MINISTRY OF EDUCATION
HOME ECONOMICS
TEACHERS ASSOCIATION, GH

Food And Nutrition

for Senior High Schools

Year 1

Abigail Naa Korkoi Palm
Lily-Versta Nyarko
Ama Achiaa - Afriyie

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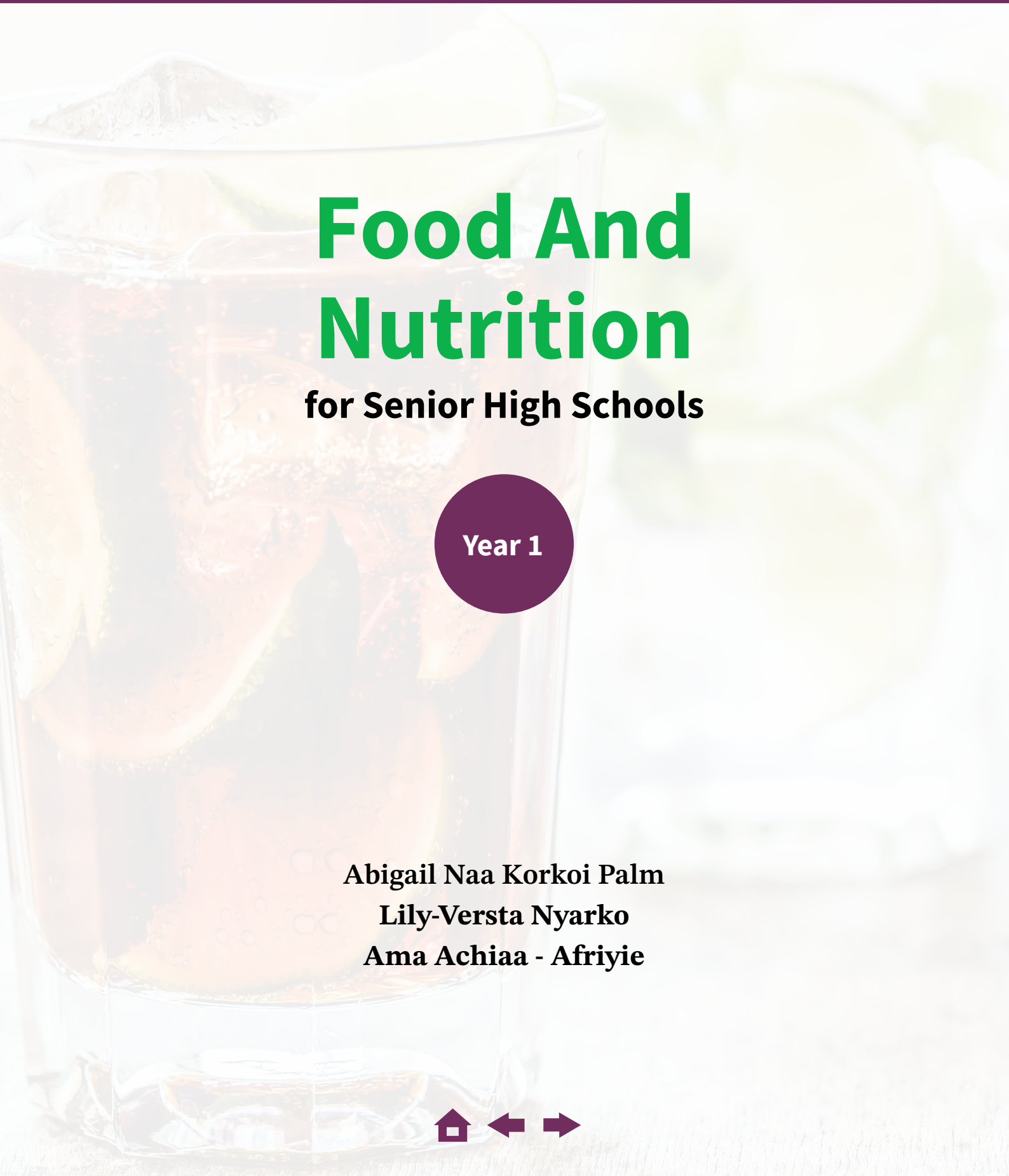

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FOREWORD

Ghana's new Senior High School Curriculum aims to ensure that all learners achieve their potential by equipping them with 21st Century skills, knowledge, character qualities and shared Ghanaian values. This will prepare learners to live a responsible adult life, progress to further studies and enter the world of work. This is the first time that Ghana has developed a Senior High School Curriculum which focuses on national values, attempting to educate a generation of Ghanaian youth who are proud of our country and can contribute effectively to its development.

The Ministry of Education is proud to have overseen the production of these Learner Materials which can be used in class and for self-study and revision. These materials have been developed through a partnership between the Ghana Education Service, teacher unions (Ghana National Association of Teachers-GNAT, National Association of Graduate Teacher -NAGRAT and the Coalition of Concerned Teachers- CCT) and National Subject Associations. These materials are informative and of high quality because they have been written by teachers for teachers with the expert backing of each subject association.

I believe that, if used appropriately, these materials will go a long way to transforming our Senior High Schools and developing Ghana so that we become a proud, prosperous and values-driven nation where our people are our greatest national asset.

Haruna Iddrisu MP
Minister for Education

SECTION

1

NUTRITION, COMMODITIES & FOOD HABITS

NUTRITION AND HEALTH

Food for Healthy Living

Introduction

Food and nutrition play an important role in our daily lives. The food choices we make affect our health, energy, growth, and overall well-being. By understanding the basic concepts of food and nutrition, we can make healthy decisions to stay strong and active.

We use different food commodities like grains, fruits, vegetables, meat, and dairy to prepare meals. Some are fresh, while others are convenience foods that are easy to cook. Heat used in cooking can affect food nutrients, so it is important to use methods that help retain them.

Our bodies need nutrients such as carbohydrates, proteins, vitamins, and minerals for growth and development. Lack of these nutrients can lead to nutrient deficiencies and health problems.

Our food habits and lifestyle are influenced by culture, religion, family, media, and personal choices. This section will help you explore these areas and apply the knowledge in daily life for better health.

KEY IDEAS

- Cooking methods affect nutrient retention during food preparation and heating.
- Food and nutrition impact health, energy, growth, and overall well-being.
- Food habits are shaped by culture, religion, family, and personal choices.
- Healthy food choices require understanding of basic food and nutrition concepts.
- Meals are prepared using fresh and convenient food commodities daily.
- Nutrients like proteins and vitamins support growth and prevent deficiencies.

CONCEPTS IN FOOD AND NUTRITION

Food is anything we eat or drink that helps our body grow, gives us energy, and keeps us healthy. This includes things like rice, fruits, vegetables, milk, meat, and even water.

Nutrition is the study of food and how it works in our body. It helps us understand what food does in our bodies and how it helps us grow, stay strong, and live a healthy life.

Table 1.1: Food and Nutrition Terms

SN	CONCEPT	MEANING
1	Food	Food is anything you eat or drink that helps your body to grow, stay strong, and remain healthy. ***Examples of some Ghanaian foods:*** • Banku with okro soup gives you strength. • Kontomire stew helps you stay healthy. • Sobolo (hibiscus drink) refreshes the body
2	Nutrients	The tiny parts in food that give you energy and help your body work are called nutrients. Nutrients are like fuel for the body, they help you play, think, grow, and stay strong. ***Examples:*** • Kenkey and fish → gives energy (carbohydrates + protein) • Groundnut soup → builds and repairs the body (protein + fats) • Mango → protects you from sickness (vitamins + minerals) • Water → keeps the body cool and working well
3	Nutrition	Is the study of how food helps your body grow, stay healthy, and get energy. Nutrition teaches us what food does inside the body and why we need to eat different kinds of food.
4	Digestion	Digestion is the way your body breaks down the food you eat into smaller parts so your body can use it. **a.** When you eat food, it does not stay in the same form inside you. **b.** Your teeth break food into smaller pieces. **c.** Your stomach and intestines use juices to change the food into very tiny bits. **d.** These tiny bits give your body energy, growth, and strength. **e.** What your body cannot use is removed as waste. **In simple terms:** Digestion is how food changes in your body so you get the good parts and remove the waste.
5	Metabolism	The way the body uses food to get energy and to build or repair itself. It is like the body's engine. It changes the nutrients from food into fuel that helps you move, think, grow, and stay alive. ***Examples:*** • When you eat waakye, the carbohydrates are changed into energy so you can walk or play football. • When you eat fish, the protein is used to build muscles and repair the body. • Even when you are sleeping, metabolism is working to keep your heart beating and your body warm.

The Journey of Food in the Body

Using rice and tomato stew with fish as an example, let us explore what happens inside your body.

1. **Digestion**

   Breaking down the food we eat. Digestion starts the moment you take a bite

   a. In the mouth, you chew the rice and fish. Your saliva helps break down the rice. (carbohydrate)

      i. **Where it begins:** Digestion starts right when you take your first bite.

      ii. **Mechanical digestion:** Your teeth chew food into smaller pieces.

      iii. **Chemical digestion:** Saliva contains an enzyme called amylase, which starts breaking down carbohydrates (like bread and rice).

      iv. **End result:** You end up with a soft mixture called a bolus, which is easy to swallow.

   b. In the stomach, stomach juices help break down the fish (protein) and rice (carbohydrates).

      i. **Food storage and mixing:** The stomach churns the bolus with strong muscular movements.

      ii. **Acid action:** Gastric juice contains hydrochloric acid it kills germs and creates a good environment for enzymes.

      iii. **Enzyme activity:** Pepsin begins breaking down proteins into smaller pieces.

      iv. **Texture change:** Food becomes a thick liquid called chyme after staying in the stomach for a few hours.

   c. In the small intestine, juices from your liver and pancreas break everything into tiny bits.

      i. **Final breakdown:** Enzymes from the pancreas and intestinal walls break down carbohydrates, proteins, and fats.

      ii. **Neutralising acid:** The liver makes bile, stored in the gallbladder, which helps digest fats and neutralises stomach acid.

      iii. **Absorption:** Tiny finger-like structures called villi absorb nutrients into the bloodstream.

      iv. **What is left:** Undigested food moves to the large intestine.

   d. **Digestion in the large intestine and colon**

      i. **Water absorption:** The main job here is to absorb water from the remaining food matter, turning it from liquid into solid waste.

ii. **Formation of faeces:** As water is pulled out, the undigested leftovers become more solid this form, *faeces* (also called stool).

iii. **Bacteria at work:** Friendly bacteria break down small leftover bits of food. They also help produce vitamins like *Vitamin K* and *B vitamins*.

iv. **Storage and exit:** The faeces are stored in the *rectum* (last part of the colon) until you are ready to release it through the *anus*.

Enzymatic Actions in Digestion

a. Carbohydrates

i. Pancreatic amylase → breaks starch into simple sugars (like maltose).

ii. Maltase, Sucrase, Lactase (from intestinal walls) → break sugars into glucose, fructose, galactose (the smallest forms your body can use).

b. Proteins

i. Trypsin and Chymotrypsin (from pancreas) → break proteins into smaller peptides.

ii. Peptidases (from intestinal walls) → break peptides into amino acids.

c. Fats (Lipids)

Pancreatic lipase → breaks fats into fatty acids and glycerol.

Nutrients and Their End Products

Table 1.2: Nutrients and their end products

SN	FOOD TYPE	END PRODUCTS
1.	Carbohydrates (rice)	Glucose (sugar for energy)
2.	Protein (fish)	Amino acids (for growth)
3.	Fat (oils)	Fatty acids & glycerol
4.	Vitamins, minerals, water	Stay the same but are absorbed

2. Absorption: Taking in the Nutrients

a. The tiny food parts pass through the walls of the small intestine.

b. The nutrients enter the blood, which carries them to all parts of the body to be used for energy, growth, and repair.

Table 1.3: Nutrient end products and their functions

SN	NUTRIENTS	WHAT IT DOES
1.	Glucose	Gives energy to walk, run, think
2.	Amino Acids	Build and repair body parts like muscles
3.	Fatty acids	Keep you warm and help body functions
4.	Vitamins & minerals	Help growth, healing, and staying healthy

Example: The glucose from the rice goes to your muscles and brain to give you energy.

3. Metabolism – How the body uses the nutrients

Table 1.4: Metabolism of nutrients

SN	Nutrient	What It Does
a.	Glucose (sugar)	Gives you energy to play, work, and think
b.	Glucose (sugar)	Help build muscles and repair your body.
c.	Fats etc	Keep you warm and store energy etc.
d.	Vitamins & Minerals	Help you stay healthy and fight sickness

Even when you are sleeping, your metabolism is still working helping you stay alive and healthy. ***Example:*** After eating rice and stew, your body breaks it down, absorbs it and uses the nutrients to give you energy during school activities and playtime.

Activity 1.1 Food's Amazing Journey

Watch the video link provided https://youtu.be/1UvuBYUbFk0 or use your textbook or any other source to research the journey of food through the body. What do you remember about food and nutrition from JHS?

1. Write one simple meaning for each of the following:
   - **a.** Digestion
   - **b.** Absorption
   - **c.** Metabolism
2. Organise yourselves into groups of 4 and share your notes with your group. Listen to your friends' thoughts as well. In your group, discuss the following questions. Make notes about your discussions:
   - **a.** What is food?
   - **b.** What is nutrition?
   - **c.** What happens to food in our bodies?
3. Present your groups findings to the whole class for feedback. Listen to the feedback from other groups and make a note of any new thing that you learned from the discussion

APPLICATION OF BASIC CONCEPTS OF FOOD AND NUTRITION IN DAILY LIFE

Food and nutrition are part of our everyday lives. It helps us stay strong, grow well and live a healthy life.

1. Understanding Nutrients and Their Functions

Nutrients are the good things in food that help our bodies work well. Each nutrient has a special function:

***Table 1.5*:** Nutrients, their functions and uses

SN	NUTRIENTS	WHAT IT DOES	EXAMPLES
a.	Carbohydrate	Give you energy	Rice, yam, bread
b.	Proteins	Help your body grow and repair itself	Eggs, beans, meat
c.	Fats	Give long-lasting energy and help organs	Oil, avocado, groundnuts
d.	Vitamins & Minerals	Keep your body healthy	Fruits, vegetables, fish
e.	Water	Helps you stay hydrated and digest food	Drinking water

2. Meal Planning and Balanced Diet

Meal planning is the process of deciding in advance what meals you or your family will eat over a certain period of time, example: day, week etc. A balanced diet means eating different types of foods in the right amounts. Includes:

a. Carbohydrates (for energy)

b. Proteins (for growth)

c. Fruits and vegetables (for vitamins)

d. Dairy (for strong bones)

e. Fats (for body functions)

Example: A family eats boiled yam (carbohydrate), Palava sauce with fish (protein and vegetables), and fruit juice (vitamins). That is a balanced meal.

3. Healthy Eating Habits

Good food choices help you grow well and avoid diseases. These healthy eating habits are outlined in ***Figure 1.1***.

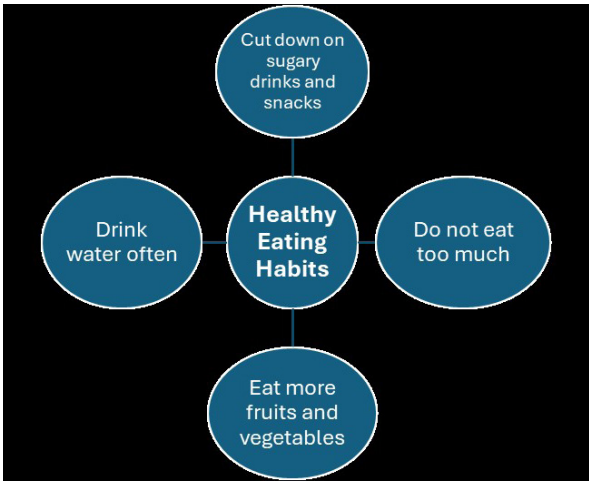


Figure 1.1: Healthy Eating Habits

These habits help prevent lifestyle diseases like obesity, diabetes, and hypertension. ***Example:*** Ms. Red drinks less soda and feels healthier.

4. Food Safety and Clean Habits

To stay safe from food poisoning: Important practices include:

Figure: 1.2: Food Safety and Clean Habits

Example: Sister Brown puts leftovers in the fridge to keep them fresh.

5. Smart Shopping for Food

When buying food, make intelligent choices:

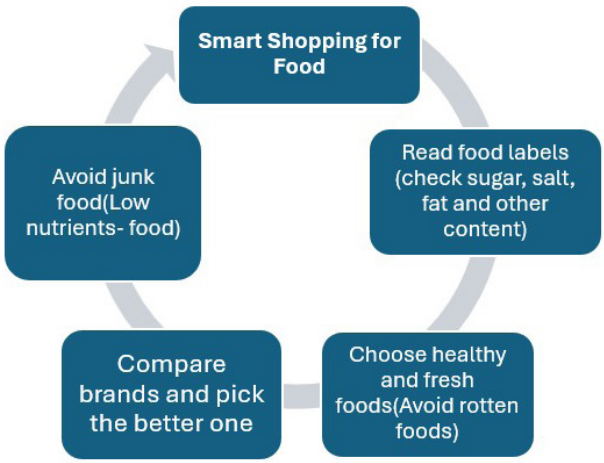


Figure 1.3: Smart Shopping for Food

Example: Mrs. Rice buys wheat bread because it is healthier and fills her up.

6. Nutrition for life stages

Through life stages people need different foods to live healthy

***Table 1.6*:** Nutrition for Different Ages

SN	Life stages	WHAT THEY NEED
a.	Babies & Children	Protein and calcium for growth
b.	Teenagers	Iron and vitamins for development

c.	Pregnant Women	Iron and folic acid for baby's health
d.	Older Adults	Calcium and fiber, less fat
e.	Sick People	Special diets (e.g., less sugar for diabetes)

Example: A pregnant woman eats beans and green vegetables to help her baby grow.

7. Cooking at Home

Cooking at home is healthy and clean. You can:

a. choose your ingredients

b. use less oil, salt, or sugar

c. cook safely

d. make meals that fit your family's needs

Example: Whyte's family makes vegetable soup instead of buying fast food.

8. Exercise and Nutrition

Eating well and exercising keeps your body and mind strong. Some benefits of exercise:

a. Burns fat

b. Builds muscles and strong bones

c. Helps you sleep and feel happy

d. Keeps your heart healthy

Example: Master Miles jogs every morning and adds fruits to his breakfast. He feels strong and ready for work.

Activity 1.2 Food Choices for Healthy Life

1. With what you learnt in JHS and previous lessons in mind, think individually about the questions below:

a. What nutrients does the body need?

b. Why do we need protein?

c. What foods give us energy?

d. What is a balanced diet?

e. What happens if we eat too much sugar or oil?

f. How does exercise help the body?

2. Organise yourselves into groups of 4 and share your thoughts with other group members. Your group can then share their findings with other groups as well. Make notes of any additional information that other groups suggest

3. Work in your group to research foods, nutrients, balanced meals (using the internet, textbooks, library or asking adults) and discuss how the answers apply to real-life (home, school, community).
4. Prepare a short summary of your research which you will use as information for a role play
5. Each group creates a short role-play (example role play below) showing **one** of the following situations: A family, school, or community situation. Your role play should include how someone uses knowledge of food and nutrition to make better food choices (e.g., eating less sugar, eating balanced meals, exercising).
6. Perform your group role play to the whole class and watch/listen to other groups

Reflections

1. What I learned
   - **a.** Eating too much sugar is not healthy.
   - **b.** Balanced meals give the body energy and strength.
   - **c.** Water and fruits are better daily choices than soda and biscuits.
2. How I can use this in my life:
   - **a.** I will try to choose fruits or water instead of sugary drinks.
   - **b.** I will remind my family/friends to eat balanced meals.
   - **c.** I will think carefully before buying snacks at school.

