MINISTRY OF EDUCATION
HOME ECONOMICS TEACHER'S ASSOCIATION GHANA

FOOD AND NUTRITION

for Senior High Schools

Year 2

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

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Ghana Education Service (GES)

ISBN: 978 – 9988 – 9586 – 0 – 2

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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 Pre-Tertiary Teachers Association of Ghana-PRETAG) 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

NUTRITION AND HEALTH

Food for Healthy Living

INTRODUCTION

This section introduces you to the importance of eating balanced meals, understanding diet-related diseases, making healthy food choices and planning meals that meet the nutritional needs of individuals, families and communities.

It also explores cooking methods that retain nutrients, the effects of processed foods and how to apply food and nutrition knowledge through interventions and research. You will learn about the basics of meal planning, the importance of using meal planning formats and preparation for different groups of people, including those with special dietary needs (pregnant women, infants, adolescents, the aged, vegetarians) Through direct experience, individual and group work you will learn about setting a table and meal service styles to promote healthy eating, good presentation, proper etiquette, and enjoyable dining experiences at home and in professional settings.

KEY IDEAS

- A balanced diet gives the body the right nutrients to stay healthy. It includes energy-giving carbohydrates, body-building proteins, healthy fats, protective vitamins and minerals, and water for hydration.
- Dietary-related diseases like obesity, diabetes, and malnutrition are caused by poor eating habits. They reduce quality of life and place economic strain on families and communities.
- Nutritional interventions are actions to improve health by addressing malnutrition, deficiencies, diet-related diseases, and promoting better diets, education, and policies.
- Basic cooking methods like steaming, poaching, grilling, and boiling help retain nutrients, making food more nutritious.
- Meal planning involves organising balanced meals to meet dietary needs, save time and money, reduce waste, and support health and sustainability.

THE COMPONENTS OF A BALANCED DIET AND DIETARY RELATED DISEASES

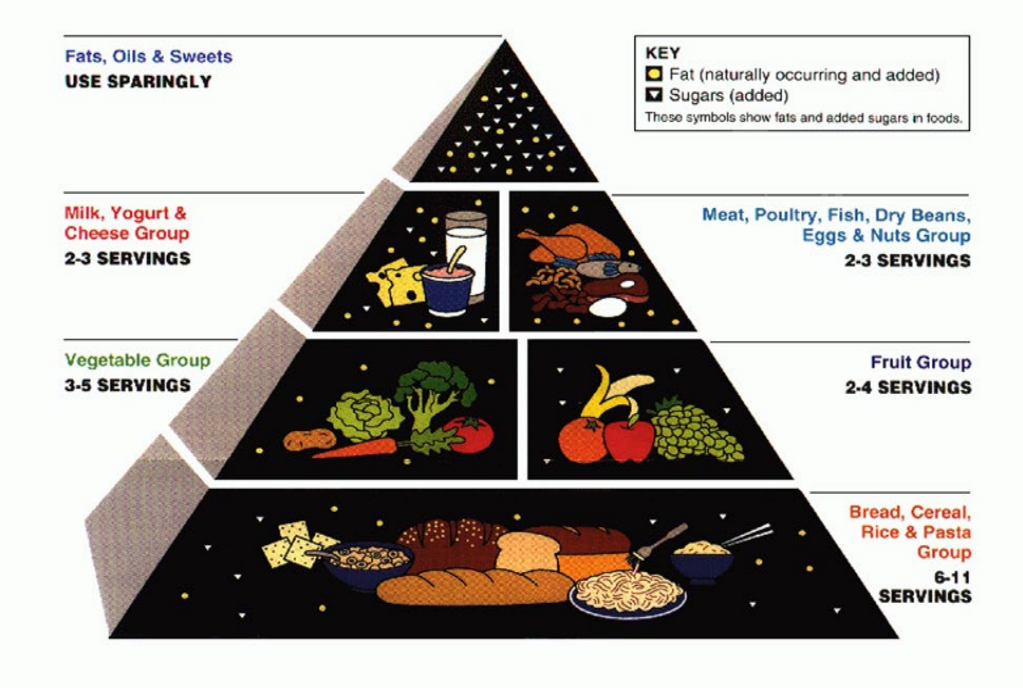


Figure 1.1: Food Pyramid with serving sizes

A Balanced Diet Includes All These Components in Appropriate Proportions to Meet an Individual's Nutritional Needs

1. Bottom Level: This forms the biggest part of the pyramid, therefore must be eaten in relatively larger quantities. They give us carbohydrate (energy). The body breaks down carbohydrates into glucose, which fuel physical activities and brain functions. Examples: bread, rice, cereal, pasta.
2. Second Level left (vegetable Group): The middle part is narrower and this provides vitamins, minerals, and fibre to fight diseases. Examples: carrots, broccoli, tomatoes etc.
3. Second Level right (Fruit Group) This also provides vitamins and minerals which prevent diseases like scurvy (Vitamin C deficiency), rickets and osteomalacia (Vitamin D deficiency). Examples: banana, watermelon, orange, apple, grapes. Each side provides fibre which helps in satiety, digestion and prevents constipation.
4. Third Level left (Milk, Yogurt & Cheese Group): This provides the body with protein, minerals and fats. It serves as a building block for muscles. It supports bones and teeth. Examples: milk, cheese, yogurt.
5. Third level right (Meat, Poultry, Fish, Eggs, Nuts & Beans Group): Proteins are essential for muscle development, healing wounds and maintaining overall body strength. Examples: meat, poultry, fish, eggs, nuts, beans.
6. Top Level - Fats, Oils & Sweets (use sparingly): This provides the body with heat and energy. One must eat very little of these, too much can cause health problems like obesity. Examples: butter, candy, chips, sugary drinks etc.

Dietary-Related Diseases and the Effects of Processed and Sugary Foods

Dietary-Related Diseases are health problems caused mainly by poor nutrition, unhealthy eating habits, and unbalanced diets.

Figure 1.2: Dietary-Related Diseases and the Effects

These conditions:

1. Affect individuals' physical and mental health.
2. Place financial strain on families due to high medical bills.
3. Reduce productivity at school or work.
4. Lead to poor quality of life and burden the healthcare system.

Effects of Processed and Sugary Foods on Health

Processed foods include items like canned goods, sugary snacks, fast food, instant noodles, and sweetened beverages. These foods can have both positive and negative effects on individuals

Positive Effects

1. Convenience: Easy to prepare, saving time for busy people.
2. Longer shelf life: Can be stored for longer without spoiling.

Negative Effects

1. Chronic disease risk**:** Regular consumption increases risk of obesity, diabetes, heart disease, and certain cancers.
2. Nutritional deficiencies**:** Many processed foods lack essential nutrients while containing excess calories.
3. Addiction patterns**:** High sugar and salt content can lead to cravings and overconsumption.

4. Digestive issues**:** Low fibre content and artificial additives may cause digestive problems.

Activity 1.1 Components of a Balanced Diet & Dietary Related Diseases

Organise yourselves into groups of four.

Materials you will need to complete this activity: Paper, markers, scissors, glue, food pictures.

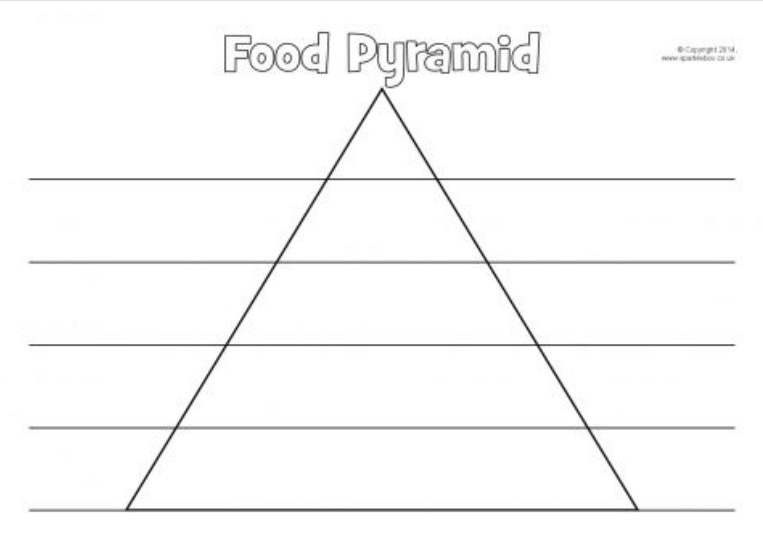
Components of a balanced diet

1. In your groups identify and list examples of food commodities under each of the food groups in the table below**.**

Fruits & Vegetables (vitamins)	Whole Grains (carbohydrates)	Fats and oil	Proteins
e.g., banana, okro	e.g., millet,	e.g., palm oil	e.g., fish

Food Pyramid

2. Create pictures or drawings to show the food pyramid (you may use pictures of food components).
3. Your pictures/drawings should show the proportions and average servings required of the food components required to meet an individual's nutritional needs.
   a. Carbohydrates such as bread, rice etc may be eaten in larger quantities.
   b. Vitamins and Minerals such as fruit & vegetables should be eaten in high quantities.
   c. Protein, minerals and fats such as dairy products, milk protein fish.
   d. Fats oils and sugar such as butter, candy, sugary drinks should be eaten in small quantities.
4. You can print and use the example food pyramid below or create your own.



Group Discussion of a balanced diet

5. Using your completed table and food pyramid discuss the importance of a balanced diet.

   You should include the following as part of your discussions

   a. Food components required for a healthy diet.
   b. Quantities of food components required for a balanced diet.
   c. The links between processed foods and dietary related diseases.
   d. Share your experiences of your own family meals and how they support the nutritional needs of family members.

   Be prepared to share your discussions with the class.

Case Study of Dietary related diseases

Organise yourselves into pairs or small groups of no more than three.

6. Read the case study below. Use the information from the case study to answer the questions that follow

   Kofi lives with his grandmother, who always cooks fresh meals at home. On a typical morning, Kofi eats millet porridge with groundnuts or boiled eggs with bread and wheat porridge. For lunch, he usually takes waakye with fish, salad, and orange. He drinks sobolo or water and eats fruit as a snack. Kofi's grandmother says, *"A strong mind and body need good food."* Because of this, Kofi has energy for sports and chores, concentrates well in class and hardly falls sick or goes to the hospital

   Akua lives with her older sister, who works as a manageress. Her sister leaves for work early, returns late, and usually stays at home only on weekends. As a result, she rarely cooks. In the mornings, Akua buys fried yam. For lunch, she often skips meals or eats instant noodles and drinks soda. In the evening, she usually eats 'Angwamo' (white rice cooked with oil) and hot pepper. She also snacks on biscuits or sweets. Lately, Akua has been feeling tired in class, missing school due to stomach pains, struggling to concentrate and always thirsty and has been diagnosed with obesity and diabetes

   a. Which of the adolescents Kofi or Akua, eats the most balanced diet?
   b. Identify two important reasons for eating a balanced diet.
   c. Describe the Impact of processed food on individuals the family and community.
   d. Describe two dietary related diseases linked to an unhealthy diet.

   Write down your answers and share with your friends.

Self-Reflection

1. Assess how you and your family use processed food.
2. Consider the impact on you, the family and society.

BASIC CONCEPT OF NUTRITIONAL INTERVENTIONS

Nutritional interventions are strategies and actions designed to improve how people eat and stay healthy. These actions help prevent or manage dietary-related diseases and improve the nutritional well-being of individuals, families, and communities.

They aim to address Malnutrition, Nutrient deficiencies, Health problems caused by poor diets, Unhealthy eating habits, Lack of essential nutrients, Low awareness about healthy foods, Weak food policies.

Types of Nutritional Interventions

1. Dietary-Based Interventions

These help people eat better by promoting access to healthy, natural foods.

Examples:

Table 1.1: Examples of dietary based intervention

i.	Balanced Diet Promotion	Eating more fruits, vegetables, whole grains, lean meat, and healthy oils.
ii.	Dietary Diversification	Adding a variety of foods to increase nutrient intake
iii.	School Feeding Programs	Giving school children healthy meals to improve learning and growth
iv.	Nutrition Education	Teaching families about meal planning, food preparation, and healthy eating.

2. Supplementation-Based Interventions

Giving specific vitamins and minerals to people who need them. Examples of Supplementation-Based Interventions.

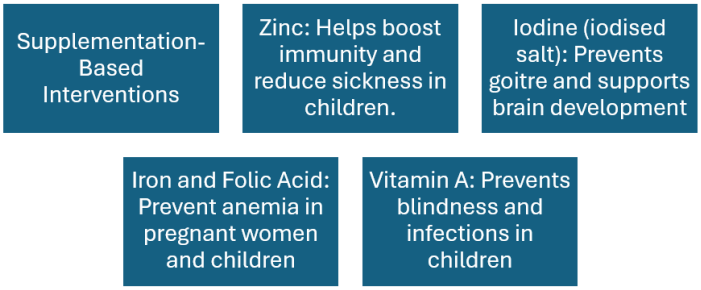


Figure 1.3: Supplementation-Based Interventions

3. Fortification-Based Interventions

Adding nutrients to everyday foods. Examples of Fortification-Based Interventions

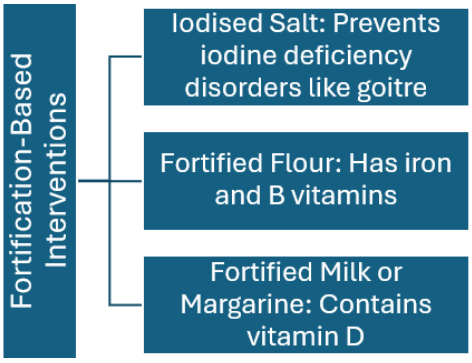


Figure 1.4: Fortification-Based Interventions

Community and Policy-Based Interventions

These are large-scale programs by governments and NGOs

Examples: Community and Policy-Based Interventions

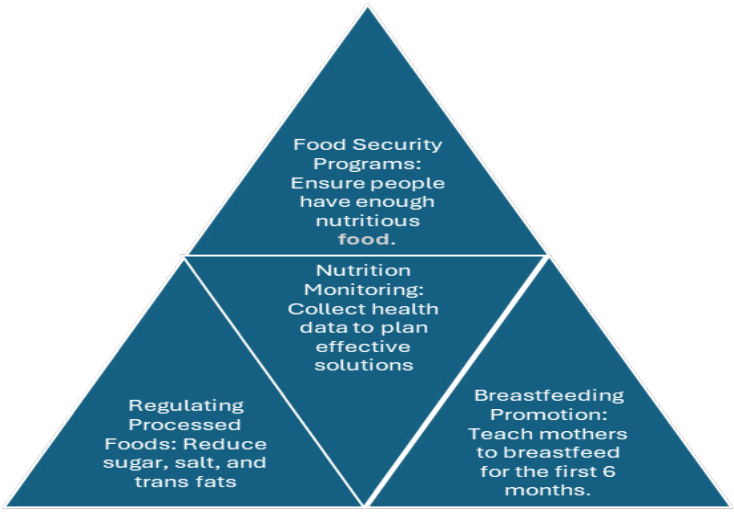


Figure 1.5: Community and Policy-Based Interventions

Activity 1.2 Nutritional Intervention discovery

You will have to do some research on your own into the basic ideas around nutritional interventions. Once you have done your research **find a partner to work with** and share the information that you have learned with them.

