cancer.

Vitamin D

Helps build and maintain teeth and bones and enhances calcium absorption. Helps the immune system, the brain, the nervous system, the skin, muscles and cartilage, reproductive organs and red blood cells. Helps regulate blood pressure and may play a role in preventing some cancers.

Vitamin E

Helps form red blood cells, muscles and other tissues. May help in protecting the body against certain forms of cancer and in reducing the risk of heart disease.

Vitamin K

Assists in blood clotting and needed for bone formation.

Good food sources

Orange vegetables like carrots, pumpkins and red/yellow peppers, ripe mangoes, papayas (papaws), yellow/orange sweet potatoes, yellow maize and yellow bananas (if eaten in large amounts), cantaloupe, apricots. Broccoli, green leafy vegetables such as spinach, amaranthus and kale, fresh unbleached red palm oil, liver and kidneys, fish liver oils, small dried fish eaten whole, egg yolks, breastmilk (particularly colostrum), fortified milk, butter and cheese.

Exposure to sun enables body to make its own vitamin D. Small amounts are found in eggs, liver, veal, beef, fatty fish and their oil; greater amount in fortified milk and margarine.

Vegetable and seed oils: soybean oil, wheat germ oil, corn oil and sunflower oil. Leafy green vegetables, whole grains, liver, egg yolks, nuts, seeds and wheat germ.

Liver, green leafy vegetables and cabbage-type vegetables. Milk, meat, eggs, cereals, fruits and vegetables provide smaller, but still significant, amounts. Also made by bacteria in the digestive system.

Continued



Vitamins, their functions and good food sources (cont.)

Water soluble vitamins are not stored in the body; they dissolve in water and excesses are eliminated.

Function

Vitamin C	Helps bind tissues and cells together and strengthens blood vessel walls. Helps maintain healthy gums. Aids in the absorption of iron in plant foods. Acts as an antioxidant, which protects the cells. Strengthens resistance to infection.
B ₁ (Thiamine)	Needed for carbohydrate metabolism and for the muscular, cardiovascular, nervous and gastrointestinal systems. Promotes proper nerve function. Especially important during pregnancy, breastfeeding and adolescence.
B ₂ (Riboflavin)	Needed for metabolism of all foods and the release of energy to cells. Essential to the functioning of vitamin B ₆ (Pyridoxine) and vitamin B ₃ (Niacin).
B ₃ (Niacin)	Needed in many enzymes that convert food to energy. Helps maintain a healthy digestive tract, nervous system and skin.
B ₅ (Pantoic acid)	Helps in energy metabolism and in the manufacture of hormones and chemicals that regulate nerve function.

Good food sources

Fresh fruits such as: guava, baobab, kiwi, mango, papaya, strawberries, cantaloupe and most vegetables including potatoes. Citrus fruits such as orange, lemon, grapefruit. Tomatoes, broccoli, green, red and yellow peppers. Fresh animal milk, breastmilk.
Liver, pork, yeast, whole unrefined grains, nuts, sunflower seeds, peas, watermelon, oatmeal, wheat germ and some fruits.
Liver, milk and other dairy products including cheese and yoghurt. Grains, green vegetables, such as broccoli, asparagus and spinach, mushrooms.
Chicken, beef, tuna and other fish, mushrooms, bran, enriched grains and cereals, groundnuts (peanuts), asparagus and green leafy vegetables, and all protein-containing foods.
Abundant in animal tissues, meat, fish, chicken and other poultry. Also in whole grain cereals, legumes, and mushrooms, avocados, broccoli.

Continued



Vitamins, their functions and good food sources (cont.)

	Function	Good food sources
B ₆ (Pyridoxin)	Needed for absorption and metabolism of protein and absorption of carbohydrates. Helps form red blood cells. Promotes nerve and brain function. Helps make body protein.	Meat, fish, poultry, eggs, green vegetables, avocado, spinach, broccoli, non-citrus fruits (prunes, bananas) liver, soy products, whole grain cereals, potatoes.
B ₁₂ (Cobalamin)	Helps build new cells, including red blood cells. Helps keep nervous system healthy.	Found almost exclusively in animal flesh and products: all meats, organs/offal and poultry. Milk, cheese and eggs, fish and shellfish.
B ₈ (Biotin)	Important in the metabolism of carbohydrates, fats and protein.	Found in almost all foods; especially good sources are organ/offal meats, egg yolks, soybeans, fish, whole grains.
Folate (Folic acid)	Essential for the production and maintenance of new cells. Especially important during pregnancy to prevent neurological and other birth defects and during infancy.	Best sources are green leafy vegetables: spinach, turnip greens, lettuces, dried beans and peas, sunflower seeds, fortified cereal products and liver. Smaller amounts found in meat, milk and milk products.