Example Role-play Below

Scene: At Home (Family Situation)

Characters: Mother, Child 1 (likes sugary drinks), Child 2 (likes fruits) and Father

Mother: (bringing groceries) I bought some foods for the week. Let's decide what to eat today.

Child 1: Can we take sugary drink and biscuits? That's my favourite!

Child 2: But too much sugar is not good. Our teacher said we need energy and vitamins too.

Father: Yes, that is true. We should balance our meals. Let is eat rice with beans and some vegetables today.

Mother: Good idea. Balanced meals will make us strong and healthy. Sugary drinks can be for a special day, not every day.

Child 1: Okay. I will drink water and eat some fruit instead.

All together: Healthy food makes a healthy family!

FOOD COMMODITIES

Food commodities are raw or processed agricultural products that are intended for human consumption. Food commodities can also be referred to basic agricultural products or raw materials used as essential ingredients in the production of food and beverages.

***Table 1.7*:** The Six Main Food Groups in Ghana

SN	Food Group	Examples	WHAT THEY DO FOR THE BODY
a.	Animal and Animal Products	Meat, fish, milk, eggs	Give us protein to build and repair our bodies
b.	Beans, Nuts & Oily Seeds	Beans, groundnuts, soybeans	Plant-based protein to help build the body
c.	3. Cereals and Grains	Rice, maize, millet	Give us energy (carbohydrates)
d.	Starchy Roots & Plantain	Cassava, yam, plantain	Also give us energy (carbohydrates
e.	Fats and oils	Palm oil, coconut oil, shea butter	Also give us energy (carbohydrates)
f.	Fruits and Vegetables	Mango, oranges, spinach, tomatoes	Protect the body with vitamins and minerals

Types of Foods by Function

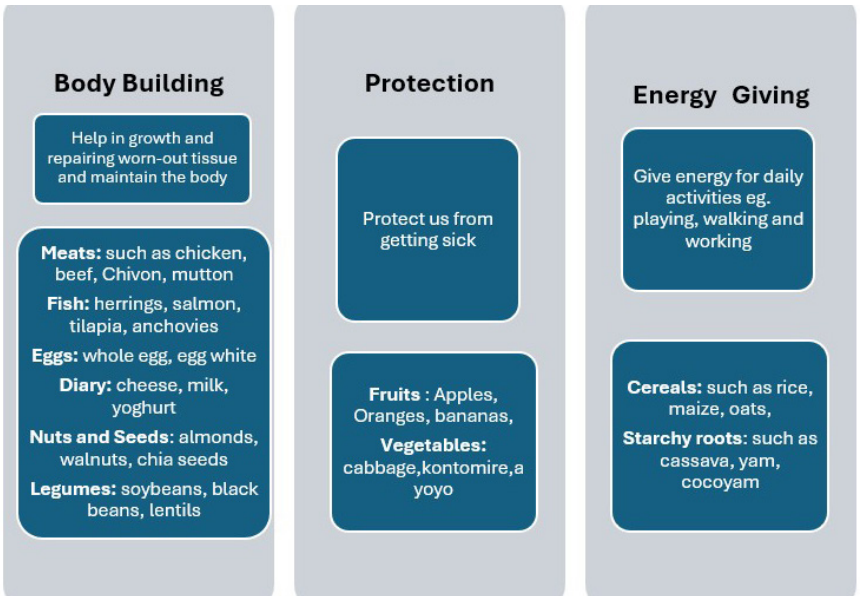


Figure 1.4: Types of Foods by Function

Importance of Food Commodities

Food commodities are very important for human survival, economic growth, and global food security. The importance of food commodities includes:

1. **Food Security:** Food commodities provide food security, make food available, and provide the essential nutritional calories for proper growth.

2. **Economic Growth:** Creates jobs and business for farmers, traders, caterers and cooks.
3. **Good Health:** Supplies nutrients like protein, vitamins, and minerals necessary for maintaining good health, preventing diseases, and promoting well-being.

Effects of Heat on Food Commodities

When we cook food, heat changes it in many ways some good, some bad.

Carbohydrates

1. **Gelatinisation:** Starch absorbs water and thickens (e.g., porridge)
2. **Caramelisation:** Sugar turns brown and tastes sweet (e.g., making toffee)
3. **Dextrinisation:** Bread crust browns and gets crisp when toasted

Proteins

1. **Coagulation:** Eggs and meat become solid when cooked
2. **Denaturation:** Structure changes, making them easier to digest
3. Too much heat? Meat becomes tough and dry

Fats

1. **Melts** when heated (used for cooking)
2. **Too much heat?** Fats break down, smoke and may be harmful. When fat or oil is overheated, it breaks down and produces harmful chemicals such as:
    a. **Aldehydes (like acrolein)** – these can irritate the eyes, throat, and lungs.
    b. **Free radicals** – unstable molecules that can damage body cells.
    c. **Trans fats** – if oil is reused many times, it can form unhealthy trans fats.

Vitamins

1. **Vitamin C and B** are lost in high heat or boiling.
    a. Vitamin C and most B vitamins are water-soluble, meaning they dissolve in water.
    b. They are also heat-sensitive. This means:
        i. When food is boiled in lots of water, the vitamins leach out into the water.
        ii. High heat can destroy their chemical structure, so even the part that remains may no longer be useful to the body.

For example

- Boiling vegetables like cabbage or spinach for a long time makes them lose much of their Vitamin C.
- Polished rice, when cooked in excess water and drained, loses its B vitamins.

  Better methods like steaming, stir-frying, or microwaving with little water help preserve these vitamins.

2. **Vitamins A, D, E, K** survive better in heat but can still reduce. These vitamins are fat-soluble, which means they dissolve in fat or oil and are more stable during cooking. However, if food is heated for too long or at very high temperatures, some of the vitamins can still break down and reduce in amount. The longer and hotter the cooking, the more loss occurs.

   Some Vitamin A– rich foods in beta-carotene, which the body converts to Vitamin A need heat to release more of the nutrient because cooking softens the tough cell walls in plants.

   Examples

   a. **Carrots** – Cooking (steaming or light frying) makes more beta-carotene available.

   b. **Tomatoes** – When cooked, they release more carotenoids (like lycopene, related to Vitamin A activity).

   c. **Kontomire and other dark green leaves** – Light cooking helps release beta-carotene.

   d. **Sweet potatoes** – Heating improves beta-carotene availability.

Minerals

Do not break down but can leach into water during boiling. Minerals (like iron, calcium, potassium, and zinc) are stable — heat does not destroy them. However, because many are water-soluble, they can move out of food into the cooking water during boiling.

For example

a. Boiling yam, cocoyam, or plantain in lots of water and then throwing the water away reduces minerals.

b. Vegetables like kontomire (cocoyam leaves) or spinach lose minerals if boiled in plenty of water and drained.

Better methods (like steaming, cooking with less water, or using the cooking water in soups/stews) help keep the minerals in the food.

Pigments and Colours

1. Chlorophyll (green) fades in overcooked vegetables turn to olive green
2. Anthocyanins (red/blue) Red or blue in berries may change with heat or pH
3. Carotenoids (orange/ yellow) are more heat-stable, e.g., in carrots

Flavours and Aromas

1. Heat improves flavour (like roasted meat)
2. **Too much heat** - Loses aroma and creates bad taste

Texture

1. Softens tough food like yam and meat
2. Too much heat - Vegetables become soggy, cakes become dry etc.

How Heat Affects Food When Cooking

Table 1.8: How Heat Affects Food When Cooking

SN	Food Component	Good Effects of Heat	Bad Effects of Too Much Heat
1.	Carbohydrate	Make starch soft and sauces thick (e.g., porridge)	Can lose nutrients if cooked too long
2.	Proteins	Firm up (like boiled eggs or meat)	Can become tough and hard to chew if overcooked
3.	Fats	Melt and help in cooking	Can turn harmful if overheated
4.	Vitamins	Some vitamins (like in tomatoes) are easier to absorb	Some (like Vitamin C) are destroyed by heat
5.	Minerals	Mostly stable, still healthy	Can be lost in cooking water if not used
6.	Flavours & Colour	Add nice smells, taste, and colour (like browned meat)	Overcooking can ruin taste and appearance of food

Classification of Effects of Heat on Food Commodities

Table 1.9: Classification of effects of heat on food commodities

S/N	Positive Effects of Heat on Food	Negative Effects of Heat on Food
1.	**Improved Taste and Texture** • Maillard Reaction: When food like meat or bread is heated, it turns brown and develops a richer flavour. This is why roasted meat or baked bread smells and tastes so good. • Caramelisation: Heat changes sugar into a sweet, brown flavour. This happens in foods like roasted vegetables, onions, and candies. • Increased Digestibility: Cooking helps break down hard parts of food, like starch in grains or proteins in beans. This makes the food softer, easier to chew, and easier for the body to digest. Heat also helps the body absorb nutrients better, for example from cooked vegetables and cereals.	**Loss of Vitamins** Some vitamins, like vitamin C and B vitamins, are sensitive to heat. When foods (like vegetables) are boiled, these vitamins can leak into the water and get lost. Loss of Antioxidants Antioxidants (nutrients that protect the body from damage) can break down when food is cooked at very high heat. This reduces some of the health benefits of the food.

2.	**Food Safety:** Heat destroys harmful bacteria, parasites, and viruses that can cause sickness. Safer to Eat: Cooking foods like meat, eggs, and some fruits or vegetables at the right temperature makes them safe for us. **Examples:** Proper cooking can remove dangerous germs such as Salmonella and E. coli.	**Formation of Harmful Compounds:** Acrylamide: When starchy foods like potatoes, bread, or biscuits are cooked at very high heat (frying, baking, or roasting), they can form a chemical called acrylamide. Acrylamide is not good for health and may increase the risk of diseases. **Trans Fats:** When cooking oil is heated for too long (especially during deep frying), it can form trans fats. Trans fats are harmful because they can lead to heart problems and other health issues.
3.	**Nutrient Preservation in Some Cases:** Sometimes, heat makes certain nutrients easier for the body to use. **Example:** When tomatoes are cooked, they release more lycopene (an antioxidant that helps protect the body).	**Loss of Texture and Appearance:** Vegetables: When vegetables are cooked for too long, they can become too soft or mushy. This makes them less tasty and less attractive to eat. Meat and Proteins: If meat is overcooked, it can become tough, dry, and chewy. This reduces its flavour and makes it less enjoyable.
4.	**Longer Shelf Life:** Heat is used in methods like canning, blanching, and pasteurisation to keep food fresh for a longer time. These methods slow down spoilage and stop harmful germs from growing.	**Potential for Overcooking** Loss of Flavour, Moisture, and Nutrients Cooking food for too long can make it lose its natural taste and juiciness. Delicate foods like fish, chicken, fruits, and vegetables can quickly lose important nutrients when overcooked. **Nuts and Seeds** When nuts or seeds are heated for a long time, their natural oils can change. This may cause them to taste bitter or rancid and lose their fresh flavour.

Activity 1.3 Food Groups and Nutrients for Health

1. Organise yourselves into groups of 4 or 5. Think about what you already know from JHS about food groups and make notes based on the following questions

- **a.** What are the six food groups?
- **b.** What are some foods in each group?
- **c.** What nutrients do these foods give the body (e.g., energy)?
- **d.** Why do we need these nutrients?

2. Use a textbook or search the internet to find information that will help you complete the table below.
3. You can use these food commodities in the table: rice, yam, fish, tomatoes, orange, cocoyam, melon seed.

Food commodities	Food group	Effect of heat on the commodity	Nutritional value
e.g., rice	Energy giving food	Softens, prolong heat will harden the rice	carbohydrate

4. Make a colourful chart or diagram that shows the six food groups. For each food group:
   - **a.** Write the name clearly.
   - **b.** Draw or paste pictures of foods in that group.
   - **c.** Write what nutrients they provide.
   - **d.** Add one sentence on why that food group is important.
5. Stick your chart on the classroom wall and walk around and look at the other groups' charts. While walking: Ask questions about the foods on the chart and take notes of new foods or facts you did not know.
6. After the walk, discuss in your group what you learned from others.

Sample of the chart

Reflection

1. What food groups do you eat the most? The least?
2. Which nutrient is important for your age?
3. What did you learn about how heat changes food?
4. How can you use this knowledge to eat healthier at home?

CONVENIENCE FOODS

Convenience foods are pre-prepared or partially prepared food products that make meal preparation faster and easier. These foods help busy households save time while still providing tasty meals. There are different types of convenience foods, and they are processed in various ways to stay fresh and last longer.

Figure 1.5: Examples of Convenience Foods

Types of Convenience Foods

1. **Ready-to-Eat (RTE) Foods:** These foods are already cooked and packaged, ready for you to eat**. Examples:** Canned vegetables, pre-made sandwiches, and salads.

   How to use: Open and eat no cooking required.

2. **Ready-to-Cook (RTC) Foods:** These foods need a little cooking or heating. Examples: Frozen vegetables, pre-cut meats, pizza dough, and stir-fry mixes.

   How to use: Just cook or heat for a few minutes.

3. **Ready-to-Heat (RTH) Foods:** These foods are already cooked, just heat them up to eat. **Examples:** Canned soups, and pre-cooked meats.

   How to use: Reheat in a microwave or on the stove.

4. **Baking and Dessert Mixes:** These mixes help you make baked goods and desserts quickly**. Examples:** Bread mixes, cake mixes, and pizza dough.

   How to use: Add a few ingredients like water or eggs, then bake.

5. **Instant Foods:** These foods are super quick to make, just add hot water or use a microwave. **Examples:** Instant noodles, instant coffee, and microwaveable rice and vegetables.

   How to use: Add hot water or microwave for a fast meal or snack.

How Convenience Foods Are Processed

1. **Freezing:** Freezing keeps foods fresh by stopping the growth of bacteria. Examples: Frozen vegetables, frozen meals, and meats.
2. **Canning:** Canning seals food in airtight containers and heats it to kill germs. Examples: Canned fruits, vegetables, soups, and meats.
3. **Dehydration (Drying):** Drying removes moisture from food to keep it fresh for longer. **Examples:** Dried fruits, powdered milk, and instant noodles.
4. **Pasteurisation:** Uses heat to kill germs and make foods last longer. Examples: Milk, juices, and sauces.
5. **Precooking and Packaging:** Some foods are cooked first, then packaged for easy use. **Examples:** Instant pasta meals, microwaveable rice, and pre-cooked meats.

Uses of Convenience Foods

1. **Ready-to-Eat Meals:** Quick meals you can eat without any preparation. Examples: Pre-packaged sandwiches, fruit cups, and snack bars.
2. **Ingredients in Cooking:** Pre-prepared foods that can be added to your home-cooked meals. Examples: Canned tomatoes, frozen meats, and soup mixes.
3. **Side Dishes:** Foods that complement the main dish. Examples: Frozen vegetables, bread rolls, and mashed potatoes.
4. **Quick Desserts and Baking:** Instant mixes for making cakes or desserts. Examples: Cake mixes, frozen dough, and canned fruit fillings.
5. **On-the-Go Meals:** Portable and easy meals or snacks. Examples: Protein bars, instant noodles, and ready-to-drink beverages.

Serving Convenience Foods

1. **Plating and Presentation:** Serve food creatively with fresh herbs or sauces to make it look appetising.
2. **Combine with Fresh Ingredients:** Add fresh vegetables or fruits to make meals more nutritious and tastier. Example: Add fresh spinach to canned soup or serve pre-made pasta with chopped tomatoes.
3. **Reheating:** Make sure to reheat foods properly to ensure safety and good taste. Example: Microwave, bake, or stove-heat according to the instructions.

Why Convenience Foods Are Useful

1. **Saves Time:** No need to spend hours in the kitchen.
2. **Easy to Use:** Simple to cook or eat with minimal effort.
3. **Variety:** Many options to choose from for different meals and tastes.

4. **Good for Busy People:** Great for families or individuals with a busy schedule.

Activity 1.4 Our Convenience Food

1. Visit a local market, supermarket around your school, or watch a video showing different types of convenience foods.
   a. Look carefully at the items on the shelves and take notes or pictures (if allowed) of the foods you find.
   b. Write down the name of the food and the type of processing that has taken place (frozen, canned, dried, etc.)
2. Complete the table below with the information found on the market visit and explain how convenience foods are used in meal preparation at home

Types of convenient foods	Examples of Foods Found on the Visit under its type	How it is used at home
a. Ready-to-Eat Foods		
b. Ready-to-Cook Foods		
c. Ready-to-Heat Foods		
d. Baking and Dessert Mixes		
e. Instant Foods		

3. Share what you found in the market or video by making a short group report. You can:
   a. Draw a poster
   b. Create a simple chart
   c. Use real packages if possible
4. Each group presents their findings for discussion
   a. Discuss how the foods have been processed
   b. Discuss ways that some convenience foods can be used to promote healthy eating at home.

Effects of Heat on Food Nutrients

Cooking food with heat does more than make it tasty, it changes its texture, flavour and nutrients.

1. **The texture of the following food commodities Changes when heat is applied**
   a. Proteins change shape when heated, eggs become solid or meat becomes softer (or tougher if overcooked).

b. Vegetables get softer because heat breaks down fibre (cellulose), making them easier to chew and digest.

c. Starches like rice and potatoes swell and become soft when cooked. (gelatinisation).

2. Nutrient Loss and Retention

a. Some vitamins are destroyed by heat, especially Vitamin C and B-vitamins.

b. Boiling can remove vitamins because they escape into the water. If you throw the water away, you lose the nutrients too.

c. Fat-soluble vitamins (A, D, E, K) are stronger but can still be damaged by very high heat.

3. Heat Helps Keep Food Safe

a. Cooking kills bacteria, viruses, and parasites that can make us sick.

b. Foods like meat, milk, and eggs must be cooked well to avoid food poisoning.

c. Methods like pasteurisation use heat to make milk and juice safe.

4. Flavour and Smell

Heat makes food smell and taste better.

a. Caramelisation gives sugar a sweet, brown taste.

b. Maillard reaction makes roasted or grilled food tasty.

c. Herbs and spices release nice smells when cooked.

5. Moisture Changes

a. Cooking can remove water, making food drier (like toasted bread).

b. Drying helps preserve food like rice, beans, and pasta.

c. In soups and sauces, heat helps balance the thickness by reducing or keeping moisture.

6. Colour Changes

a. Heat causes browning in foods (like fried onions or roasted meat).

b. Overcooked green vegetables turn yellowish because the green pigment breaks down.

c. Meat darkens because proteins change during cooking.

7. Enzymes Are Stopped by Heat

a. Enzymes in fruits and vegetables cause ripening and spoilage.

b. Cooking stops enzymes action and helps keep food fresh for longer period. Example, Cooking stops bananas or apples from turning brown.

8. Other Interesting Effects

a. Heat helps jam and jelly set because it releases pectin in fruits.

b. Proteins shrink and firm up when heated (e.g., in meat or eggs).

c. Carbohydrates soften with moist heat or turn brown with dry heat (like in baking or frying).

d. Minerals can be lost during cooking therefore use less water or reuse it in soups.

e. Sugar changes into caramel or treacle when heated for long at high temperatures.

Activity 1.5 Effects of Heat on Food Nutrients

This activity requires you to think about what you already Know, what you Want to know and what you will Learn about the effects of heat on food

1. K - What I Know:

You will work individually and write or say what you already know about what heat does to the nutritional value of food (e.g., I know heat can melt fat).

2. W – What I Want to Know:

Organise yourselves into small groups of 3 and share with others in the group what you are curious about (e.g., What happens to sugar when we heat it?)

3. L - What I Learned

Share your group discussion with the class and listen to any other information that the class has learned. Make notes of what you Knew, what you wanted to know and what you learned so that you can complete the template below.