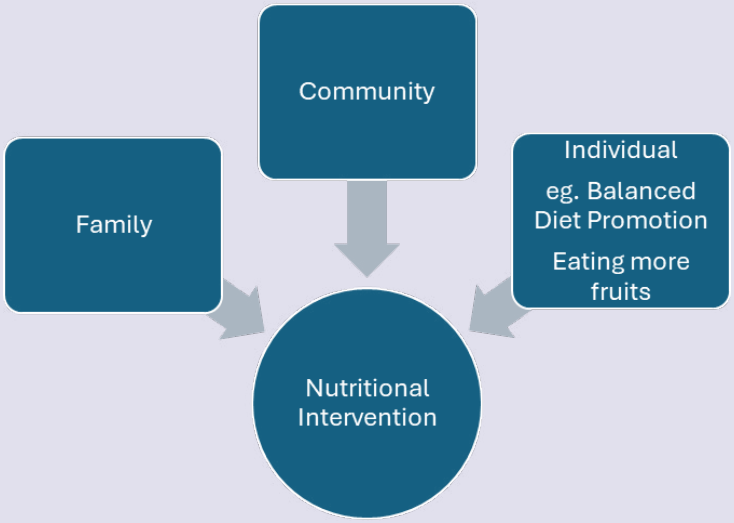
Use your books, learner materials, videos, school library, or any available materials to research:

1. The meaning of nutritional intervention.
2. At least four problems that nutritional interventions try to solve (e.g., malnutrition).
3. Share your research with a partner and make notes of additional information that they have researched. Write your notes in your notebook.
4. Describe at least one example of each type of nutritional intervention and explain its purpose:
   a. Dietary-based (e.g., balanced diet promotion)
   b. Supplementation-based (e.g., vitamin A capsules)
   c. Fortification-based (e.g., iodized salt)
   d. Community/policy-based (e.g., school feeding programme)
5. If possible, walk around your home, community, or school canteen and identify real-life examples of any of the nutritional interventions. Talk to people involved in meal preparation about nutritional interventions (either community-based interventions or those found in the products that they use.)

   Share the information that you have found out with the members of your group.
6. Make a note of any interventions that you are familiar with from your personal or family experience e.g. products that you use in the home that may include supplements of fortifications.

7. Draw a simple chart or mind map showing the four types of nutritional interventions and include one or two examples under each.

   Sample of mind map shown below.



   Under your drawing, write two sentences on why these interventions are important for each of the following:

   a. Individuals
   b. Families
   c. Communities

   You and your partner should share your chart with the class and explain your findings.

Self-Reflection

You can review the notes in your notebooks for information on:

1. Definition of nutritional interventions.
2. Problems they address.
3. Examples of the four types of nutritional interventions.
4. A chart/mind map with examples of interventions and their benefits.

HOUSEHOLD-BASED FOOD AND NUTRITIONAL INTERVENTIONS

Use the background information on basic nutritional interventions as a basis for study in this area references from the earlier lesson or other sources and link it to this lesson.

Household-Based Food

This intervention focuses on food availability, preparation and nutrition within the home.

1. Home Gardening

This means growing vegetables, fruits, and herbs around the home. It gives the family fresh food and saves money. Example: A family growing tomatoes and kontomire at home.

Think About: What food can you grow at home to help your family eat better

2. Livestock Keeping

This includes keeping animals like chickens, goats, or rabbits. They provide meat, milk, or eggs. Example: Keeping hens for eggs.

Think About: What animals can be raised easily in your area?

3. Food Storage and Preservation

This is about keeping food safe for a longer time using methods like drying, freezing, or canning. It prevents food from spoiling and wasting. Example: Drying fish or vegetables to use later.

Think About: What methods of preservation do people in your area use?

4. Planning Balanced Family Meals

This means choosing the right mix of food groups: carbohydrates, proteins, fruits, vegetables, and fats. It keeps everyone in the family healthy. Example: Kontomire stew, rice, and eggs in one meal.

Think About: What are some healthy meals your family often prepares?

Nutrition Education and Awareness

1. Breastfeeding and Infant Feeding

Feeding babies with breast milk only for the first six months. It protects babies from sickness and helps them grow.

Think About: Why is breast milk better for babies than other foods early on?

2. Healthy Cooking Techniques

Using less oil, frying less, and steaming or boiling instead. It keeps the nutrients in the food. Example: Steaming yam instead of frying it.

Think About: How can your family cook in a healthier way?

3. Reducing Junk/Processed Food

Avoid eating too many sugary snacks, fizzy drinks, and packaged foods. Junk food leads to diseases like diabetes and obesity.

Think About: What junk food do you eat often, and how can you reduce it?

4. Special Diets for Diseases

Some people need special diets due to health conditions like diabetes or high blood pressure. Eating right helps control the disease.

Think About: Do you know anyone who eats a special diet? Explain why and what their diet includes.

Household Supplementation and Fortification

These supplements help the family to eat nutritious meals.

1. Eating Fortified Foods

These are foods with extra nutrients added like iron or vitamin A. Example: Fortified salt or cereals. It prevents nutrient deficiencies.

Think About: Can you identify any fortified food at home?

2. Taking Vitamin and Mineral Supplements

These are pills or syrups with nutrients the body needs. They improve health when the diet is not enough.

Think About: Have you ever taken a vitamin supplement? Why?

Community-Based Food and Nutrition Interventions

These are programs that help more than one family they help the whole community.

1. Community Programs

Like food donations, public nutrition talks, or group farming.

Example: A women's group starts a shared farm to grow maize for sale and family use.
Think About: What community food programs are in your area?

2. School and Public Health Nutrition

These are programs that help students and people in society eat better.

Examples: Free school meals to help children concentrate in class. Nutrition education campaigns to teach about healthy eating. Food banks for people who do not have enough to eat.

Think About: Has your school or community done any of these before?

3. Agricultural Support

These are projects to help people grow or produce food.

Examples: Community gardens, help for local farmers with tools or training, learning how to grow and sell food as a job skill.

Think About: How can farming support both food and money in your area?

4. Policy and Public Health

These are laws and programs created by the government.

Examples: Laws that make sure foods have the right nutrients (fortification laws), Rules

about what food companies can put in processed food, Nutrition surveys to find out what people are eating, Research to learn what food programs work or do not work

Think About: Why is it important for the government to be involved in food and nutrition?

Activity 1.3 Nutritional interventions

Organise yourselves into groups of three or four members.

Scenario

1. Read the scenario and discuss it within your group. Then produce a presentation on nutritional interventions based on the information in the scenario.

   Adom Town is a small community in Ghana. Many families rely on farming and small trading for income. Recently, the local health centre reported a rise in dietary-related diseases such as malnutrition, hypertension, and type 2 diabetes, especially among children and older adults.

   The community has tried several interventions:
   a. A school feeding program was introduced, but some parents complain about food quality.
   b. A few households started home gardens, but many lack tools and water.
   c. The local market has fresh produce, but prices are high.
2. A health worker runs monthly nutrition education sessions, but attendance is low. Using your knowledge of household and community-based nutritional interventions, write a presentation based on the scenario. Highlight the main dietary issues and proposing solutions to the problems.

   Use the questions below to direct your thinking for your presentation
   a. What are the main dietary-related problems in Adom Town?
   b. What challenges are affecting the success of current interventions?
   c. Which community-based interventions need improvement?
   d. Propose two household-based solutions that families in Adom Town can use to improve nutrition.
   e. Propose two community-based solutions that leaders or health workers can implement to support healthy eating.

   In your group show your presentation to the whole class. Be prepared to discuss your findings.

Research Concepts of Nutritional Interventions

Work in your groups. Carry out research into nutritional interventions. If possible, make visits to a community nutrition centre or social welfare centre. Alternatively use a range of other sources such as videos, internet or other sources to carry out your research.

Use your research to:

3. Create a chart that highlights the dietary diseases, their causes and highlight the best nutritional intervention/s for tackling that disease e.g.
   a. **Disease:** Hypertension
   b. **Causes:** Too much salt in the diet, too much alcohol, older age or hereditary
   c. **Interventions to support:** Nutrition education and awareness of dietary changes required.
4. Create a concept map of Household and Community based interventions (a visual image showing connected ideas). Examples of interventions could include,
   a. **Community-Based:** Community Gardens, Food Policy and Advocacy Community Nutrition Programs
   b. **Household based:** Nutrition education, Food Assistance, Food Storage & Handling.

   Present the findings from your research for a class discussion.

Conduct a Role Play on Household Interventions

5. Work in your groups. Prepare and perform a short role play (3-5 mins) based on one of the sample situations below (or create your own).
   a. A community health worker giving a talk on healthy eating.
   b. A family meeting to plan balanced meals.
   c. A school community discussing school feeding.
6. Assign speaking roles to group members. You may use the following template for writing your role play or create your own plan.
7. Perform your role-play to another group or record it. Accept feedback from the group and provide positive feedback for their role play.

Sample Role Play Development Template

8. **Title:** Role Play on Household Interventions

   Characters and roles: List the characters and what each person will do.

Character Name	Role Description	Major Actions in Role Play

   a. Scenario description: Briefly describe the situation you will act out. Example: A community health worker giving a talk on healthy eating
   b. Steps/Actions in the role-play: Outline what will happen in your scene in order.
   c. Key learning points: What message do you want your audience to learn?
   d. Materials Needed for Role Play: List simple things like paper, chairs, signs no real product making.

BASIC RESEARCH SKILLS TO ASSESS THE IMPACT AND CHALLENGES OF HOUSEHOLD-BASED AND COMMUNITY-BASED FOOD AND NUTRITIONAL INTERVENTIONS

The focus of this area is to conduct practical research into the impact and challenges of nutritional interventions.

Research Tools

1. Interview guide: Ask planned questions to people.
2. Questionnaire: Write-down survey for families or schoolmates.
3. Observation checklist: Look and record what you see (e.g., meals served).

Sample Research Topics

1. Home gardening in your area.
2. School feeding in your school.
3. Breastfeeding support in clinics.

How to Collect Data

1. Interview parents, teachers, or health workers.
2. Observe what foods are available at home or school.
3. Focus group talks with community members.

Expected Outcomes of Interventions

Positive Impacts of research into nutritional intervention

1. Better health for children and adults (less sickness).
2. Families spend less on hospital bills.
3. More food security and self-reliance.
4. Students learn better due to proper nutrition.

Challenges Faced

1. Poverty and hunger make it hard to eat well.
2. Food taboos or beliefs stop people from eating healthy food.
3. Lack of money and support for programs.
4. People do not always know what a healthy diet looks like.

Activity 1.4 Let us Investigate

Organise yourselves into groups of no more than four.

1. In your groups design a research tool such as interview questions or a written questionnaire that you can use to find out about the impact of household and community-based interventions.

   Visit your communities/schools/home and find out about the impact of the following interventions using the tool that you have designed such as an interview and questionnaire.

   a. Household based intervention
   b. Community based intervention

Sample Questions for the Questionnaire

a. What nutritional support programmes are available in your household or community? (e.g., school feeding, food aid, community kitchens)
b. How often does your household benefit from these programmes? Daily [ ] Weekly [ ] Occasionally [ ] Never [ ]
c. Does your household receive any nutrition education from health workers or community groups? Yes [ ] No [ ] (If yes, how often?)
d. How do you ensure balanced meals in your household?
e. Do you or your community organise cooking demonstrations or healthy eating campaigns?
   Yes [ ] No [ ] (If no, why?)
f. How often does your household access fortified foods (e.g., iodised salt, fortified flour, vitamin A oil)?
g. Daily [ ] Weekly [ ] Occasionally [ ] Never [ ]
h. Are there any community rules, traditions, or beliefs that influence the kind of nutritional interventions you accept or reject?
i. What challenges does your household face in getting healthy, safe, and enough food?

2. Once you have completed your research you can use the table below to categorise the impact of the interventions.

Community based		Household based	
Success	**Challenges**	**Success**	**Challenges**
e.g., food security	e.g., cultural beliefs	e.g., improved health	e.g., poverty
1.			
2.			
3			

3. Compare your findings with other groups and present your findings using charts, graphs or ppt presentation slides.

APPROPRIATE COOKING METHODS THAT HELP RETAIN NUTRIENTS IN FOOD TO PROMOTE HEALTHY LIVING

When we cook food in certain ways (e.g., frying in too much oil or overcooking), we may lose important nutrients like vitamins and minerals. Using conservative methods helps us to keep food healthy, maintain natural taste and texture and reduce the need for too much oil, sugar, or salt.

Examples of Conservative Cooking Methods

Steaming

Food is cooked using the steam from boiling water and does not need oil. It is great for vegetables, fish etc. The benefits are to keep most vitamins (especially vitamin C). Example: Steamed 'kontomire' (cocoyam leaves) keeps its bright green colour and nutrients.

Poaching

Food is cooked in hot water or broth but not boiling (gentle heat). It is good for eggs, fish, and fruits like pears. The benefits are that gentle heat for nutrients do not get destroyed and the food stays moist. Example: poached eggs are soft, light weight and healthy.

Grilling

Food is cooked using dry heat (over fire, coal, or in an oven grill). It is popular for meat, chicken, and vegetables. Its benefits are it keeps flavour, uses no oil, and can reduce fat in meats. Example: Grilled chicken is tasty and healthier than deep fried chicken.

Boiling

Food is cooked by putting it directly into boiling water. Common for rice, yam, plantain, beans, etc. Its benefits are that it is an easy cooking method and if you do not throw away too much water, many nutrients are retained.

Note: Use the water from boiled vegetables for soups or sauces it contains nutrients.

Activity 1.5 Cook to Keep it Healthy

Cooking can change the nutritional value of food. Some methods preserve nutrients better than others. It is useful to experiment with different cooking methods for yourself to observe how this happens. Before you do this, it is helpful for you to watch a demonstration or video on this subject.

Organise yourselves into groups of three or four.

Observe a demonstration or video and discuss cooking methods

1. In your group watch a demonstration or video of how different methods of cooking can be used to retain nutrients.

2. Discuss the various conservative methods of cooking.
3. Share your experiences of meals at home. Consider the cooking methods used in your homes and discuss which of them are best for retaining nutrients.

Practical experiment to compare nutrient retention using different cooking methods

4. In your groups, plan and conduct your cooking experiment.

   Choose one type of food (e.g., carrots, kontomire, egg, yam, fish).

   Create a plan that includes cooking small portions using at least two of these methods:

   - Steaming
   - Poaching
   - Grilling

   Your plan should include the following:

   - Cooking time and temperature for each method.
   - Portion size and consistency.
   - How you will measure or observe nutrient retention (e.g., colour, texture, taste etc).

   Observe and record:

   - Colour of food after cooking (green become olive green or dark green).
   - Texture (soft, hard, dry).
   - Taste and smell.
   - Amount of water or juice lost.

   Analyse and Report on your Findings. Write a short report or create a poster

   Your report should include:

   a. Introduction: What did you want to find out?
   b. Method: What food and cooking methods you used.
   c. Observations: What you saw, smelled, and tasted.
   d. Conclusion:
      i. Which method best preserved the colour and texture?
      ii. Which method retained the most flavour?
      iii. Which method kept the food most nutritious and why?

5. Recommendation: Which method you would suggest for families to use more.

Self-Reflection

1. Which cooking method do you think is best for keeping nutrients?
2. What new thing did you learn about cooking today?
3. How can you teach your family about these methods?

THE CONCEPT OF MEAL PLANNING TO MEET NUTRITIONAL NEEDS

Have you noticed that there are many food commodities to choose from? These food commodities must be combined to create dishes to make a meal. Therefore, it is necessary to plan meals carefully to feed our families with adequate and nutritious meals. Now you will learn how to provide the required nutrients needed by your family members.