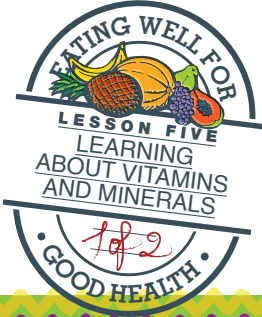
Reading this fact sheet will help you complete
Work sheet **Vitamins in my diet**



Vitamins in my diet

Fill in what you know about vitamins and their importance in your foods and in your diet.

1. Why are vitamins called micronutrients?
.....
.....
.....
2. Can vitamins be seen or tasted?
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.....
.....
3. Why do we need vitamins?
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.....
.....
4. What can happen to a person who does not get enough of the essential vitamins?
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5. What vitamins need fat in order to be absorbed by the body?
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.....
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6. Why do we need to get water-soluble vitamins regularly from food?
.....
.....
.....



7. Deficiencies of which vitamins are most likely to cause serious health problems if we do not get enough of them from our food?

.....
.....
.....

8. Do you think you get enough of the essential vitamins from the foods you eat?

.....
.....
.....

9. Do you eat a variety of different foods to be sure you get all of the vitamins you need?

.....
.....
.....

10. How can you add more foods rich in essential vitamins to your meals?

.....
.....
.....



★ Check your answers with the Answer work sheet **Vitamins in my diet**

★ You can look for more information on *Fact sheet* **Vitamins**, their functions and good food sources



Vitamins in my diet

Questions

1. Why are vitamins called micronutrients?
2. Can vitamins be seen or tasted?
3. Why do we need vitamins?
4. What can happen to a person who does not get enough of the essential vitamins?
5. What vitamins need fat in order to be absorbed by the body?
6. Why do we need to get water-soluble vitamins regularly from food?
7. Deficiencies of which vitamins are most likely to cause serious health problems if we do not get enough of them from our food?
8. Do you think you get enough of the essential vitamins from the foods you eat?
9. Do you eat a variety of different foods to be sure you get all of the vitamins you need?
10. How can you add more foods rich in essential vitamins to your meals?

Answers

- Because they are needed in very small (micro) amounts.
- No
- Vitamins are necessary for many body processes. They help the body grow, stay healthy and function well.
- Lack of adequate amounts of essential vitamins can lead to the development of serious health problems and diseases.
- The four fat-soluble vitamins: A, D, E and K
- Water-soluble vitamins are not stored in the body. Any unused amounts of these vitamins are passed out of the body through urine. Therefore, they must be taken in on a regular basis.
- A, D, C, the B-complex vitamins and folate
- Individual reflection
- Individual reflection
- Individual reflection



This Answer work sheet
will help you complete
Work sheet **Vitamins in my diet**

Vitamins matching game

Can you match the vitamins with their functions and food sources?

- Vitamin A
 - Vitamin D
 - Vitamin E
 - Vitamin K
 - Folate
 - Vitamin C
 - All water-soluble vitamins: B-complex and C
 - All fat-soluble vitamins: A, D, E and K
1. Works together with calcium to help bones grow well.
 2. Its precursor is found in dark yellow and leafy green vegetables such as carrots and sweet potatoes and deep yellow fruits such as peaches.
 3. Helps form red blood cells, muscles and tissues.
 4. Good food sources are cabbages and green salads, can be made by bacteria in the digestive track.
 5. Important for good eyesight and proper growth.
 6. Found naturally in very few foods. The best source is the body's own production of it through exposure of the skin to sunlight.
 7. Helps in blood clotting.
 8. Good food sources are dark green, yellow or orange vegetables and oil seeds.
 9. Important for production of cells. Essential during infancy and pregnancy to prevent birth defects.
 10. Need dietary fat to be absorbed in the body.
 11. Best sources are green leafy vegetables, dried beans and peas, sunflower seeds, fortified cereal products and liver.
 12. Very fragile: easily destroyed in cooking and storing.
 13. Helps bind tissues and cells together and strengthens blood vessel walls. Helps maintain healthy gums and protect the cells. Aids in absorbing iron.
 14. Citrus fruits (orange, lemon, lime, grapefruit), mango, papaya, tomatoes, red, yellow and green peppers are good sources.