K	W	L
KNOW	WANT TO KNOW	LEARNED

4. Experiment to analyse the effect of heat on food commodities. Organise yourselves to work in groups of 4.

a. You will need these materials to work with: frying pan, pot, hot plate or stove, small samples of: Oil or butter (fat), Sugar, Egg or milk (protein), Bread, yam or rice (carbohydrate)Water (for wet heat), Notebook and pen for observation

b. Apply dry heat (like roasting or toasting) and wet heat (like boiling or steaming) to each sample (Oil or butter (fat), Sugar, Egg or milk (protein), Bread, yam or rice (carbohydrate), Water (for wet heat)

c. Observe and write down what happens to each food – changes in colour, texture, smell, and taste.

d. Ask Questions: Did the food harden, melt, change colour or break apart?

e. Fill your findings into the table provided.

Samples	Changes after application of heat
Fats /oil	
Sugar	
Protein	
Carbohydrate	

5. Each group will share their findings with the class:

a. What they saw during the experiment

b. What they learned

c. What surprised them

FOOD NUTRIENTS AND THEIR EFFECTS ON GROWTH

Our bodies need different types of nutrients to grow, stay healthy, and develop properly. These nutrients come from the food we eat, and they play important roles in our growth, energy, and overall well-being.

Nutrients

Nutrients are substances in food that help our bodies function properly. There are two main types of nutrients:

1. Macronutrients: These are the nutrients we need in larger amounts because they provide energy and help our body grow and develop. Examples are:

a. *Carbohydrates:* Provide energy to our body, especially for our brain and muscles. They can be found in foods like rice, bread, and fruits.

b. *Proteins:* Help build and repair our body's tissues like muscles, skin, and hair. They are found in foods like meat, beans, and eggs.

c. *Fats:* Provide long-lasting energy, help our brain develop, and help absorb vitamins. They are found in foods like nuts, oils, and avocados.

2. **Micronutrients:**These are smaller nutrients needed in tiny amounts, but they are still very important. They help with things like immune function, nerve function, and overall health. Examples include:
    a. *Vitamins*
        i. *Vitamin A:* Helps our eyes, skin, and immune system stay healthy.
        ii. *Vitamin D*: Helps our bones grow and fight off infections.
    b. *Minerals*
        i. *Calcium:* Important for strong bones and muscles.
        ii. *Iron:* Helps make healthy blood and supports brain development.
        iii. *Zinc:* Helps the body heal and grow.

Other Important Nutrients

In addition to the main nutrients, there are other essential nutrients that help our bodies work well:

1. **Fibre:** Helps digestion and keeps us full. They are found in fruits, vegetables, and whole grains.
2. **Probiotics:** Good bacteria that support our stomach and immune system. They are found in yogurt and fermented foods.
3. **Omega-3 Fatty Acids:** Good for heart health and brain development. They are found in fish, nuts, and seeds.

How Nutrients Affect Growth and Development

1. **Healthy Growth:** Eating the right foods helps our bodies grow at a healthy rate. Nutrients give us the building blocks we need.
2. **Brain Development:** Nutrients like Omega-3s, iron, and protein help our brains develop so we can think, learn, and remember things better.
3. **Strong Immune System:** Proper nutrition helps our bodies fight infections and illnesses. A well-fed body is stronger and healthier.
4. **Healthy Skin, Hair, and Nails:** Nutrients like protein and vitamins help our skin stay smooth, our hair grow strong, and our nails stay healthy.

What Happens When We Do Not Get Enough Nutrients

1. **Growth Problems:** If we do not get enough nutrients, our body would not grow properly. We might be shorter or have trouble gaining weight.
2. **Weak Immune System:** Without enough vitamins and minerals, our body's ability to fight off sickness is weaker.
3. **Poor Skin, Hair, and Nails:** Lack of proper nutrition can cause dry skin, brittle hair, or weak nails.

Activity 1.6 Nutrients and My Body

1. Write what you know about Nutrients using the KWL chart in the previous activity.

   K – What I Know

   Write what you already know about nutrients, the foods they are found in.

   W – What I Want to Know

   Write questions or things you want to learn about nutrients.

   L – What I Learned

   After the first two activities, come back and write what new things you learned after the activity.

2. In a group of 4, form two pairs and stand in two circles, one inside the other, facing a partner.
   - **a.** Discuss these questions with your partner and write down the answers:
     - **i.** Why do we need carbohydrates?
     - **ii.** What does protein do for us?
     - **iii.** What happens if we do not eat enough protein?
     - **iv.** After 1 minute, move to a new partner and repeat the exercise.
   - **b.** Talk about the following questions with your partner:
     - **i.** What are macronutrients (carbohydrates etc.)?
     - **ii.** What are micronutrients (vitamins etc)?
     - **iii.** How are they different?
3. Share your ideas with others for feedback.

Effects of Nutrient Deficiencies

Food nutrients, their functions and deficiencies

Table 1.10: Food Nutrients, their functions and deficiencies

Nutrients	Food sources	Functions	Deficiencies
Carbohydrate	Yam Rice Plantain Potatoes Gari	• Supply heat and energy • Contributes to the synthesis of fat • Dietary fibre prevents constipation	• Hypoglycaemia • Marasmus

Protein	Meat Fish Beans Melon seeds	• For the growth and repair of worn-out tissues • Serves as a source of energy in the absence of carbohydrates • Form enzymes, hormones and antibodies	• Stunted growth • Kwashiorkor in children • Slow healing of wounds
Fats and oils	Margarine Butter Lad Coconut oil Palm oil	• Provides higher source of heat and energy • Provides high satiety level • Facilitates the absorption of fat-soluble vitamins (ADEK)	• Dry, scaly skin • Fatigue • Brittle nails and hair
Vitamins	FRUITS Orange Mango Melon Apple VEGETABLES Cucumber Carrot Cabbage	**Vitamin A (Retinol)** – for good eye sight	Poor vision
		Vitamin D (Cholecalciferol) – aids in bone health and calcium adsorption	Poor formation of bone and teeth
		Vitamin C (ascorbic acid) acts as antioxidant and aids in iron adsorption	• Slow healing of wounds • Poor iron adsorption

How Nutrient Deficiency Affects a Person

1. **Slow growth:** Children may not grow tall or strong.
2. **Weaker immunity:** You get sick more often.
3. **Poor learning:** Your brain needs nutrients to think clearly.
4. **Wounds heal slowly:** Your body takes longer to repair cuts or injuries.

How it Affects Families

1. Families spend more money on hospital bills.
2. Tiredness and weakness reduce how much work parents can do, which affects income.
3. Illness in the home can cause stress and sadness, affecting family relationships.

How It Affects Society

1. Many sick people mean less productivity and slower economic growth.
2. Children who are always sick miss school, affecting education and future job opportunities.
3. The next generation may also grow up weak and poor if the cycle continues.

Activity 1.7 Food Nutrients That Help Growth

1. Work in pairs for this activity
2. Think about the food you ate yesterday and what you have learned about foods and nutrients.
   a. What nutrients do you think were in those foods you ate?
   b. What food gives us energy? What helps us grow?
   c. Tell your partner about your food and the nutrients in them and listen to their foods and nutrients
3. Work together in pairs to complete the table below with Food nutrients, food sources their functions and deficiencies

Nutrients	Food sources	functions	Deficiencies
e.g., carbohydrate	yam	Gives energy	marasmus

4. Discuss your completed table with your peers in the class

FOOD HABITS/LIFESTYLE

Food habits refer to how and why individuals eat, which food they eat, and with whom they eat, as well as the ways individuals obtain, prepare serve, store, and discard food.

1. **Food habits** are the choices we make about what we eat, who we eat with, when we eat, how we cook, serve, or throw away food. These habits are shaped by our culture, family, religion, money and personal taste.
2. **Lifestyle** means the way a person or group lives every day. It includes:
   a. Eating habits
   b. Physical activity
   c. Sleep patterns
   d. Hobbies and habits (like drinking, smoking, or exercise)
3. **Good food habits include**
   a. eating on time
   b. do not skip meals
   c. eating lots of fruits and vegetables
   d. drinking enough water (2 litres per day)

e. eating balanced meals (combine carbohydrates, proteins, fats, vitamins & minerals)

f. reducing intake of salt, sugar, oily and fatty foods

4. Implications Good Food Habits

a. You stay healthy and strong

b. You save money on hospital bills

c. You build better relationships with others (because you feel well)

d. You reduce the risk of food-related sicknesses like diabetes

5. Bad eating Habits includes

a. Eating too much fat, sugar, salt, red meat, or fast food

b. Skipping meals (especially breakfast)

c. Overeating or eating late at night

d. Drinking too much alcohol

e. Always eating snacks between meals

f. Following food fads (foods or diets that suddenly become popular) or unhealthy trends

6. Implications Bad Food Habits

a. Obesity (too much weight)

b. Diabetes

c. High blood pressure

d. Heart disease

e. Poor concentration and tiredness

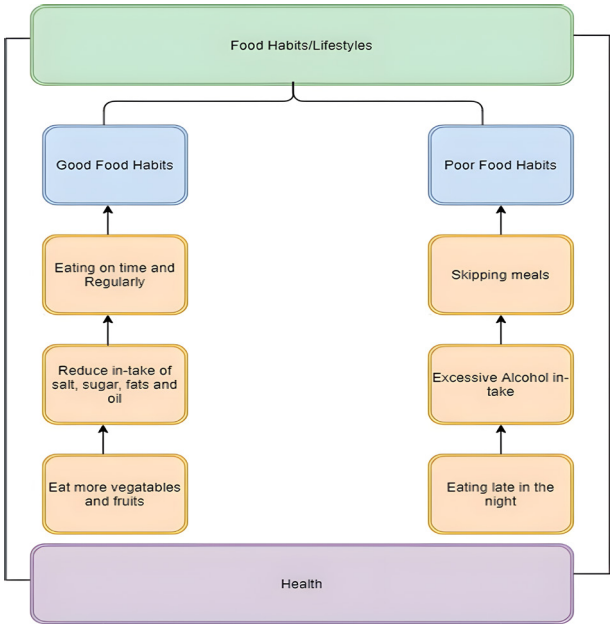


Figure 1.6: Food habits/Life style

Activity 1.8 Healthy Food Habits for Life

1. Organise yourselves into small groups of 3 and using the KWL approach discuss

   K – What I Know

   What you already know about the factors that influence food habits and lifestyle.

   W – What I Want to Know.

   What you want to know

   L – What I Learned

   What you have learned from sharing information with your group?

2. In your groups, interview two people from your community or school who come from different cultural backgrounds. The interview should focus on their food habits, lifestyle and health issues

3. Plan your interview following these useful tips

   a. Plan the questions in advance.

   b. Make and maintain eye contact.

   c. Ask open-ended questions so the interviewee can expand on their answers.

   d. Listen carefully to their responses.

   e. Take notes. Write down the Question and their Answer

4. **Habits**

   a. What foods are commonly eaten in your culture?

   b. How many meals do you usually eat in a day?

   c. What drinks do you take most often?

5. **Lifestyle:** Do you do any physical activity (walking, farming, sports)?

6. **Health & Support**

   a. Do people in your family/community have diabetes, heart problems, or overweight/obesity?

   b. What foods are good for people with these conditions?

   c. What advice would you give young people about healthy eating?

7. Write all your findings in a report in table form and share with other groups.

Interviewees	Cultural foods	Meals per day	Common drinks	Exercise	Disease conditions	Healthy eating advice
1						
2						

Factors That Influence Food Habits/ Lifestyle

You have learnt about food habits/lifestyles, its implications on the individual and some interventions to address the negative implications. This session will look at the factors that influence people's food habits/lifestyle. These factors include:

1. Geographical location
2. Culture/ethnicity
3. Technology
4. Religion
5. Education
6. Income/economic status
7. Health status

Geographical location

The availability of food in a particular environment/location influences an individual's choice of food. For example, in the north, cereals, grains and legumes (maize, rice, millet, beans) are the predominant food items that are used for foods. In the forest zone, roots, tubers and plantains are also used by the people in that area.

Culture/ethnicity

Culture and food are intertwined, and food can influence various aspects of culture. Cultures and food traditions can influence how you eat, what you eat, when you eat, where you get the food and how you prepare the food. For example, Northerners eat Tuo Zaafi, Akans eat fufu, and Ewes eat akple. No matter where one is, one would still want to eat their traditional foods.

Religion

The foods that people eat have influence on their beliefs. For example, Catholics do not eat meat on Good Fridays; Muslims are not allowed to eat pork and Seventh Day Adventist do not eat fish without scales.

Technology

The advancement of technology has brought about a variety of foods which can be found all year round and everywhere. This influences the individual's choice of food and influences food habits/lifestyle. For example, frozen chicken and apples can be found everywhere. Food delivery apps like Glovo or Bolt Food bring meals to your door.

Education

The knowledge gained about food and how food affects the body influences what to eat, what not to eat and how to eat it. People with knowledge in foods tend to select and eat balanced diets for good health.

Income/economic status

The amount of money one has will influence the choice of food. The selection and consumption of food is based on the individual's money available. For example, the amount of money one has determines the quality and quantity of food one eats.

Health status

The health condition influences what one eats. For example, a diabetic patient does not eat foods with much sugar and an overweight person should reduce carbohydrates, fat, oils intake, and take in more fruits and vegetables.

Activity 1.9 Elements that Shape Eating Habits

1. Think about what influences how people eat or live (e.g. culture). Write down at least one idea on paper.
2. Find a partner and share your ideas with them. Then organise yourselves into a group of no more than 4.
3. Combine your ideas from all the group members and choose the most important **five** factors.
4. Present your group findings to the class using any of these methods: A simple poster showing the factors with pictures or drawings, A song, poem, or short talk to explain your ideas.

Reflection

1. What new things did you learn about the factors that influence how people eat or live?
2. Which factor surprised you the most, and why?

EXTENDED READING

- Adigbo et.al (2011). *A complete course in Food and Nutrition*. Kwadwoan publishing: Accra. Pg.117-170, 263-265
- Koomson et.al (2019). *Food and Nutrition for Senior High Schools*. Aki-Ola published: Accra. Pg. 221- 304, 501-508
- Noble Amoako Sarkodie (2014). *Food and Nutrition for Schools and colleges. Bookworm publishers*: Kumasi. Pg 109-146

Review Questions

1. Explain how the body digests and absorbs cooked rice and tomato stew with fish. Describe what happens in the mouth, stomach, and small intestine.
2. Using your understanding of metabolism, explain how the nutrients from rice and stew help a student stay active and healthy throughout the school day.
3. Ama plays football after school. Using your knowledge of nutrients and their functions, explain which types of foods Ama should include in her meals after training and why.
4. Imagine you are helping your family plan a weekly menu. Use your knowledge of a balanced diet, food safety and nutritional needs across life stages to create one meal suitable for a pregnant woman, a teenage boy and an older adult. Explain your choices.
5. Explain two positive and two negative effects of heat on food commodities, giving examples of each.
6. As a food science student, explain how you would advise a family to prepare and cook vegetables to preserve nutrients and ensure food safety, using your knowledge of heat effects on food commodities.
7. Identify and describe three types of convenience foods and give one example of each.
8. You are helping a working parent plan dinner using convenience foods in a healthier way. Suggest a balanced meal using at least two convenience food items and explain how to serve it to maintain nutritional value and appeal.
9. Describe two ways heat affects the texture and nutritional value of food. Give an example of each effect.
10. You are asked to prepare a nutritious vegetable soup for school lunch. Using your understanding of heat's effects on nutrients, texture, and food safety, describe the steps you would take to ensure maximum nutrient retention, safety, and flavour in the soup.
11. Differentiate between macronutrients and micronutrients. Provide two examples of each and their functions in the body.
12. Ama is a 12-year-old student who complains of tiredness and poor concentration in school. Based on your understanding of nutrients and their role in growth and development, suggest which nutrients might be lacking in her diet and explain why.
13. Explain how nutrient deficiencies can affect both an individual and their family.

14. Analyse how long-term nutrient deficiencies within a population can impact national development and suggest one possible intervention to reduce its impact.
15. Explain how poor food habits can impact both an individual's health and their lifestyle. Propose two strategies to help improve food habits at the family or community level.
16. Analyse how two different factors, culture and income level can influence the food habits of individuals in a community. Suggest one practical intervention that could be implemented to promote healthier food choices across diverse cultural and economic groups.

SECTION

2

FOOD SECURITY, STORAGE AND SPOILAGE

NUTRITION AND HEALTH

Food Security

Introduction

This section is focused on providing you with a detailed understanding of food security, food spoilage and food storage. It covers the concepts of food security and its implications in everyday living, factors influencing food security, concepts and principles of food storage, causes of food spoilage and ways of handling food to minimise contamination and ensure food safety. This section will equip you with knowledge, understanding and skills of securing food and preventing food spoilage to ensure the availability of highly nutritious food all year round for healthy living.

KEY IDEAS

- Food can spoil when not stored or handled properly, this can make people waste money and resources.
- Food security means you and your family can always get safe, healthy food, and enough of it to live well and stay active.
- Many things affect food security. Like how much money people earn, changes in the weather, and support from the government.
- Storing food, the right way helps keep it fresh, safe, and available for use anytime, whether it is dry, refrigerated or frozen food.
- We can all help improve food security by learning more about food, using better farming and storage methods, and working together in our communities.
- You can help keep food safe by checking it before storing, using clean containers, storing at the right temperature and using older items first.

THE CONCEPTS OF FOOD SECURITY AND ITS IMPLICATIONS

Food Security

Food security means that all people, at all times, have access to enough safe and nutritious food to live an active and healthy life. This access can be physical, social, emotional, or economic. Food plays an important role in every part of our lives. Being food secure means having a steady and reliable supply of safe food. It is not just about having food; it is about having food that is safe, affordable and easy to access.

Food security includes four main parts:

Figure 2.1: The four main parts of food security

Importance of Food Security

Food security is very important for individuals, communities, and countries. Here are some key reasons why.

1. It Promotes Peace: When everyone has enough food, there is less conflict. Hunger can cause tension and unrest, so food security helps to keep communities peaceful.
2. It Keeps Us Healthy: Having access to enough safe and nutritious food helps reduce hunger and prevent diseases such as malnutrition, diabetes, and heart problems.
3. It Supports Economic Growth: When people have enough food, they are able to work better and contribute to the economy. This improves their lives and helps the country grow.
4. It Protects Human Rights: Everyone has the right to enough food to live a healthy life. Food security supports this basic human right.
5. It Increases Productivity: People who eat well have more energy to work and study. This means they can do better in school and at work.
6. It Helps the Environment: Food security is an important part of the United Nations Sustainable Development Goals (especially Goal 2 – Zero Hunger). Achieving food security can also support actions that protect the planet.

Components of Food Security

There are some components that helps us achieve food security, they are:

1. **Availability and Affordability**

   This means having enough food in your community and being able to buy it. This includes:

   a. **Food production** – This is how much food is grown locally.

   b. **Food imports** – That is food brought in from other areas or countries.

   c. **Food storage** – It simply means how well food is kept for future use.

   d. **Food distribution** – How food gets from farms to homes.

   e. **Food prices** – That is how expensive or cheap food is.

   f. **Income levels** – This implies how much money people have to spend on food.

   g. **Food budget** – The amount of money a family saves to buy food.

   h. **Dependency ratio** – This means that the more the family members, the more food is required

   i. **Food assistance programmes** – Government help to buy food (like free school meals or food vouchers).

2. **Accessibility, Quality, and Safety**

   Even if food is available, it must be safe and easy to get. This includes:

   a. **Freshness and shelf life** – How long food stay safe to consume

   b. **Nutritional content** – Food should provide the body with the essential nutrient required for perfect health, including vitamin, proteins and other vital substances.

   c. **Food handling and storage** – Ensuring food is cultivated, handled, and preserved using methods that uphold safety standards and protect public health.

   d. Safe ways of growing, processing, and storing food.

   e. **Foodborne pathogens** – Germs like bacteria can spoil food and make people sick.

   f. **Food distribution** – Food should be sold in clean, safe places and be able to reach everyone.