Meal planning

Meal planning is the art of thinking about what meal to prepare in advance to be able to serve the family with a nutritious meal to eat at a particular time. Effective meal planning can boost a healthy diet, promote good eating habits and prevent food waste

Elements Involved in Meal Planning

1. **Nutritional Balance:** Making sure your meals include all the important nutrients your body needs like energy foods (carbohydrates), body-building foods (proteins), protective foods (vitamins and minerals), and healthy fats.
2. **Dietary Needs and Preferences:** Everyone eats differently, some people avoid certain foods because of allergies, health conditions, or personal or family choices.
3. **Portion Control:** Eating the right amount of food, not too much, not too little so your body gets just what it needs to stay healthy and strong.
4. **Variety:** Including different types of foods in your meals, so eating does not get boring, and your body gets a mixture of nutrients.
5. **Budgeting:** Choosing foods that are affordable and fit within the money you have to spend.
6. **Food Safety:** Keeping food clean, storing it properly, and cooking it well to avoid sickness from germs or spoiled food.
7. **Time Management:** Planning and preparing meals in a way that fits your daily schedule, so cooking does not take too long or clash with other activities.
8. **Environmental Considerations:** Using local and seasonal foods, and avoiding waste, to help protect the environment and support local farmers.

Meal Planning Terminologies

Table 1.2: Meal planning terminologies

Terminology	Meaning
A balanced meal	A balanced meal is a meal that has the right amounts of different types of food your body needs to stay healthy. It should provide a balance of texture, flavour, colour and variety of foods to be appetising. **Example** Kenkey – Energy-giving (made from maize) Fried fish – Body-building (rich in protein) Shito and sliced tomatoes/onions - Protective (vitamins and minerals).

A three-course meal	It comprises of an appetiser or starter, a main meal (main dish and accompaniment) and a dessert. **Example** Starter: watermelon juice Main meal: chicken Jollof rice Dessert**:** pudding
A two-course meal	It comprises of a main meal and a dessert, or main dish, accompaniment and a dessert. It is without a starter or appetizer. **Example** Main Dish: chicken stew Accompaniment: Vegetable curry rice Dessert: fruit plate
Accompaniment	The carbohydrate part of a meal. Fufu, T.Z, banku, akple etc
Course	It refers to how a meal is divided up or eaten during a meal. Meals can be served in steps or sections, and each section is called a course. **Example:** A full meal might have Starter (first course): Light food like soup, juices or salad Main course: The biggest, most filling part (like rice and stew) Dessert **(**last course): Sweet food like fruit or cake
Dessert	A sweet dish which is eaten after a main meal. It normally contains sugar. For example: ice cream, trifle, puddings, fruits.
Diet	This refers to the food eaten by an individual or a diet is the kind of food and drink a person usually eats every day. Some diets are termed as "special diets", for example: low fat diet, low salt diet and diabetic diet.
	A la carte You choose each food item separately from a menu. Each item has its own price. **Example:** You go to a restaurant and order: Fried rice – GH₵15 Chicken – GH₵20 Juice – GH₵10 You pay for each one. You pick what you want, one by one **Table d'hote** You get a full meal with a set number of courses (like starter, main dish, dessert). One fixed price for everything.

Different styles of menu	**Example:** A restaurant offers: Starter: Soup Main meal: Banku with tilapia Dessert: Fruit salad All for GH₵40. You pay one price for the whole meal. **Ethnic menus** This menu shows foods from a specific culture or country. Example: An Ashanti ethnic menu might include. Fufu with light soup Palm wine It celebrates traditional or cultural foods. Note: An ethnic menu can use either À la carte or Table d'hôte or even both, depending on how the food is offered.
Dish	A prepared item of food served in a bowl or on a plate. E.g: Boiled rice, T.Z, Yakeyake etc
Main dish	The protein part of a meal. Example: fried fish, roasted chicken, baked fish, egg stew, fish stew, soup etc.
Main meal	A main dish and an accompaniment eaten together. Example; Rice and stew with boiled egg. The main meal is usually the biggest food for the day, often eaten at lunch or dinner.
Meal	A collection of prepared dishes eaten at a sitting can be light or heavy. Example: Eating bread and tea for breakfast is a meal.
Menu	It is a list of prepared dishes available to a customer or a bill of fare. A menu is a list of foods and drinks you plan to eat or serve. It can be written for days, weeks, months, or for breakfast, lunch, or supper as in restaurants and hotels. **Example** **Lunch Menu** Rice and stew Fried plantain Water or juice
One pot dish	A meal which has both the protein and accompaniment prepared together in the same pot or saucepan, for example: Jollof rice, 'apapransa', and 'mpotompoto'.
Side dish	It is a food item that accompanies the main course (It usually includes the main source of energy and protein: like rice and stew, banku with okro soup, or yam with palava sauce.) but, in this case, it is a subordinate to it. The main course can be eaten without the side dish. Example of side dish: boiled okro (added to fufu and light), salad (added to jollof rice).

Snack or elevenses	A snack is a small amount of food eaten between main meals. **Examples** Groundnuts Biscuits Fruit Snacks help stop hunger before the next big meal. Elevenses is a small snack eaten around 11:00 a.m., between breakfast and lunch. It is common in some cultures, especially in schools or workplaces. **Examples** Tea and bread Fruit juice and crackers Small cake or banana It is like a mid-morning snack to give energy before lunch.

Factors to Consider in Planning Healthy Meals

Figure 1.6: Factors to consider in planning healthy meals

Reasons for Planning Meals

Table 1.3: Reasons for planning meals

S/N	Reasons for planning meals	Explanation
1	To save time and money	Planning your meals ahead of time and creating a shopping list will save you a great amount of time. It will cut down trips to the grocery store and markets and ensure that you only purchase what you require thereby saving you money.
2	To improve health	Planning what you are going to cook for your meals will ensure that you cook a healthy meal every day, by including the correct nutrients required.
3	To prevent obesity	By planning family meals, it ensures that you can avoid food items that will lead to obesity.
4	Teaching essential skills	If children are included in the meal planning, they acquire many skills.
5	To bring variety to family meals	Different methods of cooking as well as varieties of foods are used, thereby breaking monotony.
6	To cater for the nutritional needs of the family	Meal planning will help to cater for the differences in dietary needs amongst family members.

Meal patterns

Meal patterns relate to the time of day when people eat and foods that they eat at those times. Meal patterns are the outlines used for meal planning. The Ghanaian six food groups and meal patterns can serve as a framework for planning nutritious meals. In Ghana, it is normal to eat three times a day at breakfast, lunch, and supper or dinner.

Sample menu for a day's meal

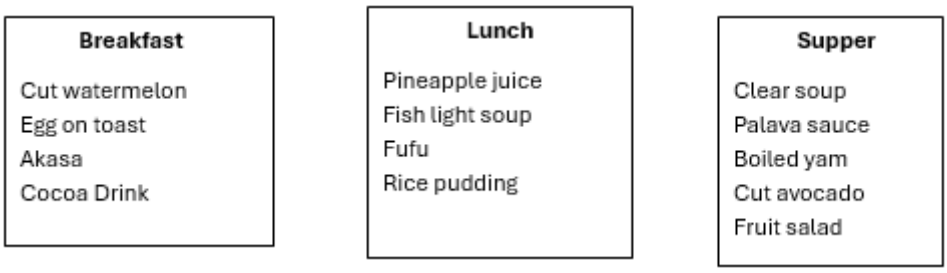


Figure 1.7: Sample menu for a day's meal

1. **Breakfast patterns**: It is the first meal of the day. Without it, it is difficult to get all the required nutrients for a day. Those who skip breakfast have been found to be less active, subject to sickness and tend to overeat later in the day, which can make them overweight. Breakfast can be light or heavy depending on the nutritional requirement of the individual. Light breakfast could include fruit or juice, cereal, bread and beverage.

   A heavy breakfast could include fruit or juice, main dish foods and accompaniments.

   In Ghana, a heavy breakfast may include: Gari and beans, fish and kenkey, 'tuo zaafi'(TZ) and 'ayoyo' soup.

Figure. 1.8: Light breakfast

Figure. 1.9: Heavy breakfast

2. **Brunch or bruncheon**: It is a combination of breakfast and lunch. It serves as a late breakfast or early lunch and can be served between eleven and twelve o'clock noon. It is also a meal which is served when breakfast is not taken
3. **Lunch**: Lunch is eaten in the afternoon. A well-balanced lunch includes dishes selected from each of the six food groups. Examples of lunch are: light soup and fufu, palava sauce and boiled plantain, akple' and okro soup, and jollof rice.
4. **Dinner patterns:** Dinner is a meal of the day that can be eaten leisurely and shared with family members. It should provide one-third of a day's total nutrients. It is a heavier meal than lunch and normally the richest meal because it is the main meal. Examples of dishes for dinner are chicken and fried yam, fried fish and fried yam, chicken and jollof rice.
5. **Supper:** This is a lighter meal than dinner and may be eaten in place of it. It is like lunch with similar food items being selected.
6. **Snacks**: Snacks are taken between meals and supplement other foods eaten during the day. Examples of snack dishes include drinks, pastries, cakes, biscuits, 'ofam', 'koose', and roasted plantain.
7. **Desserts**: They are sweet courses or dishes served after the main meal. They are not part of a meal pattern. For example: fruit salad, pancake, and trifle.

Activity 1.6 Meal Planning to Meet Nutritional Needs

Organise yourselves into small groups of no more than four.

1. Discuss the kinds of food your family usually eats. Share your experiences about healthy and unhealthy meals.
2. Your group can research meal planning by using the internet and other sources. If possible, watch a short video or look at pictures/posters showing how people plan meals for individuals and special groups in the family such as children, the elderly, pregnant women or people with health conditions.

3. As part of your research consider the factors involved in planning healthy family meals such as nutrition requirements, budget constraints, equipment and cooking facilities, cultural food preferences.
4. Discuss your research in your group and make a list of the important things to think about when planning a healthy family meal, such as: Age, health of family members and food preferences etc.
5. Create a simple meal plan (breakfast, lunch, dinner) using local foods for a family of four which includes Father, Mother, Grandmother and Adolescent son. Use a chart, drawing, or poster to show your plan. See example chart below or design your own.
6. Present your meal plan to the class and explain why you chose those foods.

Sample meal plan

Meals	Father	Mother	Grandmother	Adolescent Son	Reasons for choice
Breakfast					
Lunch					
Dinner					

DEVELOP A MEAL PLAN THAT MEETS THE NUTRITIONAL NEEDS OF INDIVIDUALS AND FAMILIES

What is a Meal Planning Format?

A meal planning format is a simple guide or outline that helps you plan meals for a person, family, or group over a period (like a day, week, or month). It helps make sure meals are balanced, organised and meet everyone's needs.

Parts of a Meal Planning Format

1. Meal Type – What kind of meal is it? (e.g., breakfast, lunch, dinner)
2. Menu – A list of the foods or dishes to be served
3. Ingredients – What you need to prepare each dish
4. Cooking Methods – How the food will be cooked (e.g., boiling, frying, baking)
5. Serving Sizes – How many people the meal will serve and portion sizes
6. Dietary Needs – Special requirements (e.g., vegetarian, gluten-free)

Why Use a Meal Planning Format?

1. Saves time when preparing meals.
2. Helps reduce food waste.
3. Encourages healthy eating.

4. Makes it easier to plan for special diets.
5. Keeps meal planning organised and stress-free.

Meal Planning Template

Dishes chosen	Reasons for choice	Ingredients &quantities

Quantities of Ingredients

Total quantities of all ingredients					
Fresh stores	Quantities	Cost	Dry stores	Quantities	Cost

Meal Preparation - Time Plan

Table 1.4: Meal Planning Template

Time	Activity

Activity 1.7 Plan Meals for Individuals in The Family

Organise yourselves into groups of three or four.

1. Apply the concept of a meal planning format by creating a one-day meal plan for a family, considering their dietary needs, ingredients, cooking methods and budgeting.
2. In your groups plan the meals for a family of five which includes father, mother, toddler and vegetarian child.
3. Fill out the Meal Planning Template below with the following:
   a. Meal Type (Breakfast, Lunch, Dinner)
   b. Menu (E.g., Jollof rice with chicken and salad)
   c. Ingredients & Quantities
   d. Cooking Methods
   e. Serving Sizes
   f. Special Dietary Needs (e.g., nutrients for growth & development, iron and calcium intake, energy needs for school and activities)
   g. Include local and affordable ingredients, cooking methods that preserve nutrients, cultural or personal preferences

Section A

Meal	Menu/dishes	Ingredients & Quantities	Reason for Choice
Breakfast			
Lunch			
Dinner			

Section B

Cooking methods to preserve nutrients		
Dishes	**Cooking method**	**Nutritional benefits**

In your group reflect on the meal planning exercise and discuss the following:

1. Which meals are most nutritious?
2. What challenges were there in planning meals with special dietary needs?
3. How did using the meal planning format help you to stay organised?
4. Would you make any changes to your plan? What changes would you make?

As a group, present your meal plan to the whole class for discussion. This may be in the form of a report or presentation of your meal planning format with explanations of your reasons for meal choices.

SPECIAL MEALS TO SUPPORT SPECIAL GROUPS OF INDIVIDUALS SUFFERING FROM DIETARY RELATED DISEASES IN THE FAMILY

People at Different Stages of Life Have Different Nutritional Needs

From babies to elderly people, everyone needs the right kinds and amounts of food to stay healthy. Planning meals for each group helps prevent sickness and supports healthy growth and development.

Figure 1.10: Some foods and their nutrients

Meals during Pregnancy

1. Mother nourishes the foetus through her body. If nutrients are not met by the foetus, they may be taken from the mother's tissues which may cause deficiencies. A pregnant mother needs food from all the six food groups.
2. Protein is needed for growth and development of the foetus.
3. Calcium for well-formed bones.
4. Iron is needed to build up an iron store before birth.
5. Overeating and late eating should be avoided since it could lead to excessive weight gain.
6. Salt and sugar should be taken in moderation and alcohol and smoking avoided.

Figure 1.11: Example of dishes needed during pregnancy

Meals for a Lactating Mother

1. The mother needs proteins, carbohydrates, vitamins and minerals for the secretion of breast milk.
2. She should drink a lot of fluids in the form of water, fruit drink, fruit juice and soup to provide the water in the breast milk.
3. The lactating mother should eat a lot of fruits and vegetables.
4. She should avoid alcohol.

Figure 1.12: Examples of dishes for a lactating mother. (Fufu and palmnut soup and fruit drinks)

Meals for Infants

1. Children from birth to five years. Usually, they are divided into zero to two and three to five years.
2. Babies should be fed with mother's breast milk only until they are six months Breast milk alone can provide the baby with enough water, energy and all the nutritional needs, provided the mother produces enough breast milk.
3. The first breast milk (colostrum) gives the baby an immune characteristic to protect the baby against diseases.
4. Protein and carbohydrates are needed for growth and development.
5. Babies should be fed every four hours.
6. After six months, babies should be introduced to a liquid diet to semi-solid diet and to adult diet. This change is known as weaning.
7. Vary dishes to prevent monotony and serve small portions at a time.

Figure 1.13: Dishes for infants

Meals for older Children

1. Children between ages six and twelve.
2. The amount of food they will need depends on their growth rate and physical activity they perform.
3. Their meals should be adequate and well balanced.
4. They need high quantities of protein, vitamins, carbohydrates, and minerals to promote growth and development and provide energy.

Figure 1.14: Dishes for older children

Meals for Adolescents

1. They are children between the ages of 13 and 19.
2. More energy is required during this period because of their increased activities.
3. Carbohydrates are needed for increased activity.
4. Protein, minerals and vitamins for growth and development.
5. Snacks are needed to supplement nutritional requirements for a day.
6. Iron is needed to provide haemoglobin.
7. Inadequate nutrients in their diets can result in health problems later in life.