Answer key: 1 Vit D, 2 Vit A, 3 Vit E, 4 Vit K, 5 Vit A, 6 Vit D, 7 Vit K, 8 Vit A, 9 Folate, 10 All fat soluble vitamins, 11 Folate, 12 All water soluble vitamins, 13 Vit C, 14 Vit C.

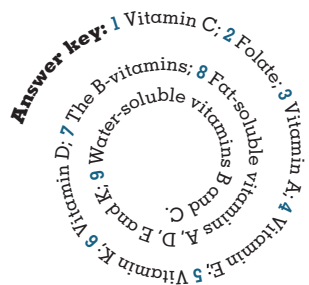
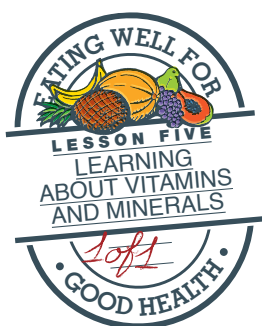
You can look for more information on Fact sheet **Vitamins, their functions and good food sources**

Vitamins: who am I?

How well do you know
your vitamins?
See if you can name the
correct vitamin for each
“Who am I?” question.

1. I help keep your gums healthy and can help fight disease. I am found in oranges, lemons, limes, grapefruit and other citrus fruits. Who am I?
.....
2. I am a B vitamin and I am especially needed during pregnancy to prevent birth defects. You can find me in green leafy vegetables. Who am I?
.....
3. I help you to see well at night and help protect you against infections. I can be found in some foods of animal origin or made from carotenes found in yellow and orange-coloured fruits and vegetables. Who am I?
.....
4. I help with red blood cells, muscles and tissue. I am found in many types of oils and nuts. Who am I?
.....
5. I help to clot your blood when you get a cut. I am found in liver and green vegetables. Who am I?
.....
6. I work with calcium to make your teeth and bones strong. You can get me from being in the sun and from eggs, liver and fish. Who am I?
.....
7. We are a group of vitamins that helps your body with many functions. There are eight of us and we can be found in many of the same foods, especially grains. Who are we?
.....
8. We need some fat to be absorbed in the body. Who are we?
.....
9. We are eliminated through urine, so we need to be eaten regularly. Who are we?
.....

★ More “Who am I” questions
can be created using the
Fact sheet **Vitamins, their functions
and good food sources**



Minerals, their functions and good food sources

“Minerals are needed to form body structures and regulate chemical reactions”

Mineral	Function	Good food sources
Calcium	Helps build strong bones and teeth. Promotes muscle and nerve function. Helps blood to clot, aids in converting food to energy. May help prevent high blood pressure.	Milk, yogurt and cheeses. Sardines and other small fish (with bones), fish sauces with fish bones. Some vegetables and leafy greens, such as broccoli, chard, turnip greens and spinach, although large quantities are needed to ensure sufficient calcium. White beans, almonds, sesame seeds, tofu (soybean curd).
Chloride	Needed to help maintain pressure of fluids outside the cells and to maintain normal fluid balance. Is essential in the formation of acid (HCL) in the stomach and also aids in the transport of carbon dioxide (CO ₂) by red blood cells.	High amounts in table salt, soy sauce. Moderate amounts in meats, including cured ham, and in milk, eggs and cheese. Large amounts in processed foods, and foods that contain sodium.
Chromium	Helps in the metabolism of carbohydrate, protein and fat. Works with insulin for proper glucose metabolism.	Egg yolks, meat, liver, whole grains, broccoli and green beans.
Cobalt	Main function is to prevent anaemia. It works with vitamin B ₁₂ in the production of red blood cells, and to ensure the health of the nervous system.	Green leafy vegetables, meat, liver, milk, oysters and clams.
Copper	Necessary for the absorption and use of iron in formulation of haemoglobin. Needed to make red blood cells, connective tissue and nerve fibres, including making skin, hair and other pigments. May assist the immune system.	Seafood, nuts, organ/offal meats, whole grains and whole grain products, seeds and legumes.

Continued



Minerals, their functions and good food sources (cont.)