3. **Utilisation and Diversity**

   This refers to how individuals make use of the food available to them, and whether their diet includes a several range of food types."

   a. **Cultural and social factors** – Beliefs, taboos, and traditions can affect food choices.

b. **Economic factors** – If food is too expensive or there is no market nearby, people may eat less healthy food.

c. **Globalisation and trade** – Foods from other countries can improve food variety.

d. **Food knowledge** – Knowing how to choose, prepare, and cook food helps people stay healthy.

e. **Food resources** – Time, money, and tools help people cook good meals.

f. **Food skills** – Being able to cook and store food properly is very important.

4. **Stability and Sustainable Practices**

Stability means having access to good food at all times, not just sometimes. Sustainability means producing and using food in ways that protect the environment.

Below are factors that affect food stability:

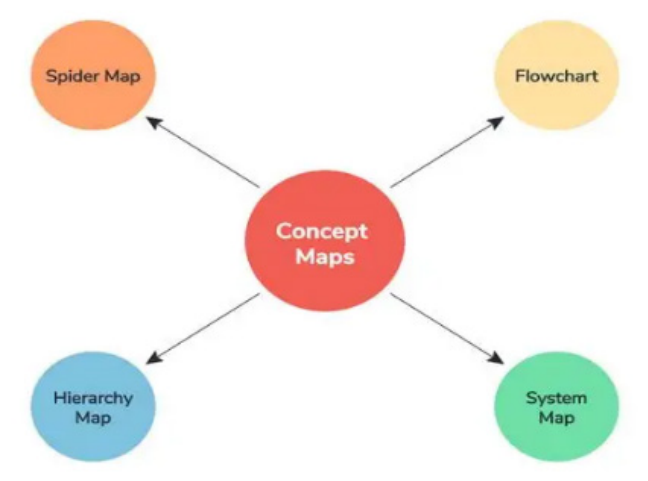
a. **Climate change** – climate conditions like droughts, floods, and rising temperatures can reduce food production.

b. **Conflicts** – in situations of wars or violence people may be hindered from growing or getting food.

c. **Local food systems** – Growing and eating local foods help communities and reduce food transport.

Activity 2.1 Learning About Food Security

1. Organise yourselves into groups of 4.
2. In your group talk about what food security means in everyday life for individuals and families. Use simple examples (e.g., having enough food at home, or a farmer growing food for the family).
3. On a big sheet of paper, draw a concept map (Sample below).
   a. In the centre write Food Security.
   b. Add the four key components that make up food security:
      i. *Availability* – Is there enough food?
      ii. *Access* – Can people afford and reach it?
      iii. *Utilization* – Is it healthy and safe to eat?
      iv. *Stability* – Can we get food all the time, even in tough times?



4. Use textbooks or search the internet to find out more information about each part. Add short notes or drawings that are relevant to each part of your diagram.
5. Each group presents their diagram to the class and talk though their notes. Other groups listen and give friendly comments (What did you like? What else can be added?).

Factors Influencing Food Security

Having enough safe and healthy food for every person in a family and the community is very important. In Ghana, this can be difficult because of several problems. These include changes in the weather, people having different amounts of money, and poor roads and storage. These problems make it hard for people, especially in rural areas, to grow, buy or use food properly.

The factors that influence food security can be classified into socio-economic, environmental and Political factors.

1. **Socio- economic factors**
    a. **Low Income and Poverty:** People who have little money cannot buy enough healthy food. They may also not have land, tools, or money to grow food. This affects their health and keeps them in poverty.
    b. **No Jobs (Unemployment):** When people do not work, they have no income to buy food. This can make life very hard for families, especially when prices are high.
    c. **Not Knowing Enough About Food and Farming (lack of Education):** When people do not learn about food and farming, they might not grow enough to eat or choose healthy meals. Learning how to grow crops, keep food fresh and eat a mix of different foods which can help stop hunger and keep families healthy.
    d. **Bad Roads and No Markets (infrastructure and market access):** If roads are in bad condition, it becomes difficult for farmers to take their

food to the market. Poor storage also means food can spoil. Farmers lose money, and people do not get enough food.

2. **Environmental Causes**
    a. **Weathers Changes and Natural Disasters:** Floods, droughts, and strong winds can destroy farms and animals. This means less food is grown and prices go up. Changing weather also affects when people plant and harvest.
    b. **Poor Soil and Dry Land (soil degradation and desertification):** When soil is weak or damaged, crops do not grow well. If people cut too many trees or use land wrongly, it can turn into dry land that cannot be farmed.
    c. **Lack of Water:** Without water, crops and animals cannot grow. When water is not available farming becomes very difficult.
3. **Political and Government Causes**
    a. **Not Enough Help for Farmers:** Farmers need support to grow more food. This includes help with tools, seeds, irrigation, and places to store food. Without support, farmers cannot grow enough.
    b. **Violence and Fighting:** When there are fighting or conflict, people may have to leave their farm. Markets and other amenities may be damaged. This makes it hard to grow or move food.
    c. **Trading Food Between Countries (Trade policies and globalisation):** When countries buy and sell food to each other, it can help, when there is not enough food in one place. But if a country brings in too much food from other places, local farmers might not be able to sell what they grow.
    d. **Losing Farmland:** Farmland is sometimes used for buildings, mining, or roads. This means less land is left to grow food. Small scale farmers may also be forced to leave their land when prices go up.

Food Problems at Different Levels

Food issues are felt in different ways by individuals, families, and whole communities.

1. **Individual Level**
    a. **Little Money or No Job:** When a person has no money or job, it is hard to buy good food. They may eat less or eat food that is not healthy.
    b. **Not Knowing About Food:** Some people do not understand how to choose healthy food or read food labels. This can lead to eating the wrong kinds of food.
    c. **Health and Disability Issues:** Some health problems require special foods. Health conditions like diabetes have increased nutritional needs.

This can be hard to manage. Disabilities can also make it harder to shop, cook, or eat properly.

2. **Family Level/Household level**
   a. **Not Enough Money:** If a family does not earn enough, they cannot buy enough food, especially when food prices are high.
   b. **Waste of Food due to improper storage:** Without fridges or cool places to store food, it can go bad. This leads to waste and makes food run out quickly. In some cases, inadequate knowledge on proper storage will cause wastage.
   c. **Many Family Members:** Large families need more food. Sometimes, food is not shared well, and younger children may not get enough to eat.
   d. **Unequal Access to Food in the Home:** In some homes, women or girls may eat less or eat after others. When women cannot earn money, they may not be able to buy food.
3. **Community Level**
   a. **Floods, droughts, and Other Disasters:** These events damage farms, kill animals, and destroy roads. When this happens, food becomes hard to grow, move, or buy.
   b. **Poor roads or Markets:** Without good roads or storage, farmers cannot move food from their farms. This causes waste and less food in the markets.
   c. **Fighting and Political Problems:** When there is conflict, farming stops. Farmers lose land or tools. Food cannot move from farms to towns or cities.
   d. **Building on Farmland (Urbanisation and land use changes):** As cities grow, farmland is used for buildings or roads. This leaves less land for growing food.
   e. **Government help and policies:** When governments do not support farming, it becomes hard to grow food. Farmers need money, tools, and advice to grow more and earn a living.

How to Make Food Available for Everyone (Addressing Food Security challenges)

1. **Better Food Movement and Markets (sales):** Fixing roads and storage places will help food get to where people need it. This also stops food from spoiling.
2. **Helpful Rules and Support:** Governments should create rules that help farmers and families. These can include free seeds, farming tools, or food help for the poor.

3. **Teaching About Food and Farming:** People need to learn about healthy eating, good farming methods, and how to keep food safe and clean.
4. **Farming That Can Handle Weather Changes:** Using crops that grow even in dry weather and planting trees can protect the land and improve food supply.
5. **Smart Farming Methods (conservative agriculture):** Avoid digging the land too much. Use simple machines and good farming tools to grow more food with less waste.

Activity 2.2 Challenges of Food Security

1. Start by writing down your own thoughts about food security.
   a. What does it mean to you?
   b. Have you or someone you know ever faced difficulty getting enough food?
   c. What do you think causes these challenges?
2. You can use a notebook to record your ideas.
3. Organise yourselves into groups of 3 or 4. Do some research using books, articles, or the internet into the factors that influence food security.
4. Classify the factors into three groups socio-economic, environmental and political and complete the table below.
5. In your groups discuss the challenges faced by individuals, households and the community caused by the factors you have identified

Social/Money Problems	Environmental Problems	Government/Political Problems
e.g., low income	Floods	Fighting

6. Share what you discovered with the class and compare ideas with other groups.

THE CONCEPT AND PRINCIPLES OF FOOD STORAGE

Food Storage

Storing food means keeping it at the right temperature and in the right place to stop it from going bad and to make it last longer. It is important to store food properly so that it stays safe to eat, keeps its quality and nutrients, saves money and helps prevent

illness. Foods that do not spoil quickly and foods that spoil easily need to be stored in different ways.

Non-Perishable Foods and how they are stored

Table 2.1: Non-perishable foods and their storage

Non-Perishable Food	Storage
a. Dry beans	In sack, airtight container
b. Flour	In tight-fitting containers, in sacks
c. Maize	In sacks, airtight containers
d. Rice	In sacks, airtight containers
e. Onion	In baskets

Perishable Foods and Their Storage

Table 2.2: Perishable foods and their storage

Perishable Food	Storage
a. Meat	Fridge/Freezer
b. Fish	Fridge/ Freezer
c. Vegetables	Fridge
d. Yam	Bury in the soil
e. Cassava	On airy racks and barns

Categories of Food Storage

1. **Dry storage:** This is used for food items that do not spoil quickly. Examples include grains, flour, and canned foods. These foods should be kept at room temperature in a dry and cool place.
2. **Refrigerated storage:** It is used for food that can spoil quickly. This includes dairy products, fruits, and vegetables. These should be stored in a refrigerator at temperatures below five degrees Celsius to stay fresh.
3. Frozen storage is for food that spoils very easily such as meat, poultry, and seafood. These foods must be kept in a freezer at temperatures of minus 18 degrees Celsius or lower to stay safe for eating.

Impact of Food Storage on Food Safety

Food storage has a great impact on food safety in several ways as shown on next page:

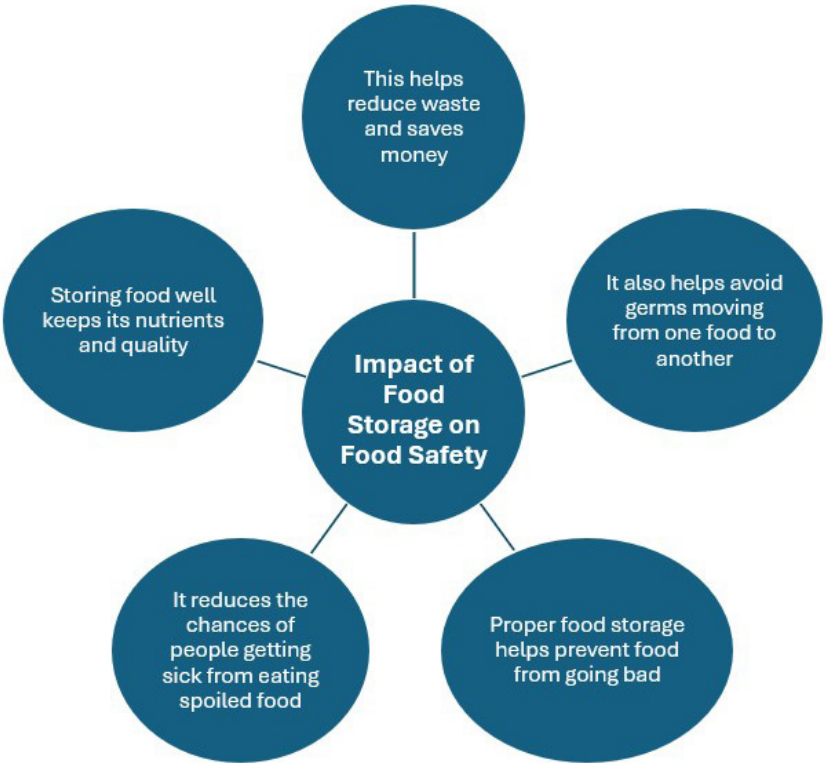


Figure 2.2: Impact of Food Storage on Food Safety

Importance of Food Storage on Food Safety

Some importance of storage on food safety are illustrated below:

Figure 2.3: Importance of Food Storage on Food Safety

Application of Food Storage Principles to Prevent Food Spoilage

1. Non-perishable foods like grains, flour, and canned goods should be stored at room temperature in clean, dry places.
2. Perishable foods such as milk, cheese, fruits, and vegetables must be kept in the refrigerator below five degrees Celsius(5°C).
3. Highly perishable foods like meat, poultry, and fish should be stored in a freezer at minus 18 degrees Celsius or lower (-18°C or below)
4. Dry foods should be kept in airtight containers to stop moisture and pests from getting in.
5. All perishable food must be kept cold or frozen to keep it safe.
6. Food should be labelled with the date it was bought or opened to keep track of freshness.
7. The First In, First Out method means using older food before newer food to avoid waste.
8. Do not overfill the fridge or freezer. This allows cold air to move around and keep all food at the right temper

Activity 2.3 How we Store Food

Imagine some of your ingredients (e.g. tomatoes,) that you wish to use to prepare some food for lunch have gone bad, how disappointing it would be. This activity will help you understand how best we can store some common food items correctly to prevent spoilage.

1. Work in pairs and take turns answering these questions with your partner:
   - **a.** How do we store food at home?
   - **b.** What food often gets spoiled?
   - **c.** Discuss reasons why you think the food spoils?
2. Each of you make a note of one or two new food storage ideas that you discussed.
3. With the aid of pictures of food items and your notes from the discussion with your partner and how they are stored you should decide if the food is perishable or non-perishable.
4. Create a simple poster, with drawings or cut-outs to match the food type with its proper category of storage (dry, refrigerated, frozen).
5. In your pairs, discuss how families can apply the principles of food storage to prevent food spoilage and maintain food safety

CAUSES OF FOOD SPOILAGE AND ITS IMPLICATIONS FOR FOOD SAFETY

Food Spoilage

Food spoilage is the process by which food loses its original quality, becoming unsafe and unpleasant to eat. This can be caused by biological factors such as the growth of bacteria, mould, or yeast; chemical reactions like oxidation; or physical damage during handling, storage, or transport.

Spoiled food often shows signs such as a bad smell, change in colour or texture, or the presence of mould. Consuming spoiled food can lead to foodborne illnesses, including stomach upset, vomiting, or more serious health issues.

Food spoilage also results in economic losses not only for families who must throw away wasted food, but also for farmers, shops, and food manufacturers. It contributes significantly to global food waste, making it a concern for both public health and environmental sustainability. Proper storage, handling, and hygiene are essential to reduce spoilage and its harmful effects.

Causes of Food Spoilage

There are four main causes of food spoilage.

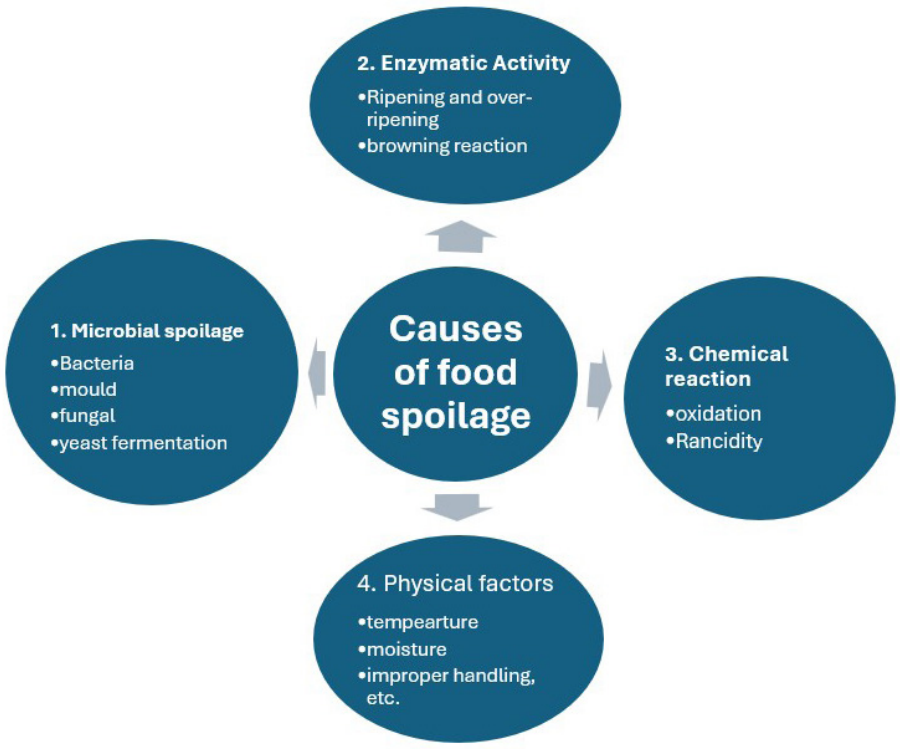


Figure 2.4: Causes of Food Spoilage

1. **Microbial spoilage**: Germs like bacteria, moulds, yeasts, and fungi grow on food, causing bad smell, slime, mould spots, or fermentation. This makes food unsafe.

2. **Enzymatic activity**: Natural enzymes in food cause ripening. If uncontrolled, they lead to over-ripening and browning (e.g., cut apple turning brown).
3. **Chemical reactions**: Air and light can change food through oxidation. This causes rancidity in oils and fats, giving bad smell and taste.
4. **Physical factors**: Conditions like poor handling, moisture, or wrong temperature damage food. Examples are bruising, freezer burn, or quick spoilage.

Implications of Food Spoilage on Food Safety

1. **Health risks**: Spoiled food may contain germs or toxins that cause food poisoning. Symptoms include stomach pain, vomiting, diarrhoea, and fever. In serious cases, it can cause hospitalisation or death, especially in children, the elderly, or weak patients.
2. **Economic losses**: Spoiled food is often thrown away, causing money loss to families, farmers, shops, and restaurants. Large amounts of waste also harm the economy.
3. **Environmental impact**: Wasted food means wasted water, energy, and labour. In landfills, spoiled food produces methane gas, which worsens climate change.
4. **Prevention**: Proper storage, good hygiene, and careful handling reduce spoilage. Refrigeration, covering food, checking expiry dates, and using leftovers in time also help. Education and awareness are important.

Activity 2.4 Discovering why Food Goes Bad

1. Work individually to research food spoilage using the internet or textbooks. Find answers to questions like:
   - **a.** The definition of food spoilage
   - **b.** The causes of food spoilage
   - **c.** Why is good storage important?
   - **d.** What happens when someone eats spoiled food?
   - **e.** Write down three important facts you find out
2. Organise yourselves into groups and share your findings with your group for their comments and suggestions. Add new ideas to your notes.
3. In your groups, observe real examples of spoiled foods and fresh food (e.g mouldy bread, fresh bread/ fruit and over ripe fruit). Compare the two food items and discuss these two questions:
   - **a.** What signs show that the food has gone bad? (for example: bad smell)
   - **b.** Write key points in your notebooks

4. Carry out further investigations by exploring a different type of food, such as fruit, vegetable, yam etc.
5. Create a chart showing
   a. what makes that food spoil? (e.g. heat)
   b. what are the effects of the spoilage? (e.g. overripe, browning)
   c. one method to prevent the food from going bad.
6. Groups present their findings and their charts for peer review.

APPROPRIATE FOOD HANDLING, STORAGE AND HYGIENIC FOOD PRACTICE

Proper Handling and Storage of Food Commodities

Storing and handling food properly is essential to keep it fresh, safe, and long-lasting. Whether you are dealing with dry goods, tinned foods, fresh produce, or frozen items, following a few basic guidelines will help protect the food's quality and prevent waste or contamination.