Figure 1.15: Variety of dishes for adolescents

Meals for Adults

1. Adults require less calories than adolescents, because their energy levels decrease as they become older.
2. Protein is needed for maintenance and repair of worn-out tissue.
3. They need balanced meals to meet their daily nutritional requirements.

Figure 1.16: Dishes for adults

Meals for the Aged

1. By the age of 60, people are said to be old.
2. Their meals should include proteins, vitamins, iron, calcium and dietary fiber.
3. They need fewer calories because of their sedentary lifestyle.
4. Protein is needed for repair of worn-out tissue and maintenance.

Figure 1.17: Dishes for the aged

Meals for Vegetarians

1. Vegetarians are people who do not eat animal flesh.
2. Combine vegetables and cereals in their diet to provide essential amino acids.
3. Include a variety of fruits and vegetables in their diet.
4. Vegans need to take food supplements to provide vitamin B12 since they are mostly found in animal food and are very important to the body.

Figure 1.18: Dishes for Vegetarians

Categories of Vegetarians

Vegetarians can be grouped into different categories and are outlined in the table below:

Table 1.5: Categories of vegetarians

Categories	Description
Vegans or strict vegetarians	They eat only vegetables or plant foods to obtain their nutrients. They do not eat animal foods.
Lacto-vegetarians	They use milk in addition to plant or vegetable foods.
Ovo-vegetarians	They eat eggs in addition to plants or vegetables.
Lacto-ovo-vegetarians	They eat both eggs and milk
Pesco vegetarians	They eat only fish and vegetables.
Fruitarians	They are vegans who eat mostly fruit.

Figure 1.19: Preparation of special diet

Planning Meals for Invalids and Convalescents

1. An invalid is someone who is sick and still experiencing symptoms like weakness, high temperature, or loss of appetite.
2. A convalescent is someone who is recovering from an illness and gaining strength again.

Both groups need special meals that help their bodies heal quickly and comfortably.

a. Meals for Invalids

When someone is sick, they may feel too tired to eat. Their appetite is usually poor. Their body still needs a lot of nourishment to fight the illness.

Tips for Feeding Invalids:

1. Give small meals that are easy to chew and digest.
2. Make sure the food is nutritious even in small portions.
3. Serve foods that are soft, warm, and appealing like porridge, light soup, or mashed yam.
4. Offer plenty of fluids such as water, fruit juice, or light soup, especially if they have a fever.

b. Meals for Convalescents

When someone starts feeling better, their appetite comes back slowly. They can eat more types of food, depending on the illness. Their meals should help them gain strength and return to normal activities.

Tips for Feeding Convalescents:

1. Offer balanced meals from all six food groups.
2. Allow the person to choose from different healthy options.
3. Give larger portions of energy-giving foods as they become more active.
4. Use varied cooking methods (like boiling, steaming, baking) to add interest and taste.

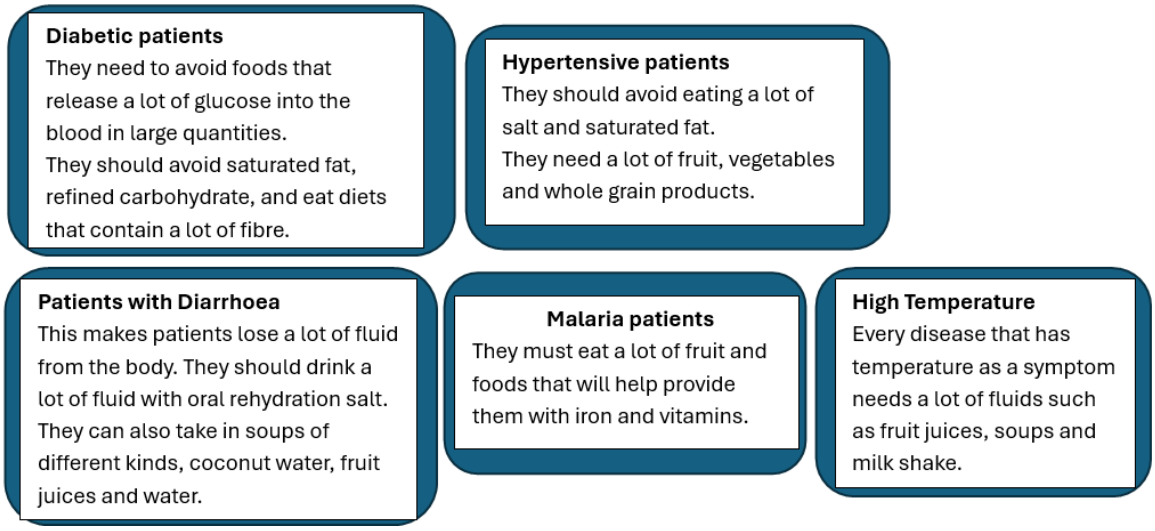


Figure 1.20: Diets for specific ailments

Activity 1.8 Special Meals for Special Groups

Organise yourselves into groups of no more than four.

1. Produce a report on the impact of meal planning for individuals and special groups.
2. Read the scenario below and use the information to support your report writing.

Ama invited Elorm to join her club members for lunch. Elorm arrived on time, but the table was not set, Ama was still cooking. When the food was finally served, some members could not eat due to health conditions like diabetes, hypertension, and ulcers.

Ama had prepared dishes like jollof rice (with white rice, tomato, oil), fried chicken, and kelewele (ripe plantain, pepper, ginger). These were unsuitable for some guests. She quickly added boiled plantain, garden egg stew (without pepper), and unsweetened fruit juice (pineapple, watermelon) to meet their needs.

a. In your group produce a report for class discussion on how the nutritional needs of individuals and special groups impact the meal planning process.
b. You can refer to the scenario and should consider the following issues in your report.
c. Discuss three things that Ama should have considered before preparing the meal.

d. Explain why it is important that you consider everyone's dietary needs when meal planning.
e. Describe the benefits of meal planning when preparing meals for those with dietary needs.

Apply meal planning principles to create menus using local food commodities

1. Imagine you are hosting a lunch for a group with the following needs:
   a. A person with diabetes.
   b. A person with hypertension.
   c. A person with an ulcer.
2. Using the following food commodities, create a menu that everyone can enjoy: Rice, plantain, garden eggs, tomatoes, chicken, fish, pineapple, watermelon, ginger, and pepper.
3. Using the assignment planning format, plan a lunch meal for a diabetic. Sample of the format is shown below.

SECTION A

Dishes chosen	Reasons for choice	Ingredients & quantities

SECTION B

Total quantities of all ingredients					
Fresh stores	Quantities	Cost	Dry stores	Quantities	cost

SECTION C

Time	Activity

This is a practical session where you will undertake practical activities to plan, prepare and cook balanced meals for special groups. These groups of people have dietary and nutritional needs. Meals must be prepared in such a way that these groups will have the nutrients they require in the right proportions. You will plan, prepare and cook for three of the following groups:

1. Toddler
2. Adolescent
3. Pregnant woman

4. Lactating mother
5. Invalid or convalescent

Activity 1.9 Meal Preparation for Special Groups

Organise yourselves into small groups of three or four.

1. Using your meal plan format from the previous lesson, plan a meal for **three** of these groups:
   a. Toddler
   b. Adolescent
   c. Pregnant woman
   d. Lactating mother
   e. Sick or recovering person (invalid/convalescent)
2. Ensure that you have gathered everything you need for the practical session
   a. Gather all the ingredients that you need for the meal.
   b. Ensure that you have the right tools and equipment.
   c. Produce a time plan for preparation and cooking.
3. Prepare and cook the meal using local, healthy ingredients.
   a. Use tools and equipment safely.
   b. Work safely throughout the preparation and cooking process.
   c. Maintain good hygiene practices.
4. Present your meal plan and your cooked meal for other groups to observe
   a. Take care over the presentation of your cooked meal so that it looks attractive to others.
   b. Ask other groups to give you feedback on how the food looks, tastes and how well it meets the person's needs.
5. Reflect in your group on how you performed the practical activity. Consider the following questions to aid you with your reflections of this activity
   a. What meal you cooked and why?
   b. Did your meal contain the nutritional requirements for the special group of people?
   c. What did you learn from the cooking and presentation process?
   d. What went well and what could be improved?

SERVING TECHNIQUES AND TABLE SETTING

Meal Service

It is a process of preparing, presenting and serving food. Suitable selection of meals champion or foster enjoyment for the individual, family or group. They are classified as formal and informal meal service.

Types of Meal Service

Table 1.6: Types of meal service

S/N	Meal service	Description
i.	American or Plate Service	Food is plated in the kitchen and served to guests. Common in casual and fine dining restaurants.
ii.	French Service	Cart French Service - The food is prepared and assembled at tableside. It is offered for small groups of Very important Personality (VIPs).
iii.	Gueridon service	Food is partially prepared in the kitchen and taken to the Gueridon Trolley to cook it completely.
iv.	Russian/Platter Service	Food is cooked in the kitchen, arranged on platters, and served to guests from the left side. Suitable for large banquets and formal dinners.
v.	Buffet Service	Food is displayed on a table, and guests serve themselves. Ideal for large gatherings and parties.
vi.	Family Style Service	Food is placed in large serving dishes on the table, and guests help themselves. It promotes a communal and informal dining experience.
vii.	Modified English service	Food is brought to the table in serving dishes and served by one person, usually the table head.
viii.	Compromise service	It is a combination of the English service and a formal meal service. The main course is served at the table and the rest of the courses are served from the kitchen.

Table and Tray Setting or Laying

Table and tray setting or laying is the arrangement and placement of tableware for a meal, creating a visually appealing and functional setup. There are two basic types of table settings, formal and informal table settings.

Table and tray setting

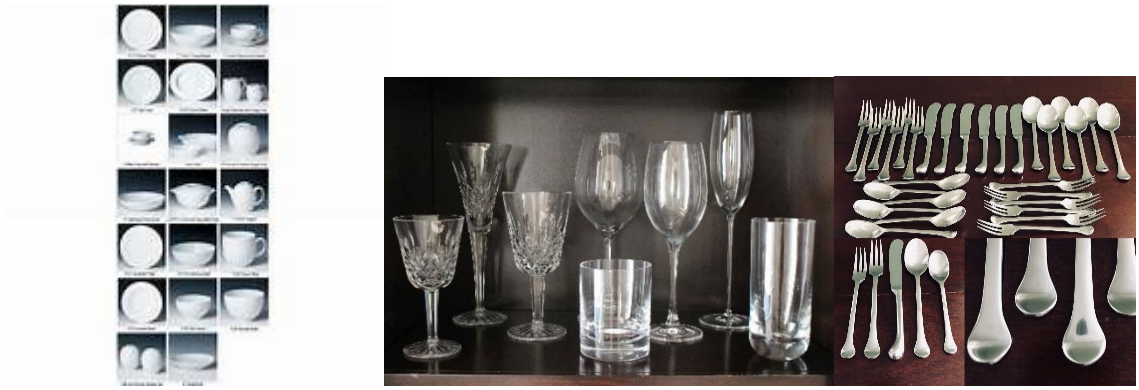
Figure 1.21: Informal table setting Figure 1.22: Formal table setting

Figure 1.23: Tray setting

Table 1.7: Table setting components

S/N	Component	Example
i.	Table cover /Tablecloth/Placemat	They should be clean and appropriately sized for the table.
ii.	Dinnerware	Plates, bowls and serving dishes.
iii.	Flatware	Forks, knives and spoons.
iv.	Glassware	Water glasses and wine glasses.
v.	Napkins or serviettes	Cloth or paper folded neatly.

Placemat Napkin variety of tablecloths



Dinnerware Glassware Flatware

Figure 1.24: Components of table setting

Importance of Table Laying

Table 1.8: Importance of Table Laying

Enhance dining experiences	The beauty and atmosphere of a well-laid table creates a visually appealing environment. This enhances the meal presentation and can make dishes look more appealing and can even influence the perception of taste.
Supports Individuals and Special Groups in the Family	Children: Use plastic plates and cups, avoid sharp cutlery. Elderly: Use light plates, easy-to-hold cutlery, and non-slip mats. Visually Impaired: Place utensils the same way each time and describe food positions. Wheelchair Users: Ensure the table is low enough for easy access.
Promotes etiquette and manners	It provides a guide for guests in the use of napkins, crockery, tools and equipment. Supports good etiquette and social practices.
Ensures functionality and efficiency	The setting ensures that all items are within reach of everyone, which helps to manage the space at the table.
Reflects professionalism	Professional table setting in the hospitality industry reflects the standards, practices of the industry and a commitment to providing high quality service.
Skills development	Table setting techniques are important skills needed to pursue careers in hospitality and event planning. The skills and competencies developed allow an individual to exhibit high levels of competence and professionalism.
Improves Meal Presentation	A well-set table makes food look more appealing and adds to the dining experience, especially during special occasions.
Encourages Mindfulness and Preparation	Setting a table helps you stay focused, feel calm, and take pride in your work. It also gets everyone ready to enjoy the meal.

Essential Skills for Table Laying

Table 1.9: Skills of Table Laying

Attention to detail	Ensuring every element is correctly placed e.g. straightness of cutlery and alignment of glasses.
Knowledge of table setting styles	Understanding different types of table settings e.g. formal, informal, buffet, etc and familiarity with etiquette and cultural variations in table settings.
Organisation and Planning	Planning the table layout based on the menu and number of guests to ensure all necessary items are available. Applying an aesthetic sense to the process can make the arrangement of the table visually appealing to enhance the dining experience.
Cleanliness and Hygiene	Ensuring all tableware is cleaned, polished and maintained. Ensuring that the surrounding work area is always clean and tidy.

Steps for Laying a Table

Figure 1.25: Steps for Laying a Table

NOTE: Cover is the arrangement of a place setting for one person. It consists of all dinnerware, glassware and cutlery used by one person at a table. By mastering these skills and steps, you can lay a table that is not only functional but also aesthetically pleasing, ensuring a pleasant dining experience for all guests.

Activity 1.10 Table Setting, Meal Service Practice

Organise yourselves into groups of no more than four.

Discussion of experiences of table setting at home

1. In your groups talk about how meals are served and tables or trays are set in your home, especially for guests or celebrations.
   a. Explain how the tools are used (plates, spoons, forks, napkins, glasses)
   b. Think about how age, health, and culture can change how a table is set.
   c. Discuss how tables are set for specific celebrations. How is this different from normal?

Visit to a local hotel or restaurant

2. Visit a local hotel or restaurant during dining time. Look at the meal service type (family-style, buffet, pre-plated), how the tables are arranged, and any cultural touches like calabashes or woven mats are used and take note.

   You may also watch videos to explore the techniques of setting a table

   a. Compare what you saw in restaurants or videos with what you already knew, or read in books, about meal service and table setting.
   b. Consider the best tools, layouts, and cultural elements for different occasions.

Plan and set a table

3. Work in your groups to plan and set a table for an event such as a birthday, family dinner, or cultural celebration.

   a. Plan your own table setting designs on paper or in a sketch before doing the hands-on task.
   b. Decide what special event you are going to set a table for and select the right tools and equipment for the event.
   c. Follow your plan to ensure the most suitable layout and include cultural touches.

Table setting feedback

4. Show your table setting to the class for peer feedback and view other groups table settings. Base feedback on:

   a. Neatness
   b. Correct tools e.g. cutlery, crockery, glassware etc
   c. Suitable layout for the occasion selected
   d. Creativity

EXTENDED READING

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- Davis, M. L., & Johnson, T. K. (2019). *Specialised Meal Planning: Dietary Needs for Different Populations*. Health and Nutrition Publishers.
- Roberts, E. M., & Allen, N. F. (2018). *Mastering Meal Preparation: Techniques and Tips for Home Cooks*. Culinary Arts Publishing.