Mineral	Function	Good food sources
Fluoride	Helps make teeth more resistant to acids and decay and to make bones stronger.	Drinking water, if fluoride-containing or fluoridated. Seafood such as sardines, salmon, cod, mackerel and shrimps. Tea and some fruit juices.
Iodine	Necessary for making the thyroid hormones that regulate body temperature, metabolic rate, reproduction, growth, red blood cells, and nerve and muscle function. Essential for the normal growth, development and functioning of the brain and body.	Highest sources: Iodized salt, seafood, saltwater fish, seaweed, such as kelp and dulse, white deep-water fish. Good sources from plants grown in iodine-rich soil: garlic, lima beans, sesame seeds, soybeans, spinach, summer squash, chard and turnip greens. Milk and milk products, if iodine is added to animal feed.
Iron	Primary function is to transport oxygen from the lungs through the body. It is an essential part of haemoglobin, the red substance in blood that carries oxygen throughout the body for use in energy production in the cells. Is needed for helping the immune system fight disease.	Best sources: red meats, including liver, fish, shellfish, poultry. Medium sources: eggs, legumes, including kidney beans, soybeans, tofu, leafy green vegetables. Apricots, almonds, sesame seeds, raisins.
Magnesium	Needed by cells for genetic material and bone growth. It helps maintain normal muscle and nerve function, keeps heart rhythm steady, helps blood clotting, supports a healthy immune system, and works with calcium to keep bones and teeth strong. Also helps regulate blood sugar levels, promote normal blood pressure, and helps in releasing energy in body.	High amounts in dark green vegetables such as spinach, leafy greens and broccoli, nuts and unrefined, whole grains. Medium amounts in meats and milk.
Manganese	Needed for normal bone formation. Important for metabolizing protein, fat and carbohydrate.	Nuts, whole grains and cereal products are the richest dietary sources. Adequate amounts are found in fruits and vegetables.

Continued



Minerals, their functions and good food sources (cont.)



**This Fact sheet will help you complete
Work sheet Minerals in my diet**

Mineral	Function	Good food sources
Molybdenum	Aids in metabolism and helps regulate iron storage.	Highest sources: legumes, such as beans, peas and lentils. Medium: grain products and nuts (depending on the soil content and other conditions.)
Phosphorous	Needed for energy metabolism, body chemistry, nerve and muscle function and is necessary for all growth. Part of the body system responsible for transmission of genetic information (DNA and RNA). Works with calcium to build bones and teeth.	All animal sources: milk, cheese, yoghurt and other milk products, meat, fish, poultry, eggs. Also some plant seeds and legumes (such as beans, peas, lentils), cereals and nuts.
Potassium	Helps maintain regular fluid balance inside the cells. Needed for nerve impulses, muscle contractions and promotes a steady heartbeat.	Highest sources are fruits and vegetables, such as bananas, plums and prune juice, orange and orange juice, tomatoes, spinach, green beans, mushrooms, broccoli and some squashes. Also, meats, milk, grains, legumes and sunflower seeds.
Selenium	Needed as an antioxidant that interacts with vitamin E to prevent breakdown of fats and body chemicals. Regulates thyroid hormone.	Seafood, kidney liver, chicken and other meats. Whole grains and vegetables (depending on soil content) including seeds, broccoli, brown rice, corn, garlic, onions, salmon, soybeans; dairy products. Molasses.
Sodium	Important for the regulation of fluid outside the cells, including blood plasma. Regulates blood volume and blood pressure. Assists in nerve impulse transmission, muscle contraction and heart function. Helps transport substances across cell membranes.	Sodium is found in virtually all foods, with processed foods generally having the most, and unprocessed foods such as fresh fruits and vegetables the least. Moderate amounts in meats, nuts, grains; low amounts in dairy products, depending on their processing. Added to food in the form of sodium chloride, or table salt.
Sulphur	Essential part of various amino acids, thiamine, insulin, biotin. Helps keep hair and nails strong and healthy and helps maintain elasticity in the skin.	Meat, milk, eggs and legumes.
Zinc	Helps in forming protein, important for growth and development, the immune system, neurological function, blood clotting and reproduction. Essential for digestion and metabolism. Assists in vitamin A activity.	High sources: Fish, beef and other red meats, shellfish (oysters, shrimp, crabs). Good sources: poultry, eggs, whole grains, nuts and legumes.



Minerals in my diet

Fill in what you know about the minerals and their importance in your diet and in the foods you eat.

1. Why are minerals called micronutrients?

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.....
.....

2. Where do the minerals in foods come from?

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.....
.....