General Guidelines for Storing Food

1. **Inspect and Sort**
   a. Check all food before storage. Look for damaged packaging, pests, mould, or items past their use-by date. Throw away anything that looks unsafe or spoiled.
   b. Sort foods by type and date of purchase. This makes it easier to use older items first and find what you need quickly.
2. **Choose the Right Storage Area**
   a. Store food in a cool, dry, and well-ventilated place.
   b. Keep it away from direct sunlight, heat, and dampness, which can cause spoilage.
   c. Good places include a pantry, cupboard, basement, or a dedicated food storage room.
3. **Consider Storage Space**
   a. Choose a clean, organised space with shelves or storage bins to keep food off the floor.
   b. Ensure food is easy to reach and identify, avoiding over stacking.
4. **Use the Right Containers**
   a. For dry goods (like rice, flour, or sugar), transfer them into airtight containers to protect them from moisture, insects, and dirt.

b. Use clear containers so you can easily see the contents, and always label them with the food name and date of storage.

Figure 2.5: Airtight containers with food items well labelled

5. **Handle Raw Foods Safely**
   - **a.** Store raw meat, poultry, and seafood separately from cooked or ready-to-eat food.
   - **b.** Use sealed containers or bags to prevent juices from leaking onto other foods and causing cross-contamination.
6. **Follow the FIFO Rule (First In, First Out)**
   - **a.** Use older items first before newer ones to avoid waste.
   - **b.** Label everything with the date you stored it so you can keep track of freshness.
7. **Keep Proper Temperature**
   - **a.** Refrigerators should be kept below 4°C (39.2°F) to keep perishable food like meat, dairy, fruits, and vegetables fresh.
   - **b.** Freezers should be set at -18°C (64.4°F) or lower to keep frozen foods safe for longer periods.
8. **Prevent Cross-Contamination**: Store raw meat, poultry, and seafood on the lowest shelves of the fridge in sealed containers. This keeps their juices from dripping onto other food.

How to Store Specific Foods

These are some specific food items and how it can best be stored.

Fish

Keep cold: Store fresh fish in the fridge at or below 4°C, or freeze at -18°C if you are not using soon. Use airtight containers or zip-lock bags to stop juices from leaking and avoid absorbing other smells. If transporting, keep fish on ice or in a cold container. Eat fresh fish within two days, or freeze for longer storage.

Figure 2.6: Fishes in a freezer

Onion

Store in a cool, dry place with good air circulation like a mesh bag, basket, or open container. Avoid moisture, which causes onions to rot or sprout. Check onions regularly and remove any that are going bad.

Figure 2.7: Onions in a basket

Mango

Unripe mangoes should be kept at room temperature, away from direct sunlight, until they ripen. Once ripe, place them in the fridge to keep them fresh for longer. Check ripeness by gently pressing. Ripe mangoes are slightly soft.

Figure 2.8: Ripped Mangoes in a fridge

Fresh Tomatoes

Keep unripe tomatoes at room temperature, away from sunlight, to allow proper ripening. Do not refrigerate unripe tomatoes, as cold can ruin their flavour and texture. Store ripe tomatoes stem side down to reduce spoilage and use them within a few days. Cooked tomatoes can be kept in airtight containers in the fridge or freezer, depending on when you plan to use them.

Activity 2.5 Store it Right

This activity will help you understand the correct ways to store common food items and explore the challenges people face when storing food at home or in the community.

1. Watch a demonstration/video on how to store food commodities
2. Organise yourselves into groups of 3 or 4 to discuss guidelines for storing food items such as fish, onion, fruit etc at home.
3. Discuss challenges individual, families and societies face (e.g., no fridge etc), when storing foods. Each group writes their ideas in a book or on a flip or mini poster.
4. In your group, choose two food items (e.g., Onion, mango, banana, beans, rice). Using sample food items or models, demonstrate how to store them properly using containers, cloth bags or boxes.
5. Display your work for other groups to observe and ask questions for further discussions

EXTENDED READING

- Adigbo C.& Maddah (2010) *A complete course in Food and Nutrition*. Kwadwoan Publishers. Pages 194-196
- Koomson J. &Dollar J.H(2019) *Food and Nutrition for Senior High Schools*. Aki Ola Publishers Pages 344-357
- Sarkodie N. A (2021) *Food and Nutrition for Schools and Colleges*. Pages 161-162

Review Questions

1.
   a. What is food security and why is it important for families and communities?
   b. Give two ways food security helps people live better lives.
   c. Name one key part of food security and explain how it affects your everyday life.
2. List three challenges of food security in everyday life. For each one, give one way it can be solved.
3. Write a short report about two socio-economic factors that affect food security in Ghana.
4. Explain the concepts of food spoilage, food storage, and the importance of food storage in keeping food safe and preventing illness.
5. Critically examine four ways individuals and families can apply the principles of food storage in daily life to prevent food spoilage and promote food safety.
6. How can poor food storage lead to food spoilage? Give two simple ways to stop food from spoiling at home.
7. With a partner or group, name two old-fashioned ways and two modern ways people store food in your community. Explain how these ways help stop food from going bad.
8. List and explain three basic guidelines to follow when storing food at home to keep it safe and fresh.
9. What are some challenges that individuals, families, or communities may face when trying to store food properly? Give at least three examples and explain how they affect food safety.

SECTION

3

FOOD LABORATORY AND HYGIENE

FOOD PRODUCTION

Food Production Technology

Introduction

A food laboratory is a special place where food is prepared, tested, and studied to ensure it is safe, nutritious, and of good quality. These laboratories are commonly found in schools, restaurants, and food industries, and they play an important role in teaching, research, and food production. In order for food laboratories to work well, they must be properly planned and arranged. The type of kitchen laboratory layout affects how food is cooked, how clean the space stays, and how smoothly work can be done.

When designing or planning a food laboratory, several factors must be considered, such as space, equipment, safety, and the number of users. Sometimes, old laboratories may need to be redesigned or renovated to improve their function. Cleanliness is also very important in a food laboratory to prevent germs and contamination. In this lesson, we will learn about all these areas and how to improve food laboratories for better results.

KEY IDEAS

- Food laboratories ensure food safety, nutrition, and quality through testing.
- Proper planning of food laboratories improves workflow, safety, and cleanliness.
- Kitchen laboratory layout affects cooking efficiency, hygiene, and productivity greatly.
- Factors like space, equipment, and safety are crucial when designing.
- Regular cleaning prevents contamination, maintaining food laboratories health and standards.

CONCEPT OF FOOD LABORATORIES AND THEIR FUNCTIONS IN FOOD PRODUCTION

What Is a Food Laboratory?

A food laboratory is a special place where food is, tested and checked for safety and quality, Prepared and cooked, just like in a kitchen, studied to improve recipes and discover new food products

You can find food laboratories in places like, Schools and Colleges, Food factories, Research institutions, Restaurants and hotels. Some food laboratories look like modern kitchens, while others are filled with scientific equipment.

Functions of a Food Laboratory

The food laboratory plays an important role related to ***Figure 3.1***.

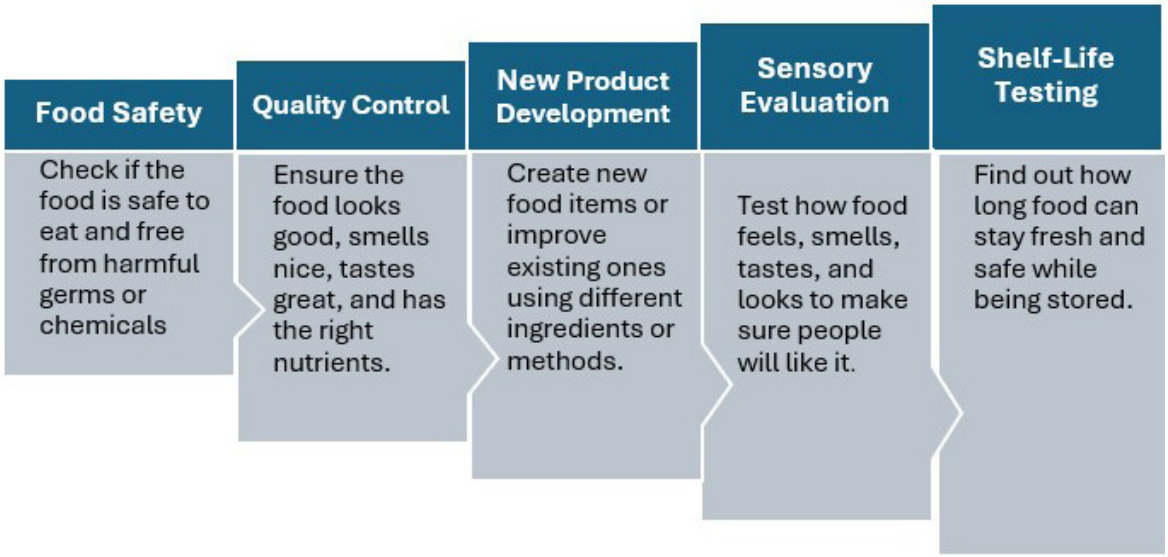


Figure 3.1: Functions of a Food Laboratory

Types of Food Laboratories

Table 3.1: Types of Food Laboratories

SN	Type of Food Laboratories	What it Does	Tools/Equipment Used
1.	Kitchen Laboratory	Prepares, cooks, and serves food; tests recipes.	Oven, stove, fridge, utensils, dishes.
2.	Microbiological Laboratory	Studies tiny organisms like bacteria or yeast that may spoil food.	Microscope, incubator, autoclave.
3.	Chemical Analysis Lab	Checks for chemicals in food (e.g. nutrients or harmful substances).	Chromatograph, spectrophotometer, mass spectrometer.
4.	Nutritional Analysis Lab	Measures nutrients in food including macronutrients and micronutrients (e.g. protein, vitamins).	Spectrophotometer, chromatograph
5.	Sensory Evaluation Lab	These laboratories are made to check how food tastes, smells, feels, and looks when creating new foods. They also control light, temperature, and air to avoid distractions and make testing accurate.	Special rooms with calm light and no noise

Figure: 3.2: Why Food Laboratories Matter

Activity 3.1 Exploring and Discovering Food Laboratories

1. Organise yourselves into groups of four to discuss the meaning of a food laboratory. Each group writes a simple definition in their own words.
2. Explore the internet or view pictures or any other sources showing different types of food laboratories (e.g. kitchen labs, microbiology labs).
3. Make a List of all the food laboratories that you find and their functions
4. Pick one type of food laboratory that you have researched and use drawing paper to create a simple poster showing:
   a. The name of the lab, what it does (functions)
   b. Display your poster around the class and be prepared to explain the functions of your chosen food lab to others.

TYPES OF KITCHEN LABORATORIES LAYOUT AND THEIR IMPLICATION IN FOOD PRODUCTION

A food or kitchen laboratory is an important part of any place where food is prepared. It is where food is cooked, tested, and served. It can be found in homes, schools, restaurants, hotels, hospitals, and food factories. The size, design, and tools in a kitchen laboratory may be different depending on what it is used for and how much food is prepared there.

Figure 3.3: Traditional and modern food laboratory

Zones in a Kitchen Laboratory

Every kitchen has different working areas

1. **Food Preparation Area:** This is the place where food ingredients are cleaned, cut, mixed and made ready for cooking. It usually has tables to work on, cutting boards, and sinks for washing food.
2. **Cooking Area:** This is the area where food is really cooked. It has stoves, ovens, grills, fryers, and other tools used to make different kinds of meals.
3. **Storage Area:** This area has fridges and freezers to keep food that can spoil fresh. It also has shelves, cupboards, and pantries to store dry foods and kitchen tools.
4. **Utensils Area:** Where cooking items like pots, pans, spoons, and bowls are kept.
5. Ventilation System: This area has fans or vents that take away smoke, smells, and heat from cooking. This helps to keep the kitchen safe and comfortable for those working there.
6. **Dishwashing area:** This area is a special area where washing and cleaning of dishes, utensils, and cooking tools are done to keep them safe and hygienic.

Types of Kitchen Laboratories

***Table 3.2*:** Types of kitchen laboratory and its functions

SN	Type	What it is used for
1.	Family Kitchen laboratory	Cooking food for the family at home
2.	School/Educational Kitchen	Teaching cooking and food science
3.	Research & Development Kitchen	Testing new food ideas or recipes
4.	Commercial Kitchen	Found in restaurants or hotels for large food production
5.	Experimental/ Test Kitchen	Used to try out recipes before selling

6.	Hospital/Clinic Kitchen	Prepares food for patients with health needs
7.	Food Processing Kitchen	Prepares food for packaging or selling

Functions of the Family Kitchen Laboratory

The family kitchen laboratory is a very important part of the home. Some of the main things it is used for include

1. cooking and serving food: This is where meals are prepared and served to the family.
2. welcoming guests: Visitors can be received and sometimes entertained in the kitchen.
3. storage: It is a place to keep cooking tools, utensils, and equipment safely.
4. family meetings: Family members can hold small meetings or discussions in the kitchen.
5. laundry activities: Some washing or laundry tasks can also take place in the kitchen area.

Kitchen Layouts and Why They Matter

Kitchen layout means how the different parts of a kitchen are arranged. The right layout makes cooking faster, safer, and easier.

Table 3.3: Kitchen Layouts and Why They Matter

SN	Layout	Description
a.	Single-Line	All equipment is in one straight line. Saves space.
b.	L-Shaped	Shaped like an "L", good for small kitchens.
c.	U-Shaped	Work areas are on 3 sides. Easy to move around.
d.	Island Layout	Has a central table or counter (the island). Good for teamwork.
e.	Parallel/Galley Layout	Two counters facing each other. Good for fast cooking.

Figure 3.4: The various kitchen layouts

Why Kitchen Layouts Are Important

1. Helps with speed and work flow
2. Keeps the kitchen safe and clean
3. Saves space
4. Helps with teamwork and learning

Traditional Versus Modern Kitchens

In Ghana and around the world, kitchens have changed a lot over time. This change shows how technology, food safety, and care for the environment keep improving. Traditional kitchens are important because they show our culture and make good use of local resources. Modern kitchens focus on making work easier, safer, and faster through new equipment and designs.

1. **Infrastructure and Design**

   Traditional: simple structures, often outside, smoky, with little storage.

   Modern: built inside houses, with cupboards, running water, good ventilation, and tiled floors.

2. **Cooking Equipment and Technology**

   Traditional: firewood, charcoal pots, clay stoves, mortar and pestle.

   Modern: gas/electric cookers, ovens, fridges, blenders, microwaves.

3. **Safety and Hygiene Standards**

   Traditional: more smoke, burns, and less storage for clean water/food.

   Modern: safer equipment, clean spaces, and better waste disposal.

4. **Accessibility and Affordability**

   Traditional: cheaper to set up, uses local materials and fuel.

   Modern: more expensive but saves time and energy.

5. **Application in Institutions**

   Schools, hospitals, and restaurants prefer modern kitchens because they must cook safely, quickly, and in large amounts.

   Many homes in villages still use traditional kitchens because they are affordable and use available resources.

Table 3.4: Traditional vs. Modern Kitchens

SN	Similarities	Differences
a.	Both traditional and modern kitchens use fuel for cooking	Modern kitchens are well organised and arranged neatly.
b.	Both use tools and equipment to prepare food	Modern kitchens use advanced and sophisticated equipment that makes cooking easier and faster.

***Table 3.5*:** Traditional kitchen laboratory

SN	Advantages	Disadvantages
1.	Easy to build.	Not enough space to store things.
2.	Tools and equipment are easy to buy	Poor airflow or ventilation.
3.		Walls get dirty from smoke

***Table 3.6*:** Modern kitchen laboratory

SN	Advantages	Disadvantages
1.	Uses advanced tools and equipment.	Tools and equipment are expensive to buy.
2.	Equipment is arranged in a neat and organised way	Maintaining and taking care of the tools can be difficult.

Fuels Used in the Kitchen/Food Laboratory

In kitchens and food laboratories, different fuels are used for cooking and heating. The type of fuel chosen depends on cost, availability, safety, efficiency, and its effect on the environment. Here are some common fuels:

1. **LPG (Liquefied Petroleum Gas):** LPG is a mix of gases called propane and butane. It is stored in pressurised cylinders. It is widely used in homes and commercial kitchens because it is easy to use and cooks' food quickly. May be limited in rural areas.

Safety Tips

a. Always check for gas leaks.

b. Turn off the gas cylinder when not in use.

c. Ensure good ventilation in the cooking area.

2. **Kerosene** is a liquid fuel from oil. It is used in wick stoves and pressure stoves. People often use it in areas where gas or electricity is not available. Produce smoke, unpleasant odours, can cause indoor air pollution, can be difficult to operate and clean.

Safety Tips

a. Store kerosene away from flames and sunlight.

b. Use only in well-ventilated areas.

c. Do not refill a hot stove.

3. **Charcoal** is made by burning wood without air. It is a solid fuel often used in coal pots or open grills. It is a traditional way of cooking and gives food a smoky taste. Affordable and widely available, suitable for outdoor cooking, provides strong, even heat for grilling and roasting, produces carbon monoxide

dangerous in enclosed spaces, contributes to deforestation and air pollution, Time-consuming to light and maintain.

Safety Tips

a. Use outdoors or in open, well-ventilated spaces.

b. Never use charcoal indoors without proper ventilation.

c. Keep children away from hot coal pots.

4. **Electricity** powers many kitchen tools like ovens, induction cookers, hotplates, and microwaves. It is clean and easy to control but needs a constant power supply. Precise temperature control, safer when used correctly, dependent on availability and stable power supply, the cost of electricity may be high, not usable during power outages unless backed by generators.

Safety Tips

a. Avoid using damaged cords or sockets.

b. Keep water away from electrical appliances.

c. Switch off appliances when not in use.

Types of Fuel Used in Kitchens

Table 3.7: Types of Fuel Used in Kitchens

SN	FUEL	GOOD SIDE	BAD SIDE	SAFETY TIPS
i	Gas (LPG)	Cooks fast, clean. Burns cleanly with very little smoke or soot. Heats food quickly and efficiently. Temperature is easy to control using the regulators. Easy to find in cities and towns.	Can be dangerous if not handled well. It can be expensive in some places. It may be hard to find in rural areas.	Check for leaks, turn off after use. Make sure the cooking area has fresh air and proper airflow.
ii.	Kerosene	Relatively cheap and found in many places. Easy to carry and store. Good to use when there is no electricity or in emergencies.	Makes smoke and smell. Produces smoke and bad smells. Can cause indoor air pollution. Stoves can be hard to use and clean.	Keep kerosene away from fire and sunlight. Always use it in a place with good airflow. Never refill a stove when it is hot.

iii.	Charcoal	It is cheap and easy to find Good for cooking outside. Gives strong heat for grilling and roasting.	Produces carbon monoxide which can be dangerous indoors. Can cause deforestation and air pollution It takes time to light and keep burning	Use charcoal outside or in a place with lots of fresh air. Never use charcoal indoors unless there is proper ventilation. Keep children away from hot charcoal pots.
iv.	Electricity	It is clean and does not produce smoke. The temperature can be control accurately. It is safer if used properly.	Can not be use if electricity power goes off. Electricity can be expensive. Cannot be used during power cuts unless you have a generator	Do not use cords or sockets that are damaged. Keep water away from electrical appliances. Turn off appliances when you are not using them.
v.	Pellets	Cooks fast, clean, safe	Dust Can be irritating or dangerous if inhaled	Use correct equipment only burn fuel pellets in approved stoves

Activity 3.2 Exploring Kitchen Laboratories and Fuels

1. Organise yourselves to work in groups of four, look and discuss pictures or videos of different kitchens (modern and traditional). Talk about:
   - **a.** How the kitchens are arranged (zones/layouts).
   - **b.** What are the similarities, differences between modern and traditional kitchens
   - **c.** What are the advantages and disadvantages of modern and traditional kitchens
   - **d.** What tools and equipment are used in modern and traditional kitchens
2. Complete this table with similarities and differences between modern and traditional kitchens.