REVIEW QUESTIONS 1

1. Describe the main components of a balanced diet and explain the role each one plays in maintaining good health.
2. Identify two advantages and two disadvantages of processed foods for individual health.
3. Compare and contrast the positive and negative effects of processed foods on family meal preparation and health.
4. Mrs. Taylor, a busy 40-year-old market trader, often buys processed and ready-to-eat meals for her family to save time. Her 15-year-old son, Nana yaw, has developed unhealthy eating habits, frequently skipping breakfast and consuming energy drinks and snacks. As a result, Nana Yaw experienced fatigue, headaches, weight gain, and poor concentration. A clinic visit revealed he is overweight and at risk of pre-diabetes due to poor diet and inactivity.

Based on the scenario, answer the questions below:

a. What unhealthy eating habits can you identify in Nana Yaw's lifestyle?

b. How did Mrs. Taylor's lifestyle and food choices affect her family's health?

c. What could Nana Yaw and his mother do to prevent the risk of diabetes and improve family health?

d. What lessons can other families learn from this scenario?

5. Explain three roles of education in nutritional interventions.
6. Give two examples of dietary-based interventions and explain how they help improve nutrition.
7. Differentiate between household-based and community-based nutritional interventions.
8. Given the rise in obesity in your community, suggest two combinations of household and community-based interventions that could help address this problem.
9. What are some common challenges faced when implementing household and community-based nutritional interventions?
10. Create a questionnaire to investigate the eating habits of households in your area.
11. Recommend three cooking methods that are best for nutrient retention. Explain your reasons for recommending those cooking methods, the nutrient benefits and the types of food that are best suited for each method.
12. Analyse how adopting two nutrient-retaining cooking methods in school feeding programs could benefit children's health.
13. Explain why it is necessary to consider the nutritional requirements of each family member when planning meals.
14. Describe the factors to be considered when planning meals for a family.

15. Explain why serving size and dietary restrictions are important when planning meals for a family.

16. Design a one-day meal plan (breakfast, lunch, dinner) for a family of four, including at least one vegetarian. Explain how the plan meets their nutritional needs.

17. Describe how to plan, cook and serve meals for someone who is hypertensive in the family.

18. Identify and explain the unique nutritional requirements of the following special groups:

    a. Pregnant women
    b. Infants (0–2 years)
    c. The elderly

19. Imagine you are organising a cultural dinner event in your school. Choose a meal service method and explain how it would reflect the culture and meet the needs of the guests.

20. Create a step-by-step guide for laying a formal table. Explain how each step contributes to the effectiveness and aesthetics of the meal.

21. Title: Designing a Meal Service and Table Layout for a Special Event

Scenario

Your school is hosting a formal dinner to honour visiting cultural ambassadors from three different countries. You have been placed in charge of planning the meal service style and table setting for 12 guests.

a. Select the most appropriate meal service style from the list in the text (American/Plate Service, French Service, Russian/Platter Service, Buffet Service, Family Style Service, Modified English Service, Compromise Service).

b. Justify your choice by explaining how it will enhance the dining experience for the guests, considering their cultural differences and the formality of the event.

c. Create a detailed table setting plan for this event, specifying the placement of:

    i. Dinnerware
    ii. Flatware
    iii. Glassware
    iv. Napkins
    v. Additional items (bread plate, butter knife, centre piece, condiments)

d. Explain how your table layout will meet the needs of any special groups (e.g., elderly guests, wheelchair users) who may attend.

SECTION

2

FOOD PRESERVATION

NUTRITION AND HEALTH

Food Security

INTRODUCTION

This section focuses on helping you understand how to preserve and package food using scientific principles. Food preservation is the process of treating food to slow down spoilage and keep it safe, nutritious, and available during times of scarcity. You will explore different preservation methods such as drying, freezing, canning, and the use of safe chemicals, as well as their importance in reducing food waste and supporting food security.

You will also learn how packaging protects food, extends shelf life, and makes products attractive for storage and sale. Scientific principles such as temperature control, moisture removal, and proper storage will guide your practical activities in making and packaging preserves like jam, marmalade, 'shito', and pickles.

Through hands-on experiences, group tasks, and real-life investigations, you will develop skills in food safety, preparation, packaging, and marketing. These skills are valuable for daily life and careers in food processing or entrepreneurship.

KEY IDEAS

- Purpose of Preservation: Food preservation helps prevent spoilage, maintain quality, and ensure food is available during scarcity.
- Scientific Principles: Preservation is guided by principles such as temperature control, moisture reduction, and proper storage.
- Methods of Preservation: Common methods include drying, freezing, canning, and use of safe chemicals.
- Food Packaging: Packaging protects food, enhances shelf life, and improves market appeal.
- Practical Skills: Learners gain hands-on experience in making preserves like jam, marmalade, pickles, and 'shito'.
- Food Safety and Quality: Emphasis is placed on maintaining food safety and nutritional value.

CONCEPT OF FOOD PRESERVATION, PRINCIPLES AND ITS IMPORTANCE

Food often spoils when not stored properly. This leads to waste at home and in the community. Food preservation means treating or handling food in a way that keeps it from going bad too quickly. It helps food last longer while keeping it safe, nutritious and good to eat.

Figure 2.1: Food items that can be preserved

Why is preserving food important?

Preserving food is important because it:

1. Extends shelf life, so we can use food for longer periods.
2. Reduces waste, saving money and resources.
3. Prevents post-harvest losses for farmers and food sellers.
4. Ensures food is available in emergencies or in places with limited access.
5. Supports food security, helping families eat well throughout the year.

Principles of Food Preservation

Food spoils due to microorganisms (germs), enzymes, and chemical reactions. These succeed in warmth, moisture and air. Preservation involves removing or controlling these conditions by:

1. Reducing moisture (drying foods)
2. Using temperature control (freezing, cooking)
3. Adding safe chemicals (salt, vinegar)
4. Altering acidity (pH) (pickling)
5. Blocking air (vacuum sealing)

Figure 2.2: Dried food items

Scientific Methods to Stop Spoilage

1. Low temperatures slow down microbe growth (freezing or refrigeration).
2. High heat kills microbes (boiling, pasteurizing).
3. Drying removes water so germs cannot grow.
4. Adding acids like vinegar stops enzymes and bacteria.
5. Using antioxidants prevents food from changing colour or smell.
6. Proper packaging keeps air and moisture out.

By learning these techniques, you can help reduce food waste, store food safely and even to explore food related business opportunities.

Activity 2.1 Food Preservation

Organise yourselves into small groups of three to four. Read these real-life scenarios:

1. A bunch of vegetables left in the fridge turns slimy and is thrown away.
2. Cooked rice is forgotten overnight and discarded the next day.
3. Bread stored in a damp cupboard grows mould quickly.

In your groups discuss

1. Why did the food spoil?
2. What could have been done to it to stop the spoilage?
3. How does this kind of waste affect families?
4. In your own words define preservation.

In your groups, explore pictures, videos / listening to the sound or real preserved food samples (realia). Analyse and discuss the importance of food preservation. Use this link https://youtu.be/XlQR_pBx52s and any other source of information on the importance of food preservation.

Choose **one** preservation method (e.g. drying, salting, storing in cool places) and create a short presentation of not more than one page that teaches others how preserved foods can help reduce food wastage.

You should include the following information in your presentation.

1. The principle behind the method.
2. How it works in your locality.
3. How food preservation helps families and communities.
4. Share your work with your friends/class for feedback.

Self-Reflection

1. What did you learn about why food goes bad and how to stop it?
2. What did you learn from working with your group to find scientific principles or ways to preserve foods?

METHODS OF FOOD PRESERVATION AND THEIR EFFECTIVENESS IN EXTENDING FOOD SHELF LIFE

To keep food safe and fresh for longer, we use food preservation methods. These methods slow down or stop the things that make food spoil, such as germs (microorganisms), enzymes, oxygen and too much moisture. Using the right method helps to prevent waste, save money and keep food nutritious.

Use the knowledge gathered from the previous activities as a guide.

Common Methods of Preserving Food

There are many ways to preserve food. Each method works best depending on the type of food and how long it needs to stay fresh.

1. Drying – Removes moisture from food (e.g., drying fish, grains, fruits etc).
2. Freezing – Keeps food at low temperatures to stop spoilage (e.g., frozen meat or vegetables).
3. Canning/Bottling – Food is sealed in jars or cans and heated to kill germs.
4. Salting/Sugaring – High amounts of salt or sugar draw out water from germs, stopping their growth.
5. Use of Safe Chemicals – Like vinegar or lemon juice in pickling.

What Causes Food to Spoil and How to Prevent It

Understanding what causes food to spoil helps us choose the best preservation method

Causes of food spoilage, effect on food and its preservation methods

Table 2.1: Causes of food spoilage, effect on food and its preservation methods

Cause of Spoilage	How It Affects Food	Preservation Methods
Microbial Growth	Bacteria and moulds make food smelly, slimy and unsafe.	Freezing, canning, drying, salting, sugaring.
Enzyme Activity	Speeds up ripening and browning of fruits.	Blanching, refrigeration, pickling
Oxidation	Oxygen changes food colour, taste and nutrients.	Vacuum packaging, antioxidants, freezing
Excess Moisture	Makes food soft, soggy, or mouldy.	Drying, airtight storage, use of desiccants

Activity 2.2 Preserve to Save foodRemember what you learned in the last activity about food spoilage and preservation concepts.

Organise yourselves into a group of four members

Different factors that affect food spoilage and preservation methods

1. Discuss in your group what factors spoil food. On your paper or notebook write at least **three** things that can spoil food. Here are some examples to help you:
   a. Germs or bacteria (microbial growth)
   b. Too much heat or air
   c. Not storing food properly
2. Make notes about the following in your notebook
   a. What changes do you see in food that's left out too long? (Example: bad smell)
   b. Why does bread grow mould or fruits become soft and rotten?
   c. What happens when you peel a banana or apple and leave it out?
   d. In what two ways the foods mentioned above be preserved to reduce waste.
3. Write **three** other causes of food spoilage, an example of food that is affected by the spoilage and preservation methods suitable for the food. Fill your answers in the table below. One example is already done for you.

Spoilage Cause	Food Example	Preservation Method
Germs (microbial growth)	Fish	Smoking or drying

4. Share your answers with the other members of your group
5. Together, choose one spoiled food and discuss how to preserve it.

How food preservation contributes to reducing food waste

In the same groups discuss:

1. How preservation methods can help reduce food waste in your home or community.
2. How reducing spoilage contributes to food security.

Use these prompts to guide your discussion:

1. What foods spoil quickly in our homes?
2. How could applying preservation methods extend their shelf life?
3. How does this reduce the amount of food thrown away?
4. Why is food preservation important in areas where food availability is seasonal or limited?

DIFFERENTIATE BETWEEN VARIOUS FOOD PRESERVATION METHODS SUCH AS DRYING, FREEZING, FERMENTATION AND CANNING

Whilst studying this area, consider the previous lessons and the definition of food preservation. Let us look at the differences in methods of food preservation.

Methods of Food Preservation

1. Temperature Control Methods: Temperature uses both cold and hot temperatures in preserving foods.
2. Cold Temperatures: Used in refrigeration (-4°C to 4°C) and freezing (-18°C). Inhibits microbial growth but does not completely destroy microbes, keep nutrients, easy to practice at home. Examples of foods: Meat, vegetables etc.
3. Hot Temperatures: Boiling and pasteurization destroy bacteria and enzymes. Prolonged exposure ensures safe food. Makes food light, it is low cost. Examples of foods: Fruits, fish, grains etc.

Figure 2.3: Frozen foods in a freezer

4. Canning Food is placed in sealed containers and heated to destroy microorganisms and spores. Example of foods: Tomatoes, beans, fish, meat etc.
   a. Effective for long-term storage or very long shelf life. Nutrients like thiamine and vitamin C may degrade slightly.
   b. Safe canning requires proper sealing and heat treatment.

Figure 2.4: Canned foods

5. Use of Chemical Preservatives Salting and Sugaring: Dehydrates microbes.
6. Smoking: Adds antimicrobial properties through smoke compounds.
7. Vinegar and Acids: Lower pH to inhibit microbial growth.
8. Antioxidants and Sulphites: Slow oxidation and prevent spoilage. Example of foods: Pickles, smoked fish etc.

Figure 2.5: Chemical preservation of fruits

9. Drying / Dehydration Sun Drying: Traditional and weather dependent.
10. Oven Drying: Controlled low temperature in conventional ovens.
11. Spray and Roller Drying: Industrial methods for liquids like milk.
12. Freeze Drying: Advanced method combining freezing and vacuum drying. Preserves texture and nutrients well.

    Purpose

    a. Reduces moisture to prevent microbial growth and enzyme activity.
    b. Makes food lighter and more storable.

Figure 2.6: Sun dried fish Figure 2.7: Dried maize

13. Irradiation uses gamma or beta rays to destroy microbes.
    a. Maintains food flavour and nutrition with minimal changes.
    b. Less popular due to public concern about safety. It is expensive to use, very effective and modern. Examples spices, dried foods.

Figure 2.8: Preserving fruit using gamma ray

Values and Precautions

1. Avoid use of harmful chemicals like formalin.
2. Ensure honesty and food safety in all preservation practices.
3. Use appropriate, clean, and food-safe tools and storage materials.

Activity 2.3 Finding Ways to Stop Spoilage

Organise yourselves into groups of four

Modern ways of preserving food

1. Work in pairs initially to research modern/current technology for preserving foods. Use different sources such as books, magazines, internet
2. Share the information with the rest of your group and listen to what they have discovered. Using the information within your group complete the table below showing current/modern food preservation methods.

Food items	Current or modern ways of preserving foods	What it does	Tools or material or machines used
E.g., fish	Dehydration	Reduce moisture	Dryer, sun (solar)
1.			
2.			
3.			
4.			

Challenges in preserving foods

In your groups, use these questions from the household level to the national level to help you fill in the various challenges in the table below. An example has been provided for you.

Household Level Problems

1. What causes food to spoil quickly in your home?
2. Do you have access to a working refrigerator or freezer?
3. How do you preserve leftover food safely at home?

Community Level Problems

1. Is there a cold store or food processing centre in your area?
2. How do people in your community preserve foods?
3. Which type of facilities/ material do groups or cooperatives in the community use to help with food preservation?
4. Is there a place where harvested foods can be stored safely in the community?

National Level Problems

1. How does the condition of roads affect the transport of perishable food across the country?
2. What storage facilities (like silos or cold rooms) do the country have for food preservation or have you heard of anything like that?
3. How often do power outages or fuel shortages affect food preservation on a large scale?

Household Level Problems	Community Level Problems	National Level Problems
Power outage at home	*No cold store nearby*	*Poor roads to transport food*

Self-Reflection

1. What did you learn about how people keep food fresh and why it is important?
2. What problems do people face when trying to preserve food at home, in the community, and across the country?

DEMONSTRATION OF SCIENTIFIC PRINCIPLES IN FOOD PRESERVATION

In our previous lessons, we have learnt a lot about food preservation. It will be useful to remember the theory that you have been taught about food preservation to support the practical process of making preserves.

Explore the science behind making food preserves and engage in hands-on activities such as preparing, packaging and presenting food items like 'shito' and mango jam.

Types of Preserves

1. Jam: Cook fruit and sugar until gel-like.
2. Jelly: Made from fruit juice and sugar.

3. Conserve: Fruit with pieces intact.
4. Marmalade: Citrus-based jam.
5. Shito: Ghanaian hot pepper sauce made with fish/shrimp.