3. Why do we need minerals?

.....
.....
.....

4. Do they provide energy (calories)?

.....
.....
.....

5. Are minerals destroyed by heat or air?

.....
.....
.....

6. What can happen to a person who does not get enough of the essential minerals?

.....
.....
.....



7. Deficiencies of what four minerals are most likely to cause serious health problems if we do not get enough of them from our food?

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.....
.....

8. Do you think you get enough of these essential minerals from the foods you eat?

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.....
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9. Do you eat a variety of different foods to be sure you get all of the minerals you need?

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.....

10. How can you add more foods rich in essential minerals to your meals?

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★ You can look for more information on *Fact sheet Minerals,* their functions and good food sources

★ Check your answers on Answer work sheet *Minerals in my diet*



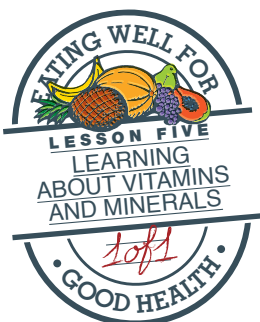
Minerals in my diet

Questions

1. Why are minerals called micronutrients?
2. Where do the minerals in foods come from?
3. Why do we need minerals?
4. Do they provide energy (calories)?
5. Are minerals destroyed by heat or air?
6. What can happen to a person who does not get enough of the essential minerals?
7. Deficiencies of what four minerals are most likely to cause serious health problems if we do not get enough of them from our food?
8. Do you think you get enough of the essential minerals from the foods you eat?
9. Do you eat a variety of different foods to be sure you get all of the minerals you need?
10. How can you add more foods rich in essential minerals to your meals?

Answers

- Because they are needed in very small (micro) amounts.
- They are taken up from the soil into plants we eat.
- Minerals are needed to help the body form its structures, regulate chemical reactions and to regulate many body processes.
- No
- No
- Lack of adequate amounts of essential minerals can lead to the development of serious health problems and diseases.
- Calcium, iron, iodine and zinc
- Individual reflection
- Individual reflection
- Individual reflection



★ Use this Answer work sheet to check your answers on Work sheet Minerals in my diet

Minerals matching game

Can you match the minerals with their functions and food sources?

- Calcium
- Iron
- Iodine
- Zinc

1. Foods rich in this mineral are red meats, liver, fish and poultry.
2. Best sources are red meat, fish and shellfish: shrimp, oysters, crabs.
3. Helps build strong bones and teeth.
4. Important for preventing mental retardation, brain damage and goitre.
5. Carries oxygen from the lungs through the body. Lack of this mineral can cause anaemia.
6. Good sources are milk, yoghurt, cheeses, small fishes with bones and leafy green vegetables.
7. Best sources are seaweed, saltwater fish, seafood and fortified salt.
8. Helps keep cells strong, assists the immune system, the central nervous system and the brain. Is involved in 100 chemical reactions in the body.



Answer key: 1 Iron; 2 Zinc; 3 Calcium; 4 Iodine; 5 Iron; 6 Calcium; 7 Iodine; 8 Zinc.

You can find more information on Fact sheet Minerals, their functions and good food sources

Minerals: who am I?

How well do you know your minerals? See if you can name the correct mineral for each "Who am I?" question.

1. I help to build strong bones and I am found in dairy products and in broccoli. Who am I?
.....
2. I help your thyroid gland to function and am very important in pregnancy for the unborn baby. I come mostly from the sea and I am added to other foods. Who am I?
.....
3. I make the part of your blood that is red and carries oxygen through the body. I am found in many meats. Who am I?
.....
4. I am highest during adolescence and decrease over time, especially for women as they have children. Who am I?
.....
5. I help to heal your cuts and wounds and help your sense of taste. I am found in fish, oysters and crabs. Who am I?
.....
6. If my levels are low, your bones can become brittle and break. Who am I?
.....
7. I will absorb much better if you eat me together with lemons, oranges, grapefruits, tomatoes and other foods rich in vitamin C. Who am I?
.....
8. You can find me in the soil and in the sea and in plants in many parts of the world, especially in coastal areas, but I am absent in many other places. Who am I?
.....

★ More "Who am I" questions can be created using the Fact sheet Minerals, their functions and good food sources

Answer key: 1 Calcium; 2 Iodine; 3 Iron; 4 Calcium; 5 Zinc; 6 Calcium; 7 Iron; 8 Iodine.