Type of kitchen	Similarities	Differences

3. Fill in the types of fuels used in each kitchen (gas, kerosene, charcoal, electricity. pellets). ***Advantages and disadvantages*** of each fuel. Safety tips for using each fuel in the table provided.

Types of fuels	Advantages	Disadvantages	Safety tips

4. In your group present your findings to the class.

Factors That Affect the Planning and Layout of Food Laboratories

Planning a food laboratory means thinking ahead about how to design and organise the space where food is prepared, cooked, tested, or stored. A well-planned laboratory helps us work safely, efficiently, and neatly.

Figure 3.5: Food laboratory

Things to Consider When Planning a Food Laboratory

***Table 3.8*:** Planning a Food Laboratory

SN	Factor	Explanation (Simple Language)
a.	Purpose and Scope	It shows what it will be used for and how it should be arranged. If the laboratory is meant for cooking, food safety testing, quality checks, research, or a mix of these, it will guide the kind of equipment to use and how much space is needed.
b.	Building Infrastructure	Does the building have water, electricity, waste bins, and proper airflow (ventilation)? These are needed for safety and hygiene.
c.	Space and Layout	The size and design of the laboratory affect how smoothly and safely people can work. Things like where the work tables are placed, how equipment is arranged, and how samples move around the laboratory must be planned carefully.
d.	Equipment Selection	Choosing the right equipment for the laboratory is very important. The choice should depend on the type of tests and work to be done, and also on the money available. It is also important to take good care of the equipment and check it regularly to make sure it works well
e.	Safety and Security	There must be first aid, safety gear (like gloves), and emergency exits. People working in the laboratory must know how to stay safe.

Planning a Kitchen or Food Laboratory at Home

***Table 3.9*:** Planning a Kitchen or Food Laboratory at Home

SN	Socio-Cultural Factors	Economic Factors
a.	Traditions, lifestyle, and family needs influence the food laboratory's design. **Functions of the food laboratory** – The laboratories purpose (cooking, testing, research) decides equipment and layout.	**Family budget** – The family budget helps decide how much money can be spent on the kitchen.
b.	Type of fuel available (gas, electricity, pellets, firewood) affects equipment and design.	Cost of building the kitchen-Building cost depends on materials, design, and the size of the kitchen.
c.	Good placement of doors and windows allows fresh air, safety, and easy movement.	**Cost of equipment and tools** – Money is needed for stoves, fridges, utensils, and other kitchen tools.
d.	The laboratory should meet household or community cooking and food requirements (cooking, eating and washing).	**Money needed for care and maintenance** – Regular cleaning and repairs keep the kitchen safe, neat, and lasting longer.
e.	**Environment** – Weather, location, and surroundings (dusty, windy, busy area) influence ventilation, lighting, and waste disposal.	**Space size based on what the family can afford** – The kitchen size should match the family's budget and available home space.

Tips for Good Kitchen/Laboratory Design

Figure 3.6: Tips for Good Kitchen/Laboratory Design

Activity 3.3 Factors in planning a Kitchen Laboratory

1. Work in pairs to discuss the factors that affect food laboratory planning and the factors to consider when planning them for family use

2. In your pairs join other pairs to form a group of six members. Each person thinks of one factor that affects planning a food laboratory (for example: space, ventilation, safety equipment, cost, location, number of users, water, electricity, etc.) and writes it down.
3. Take turns to share your ideas within the group and discuss how each factor can affect food laboratory planning (e.g., "Without enough space, the laboratory will be overcrowded and people will find it hard to work").
4. Together, agree on the five most important factors and explain why you chose them.
5. Prepare a short presentation and deliver it to other groups. After your presentation, allow at least one question from another group.

Reflect as a group: Which factor do you think is the most important, and how does proper planning affect safety in the food laboratory?

REDESIGNING A FOOD LABORATORY

Figure 3.7: Redesigned or renovated kitchen

Redesigning or renovating means making changes to improve how a food laboratory looks and works. This can include changing the layout, improving safety, adding new equipment, or making the space more comfortable and cleaner.

Simple Ways to Improve a Food Laboratory Include

1. **Change the Layout and Flow**
   a. Arrange tables, sinks, and storage in a way that makes it easier to move around.
   b. Keep cleaning areas far from cooking or testing spaces to avoid mixing things up.
2. **Make a Plan and Budget**
   a. Think about what you want to change, how much it will cost, and how long it will take.
   b. Plan for new furniture, lighting, shelves, or equipment.
3. **Flooring and walls**
   a. Choose strong floors and walls that are smooth, easy to clean, and do not hold germs.
   b. Avoid using cracked or rough surfaces where dirt can hide.
4. **Improve the Lighting**
   a. Good lighting helps people see clearly when cooking or testing food.
   b. Use bright lights that do not hurt the eyes.

Importance of Re-designing a Food Laboratory

When we redesign a food laboratory, we make it better for everyone who uses it. Careful planning helps us get good results such as:

1. **Promote safety and hygiene:** The laboratory should be clean and safe so that people do not get hurt and food does not get contaminated.
2. **Promote efficiency and productivity:** The design should make work easier and faster, so more work can be done in less time.
3. **Ensure compliance and adaptability to changing needs:** The laboratory should follow all rules and be flexible enough to adjust when new needs or technologies come up.
4. **Promote comfort of use:** The space should be comfortable to work in, with good lighting, ventilation, and enough room for movement.
5. **Easy care and maintenance:** The design should make cleaning and repairing of the laboratory simple and not time-consuming.

Activity 3.4 Design and Improve Kitchen Laboratories

1. Organise yourselves into groups of 4
2. Visit a food laboratory or kitchen in the community (school kitchen, canteen, restaurant).
   a. Look at how the cooking, washing, and storage areas are arranged.
   b. Observe how they keep the place clean and safe i.e. are the floors, walls, preparation areas easy to clean
   c. Discuss the design and make notes about how user friendly the space is. i.e. is there enough room for everyone to move around, are workspaces, kept separate from cleaning areas
   d. Is the food laboratory well-lit so everyone can see clearly what they are doing?
3. Write down what you saw and explain why cleanliness and order are important and two things that could be improved
4. Share your findings with other groups.
5. Working in your groups, draw or sketch your dream food laboratory.
   a. Show the cooking, washing, and storage areas clearly.
   b. Include the following in your design and explain how it will make the kitchen safe, clean, and easy to use. Example:
      i. Zones (washing, cooking, storage)
      ii. Safety (first aid, fire extinguisher, safe wiring)
      iii. Comfort (space, air, good light)
      iv. Tools and equipment (cookers, sinks, storage)

PERSONAL, FOOD AND ENVIRONMENTAL HYGIENE IN THE FOOD LABORATORY

Personal Hygiene in the Food Laboratory

Good personal hygiene is very important for anyone working in a food laboratory. It helps keep food safe and prevents the spread of germs. Good personal hygiene includes:

1. Wear clean clothes and protective clothing (like aprons, gloves, or caps) to keep food safe.
2. Wash your hands often with soap and water to stop harmful germs from spreading.
3. Bath regularly to stay clean and fresh.
4. Keep your nails short and clean by trimming fingernails and toenails.

5. Brush your teeth twice a day to keep your mouth clean and healthy.

Figure 3.8: Handwashing under running water

Food Hygiene

Food hygiene means keeping food clean and safe to eat. It helps prevent sickness and makes sure the food is healthy.

1. **Use clean food items** – choose fresh and good quality foods.
2. **Cook food properly** – make sure food is well cooked before eating.
3. **Store food the right way** – keep food covered and in safe places.
4. **Wash your hands before touching food** – this stops germs from spreading.
5. **Use clean tools and equipment** – always cook with clean pots, spoons, knives, and plates.

Figure 3.9: A seller with clean hands touching fruits

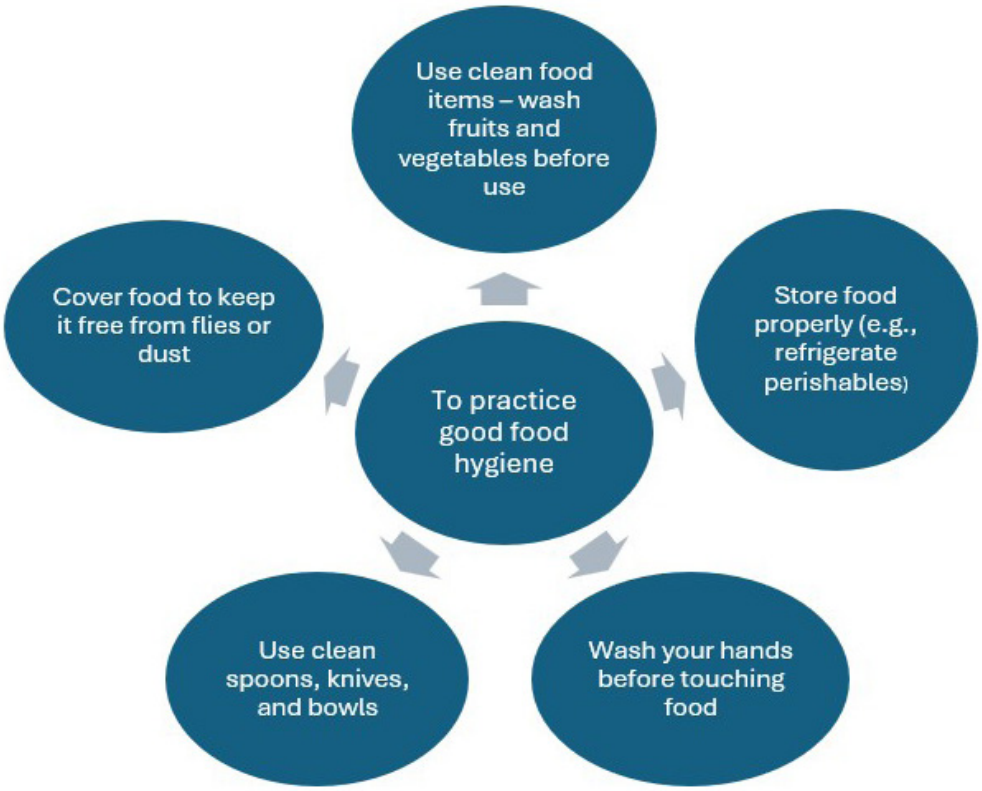


Figure 3.10: To practice good food hygiene

Environmental hygiene

Environmental Hygiene means keeping the kitchen and its surroundings clean and safe. This prevents germs and makes cooking healthy.

Figure 3.11: Cleaning done on stove

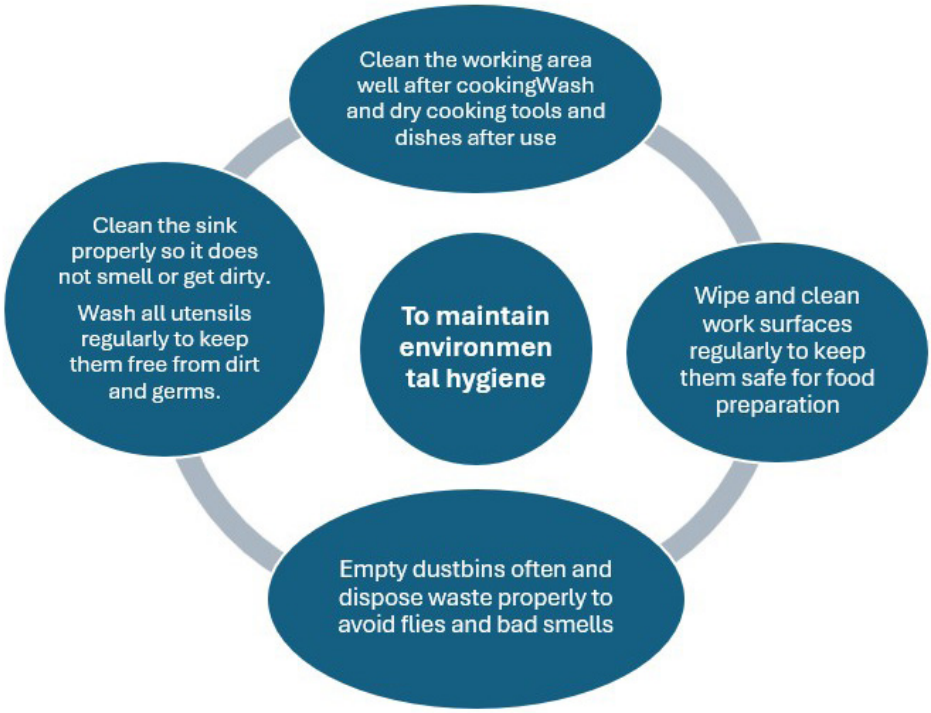


Figure 3.12: Maintain Environmental hygiene

Activity 3.5 Hygiene for Safe Food

1. Working in pairs make notes about what you learnt in JHS Career Technology about food hygiene.
   - **a.** Answer simple questions like:
     - **i.** What is personal hygiene?
     - **ii.** How do we keep food clean?
     - **iii.** Why should our kitchen be clean?
   - **b.** Write down 4 important points you remember.
2. In your pairs discuss what hygiene means in a food laboratory and share with the class
3. Organise yourselves into groups of 3 or 4 and create a poster that shows how to practice good hygiene in the food laboratory (personal, food, or environmental hygiene).
4. On your poster include the following information
   - **a.** Show good practices like washing hands, covering food, cleaning the working area.
   - **b.** Add a short slogan (e.g., Clean Hands, Safe Food).
5. Share your poster and slogan with the class, explaining why hygiene is important for food safety and healthy living.

EXTENDED READING

- Adigo, E. C., & Maddah, C, K. (2011). *Foods and Nutrition.* Kwadwoan Publishing: Accra.
- Koomson, J. E & Dollar, J. K. (2019). *Food and Nutrition for Senior High Schools.* Aki-Ola published: Accra. Pg. 181- 201, 305-320.
- Sarkodie, N. K. (2014). *Food and Nutrition for Schools and colleges*. Bookworm publishers: Kumasi. Pg. 83-149

Review Questions

1. Match each type of food laboratory (a - e) with what it is used for (i-v):
   - **a.** Kitchen laboratory
   - **b.** Microbiological laboratory
   - **c.** Chemical analysis laboratory
   - **d.** Nutritional analysis laboratory
   - **e.** Sensory evaluation laboratory
   - **i.** Checks how food tastes, smells, and looks
   - **ii.** Prepares and cooks food for testing
   - **iii.** Studies germs and bacteria in food
   - **iv.** Finds out what nutrients like vitamins and minerals are in food
   - **v.** Looks at the chemicals and additives in food
2. What are two differences between a traditional kitchen and a modern kitchen?
3. How does the layout of a kitchen affect food production?
4. Why is it important to think about the purpose of a food laboratory when planning it?
5. A family wants to build a small kitchen laboratory. Use your knowledge to suggest how they can plan it well using both social and economic factors.
6. If you are asked to redesign a food laboratory to improve how work is done, what would you change and why?
7. A school food lab is old and unsafe. It has broken lights with cracked tiles on the floor and walls. Plan how you would redesign it to make it safe, clean, and easy to use. Explain your choices.
8. You are asked to train a new food lab worker. What hygiene rules would you teach them, and why are these rules important?

SECTION

4

BEVERAGES

FOOD PRODUCTION

Food Processing Techniques

Introduction

Beverages play a significant role in our daily lives by providing hydration, nutrition, and enjoyment. They range from non-alcoholic drinks like juices, teas, and smoothies to alcoholic options such as wines and spirits. Each beverage type serves different nutritional and social purposes, from energising the body to supporting cultural traditions. Understanding the scientific principles behind the selection, processing, and preservation of beverages is essential for maintaining their quality, safety, and nutritional value.

Additionally, enriching or fortifying beverages can help meet specific health and dietary needs of individuals, families, and the broader society. This includes adding vitamins, minerals, or natural ingredients from local food sources to improve both health benefits and taste. Through practical experiments using local ingredients, learners can explore how to create nutritious, culturally relevant, and economically viable beverage options. Scientific knowledge also helps in understanding how alcoholic beverages are produced, highlighting the importance of safe and sustainable practices in beverage development.

KEY IDEAS

- Beverages provide hydration, nutrition, and enjoyment in daily life.
- Different beverages serve nutritional, cultural, and social functions.
- Fortifying drinks with nutrients supports health and dietary needs.
- Safe, sustainable production of alcoholic beverages is scientifically important.
- Scientific knowledge ensures beverage quality, safety, and nutritional value.
- Using local ingredients makes beverages nutritious and culturally relevant.

TYPES OF BEVERAGES AND THEIR USES

The Concept of Beverages

Beverages are liquid that people drink when they are thirsty, to stay hydrated, or just for enjoyment. A beverage can also be described as a drink with flavour. It can make you feel refreshed, give you energy, or help you stay alert. Some beverages are sweet, while others are not.

There are many types of beverages, and they are made to suit different likes and choices.

Beverages can be grouped into the following main types:

1. **Refreshing drinks** – help you feel cool and relaxed.
2. **Nourishing drinks** – give the body nutrients and strength.
3. **Stimulating drinks** – keep the mind and body active.

There are two main types of Beverages: Alcoholic and Non- Alcoholic

1. **Alcoholic Beverages**

   Alcoholic beverages are drinks that contain alcohol (ethanol) a substance that can affect how we think and feel. These drinks are made by fermenting or distilling grains, fruits, or other natural ingredients.

How are alcoholic drinks made

a. **Fermentation** – This is when tiny organisms called yeast break down sugars in foods (like grains or fruits) to produce alcohol.

b. **Distillation** – This is a process used to make drinks stronger by removing water and increasing the alcohol content.

Reasons people drink alcohol

a. For social reasons (e.g., at parties or celebrations)

b. For cultural traditions (e.g., traditional ceremonies)

c. For recreation or relaxation

Note

- Alcohol should always be used responsibly, because drinking too much can lead to health problems, addiction, or accidents.

Types of alcoholic beverages

a. **Soft Liquor** (Lower alcohol content):

   i. ***Beer*** – Made from fermented cereal grains like barley.

   ii. ***Wine*** – Made by fermenting grapes or other fruits.

b. **Hard Liquor / Spirits** (Stronger alcohol content): Whisky, Vodka, Rum, Gin

Examples of Local Alcoholic Drinks in Ghana

a. **Pito** – A traditional drink made from fermented millet.

b. **Palm Wine** – Collected from palm trees and naturally fermented.

c. **Akpeteshie** – A very strong local spirit distilled from palm wine or sugarcane juice. It is Ghana's version of local gin.

Figure 4.1: Pictures of Alcoholic beverages (Soft Liquor)

Figure 4.2: Types of Alcoholic beverage (Hard Liquor)

1. Non-Alcoholic Beverages

These drinks have no alcohol. They are taken to refresh, energize, or nourish the body.

Examples: Water – the best natural drink. Fruit juices – like orange or pineapple juice. Milk and cocoa drinks, soft drinks (fizzy drinks), tea, coffee, and chocolate drinks, Local drinks in Ghana such as sobolo, asaana, lamugin, and pito without alcohol.

They are grouped into ***three*** types

a. Stimulating Beverages

Stimulating beverages are drinks that help you stay awake, active, and focused. They give the body extra energy and make the mind more alert. However, if you drink them too often or in large amounts, they can cause the heartbeat, breathing, and blood pressure to increase. This is because many of them contain a substance called caffeine.

Examples: Tea, Coffee, Ginger drink.

Figure 4.3: Pictures of Stimulating beverages

b. Refreshing Beverages

They are drinks that make the body feel cool, fresh, and lively. They help to quench thirst and give you a feeling of energy and comfort, especially on hot days. **Examples**: soft drinks (carbonated drinks), fruit juices, and vegetable drinks.