Figure 2.9: Some preserved foods

Practical Preparation of Jam Preserves

Jam Preparation (e.g., Mango):

- Ingredients: Firm mangoes, sugar, lemon juice (pectin), jars.
- Tools: Cooking pot, thermometer, spoon, saucer.

Procedure for mango jam

1. Simmer fruits gently.
2. Add sugar and boil steadily.
3. Test for setting using a cold saucer.
4. Pour into jars while hot.

Scientific Principles Applied

1. Sugar concentration inhibits microbial growth.
2. Heat destroys spoilage organisms.
3. Acid (lemon juice) lowers pH.

Packaging

Steps:

1. Sterilise jars before use.
2. Label with name, ingredients, date, expiry.
3. Decorate with logo and product information.

Marketing Plan

1. Decide on product name and logo.
2. Draft a pricing and promotion plan.
3. Identify potential customers.
4. Create a poster or digital ad for the product.

Values and Ethics in Food Preservation

Why is it important to avoid chemicals like formalin?

Formalin is dangerous, not safe for food, and can cause serious illness.

What does it mean to be honest and responsible when selling preserved food?

It means using safe methods, giving true information and protecting customers' health.

Activity 2.4 Modern Food Preservation Methods/Practice

Practical Preparation and Packaging of Preserves (1)

Organise yourselves into small groups of three to four

1. Choose a food item to preserve (e.g., fruits, vegetables, meats, fish).
2. Follow a recipe to prepare the preserve (e.g., pickles). Write the ingredients and methods. Use the example below or any other recipe from different source to guide in your preparation of the chosen preserve:

Preparation of Shito

Ingredients

- 280g powdered herrings
- 280g powdered shrimps
- 224g tomato puree
- 28g powdered red pepper
- 224g blended onions
- 28g ground ginger
- 3g white pepper
- 3g ground garlic
- ½ lit cooking oil
- Salt to taste, etc

Method

1. Heat oil in a saucepan.
2. Pour in onions and spices.
3. Cook for 15 minutes, stirring well to avoid sticking.
4. Add pepper and tomato puree.
5. Continue cooking for about 40 minutes until the onion is well-cooked.
6. Add powdered fish and shrimp and salt.
7. Cook for 10 minutes or until the vapour coming from the Shito is minimal.

8. Remove and cool.
9. Serve with other accompaniments or pour into sterilised bottles to be used later, etc.

Package and label the preserves

1. Package the preserves in appropriate clean containers e.g. Glass jars with lids etc.
2. Label the containers with ingredients and date.

Develop a marketing strategy (way to promote products) to sell your preserves in the local community/ school. Follow this guideline:

1. Research your audience (Students, teachers, parents, neighbours)
2. Choose flavours they like (e.g. pineapple, mango, pepper sauce)
3. Create a catchy name and slogan; "Sweet Sun Preserves" or "Hot finger's Natural Jam"
4. Create a Slogan: "Taste the freshness in every spoon"
5. Design poster or flyer: Use drawings or photos of the preserves, include price, flavours, and contact info.
6. Display in classrooms, notice boards, or community centres.
7. Offer feedback sample: Let people taste before buying by using small spoons or bread slices. Ask for feedback to improve the product.

Produce your marketing strategy as a report and share with the class for discussions and feedback.

Preserving Food at Home

Preserve a food item at home and document the process.

1. Choose a food item to preserve.
2. Follow a preservation method (e.g., canning, freezing, bottling, pickling etc.).
3. Document the steps and challenges. (look at the sample of the steps in the above activity).

DEMONSTRATION ON SCIENTIFIC PRINCIPLES IN FOOD PRESERVATION

The previous activity focused on preservation activities. This week, you will explore through hands-on group activities and guided practice how to prepare other types of preserves, including Orange Marmalade, Pineapple Jam, and Pickled Red Onions. Refer to the recipe samples below.

Activity 2.5 Modern Food Preservation Methods/ Practice

Practical Preparation and Packaging of Preserves (2)

Use the example in Activity 2.4 to guide in your preparation of marmalade and any other preserves

Prepare a preserve using a different food item for this practical session (2).

Organise yourselves into small groups of three to four

1. Choose a food item to preserve (e.g., fruits, vegetables, meats, fish).
2. Follow a recipe to prepare the preserve (e.g., jam). Write the ingredients and methods. Use the example below or any other recipe from different source to guide in your preparation of the chosen preserve:

Orange Marmalade

Ingredients

- 450g Oranges
- 2–3 pints of Water
- 900g Sugar
- 1 Large Lemon

Method

1. Cut oranges and remove the seeds (pips).
2. Soak the peel and pulp overnight.
3. Wrap the seeds and pulp in a clean cloth (muslin).
4. Simmer the fruit, water, and bag of seeds for about 1½ hours.
5. Remove the bag and add sugar and lemon juice.
6. Boil uncovered until the mixture thickens (about 20 minutes).
7. Pour into clean jars and cover tightly.

Pineapple Jam

Ingredients

- 800g Pineapple
- 800g Sugar
- 2 pints Water
- 1 Medium-sized Ginger Root

Method

1. Wash, peel, and grate the pineapple.
2. Wash and grate the ginger.
3. Add pineapple, ginger, and water into a pot and simmer for 1½ hours.

4. Warm the sugar separately.
5. Add sugar to the soft fruit and stir until dissolved.
6. Let the jam boil. Stir occasionally and remove the foam (scum).
7. Check if it has set (thickened).
8. Pour into warm jars and cover tightly.

Pickled Red Onions

Ingredients

1. Red Onions
2. Peppercorns
3. Vinegar
4. Water
5. Salt
6. Sugar

Method

1. Slice onions thinly.
2. Add onions and peppercorns to a bowl.
3. Heat water, vinegar, salt, and sugar until dissolved.
4. Let the liquid cool slightly, then pour over the onions.
5. Put the mixture into clean jars.

Package and label the Preserves

Choose good containers (jars, bottles) and make sure they:

1. Look attractive to buyers (aesthetics)
2. Are clean and safe for storing food
3. Label the containers with ingredients and date.

Marketing Strategies for Preserves

To sell your products, try these ideas:

1. Know your product and set a fair price.
2. Know who your customers are (children, adults, families).
3. Create a simple website or social media page.
4. Offer rewards or discounts to loyal customers.
5. Work with a delivery service.
6. Partner with food bloggers to promote your preserves.
7. Ask for feedback to improve.
8. Use eco-friendly packaging and plan for long-term growth.

Important Values to Remember

1. Always use fresh and safe ingredients.
2. Never use harmful chemicals like formalin.
3. Be honest, truthful, and loving in preparing food for others.

Self-Reflection

1. What new preserve did you prepare?

2. What did you learn in preparing, packing and marketing your preserve?

PACKAGE PRESERVES USING SCIENTIFIC PRINCIPLES

What is Food Packaging?

Figure 2.10: Packed foods

Food packaging means protecting food using the right materials, so it stays fresh, safe, and attractive from the time it is made until it is used. Packaging helps during:

1. Storage
2. Transportation
3. Sales
4. Advertisement
5. Everyday use

Why Is Packaging Important?

Food packaging is important because it helps to:

1. Protect the food from germs, dust, and damage.
2. Make the food look nice and appealing to buyers.
3. Keep flavours and smells inside (no smell transfer).
4. Help in safe storage, selling, and transport.

Scientific Principles Behind Good Packaging

Packaging uses science to keep food safe and fresh. These principles are grouped into three main areas:

1. **Physical Principles (How packaging behaves physically)**
   a. **Protection**

      The package should absorb shocks or pressure (e.g., during transport) to stop the food from breaking or spilling.

      Example: Bubble wrap or strong boxes for glass jars.

   b. **Containment**

      The package should hold the food well without leaking.

      Example: Jars and bottles with tight-fitting lids.

   c. **Structural Integrity**

      The packaging must keep its shape even when stacked, stored, or moved.

      Example: Cans and plastic containers that do not bend or collapse easily.

2. **Chemical Principles (How packaging reacts with food or air)**
   a. **Chemical Resistance**

      It should not react with the food inside.

      Example: Acid from tomatoes should not react with or damage the container.

   b. **Corrosion Resistance**

      The material must not rust or break down.

      Example: Coated tins used for canned foods.

   c. **Non-Toxicity**

      The packaging must be safe and should not release harmful substances into the food.

      Example: BPA-free plastics.

3. **Biological Principles (How packaging prevents germs and pests)**
   a. **Sanitation**

      Packaging should be easy to clean or come already clean.

      Example: Sterilised jars or vacuum-sealed packs.

   b. **Pest Control**

      Should stop insects, rats, and other pests from getting in.

      Example: Airtight packaging and sealed containers.

Types of Food Packaging Materials and their Qualities

When choosing packaging for food like jam, marmalade, pickles, or shito we need materials with the following qualities:

Table 2.2: Food Packaging Materials and Their Qualities

Material/Quality	Use or Importance
Vapour-proof	Keeps moisture in or out, useful for dried foods

Grease-proof	Prevents oil or grease from leaking (e.g., shito)
Waterproof	Does not let liquids pass through
Odourless	Does not affect the smell or taste of the food
Glass Jars/Bottles	Strong, see-through, and reusable good for jams and pickles
Vacuum Packaging	Removes air to keep food fresh for longer (slows spoilage)

Activity 2.6 Preserve it Right

Organise yourselves into small groups of three to four.

1. Visit a local market, school shop or canteen, food processing centre or food packaging shop. Observe and take notes on the following:
   a. Types of food preserves on sale (e.g., jam, marmalade, pickles, shito).
   b. Types of packaging used (glass jars, plastic containers, vacuum packs, etc.).
   c. Labels and how they attract customers.
2. Prepare a short presentation of 50 words or poster with pictures, sketches and notes from the visit.
3. Work with your group to research packaging materials. Surf the internet or use library resources, market, shops and other sources to:
   a. Find modern packaging materials used for preserves (e.g., biodegradable films, vacuum sealing, glass alternatives).
   b. Compare the identified scientific properties of packages found on the visit to the one in books or on the internet (e.g., non-toxic, vapour/grease proof, pest-resistant).
   c. Discuss with your friends about how the modern packaging methods you discovered on the visit could be used in your next practical activity on packaging preserves for improvement.
   d. Put your findings on paper for discussion with peers.
4. Pick a type of preserve (e.g., jam, marmalade, pickles, or shito) that you prepared. Using local and/or recycled materials, design a package for the assigned preserve that meets the following scientific criteria:
   a. Physical: Prevents breakage, leakage, maintains shape.
   b. Chemical: Non-toxic, corrosion-resistant, safe with food contact.
   c. Biological: Pest-proof, cleanable.
5. Produce a label which must include the product name, ingredients, date of production, expiry date, storage instructions and an attractive design.
6. Do the packing practical after school or on weekends and present for gallery walk the next week.
7. In your groups display your preserve packaging for exhibition or in a gallery walk. Visit other groups' work and give feedback, accept feedback from others on your

product. Feedback should include things such as creativity, scientific accuracy, appeal, safety.

Self-Reflection

1. Explain the scientific principles involved in food packaging.
2. Identify and describe types of modern packaging used for preserves.

EXTENDED READING

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REVIEW QUESTIONS 2

1. Match the following food preservation principles to the correct preservation method.

Principle	Preservation Method
Temperature control	Pickling
Moisture reduction	Addition of antioxidants
Acidity control	Freezing
Oxidation prevention	Drying

2. Identify any two preservation techniques that control microbial growth and explain how they work.
3. Explain two reasons why food preservation is important to the community.
4. Describe three causes of food spoilage and the related preservation method for each.
5. How does salting or sugaring help in preventing food spoilage?
6. A food vendor stores food in open containers in a warm, humid environment. Identify the risks involved and suggest improvements based on preservation methods.
7. What is the role of antioxidants in food preservation?
8. Suggest three appropriate preservation methods for each of the following:
   a. Fish
   b. Cassava
   c. Pepper
9. Explain why appropriate packaging is important after preservation.
10. Evaluate two roles of technology in improving modern food preservation methods with two examples of equipment used in the process.
11. List and explain any three scientific principles applied during the preparation of Shito or Mango jam.
12. Describe two methods used to test for the setting point of jams and jellies before bottling.
13. Design a Simple Marketing Plan for a Homemade Mango Jam.
14. Describe how values like honesty and truthfulness influence choice of ingredients and additives.
15. Describe the steps you would use in preparing one preserve (e.g., pineapple jam) at home. Include ingredients, method, packaging and any challenges you are likely to face.
16. Explain why non-toxic materials must be used in food packaging.

17. Explain the **three** scientific principles of packaging: Physical principles, chemical principles, biological principles.

18. Produce a comparison table showing how **three** different packaging types (tin can, glass jar, plastic pouch) fulfil the physical, chemical, and biological packaging principles.

SECTION

3

METHODS OF FOOD PREPARATION AND HEAT TRANSFER

FOOD PRODUCTION

Food Production Technology

INTRODUCTION

Cooking involves moving heat, think of it as energy from a source into your food. This can happen in three ways: conduction, when food touches a hot surface; convection, when heat is carried through moving air or liquid; and radiation, when energy comes as waves (e.g. from a grill or microwave).

Understanding how heat moves in these ways helps you choose the best cooking method for example, frying, steaming, baking, or grilling to produce safe, tasty meals while preserving nutrients. Throughout this unit, you will learn when and why each method is used, try hands-on cooking experiments, and explore how to cook efficiently and safely using tools and fuels wisely.

KEY IDEAS

- Conduction heats food where it touches a surface, like a pan heating meat, but if contact is not good or the surface is poor, food can cook unevenly or stick.
- Convection spreads heat using moving air or liquid, such as boiling water or oven fans, helping to cook more evenly but it needs good airflow and can use more energy.
- Heat affects nutrients and water, causing moisture to evaporate (which can dry food) and reducing heat-sensitive vitamins (like B and C) in cooking liquids.
- Heat changes food's structure, causing proteins to firm up, starches to thicken, and sugars to caramelize, which transforms flavour and texture.
- Heat moves three main ways in cooking: conduction (direct contact), convection (through air or liquid), and radiation (invisible waves like in grilling or microwaving)
- Radiation uses invisible waves to brown and cook food, like under broilers or on grills, and adds quick flavour but only if distance and heat control are correct to avoid burning or undercooking.

HEAT TRANSFER

When we cook food at home or in food factories heat is used to make it safe, tasty and enjoyable. In cooking, heat transfers in three main ways:

1. Conduction happens when food touches a hot surface like a pan or grill and heat travels directly through contact.
2. Convection uses warm air or liquid to move heat around, such as boiling water or an oven with a fan.
3. Radiation sends heat through invisible waves (like infrared or microwaves) that cook food without direct contact.

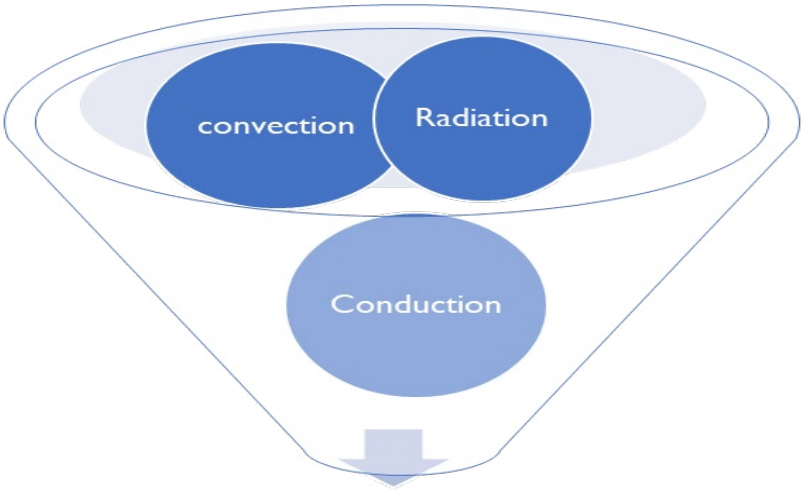


Figure 3.1: Methods of Heat Transfer in cooking

Each method works differently but often overlaps during cooking. For example: baking uses conduction (the pan), convection (hot air moving), and sometimes radiation (from heating elements). Knowing how heat moves helps you pick the best cooking method to ensure food is cooked safely, tastes great, and saves energy.