Figure: 4.4: Picture of Refreshing beverages

c. Nourishing Beverages

These are healthy drinks that give your body nutrients and energy. Examples: Milkshakes, Smoothies, Cocoa drinks, Millet drink (Zonkom), Coconut water

Nourishing beverages are drinks that help the body grow strong and stay healthy. They give the body important nutrients and can also help with digestion. Some of these drinks contain electrolytes, which help the body work well by keeping the right balance of fluids, supporting the nerves, and helping the muscles to move properly.

Examples: Cereal drinks, millet drink (Zonkom), milkshakes, cocoa drinks, coconut water/drink.

Figure 4.5: Pictures of Nourishing Beverages

Note

- Some fruit juices are mixed with little alcohol (Cocktail), Mocktail is a mixed drink that looks and taste like cocktail but without alcohol (Orange, pineapple plus soda water or tonic water).

Uses of Beverages

Beverages serve various purposes and are used for a wide range of reasons. The uses of beverages depend on their types and properties.

Here are some common uses of beverages:

1. **Hydration** – Beverages like water help the body stay hydrated and prevent dryness (dehydration). They keep the body in balance.
2. **Quenching thirst** – Cold drinks such as water, juice, lemonade, and iced tea help to stop thirst and make you feel refreshed, especially on hot days. unfermented pito, palm wine, zonkom and asana are used to quench thirst and provide relief on hot days.
3. **Nutrition** – Some drinks like milk, fresh juices, and smoothies give the body important nutrients such as vitamins and minerals that help us stay healthy.
4. **Energy boost** – Drinks with caffeine, like coffee or energy drinks, can give quick energy and make you feel more awake and alert.
5. **Social enjoyment** – Beverages like tea, coffee, soft drinks, and even special party drinks are often enjoyed with friends and family during gatherings, parties, or celebrations.

Factors to Consider When Choosing Beverages

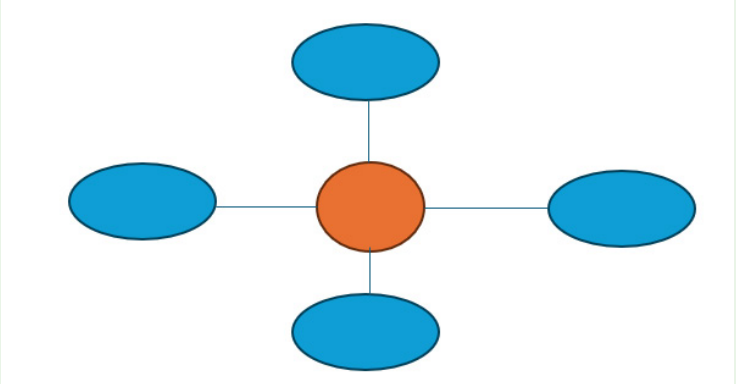
When picking a drink, it is important to think about your health, your personal needs, and the environment. Here are some simple things to look out for:

1. **Nutritional Content** look at the label to find out what is inside the drink. Check for:
   - **a.** Calories (energy the drink gives)
   - **b.** Sugar
   - **c.** Vitamins and minerals
   - **d.** Some drinks, like milk or fruit juice, have useful nutrients. Others, like fizzy drinks, may not have many healthy things.
2. **Sugar Content** too much sugar can be bad for your health.
   - **a.** Many soft drinks and sweetened juices have a lot of sugar.
   - **b.** People with diabetes should stay away from sugary drinks.
   - **c.** Even if you do not have diabetes, it is still good to choose drinks with less sugar.

3. **Health Conditions** - Think about your health before choosing a drink.
   a. If you have diabetes, you should avoid sugary drinks.
   b. If you have high blood pressure or are trying to lose weight, choose drinks that are low in sugar, fat, and salt.
   c. Drink plenty of water to stay healthy.
4. **Environmental Impact** - Drinks also affect the environment. Think about:
   a. ***Packaging:*** Bottles made from plastic, glass, or metal take a lot of energy to make.
   b. ***Pollution:*** Factories that make drinks and bottles can pollute the air, water, and land.
   c. ***Waste:*** If packaging is thrown away carelessly, it can harm rivers, oceans, and forests. You can help the environment by:
      i. Choosing drinks with recyclable or reusable packaging.
      ii. Avoiding single-use plastic bottles.
      iii. Supporting brands that care about nature.

Activity 4.1 Concept of Beverages

1. **Types of beverages and their uses**
   a. Organise yourselves into groups of 4
   b. Surf the internet or other sources to brainstorm ideas on the meaning and types of beverages
   c. In your group create a or spider web diagram/ mind map (this is a simple diagram with a central topic in the middle and lots of branches see below) where you can record the information that you have found out about different types of beverages and their uses e.g.
   d. Include examples of the types of beverages that you have thought of
   e. Talk through your diagram with the class explaining the types and uses of beverages that you have researched



2. Beverage Choice Game

a. Working in your groups, think of one beverage (e.g., water, juice, soda, tea, milk).

b. On a chart or board, write the beverage name.

In a group, discuss:

i. What the drink gives the body (nutrition, energy, hydration).

ii. Who can or cannot drink it (people with health issues like diabetes, children, etc.).

iii. Sugar content.

iv. How it affects the environment (plastic bottles, cans, or natural packaging).

c. Still in your group present answers to the class. As a class, agree on which beverages are the healthiest choices and why.

SCIENTIFIC PRINCIPLES INVOLVED IN THE SELECTION, PROCESSING AND PRESERVATION OF BEVERAGES

This topic explains the science behind making, choosing, processing, and storing drinks. It helps us understand how to keep beverages safe, healthy, and of good quality. For example, fruit juice needs proper processing to keep its vitamins, milk must be stored well to stay fresh, and soft drinks are made under strict rules to ensure safety. Learning these principles helps us enjoy drinks that are tasty, nutritious, and safe, while also showing us the best practices in food science and technology.

General Rules for Making Good Beverages

To make beverages that are clean, safe, and of good quality, we must follow the rules in ***Table 4.1***.

Table 4.1: Rules for Making Good Beverages

SN	Principle	What it means
a.	Quality Ingredients	Use clean, fresh fruits, water, milk, or other raw materials to ensure safety, flavour, and nutritional value. Bad ingredients = bad drink.
b.	Cleanliness	Wash all utensils and surfaces before and after making a drink.
c.	Safety	Wash hands, clean tools, and avoid mixing raw and cooked items.
d.	Measurement	Use the right amounts of each ingredient for taste and nutrition.
e.	Temperature Control	Hot drinks should be at the right heat; cold ones should stay cool.

Different drinks need special care to taste good, stay safe, and keep their nutrients. Scientists use certain rules when making drinks like juice, milk, tea, or smoothies.

***Table 4.2*:** Make Different Beverages (Science Behind It)

SN	Beverage	Science Tip
a.	Tea	Do not use boiling water. Use hot water around 85–90°C. Do not soak it too long – it can taste bitter because of the tannin.
b.	Coffee	Use water at 90–96°C to get flavour and caffeine, but not bitterness from tannin.
c.	Cocoa	Needs to be boiled so the starch breaks down and it tastes smooth. This improves texture and digestibility while developing flavour.
d.	Fruit – based beverages	Use low heat or cold process to save vitamin C and keep it fresh.

How to Select the Right Beverages

When evaluating drinks, we look at:

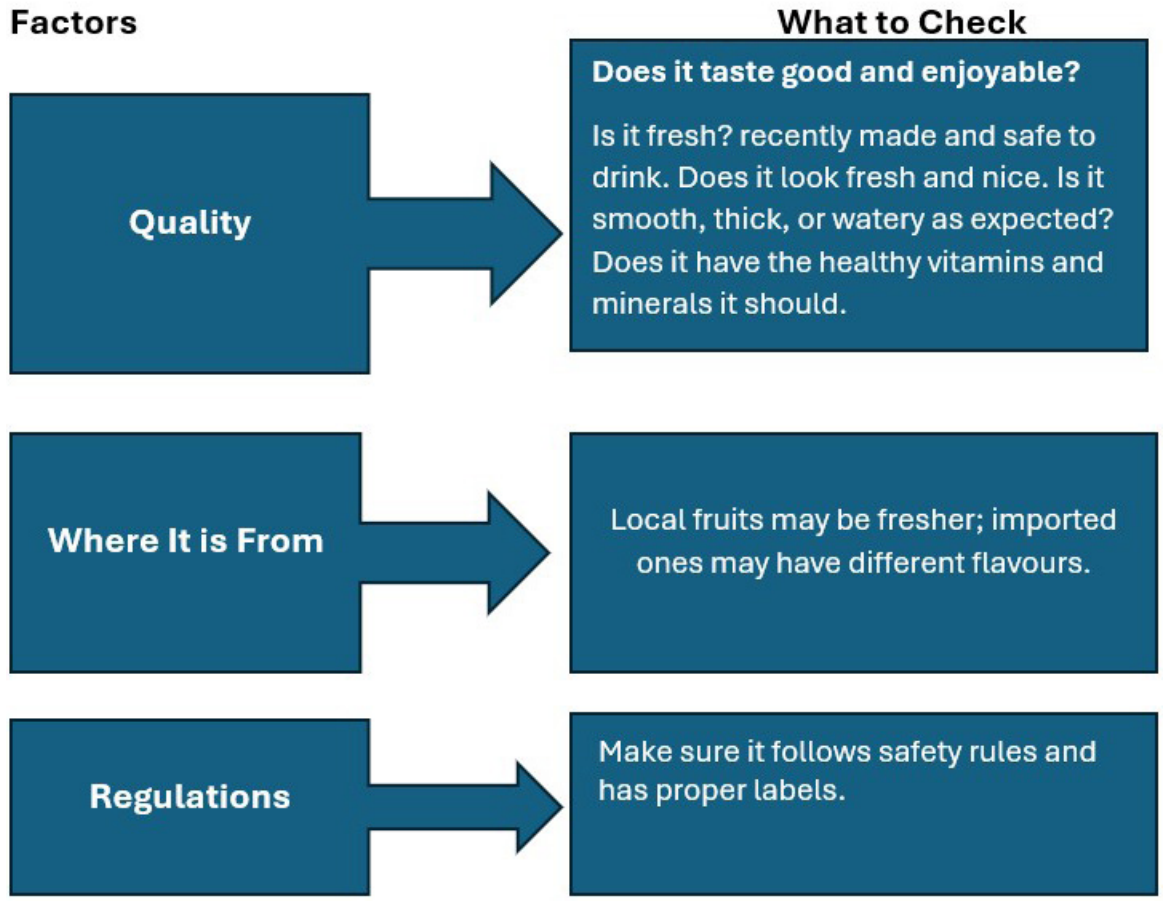


Figure 4.6: Factors to consider when choosing a beverage

Using poor quality ingredients can make the drink taste bad, look dull, and lose important nutrients. Always use good ingredients for the best drinks.

How Beverages Are Processed (Made Ready to Drink)

How Beverages Are Made Better

1. **Filtration** – This process removes dirt, solids, and unwanted particles from drinks. It makes the drink clearer, cleaner, and tastier.
2. **Pasteurisation** – Drinks like milk and juice are gently heated to kill germs. This keeps them safe to drink without changing the taste or nutrients much.
3. **Carbonation** – Carbon dioxide gas is added to drinks like soda. This creates bubbles, makes the drink feel fizzy, and helps it last longer.
4. **Homogenisation** – This mixes the drink evenly so that particles do not separate. Milk and fruit drinks often go through this to stay smooth and uniform.

How to Keep Beverages Fresh (Preservation)

Beverages can go bad if we do not store them properly. Preservation means using methods to make drinks last longer and stay safe to drink.

Here are some easy ways beverages are preserved:

1. **Sterilisation**

   This means heating the drink at a very high temperature to kill all germs (microorganisms). It helps drinks last much longer without spoiling. It is mostly used for canned or bottled drinks like milk or soft drinks.

2. **Packaging**

   The container used matters a lot. Glass bottles, plastic bottles, and paper packs (tetra packs) help keep air, light, and germs out. Good packaging keeps the drink clean and safe to drink.

3. **Refrigeration**

   Putting drinks in a fridge keeps them cold and slows down spoilage. It is great for fresh juices, milk, yogurt drinks, and iced teas.

4. **Preservatives**

   These are special chemicals added to drinks to stop germs from growing. Common ones are benzoates and sorbates. They are added in small, safe amounts to keep the drink fresh.

Activity 4.2 Beverage Science Explorer

1. Organise yourselves into groups of 3 or 4
2. Research the internet or textbooks to find information on how different beverages (like juice, milk, tea, or soda) are made and preserved. Focus on:

- How ingredients are chosen (selection)
- How beverages are processed (heating, filtering, mixing, carbonation)
- How beverages are kept fresh (preservation methods)

3. Make a simple poster or chart showing:
   - Types of beverages
   - Their processing steps
   - Preservation methods
   - Any interesting scientific principle you discovered
4. Present your poster in the class, share new ideas and insights. Listen to others and ask questions.

Reflection

Discuss which ideas were most interesting and why some beverages need special treatment to stay fresh and safe.

ENRICHING AND FORTIFYING BEVERAGES

Beverage production is the process of making drinks such as water, milk, juice, tea, coffee, and soft drinks. Sometimes, extra steps are taken to make these drinks healthier or more appealing. Two of these steps are enrichment and fortification.

These processes help to improve the nutrition of the drink (making it healthier). Enhance the flavour and texture so it tastes better. It increases the shelf life, so that the drink lasts longer without spoiling. In simple terms, enrichment and fortification make beverages not only refreshing but also good for the body.

Enrichment

Enrichment is adding back nutrients to a drink that may have been lost during processing (Vitamins or minerals). ***Example***: Adding vitamin C to orange juice or calcium to milk.

Fortification

This is when important nutrients are added to help solve a specific problem, like iron deficiency or weak bones. ***Example****:* Adding iron to a drink to help fight anaemia (low red blood cells).

Substances Added to Fortify or Enrich Beverages

***Table 4.3*:** Substances Added to Fortify or Enrich Beverages

SN	Nutrient	What it Does	Found In
a.	Vitamin C	Protects the body, boosts immunity	Juices, fruit drinks
b.	Vitamin D	Strengthens bones	Milk, plant-based milk
c.	Iron	Prevents anaemia (tiredness)	Fortified drinks
d.	Calcium	Builds strong bones and teeth	Juices, milk
e.	Proteins	Builds muscles, keeps you strong	Shakes, smoothies
f.	Fibre	Aids digestion	Juices, smoothies
g.	Omega-3	Boosts brain power	Milk, health drinks
h.	Plant Extracts	Helps the body fight disease	Herbal and energy drinks

Importance of Beverage Fortification and Enrichment for Individuals, Families and Society

1. For Individuals

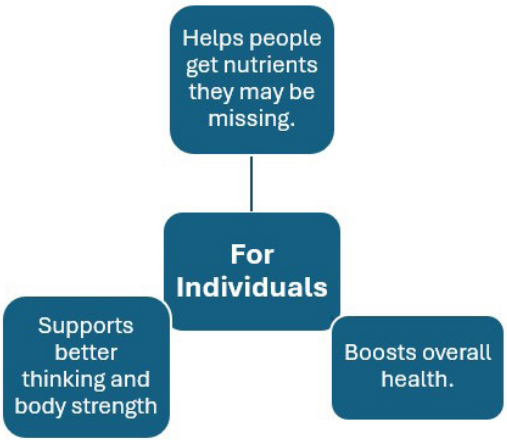


Figure 4.7: Beverage fortification and enrichment for individuals

2. For the Families

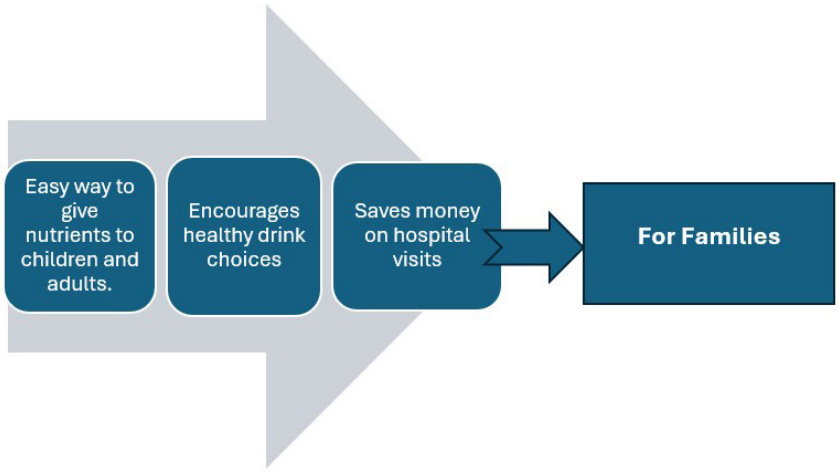


Figure 4.8: Beverage fortification and enrichment for families

3. For Society

Figure 4.9: Beverage fortification and enrichment for to society

Note

- Not all drinks are healthy, check if they are fortified or enriched.
- Look out for too much sugar.
- Choose drinks that add value to your health.

Pre-activity

Window shop to find these

1. Visit a shop or market.
2. Choose 2–3 different beverages.
3. Check the labels, find added vitamins or minerals
4. Share with your friends what nutrients you find and why they are good for you.

Activity 4.3 Boost My Drink

1. Organise yourselves to work in small groups of 3 or 4
2. Research the internet for videos, or short readings to learn how drinks like milk, juice, or cocoa are enriched or fortified.
3. Analyse two ways that beverages can be enriched or fortified to meet the nutritional needs of a specific group of people. E.g. the elderly, children
4. Imagine you are a drink maker. Choose one beverage (e.g., milk, orange juice, cocoa drink).

5. Decide which nutrients you would add to make the beverage healthier for one specific group of people (e.g., vitamin C, calcium, iron
   a. Give your drink a fun name. ***Example:*** 'dream healthy drink'
   b. On a paper, write your beverage and list:
      i. The nutrient you added
      ii. Its function in the body (e.g., calcium = strong bones)
      iii. How it meets the nutritional need of your selected group
6. Share your improved drink with the class.

FUNCTIONS, NUTRITIONAL AND FOOD SAFETY BEVERAGE ENRICHMENT AND FORTIFICATION

Enrichment and fortification mean adding extra nutrients or helpful ingredients to drinks to make them more nutritious, tasty, and long-lasting. These changes help meet our food, health, and social needs at home, school, or in the community.

Functions of Beverage Enrichment and Fortification

Here are what enriching and fortifying drinks can do:

1. **Better Nutrition and Taste:** Vitamins, minerals, and flavours are added to make drinks healthier and tastier.
2. **Improved Texture and Feel:** Some ingredients make drinks feel smoother and nicer in the mouth.
3. **Longer Shelf Life:** Preservatives are added to help the drink stay fresh for longer time.
4. **Health Boost:** Fortified drinks may support strong bones, better eyesight, and a strong immune system.
5. **Special Nutrition for Specific People:** Some drinks are made especially for children, pregnant women, or athletes to meet their health needs.
6. **Energy and Brain Boost:** Some drinks help you feel active and focused.
7. **Stand Out on the Market:** Fortified drinks attract more customers because of their special features.

Nutritional and Food Safety Implications of Beverage Enrichment and Fortification

Enriched and fortified drinks can boost health with added nutrients, but too much can be harmful. Choose wisely based on your diet and health needs to stay safe and healthy.

Benefits and Risks of Fortified Beverages

Table 4.4: Benefits and risks associated with fortified beverages

SN	Nutritional Benefits	Food Safety Risks
a.	Fills nutrient gaps (like Vitamin C or Iron)	Taking too much can be harmful
b.	Makes drinks more nutritious	Some nutrients may react badly with others
c.	Promotes good health (like stronger bones)	May cause allergies or side effects in some people
d.	Easy to carry and drink anytime	Needs good quality control to keep it safe
e.	Available even where food is limited	Overuse can cause health problems

Activity 4.4 Healthy or Risky? Let us Decide

1. Organise yourselves to work in groups of 4
2. Each person in the group names one beverage they know that is enriched or fortified (e.g. fortified fruit juice, vitamin water, sobolo with added ginger). Make a list of four drinks
3. In your group discuss ideas on what the nutritional benefits of those drinks give?
4. Discuss what safety concerns or risks might they have (e.g., too much sugar, unsafe storage, over-fortification)?
5. Prepare your group report on the 4 enriched or fortified drinks for discussion and feedback with the class.

Experiments to Produce Non-Alcoholic Beverages (1)

Simple Steps in Making a Non-Alcoholic Beverage (Drink)

1. **Pre-preparation**
   - **a.** Choose what you need, like fruits, water, herbs, or juice.
   - **b.** Wash the fruits or herbs well. Cut or peel them if needed.
2. **Making the Drink (Preparation)**
   - **a.** Put everything together and blend or stir it.
   - **b.** If you are using fresh fruits, squeeze out the juice.

c. Heat the drink to kill germs. This is called pasteurisation or sterilisation.

d. Remove seeds or small bits to make the drink smooth.

3. **After Making the Drink (Post-preparation)**

a. Pour it into clean bottles, cups, or containers.

b. Wash all tools and clean the working area.

4. **Making Healthy Fortified Drinks (Enriched Drinks)**: These are drinks made to be tasty and good for the body.

Steps to Make a Healthy Fortified Drink

1. **Choose the main ingredient:** Water, orange juice, pineapple juice, or plant extracts (like hibiscus).
2. **Prepare ingredients:** Wash, Peel, cut fruits and Vegetables.
3. **Take out the juice (Extraction):** Use a blender or squeezer to get the juice or pulp.
4. **Mix everything:** Blend the juice with water and other healthy ingredients thoroughly to create a uniform blend.
5. **Sweeten and flavour:** Add sugar, honey, lemon, or flavours to make it taste nice.
6. **Add nutrients (Fortify/Enrich):** Put in vitamins (like Vitamin C), iron, or other healthy things to make the drink better for the body.
7. **Filter and clear the drink:** Strain it so it looks clean and clear.
8. **Add bubbles (Optional):** For fizzy drinks, add gas (carbon dioxide) to make it bubbly.

Figure 4.10: Oranges

Figure 4.11: Squeeze oranges

Figure 4.12: Orange juices

Activity 4.5 Make Your Own Healthy Local Drink

You will prepare, enrich, and package a non-alcoholic local beverage using natural ingredients found in your communities. Organise yourselves into groups of 3 or 4

Materials needed

Local ingredients (e.g. **sobolo leaves**, **prekese**, **turkey berries**, ginger, pineapple, lemon, sugar/honey, moringa powder, cloves, watermelon).

Steps

1. Interview family members or neighbours to find out:
   - **a.** What local ingredients they use for drinks
   - **b.** How they prepare them
   - **c.** Any special ingredients added for health benefit.
2. Explore a video using the link provided or other sources https://youtu.be/iqbCTXJG63I on how to prepare the local drink (e.g., Sobolo).
3. Choose a local drink to prepare (e.g., sobolo). Make a work plan (List your ingredients and steps) to make and bottle your drink
   - **a.** Clean all tools and ingredients
   - **b.** Blend, squeeze, or boil ingredients
   - **c.** Add healthy enrichments (e.g., moringa, turkey berry, ginger)
   - **d.** Strain and taste
   - **e.** Pour into bottles or jars
   - **f.** Label with drink name, ingredients, and date
   - **g.** Display your bottled and labelled drink for peer appraisal
4. Work in your groups to write a short report on the activity:
   - **a.** Explain what drink you made
   - **b.** How you made it
   - **c.** Why your drink is healthy

Reflection

Make a note of the following after the activity:

- **a.** What you learned
- **b.** What went well
- **c.** What you would improve next time

Experiments to Produce Non-Alcoholic Beverages (2)

These are drinks without alcohol that are made from natural ingredients like fruits, herbs, grains, or flowers. They are safe, healthy, and can be used at home or shared with friends and family. There are four simple drink experiments you can try using local Ghanaian ingredients. Each drink also has health benefits.

Experiment 1: Ginger and Turmeric Infused Water

Ingredients

- Fresh ginger
- Fresh turmeric
- Water
- Honey or lemon (optional)

Steps

1. Wash and slice the ginger and turmeric.
2. Put them into a bottle or jug with clean water.
3. Let it sit (infuse) for 30 minutes to 1 hour.
4. Strain the water and add a little honey or lemon to taste.

Note

- Reduces inflammation (swelling)
- Helps your stomach and boosts your immune system

Experiment 2: Coconut Water with Pineapple and Mint

Ingredients

- Coconut water (from fresh coconut)
- Pineapple pieces
- Fresh mint leaves
- Ice cubes

Steps

1. Pour out fresh coconut water into a bowl.
2. Blend it together with pineapple and mint.
3. Serve it cold with ice for a refreshing drink.

Note

- Helps keep you hydrated
- Good for digestion

Experiment 3: Sorghum-Based Fermented Drink

Ingredients

- Sorghum grains
- Water
- Starter culture or natural yeast (e.g. from soaked millet)

Steps

1. Soak and cook the sorghum.
2. Add starter culture and allow it to ferment for 1–2 days.
3. Strain and pour into clean bottles.

Note

- Contains good bacteria for your tummy (probiotics).
- High in fibre and supports your immune system

Experiment 4: Hibiscus Flower Tea (Sobolo)

Ingredients

- Dried hibiscus flowers (sobolo leaves)
- Water
- Honey or lemon (optional)

Steps

1. Boil water and add the hibiscus leaves.
2. Let them steep (soak) until the water turns red.
3. Strain the drink. Add honey or lemon to taste.

Note

- High in vitamins. Has anti-oxidants.
- Supports a healthy heart and reduces tiredness

1. **Tips for all experiments**
   - **a.** Use clean water and clean tools
   - **b.** Wash your hands before you start
   - **c.** Always label your drink bottles with the name and date
   - **d.** Share your drink with family and friends
2. Why These Drinks Are Important? These healthy local drinks are:
   - **a.** Affordable and easy to make
   - **b.** Nutritious, giving your body what it needs

c. Fun to create and share

d. Safe for people of all ages

Activity 4.6 My Healthy Local Drink Project

Make improvements to what you did previously. You will plan, prepare, enrich, and present a non-alcoholic beverage using local Ghanaian ingredients like sobolo, prekese, turkey berries, ginger, pineapple, etc.

Materials needed

1. Clean bowls, spoons, and bottles/cups
2. Ingredients (Choose based on your group's plan, ***e.g.,*** *sobolo leaves, ginger, turmeric, coconut, pineapple, honey, lemon, prekese, turkey berries*)
3. Clean water
4. Blender or grater (if needed)
5. Strainer or sieve
6. Sugar or other natural sweeteners (optional)
7. Chart paper or cardboard (for your group report/poster)
8. Markers or pens
9. Smartphone (optional – for video or PowerPoint presentation)

Example of Drink Ideas

a. Sobolo enriched with ginger and pineapple

b. Coconut-pineapple cooler with mint

c. Ginger-lemon-turmeric tea

d. Prekese and turkey berry smoothie

1. Organise yourselves to work in groups of 4
2. Explore a video on how to prepare a healthy local drink using the link provided https://youtu.be/iqbCTXJG63I, refer to your previous lesson or any other source
3. Pick one local drink and plan to upgrade it by adding nutritious ingredients. *(e.g., Add moringa to sobolo, tiger nut to brukina)*
4. Make your drink and upgrade it adding nutritious ingredients, bottle it and label it. Refer to previous session on making beverages. Give it a new name
5. In your group, reflect and write a report on beverage enrichment and fortification
   a. Explain why your version is healthier
   b. Who would benefit from drinking it

c. Present information on your drink and share with the class using a poster/chart showing the steps and ingredients.

d. Display your bottled and labelled drink for appraisal by your friends

ALCOHOLIC BEVERAGE PRODUCTION

Alcoholic beverages are drinks that contain ethanol (alcohol) and are usually made by fermenting foods like cereals (e.g. sorghum), fruits (e.g. pineapple), or tubers (e.g. cassava). They are enjoyed by many people during social events, ceremonies, and traditional gatherings.

Figure 4.13: Pito production

Steps in Making Alcoholic Beverages from Local Ingredients

Step 1: Choose Your Ingredients

Use foods that are rich in sugar or starch, such as:

1. Sorghum, millet, maize (grains)
2. Cassava, yam (tubers)
3. Pineapple, palm sap, banana (fruits)
4. Sugarcane, honey (sugar sources)

Step 2: Prepare the Ingredients

1. Clean and crush the ingredients
2. Cook or boil to break down the starch
3. Add enzymes like amylase to turn starch into sugar

Step 3: Start Fermentation (Turning Sugar to Alcohol)

1. Add yeast like Saccharomyces cerevisiae (Baker's yeast or Brewer's yeast)
2. Keep the mixture warm (25–35°C) and cover it to avoid air
3. Leave for 3 to 14 days
4. The yeast changes sugar into alcohol and gas (CO_2)

Step 4: Filter and Clarify

1. Strain the mixture to remove particles
2. Let the drink settle and become clear

Step 5: Distillation (For Stronger Drinks Like Spirits)

1. Heat the drink to collect alcohol vapour
2. Cool and collect the vapour as a liquid (ethanol)
3. Repeat for stronger alcohol if needed

Step 6: Age or Store

1. Store the drink in clay pots, glass, or barrels
2. Some drinks are ready fast (like palm wine)
3. Others take months or years to improve taste

Step 7: Packaging

1. Bottle the drink in clean, sealed containers
2. Add herbs or safe chemicals to preserve it

Step 8: Test the Quality

1. Use a hydrometer to check alcohol level
2. Taste and make sure it's safe to drink

Enriching and Fortifying Alcoholic Drinks

1. **Enrichment:** Add natural things like ginger, herbs, or fruits
2. **Fortification:** Add vitamins, minerals, or antioxidants
3. Improve alcohol level by adjusting fermentation or distillation
4. Use herbal infusions to boost flavour and health benefits

Scientific Ideas Behind the production Process

***Table 4.5*:** Scientific ideas behind beverage production

SN	Scientific Principle	What Happens
i.	Fermentation (Biology & Chemistry)	Yeast eats sugar → produces alcohol and gas (CO_2)
ii.	Distillation (Physics)	Alcohol is separated by heating boils at 78.3°C
iii.	Safety Control (Microbiology)	Heating or filtering removes harmful germs
iv.	Flavour Science (Biochemistry)	Special smells and tastes develop during storage (ageing, esters, etc.)

v.	Preservation (Food Chemistry)	pH control and preservatives keep the drink safe and longer-lasting

Example: Local Pito Production (Made from Sorghum/Millet)

1. Soak and ferment sorghum
2. Boil the mixture
3. Cool and let it ferment again
4. Strain and serve (fresh and slightly fizzy)

Activity 4.7 Local Drink Makers

1. Watch a video using the link https://youtu.be/vwfV7c7vS1Y or read from books or websites about how local alcoholic drinks are made (e.g., pito, palm wine, or corn beer).

   Find out:

   a. What ingredients are used

   b. What makes the drink alcoholic (fermentation)

   c. How the drink can be made healthier (fortification or enrichment)

2. Organise yourselves in groups of 4
3. Choose one local alcoholic beverage to prepare. Work together to write a simple work plan:

Example Work Plan Table

SN	Step	What to Do	Tools/Ingredients Needed
1.	Ingredient selection	Choose millet, ginger, sugar, yeast	Bowl, knife, spoon
2.	Cleaning/preparation	Wash, peel, and cut	Water, cloth
3.	Fermentation	Mix and let it sit for 2–3 days	Pot, clean bottle
4.	Enrichment	Add Vitamin C, ginger, or moringa	Powder, juice, spices
5.	Packaging	Bottle the drink safely	Clean bottles or containers

4. Use your plan to prepare and enrich the drink.

   a. Work as a team and follow clean and safe practices.

   b. Observe what happens during fermentation (e.g., bubbles, smell, colour).

   c. Package your drink neatly.

d. Create a small poster or label showing:

i. The name of your drink

ii. The ingredients used

iii. The nutrients added and their benefits

5. Display your beverage for appraisal by your friends

EXTENDED READING

- Adigbo, E. C & Maddah, C. K. (2011). *A complete course in Food and Nutrition.* Kwadwoan publishing: Accra.
- Koomson, J. E & Dollar, J. K. (2019). *Food and Nutrition for Senior High Schools.* Aki-Ola published: Accra.
- Sarkodie, N. K. (2014). *Food and Nutrition for Schools and colleges*. Bookworm publishers: Kumasi.

Review Questions

1. List any four steps involved in producing a local alcoholic beverage and explain what happens during fermentation.
2. After making and fortifying a local alcoholic beverage in class, reflect on the process. What went well, what was difficult, and what would you change if you were to do it again?
3. Why is it important to use clean tools and the right temperature when making and storing beverages? Explain how these scientific principles help keep the beverage safe and tasty.
4. What is the difference between beverage enrichment and fortification? Give one example of each.
5. Why do you think fortified and enriched beverages are important for families and society? Explain with at least two reasons.
6. What are three functions of beverage enrichment and fortification? Explain each one in simple terms.
7. What are two possible food safety or nutrition issues that can happen with fortified drinks? Explain how they might affect people.
8. What are the main steps in making a fortified non-alcoholic beverage? List and briefly explain each step in your own words.
9. After preparing your non-alcoholic beverage in class, what challenges did you face during the fortification or enrichment process, and how did you solve them? What would you do better next time?
10. Choose one of the local beverages from the experiments and write its recipe. Include the ingredients, method, and tools you need to prepare it.
11. After preparing and enriching a beverage using local ingredients, reflect on your experience. What went well, what challenges did you face, and how would you improve it next time?
12. Write a simple recipe to prepare a local alcoholic beverage like palm wine or sorghum beer. List the ingredients, method, and tools you would need.
13. After producing and fortifying a local alcoholic beverage, write your reflection. What did you learn? What challenges did you face, and how would you improve next time?

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GLOSSARY

Affordability	How easy it is for people to buy food with the money they have
Alcoholic Beverage	A drink that contains ethanol (alcohol), such as beer, wine, or spirits.
Availability	Having enough food in homes markets or shops for everyone
Beverage	A drinkable liquid, which can be alcoholic or non-alcoholic, consumed for hydration, nutrition, or enjoyment.
Beverage Fortification Risks	Possible negative effects (e.g., nutrient overdose or allergies) linked with consuming overly fortified drinks.
Bolus	The soft, moist lump of chewed food formed in the mouth that's ready to be swallowed and continue through digestion.
Buzz Group	A small group of learners engaging in a short discussion to brainstorm or explore a topic.
Carbohydrates	A macronutrient that gives the body quick energy especially for the brain and muscles. Found in foods like rice, bread, and fruits.
Chyme	The thick, liquid mixture of partially digested food created in the stomach after it's churned with digestive juices.
Commercial Kitchen	A professional cooking space used in restaurants or catering businesses, built for high-volume and efficient food service.
Contamination	When food becomes unsafe because of germs dirt or harmful substances
Cross-contamination	When germs from one food spread to another making it unsafe

Culture/Ethnicity	The traditions and customs from a person's background that shape food preferences and preparation methods.
Diabetes	A chronic illness where the body struggles to manage sugar levels, often needing dietary changes and medication.
Dry storage	Keeping food like rice or beans in a cool dry place
Economic Factors	Financial considerations that influence the design and functionality of a kitchen, including budget for equipment and maintenance.
Enrichment	The process of adding nutrients that were lost during processing back into the beverage.
Equipment Selection	Choosing tools and appliances that match the intended use of the kitchen or food lab, ensuring efficiency and safety.
Fermentable Sugars	Natural sugars in raw materials that yeast can convert into alcohol during fermentation.
FIFO (First in First Out)	Using older food before newer food to stop waste
Food habits/lifestyle	The regular way people choose, prepare, and eat food in their daily lives.
Food Laboratory	A dedicated space used for food preparation, experiments, and learning, often found in schools or industries.
Food Safety	Practices that ensure beverages are free from harmful contaminants and safe for consumption.
Food security	Always having safe healthy and enough food to live well
Food spoilage	When food goes bad and is no longer safe to eat
Fortification	Adding nutrients that were not originally present in the beverage to improve its nutritional value.

Geographical location	Where someone lives, which influences the type of food available like cereals in the north and tubers in forest zones.
Health status	A person's medical condition like diabetes or obesity that affects the kinds of foods they should consume or avoid.
Heart disease	A group of conditions affecting the heart and blood vessels, often linked to unhealthy food choices and lack of exercise.
Home Kitchen	A private space where a family prepares meals, shaped by household needs, traditions, and available resources.
Hygiene	Keeping things clean to stop germs and protect health
Infrastructure	The essential services like water, electricity, and drainage that support safe and efficient kitchen or lab operations.
Kitchen Planning	The process of designing a kitchen layout and choosing its features to meet functional, cultural, and safety needs.
Local Commodities	Indigenous or locally sourced ingredients used in food or beverage production.
Macronutrients	Nutrients needed in large amounts for energy, growth, and body development. They include carbohydrates, proteins, and fats.
Malnutrition	When someone does not get enough healthy food to grow or stay strong
Microbial spoilage	Food going bad because of tiny germs like bacteria or mould
Microbiological Food Laboratory	A specialised lab where food samples are tested for microorganisms like bacteria and fungi, helping ensure food safety and quality.

Mixed-Ability Group	A learning group made up of students with varied skill levels and strengths.
Modern Kitchen	A kitchen equipped with advanced appliances, organised workspaces, and features that promote convenience and safety.
Nutrients	Substances in food that help the body grow, stay healthy, and function properly.
Nutritional Value	The content of nutrients in a beverage that contribute to health, such as vitamins and minerals.
Obesity	A condition where a person has too much body fat, often caused by overeating and lack of physical activity.
Perishable foods	Foods that spoil quickly like meat fruits vegetables or fish
Poor concentration and tiredness	A state of mental and physical fatigue that can result from poor nutrition, dehydration, or skipping meals.
Purpose and Scope	The intended function of a kitchen or food lab and the extent of its use, which influence design and equipment choices.
Quality Standards	Specific criteria used to judge the taste, appearance, and safety of a beverage.
Raw Materials	Natural ingredients (e.g., cereal grains, fruits) used to produce beverages.
Refrigerated storage	Keeping food in a fridge to make it stay fresh longer
Religion	Spiritual beliefs that impact food choices, such as avoiding pork or fish without scales.
Safety and Security	Measures like fire extinguishers, first aid kits, and proper exits that protect users from accidents or hazards.

Scientific Principles	Basic scientific rules or concepts guiding the processing and preservation of beverages.
Sensory Evaluation	A method used to assess a beverage's quality using the senses (taste, smell, sight).
Shelf life	The time food stays safe and good to eat
Socio-Cultural Factors	Traditions, customs, and family lifestyles that affect kitchen design, such as cooking methods and shared spaces.
Space and Layout	How the kitchen area is arranged to allow smooth movement, cooking, cleaning, and collaboration.
Traditional Kitchen	A kitchen that uses older tools and methods, often with open fires or basic equipment, reflecting historical and cultural practices.
Utilisation	How food is used prepared or cooked for healthy eating
Villi	Tiny, finger-like structures lining the small intestine that absorb nutrients from digested food into the bloodstream.

This book is intended to be used for the Year One Food And Nutrition Senior High School (SHS) Curriculum. It contains information and activities to support teachers to deliver the curriculum in the classroom as well as additional exercises to support learners' self-study and revision. Learners can use the review questions to assess their understanding and explore concepts and additional content in their own time using the extended reading list provided.

All materials can be accessed electronically from the Ministry of Education's Curriculum Microsite.

[Scan the QR Code to visit the website]

Ghana Education Service (GES)