Conduction (Cooking by Direct Contact)

Conduction is when heat travels by touching from a hot surface directly into your food. Imagine placing a cut of meat or yam in a hot pan. The flame heats the pan, and the pan's surface transfers this heat straight into the food where they touch. This is how you get that seared crust on meat or browned edges on toast. Example: Cooking an egg in a frying pan, the heat spreads through the pan and into the egg only at the spots touching the pan.

Tip for Even Cooking: Use good cookware like cast iron or thick-bottomed pans to spread heat evenly. Always preheat the pan so food cooks uniformly.

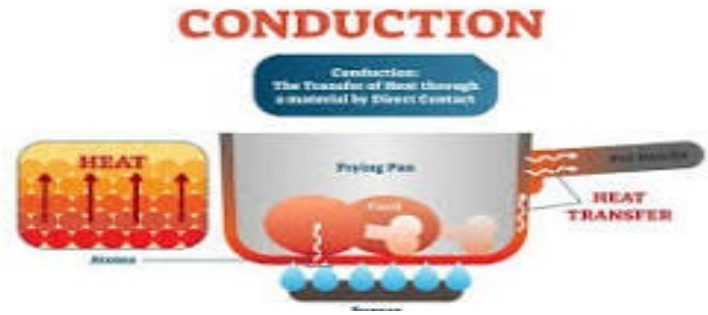


Figure 3.2: Conduction method of cooking

Convection (Cooking with Moving Air or Liquid)

Convection is the way heat travels when a fluid like air or water moves. In cooking, this happens naturally or with help from fans or stirring:

1. **Natural Convection**
   When heat warms a fluid (like water or air), the warmer parts become lighter and

rise, while cooler, denser parts sink. This forms a looping flow that spreads heat evenly. For example: in boiling water, hot water rises from the bottom and cooler water sinks, circulating heat throughout the pot.

2. **Forced Convection**
   This type uses devices like fans in ovens or stirring spoons. The moving fluid helps heat reach all parts of the food faster and more evenly, cutting down cooking time and improving browning.

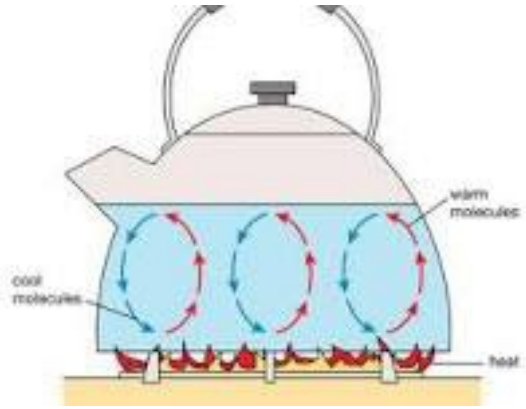


Figure 3.3: Convection method of cooking

3. **Radiation (Cooking with invisible heat waves)**
   Radiation moves heat through invisible waves. Heat travels from a hot source like glowing coals, a broiler, or a microwave through the air and is absorbed directly by the food. For example: grilling places food over hot coals or flames, and that radiant energy cooks the surface quickly, creating browning. You do not need to touch the heat; it moves across a gap.

   Closer or hotter sources speed up cooking; further away or cooler sources slow it down. Tools like broilers, infrared grills, and microwaves (which use microwave radiation) all use this method.

Note: Radiation gives quick browning, great for texture and flavour but it is easy to overcook or burn if the food is too close or the heat is too intense.

Figure 3.4: Radiation method of cooking

Activity 3.1 Heat Moves, Food Improves

In this activity, you will experiment with methods of heat transfer and observe the effects on food. This will help you better understand the types of heat transfer and apply them to real-world cooking methods.

Experiment with one method of heat transfer

Organise yourselves into groups of 3.

Each group will experiment with one method of heat transfer so that you can share the results of your experiments with other groups:

1. Conduction
2. Convection
3. Radiation

Follow step-by-step instructions to test how heat moves in different cooking methods and see how it changes food.

Materials Needed

1. Yam slices, egg, fish, or meat
2. Cooking pot with lid
3. Frying pan
4. Charcoal grill (or oven)
5. Stove or charcoal heat source
6. Spoon or tongs

Method 1 – Conduction

1. Place a frying pan on the stove and heat it.
2. Put a yam slice or piece of meat directly on the hot pan.
3. Watch carefully: Notice how the part touching the pan cooks first. Turn it over to cook the other side. Note the time it takes to cook the Yam.

Method 2 – Convection

1. Pour water into a cooking pot and place it on the stove.
2. When the water begins to boil, add an egg or yam slice.
3. Notice: How the food moves around in the boiling water. How long it takes to cook. How it cooks evenly all around.

Method 3 – Radiation

1. Light a charcoal grill until the coals are hot.
2. Place fish or plantain on the grill, above the coals (not touching them).
3. Watch: How heat from the charcoal cooks the food from a distance. How the colour and aroma change. Note how long it takes to cook.

Use the table below to write what you observed:

Method	Food Used	Signs of Cooking	How Heat Moved	Effect on Food
Conduction				
Convection				
Radiation				

Class discussion on the major principles of heat transfer

Using your experiment and observations, share your group findings with the class. Listen to other groups and make notes about their experiments. In your discussions consider the following:

- Which method cooked the food fastest?
- Which gave the best taste, texture, or colour?
- Did any method seem to lose more nutrients?

METHODS OF FOOD PREPARATION AND PROCESSING THAT APPLY PRINCIPLES OF HEAT TRANSFER

Conduction-Based Cooking Methods

Conduction happens when heat moves directly from one object to another through touch. It usually takes place when food touches a hot pan or surface. Examples of conduction cooking:

Table 3.1: Conduction-Based Cooking Methods

S/N	Methods	Explanation
a.	Frying (Shallow and Deep Frying)	Food touches hot oil in a pan or deep fryer. The oil transfers heat directly to the food
b.	Sautéing and Stir-Frying	Food is quickly cooked in a small amount of oil in a hot pan
c.	Boiling and Simmering	The pot touches the heat source and transfers heat to the water, then to the food
d.	Grilling (Contact Grills)	Food touches a hot metal surface, cooking from the bottom
e.	Baking and Roasting (Partly conduction)	Heat moves from the hot baking tray to the food.

Convection-Based Cooking Methods

Convection happens when heat moves through liquids or gases (like water or air). This can be natural or with help from fans or stirring. Examples of convection cooking:

- Boiling and Simmering: Water moves around the food and cooks it evenly.
- Steaming: Hot steam surrounds the food and cooks it gently.
- Deep Frying: Hot oil circulates around the food, cooking it on all sides.
- Baking in Convection Ovens: Fans move hot air around the food for even cooking.
- Pasteurisation and Sterilisation: Used in food factories to heat liquids like milk to kill germs using convection.

Radiation-Based Cooking Methods

Radiation transfers heat through invisible energy waves. It does not need direct contact or moving air, heat travels through space to cook food. Examples of radiation cooking.

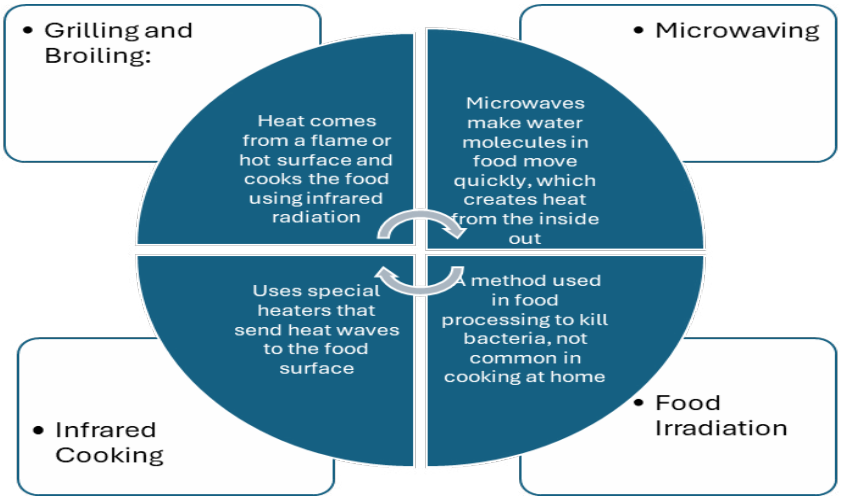


Figure 3.5: Radiation-Based Cooking Methods

Combination Cooking Methods (Using More Than One Heat Type)

1. Steaming uses hot steam (convection) to cook food gently. Sometimes the plate or tray also uses conduction. Keeps nutrients in vegetables and fish.
2. Sous-Vide food is sealed in a bag and cooked in a warm water bath (conduction). After that, it is often finished with a quick grill or pan-fry (radiation or conduction) for extra flavour and colour.

How Heat Transfer Is Used in Cooking

Understanding how heat works in cooking helps us choose the best method to get the taste, texture, and nutrients we want.

1. **Conduction Cooking Methods (Direct Contact Heat)**
   a. Pan-Frying: A hot pan touches the food directly. For example: eggs or pancakes cook from the bottom up.
   b. Sautéing**:** Uses a hot pan and a little oil. It cooks food quickly like vegetables or thin meat slices.
2. **Convection Cooking Methods (Heat Moves Through Liquid or Air)**
   a. Boiling: Water gets hot and moves around the food, cooking it. Great for eggs, pasta, or vegetables.

b. Baking and Roasting: Heat moves around the oven, cooking food evenly. Roasting uses higher heat to brown the outside of meats or vegetables.

3. **Radiation Cooking Methods (Heat Through Waves)**

a. Grilling heat from below cooks food with radiation. It creates a smoky, crispy outside.

b. Broiling is similar to grilling, but the heat comes from above. Good for melting cheese or browning meat.

c. Microwaving fast cooking method using microwave energy. Good for reheating or cooking small portions.

Activity 3.2 Heating It Right, Exploring Cooking Methods

In this activity you will make the connection between cooking methods for specific foods and the type of heat transfer that is employed for that method. This will help you to select the best cooking method for different foods in the future.

Organise yourselves into groups of 4.

Explain how heat transfer is applied in different methods of cooking

In your groups discuss the heat transfer principles (Conduction, Convection, Radiation). You should:

1. Identify one cooking method for each heat transfer principle.
2. Give one Ghanaian food example for each method.
3. Explain briefly how heat moves in that method.

Sample Table for Recording Work:

Heat Transfer Type	Cooking Method	Example Ghanaian Food	How Heat Moves
Conduction	e.g, Pan-frying	e.g., Fried eggs	e.g., Heat passes from pan surface to egg through direct contact
Convection			
Radiation			

Discuss how the principles of heat transfer influence food preparation and cooking in households.

1. Share and discuss your table with the other groups. Listen to their feedback and note any new cooking methods or dishes that you didn't know about.
2. In your wider discussions with other groups talk about the method you think is best for:
   a. Preserving nutrients
   b. Enhancing flavour
   c. Cooking food quickly

PRINCIPLES OF HEAT TRANSFER TO DIFFERENT METHODS OF FOOD PREPARATION

This area explores the three primary modes of heat transfer in both household cooking and in the food industry.

Conduction in Food Preparation Heat moves directly from something hot (like a pan or oven tray) to the food it touches

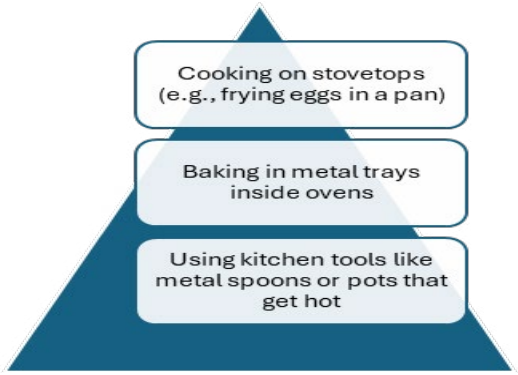


Figure 3.6: Conduction food preparation at home

Figure 3.7: Conduction food preparation in the food industry

Convection in Food Preparation

Heat moves through liquids (like water or oil) or gases (like air) to cook food more evenly.

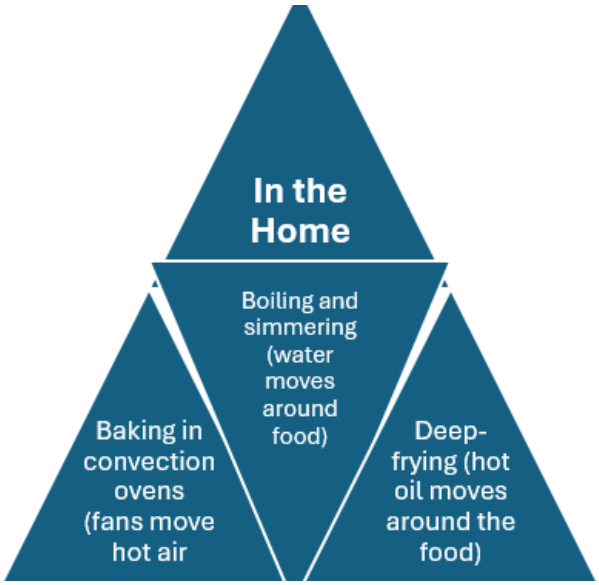


Figure 3.8: Convection food preparation at home

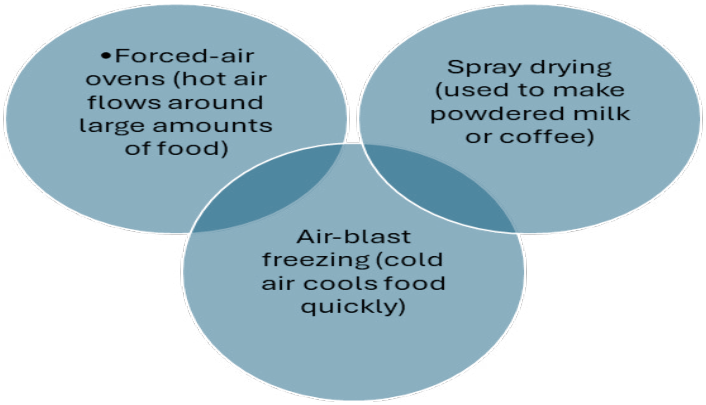


Figure 3.9: Convection food preparation in the food industry

Radiation in Food Preparation

Heat travels in waves from a heat source to the food no need for direct contact.

In the Home		
Grilling and broiling (heat comes from flame or top grill)	Microwave cooking (microwaves heat food from inside)	Toasting (heat waves brown bread

Figure 3.10: Radiation in food preparation in the home

In the Food Industry		
Infrared heating (heat waves cook food quickly	Microwave processing (used in packaged meals)	Food irradiation (used to kill bacteria and preserve food

Figure: 3.11: Radiation in food preparation in the industry

Implications of Heat Transfer in Food Preparation and Processing

1. **Nutritional impact**
   a. Some methods, like steaming or gentle convection, help keep more nutrients.
   b. Too much heat (especially long cooking) can destroy vitamins.
   c. Different methods influence texture.
2. **Food safety**
   a. Proper heat transfer ensures the destruction of harmful micro-organisms.
   b. Uneven heat transfer can lead to foodborne illnesses if parts remain undercooked.

3. **Efficiency and cost considerations:**
   a. The food industry uses advanced convection-based systems to enhance efficiency.
   b. Infrared and microwave heating reduce cooking times and energy consumption.
4. **Quality and sensory attributes**
   a. Different methods influence texture.
   b. Maillard reaction and caramelisation in baked goods rely on heat transfer principles.

Activity 3.3 Let us Cook and Learn with Heat

In this activity, you will experiment with methods of heat transfer and observe the effects on food. You will discuss these effects and how they relate to household cooking and food industry processes.

Organise yourselves into groups of 3.

Choose Your Food and Method

1. Each group will experiment with one method of heat transfer so that you can share the results of your experiments with other groups. In your group select your method:
   - Group 1 (**Conduction**): Fry yam slices in a pan.
   - Group 2 (**Convection**): Boil an egg or yam in water.
   - Group 3 (**Radiation**): Toast bread or grill fish over charcoal.

Tools and Materials Needed

- Yam slices, egg, fish, or meat
- Cooking pot with lid
- Frying pan
- Charcoal grill (or oven)
- Stove or charcoal heat source
- Spoon or tongs

Follow the steps below and make notes as you conduct the experiment

2. Make notes on the cooking process as you conduct your experiment. Consider the following:
   - How heat moves from the source to the food.
   - Changes in texture, colour, flavour, and smell.
   - How evenly the food is cooked.

Method 1 – Conduction

1. Place a frying pan on the stove and heat it.
2. Put a yam slice or piece of meat directly on the hot pan.
3. Observe cooking process and make notes.

Method 2 – Convection

1. Pour water into a cooking pot and place it on the stove.
2. When the water begins to boil, add an egg or yam slice.
3. Observe cooking process and make notes.

Method 3 – Radiation

1. Light a charcoal grill until the coals are hot.
2. Place fish or plantain on the grill, above the coals (not touching them).
3. Observe cooking process and make notes.

Complete the chart/table and share your results with others

3. Discuss how these results relate to household cooking and food industry processes. Provide as many examples of household cooking and food industrial processes as you can.
4. In your group complete the table below with the answers. An example is provided.
5. Share your results with other groups that have used the same and different methods of heat transfer.

Heat Transfer Method	Principles of heat transfer	Household Preparation Examples	Industrial Processing Examples (mostly done on large scale)
Conduction	e.g., Heat passes directly from one solid surface to the food in contact with it.	e.g., Toasting bread on a stovetop grill	e.g., Cooking burger patties on heated conveyor belts
Convection			
Radiation			

DIFFERENT METHODS OF FOOD PREPARATION AND PROCESSING METHODS OF FOOD

Sustainability in cooking and food processing means using methods that protect the environment, reduce waste, save energy and promote health. It involves choosing cooking and processing techniques that conserve natural resources whilst ensuring food safety and quality.

Sustainable Cooking Methods

Sustainable cooking methods help to reduce energy use, food waste and pollution. They are grouped into dry heat and moist heat methods.

1. Dry Heat Methods

These methods use little or no water and cook food using hot air or direct heat.

- Baking – Cooking in an oven (e.g., bread, cakes).
- Grilling – Cooking over direct heat (e.g., meat, fish).
- Roasting – Cooking in dry heat like an oven (e.g., chicken, potatoes).
- Air Frying – Uses hot air to fry food with little or no oil.
- Solar Cooking – Uses sunlight to cook food, usually in a solar cooker.

2. Moist Heat Methods

These methods use water or steam to cook food.

- Boiling: Cooking food in water at 100°C.
- Stewing: Slow cooking in a small amount of water/liquid.
- Steaming: Cooking food using steam from boiling water.

Sustainable Food Processing Methods

Processing helps preserve food for longer use while reducing waste. Some of the processes are:

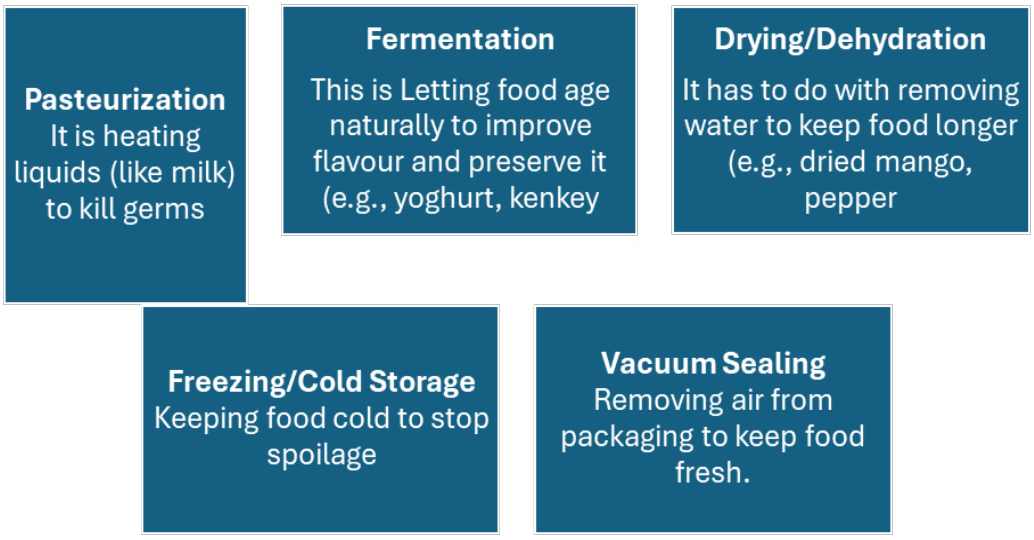


Figure 3.12: Methods of Sustainable food processes

Why Use Sustainable Methods?

- Save energy and reduce pollution.
- Use less water and cooking fuel.
- Keep nutrients in food.
- Help protect the environment.
- Reduce food waste.

How to Reduce Food Waste

1. Upcycle Food Scraps – Using leftover vegetable peels in soups.
2. Compost Leftovers – Turn food waste into plant fertilizer.

3. Cook the Right Amount – Avoid cooking more than needed.
4. Use Eco-Friendly Fuel – Try gas, charcoal alternatives, or solar. These are friendly to the environment.

Activity 3.4 Sustainable Cooking

This activity is a knowledge review of the dry and moist heat methods of cooking. You have learnt this in JHS Career Technology, and you can use your textbooks, class notes, or other information to complete the tasks.

Organise yourselves into pairs for this activity

Cooking methods

1. Discuss all the cooking methods that you can remember from JHS Career Technology and from previous lessons. Write them down in a list.
   a. Share your list with your partner. Add any methods they remembered that you forgot.
   b. On a sheet of paper, draw two columns with headings Dry heat methods, Moist heat methods (See below)
   c. Place each method from your list and your partners list into the correct column.

Dry heat method	Moist heat method
(e.g., baking)	(e.g., boiling)

Sustainability

2. For each cooking method you have included on your list, write one way it can be made more sustainable (e.g., using solar ovens for baking etc).
3. Discuss how these methods can save energy, reduce food waste, or encourage the use of healthier food options.
4. In your pairs, share your findings for discussion and feedback with other groups.

COOKING METHODS

Refer to the methods of cooking from the discussions in the previous lessons or JHS Career Technology.

The following shows the advantages and disadvantages in the cooking methods under their various categories.

Moist methods of cooking

Table 3.2: Moist Cooking Methods

S/N	Method of Cooking	Implications to Healthy Living	
		Advantages	Disadvantages
1.	Boiling: Cooking food in water at 100°C (212°F).	Simple and easy to execute also retains more nutrients compared to some methods, particularly if the cooking liquid is consumed e.g., soups.	Some vitamins (vitamin C and B vitamins) and minerals can leach into the water, some can be destroyed by high temperatures and lost if thewater is discarded.
2.	Steaming: Cooking food with steam by placing it above boiling water.	Preserves most nutrients, colour, and flavour. Minimal use of fats and oils.	Can be time-consuming for certain foods. Requires a steamer or special equipment.
3.	Poaching: Gently cooking food in simmering liquid (below boiling point, 160-180°F or 71-82°C).	Good for delicate foods like eggs, fish, and fruits. Maintains moisture and tenderness without adding fats.	Limited to certain types of food. Some nutrients may leach into the poaching liquid.

Dry Heat Method of Cooking

Table 3.3: Dry Heat Method of Cooking

S/N	Method of Cooking	Implications to Healthy Living	
		Advantage	Disadvantage
1.	Grilling: Cooking food on a grill or over direct heat.	Enhances flavour through caramelization and charring. Excess fats drip off, reducing overall fat content.	High temperatures can create harmful compounds e.g., Heterocyclic amines HCAs and Polycyclic aromatic hydrocarbons PAHs. Requires monitoring to prevent burning and overcooking.
2.	Baking/Roasting: Cooking food using dry heat in an oven, hot pan or pot.	Even cooking and suitable for a wide range of foods. Can cook without added fats if desired.	Long cooking times may reduce heat-sensitive nutrients. Some foods may require added fats to prevent drying out.

3.	Microwaving: Cooking food using microwave radiation.	Quick and convenient. Preserves nutrients better than some other methods due to short cooking times.	Uneven cooking can occur. Limited to foods that can be microwaved.

Hot Fat Method of Cooking

Table 3.4: Hot Fat Method of Cooking

S/N	Method of Cooking	Implications to Healthy Living	
		Advantage	Disadvantage
1.	Deep Frying: Cooking food by submerging it in hot oil or fat, usually at temperatures between 350°F and 375°F (175°C and 190°C).	Results in a crispy texture and can enhance flavour. Quick cooking method suitable for many types of food.	High in calories and fats, potentially leading to weight gain if consumed frequently. The formation of trans fats and other harmful compounds can occur when oils are reused or overheated. It can increase the risk of heart disease and other health issues when consumed in excess.
2.	Shallow Frying: Cooking food in a small amount of oil or fat, typically in a skillet or frying pan.	Allows for control over the amount of fat used, making it a potentially healthier option than deep frying. Can enhance the flavour and texture of food.	Still adds fats and calories to food. Potential formation of harmful compounds if the oil is overheated. Requires careful monitoring to avoid burning and excessive oil absorption.
3.	Sautéing: Cooking food quickly in a small amount of oil or fat over high heat.	Quick method that retains colour, texture, and nutrients. Allows control over the amount of added fat.	Requires constant attention to prevent burning. Depending on the oil used, it can add significant calories and fats.
4.	Stir-Frying: Quick cooking method that involves cooking small pieces of food in a small amount of oil over high heat.	Uses short cooking times, which helps preserve the vitamins and minerals in vegetables. Control the fat and calorie content of the dish.	Uneven cooking can occur due to portion size. Limited to foods such as vegetables and food that can be stir-fried.

Reasons why we cook

Cooking food is important because it makes our meals safe, tasty, easier to digest and better for our health. It also helps us enjoy food as part of our culture and family life.

1. Food Safety
   - Cooking kills harmful germs like Salmonella and E. coli found in raw food.
   - It removes natural poisons in some foods, like the harmful substances in raw beans.
2. Palatability (Taste and Texture)
   a. Cooking improves taste and smell through browning (like roasting or frying).
   b. It changes the texture, making food soft, crunchy or chewy for example: cooking meat makes it soft.
3. Digestibility
   a. Heat breaks down food, making it easier for the body to digest.
   b. It also helps us absorb nutrients from vegetables by breaking plant cell walls.
4. Nutritional Value
   - Cooking helps us get more nutrients, like lycopene in tomatoes and beta-carotene in carrots.
   - It also reduces things that stop the body from using nutrients, like phytic acid in beans.
5. Cultural and Social Importance
   a. Cooking is part of our culture; recipes are passed down through families.
   b. Sharing cooked meals brings families and friends together.

Terminologies

There are some common terms used in food preparation and cooking. The chart below gives descriptions of some culinary terms.

Table 3.5: some common culinary terms

Marinade	A mixture used to soak food in before cooking for flavour
Dice	To cut food into small cubes.
Knead	To press and fold dough to make it smooth.
Blend	To mix ingredients until smooth.
Baste	To pour liquid over food while it cooks to keep it moist
Blanch	To boil food for a short time, then cool it quickly.
Coat	To cover food with a layer (like flour or breadcrumbs).
Glaze	To brush food with a shiny sauce or sugar coating.
Refresh	To cool cooked food in cold water to stop cooking
Sauté	To quickly fry food in a small amount of oil.
Toss	To lightly mix food, like tossing a salad

Activity 3.5 Methods of Cooking Food

Common Culinary Terms

There are some common terms used in food preparation and cooking, and it is useful to know what they mean and what dishes they may relate to.

1. Work in pairs to complete the chart below. Explain what is meant by the culinary term and list one dish that you know uses this method of preparation or cooking.
2. Share your findings with the class in a class discussion

Terminology	Meaning	Dish
Marinade		
Dice		
Knead		
Blend		
Baste		
Blanch		
Coat		
Glaze		
Refresh		
Sauté		
Toss		

Advantages and Disadvantages of Different Cooking Methods

Organise yourselves into groups of four

3. Watch short cooking videos showing different methods of cooking (e.g., steaming fish, roasting plantain, baking bread)

   or

   Use a mini class demonstration. If you can use the food lab you can carry out experiments on different methods of cooking.

   or

   Group simulation. If you cannot get access to a food lab, work in the classroom using classroom objects. Pretend you are following a cooking method for a particular food i.e. steaming vegetables. One person should describe each step to the rest of the group for example.

   - Cooking tools used.
   - Safety and hygiene practices.
   - Steps followed i.e. Preparing the veg, steaming process, time required etc.

4. Whichever method you use to research cooking methods, take notes of the process and share your results with the other groups. Listen to their feedback and use

this information to help clarify which cooking method works best in sustaining nutrients and fuel.

5. In your groups
   a. Choose at least three cooking methods
   b. For each method, write: Advantages (e.g., steaming keeps vitamins in vegetables) and Disadvantages (e.g., deep frying adds a lot of oil and calories).
   c. Use a three-column table in your notebook to make your comparison clear on the advantages and disadvantages of cooking methods.
   d. Share your notes with another group and discuss: Which cooking method do you think is the healthiest for daily home meals in Ghana and Why?

Example table

COOKING METHOD	TWO ADVANTAGES e.g., Keeps vitamins	TWO DISADVANTAGES e.g., Cooking times

CHALLENGES IN APPLYING THE VARIOUS HEAT TRANSFER IN FOOD PREPARATION AND PROCESSING

It is helpful for this session if you can reflect on previous lessons about different methods of heat transfer. This will act as a guide to understanding this subject area and the challenges involved in applying the various heat transfers in food preparation.

Challenges in Using Heat Methods

1. Conduction (e.g. Frying in a pan)

Table 3.6: Challenges in conduction

Challenge	What it means
Heat is uneven	Some parts of food cook faster
Heat loss	Energy can escape, wasting electricity/gas
Food sticks to pan	Food burns or tears when stuck

2. Convection (e.g. Boiling, Oven Baking)

Table 3.7: Challenges in convection

Challenge	What It Means
Uses a lot of energy	Big ovens or stoves use more electricity or gas
Poor air/water flow	Some parts may stay raw or overcooked
Loss of water and nutrients	Boiling vegetables can remove vitamins

3. Radiation (e.g. Grilling, Microwaving)

Table 3.8: Challenges in radiation

Challenge	What It Means
Food may burn or stay raw	Hard to control temperature sometimes
Safety concerns	Microwaves or grills can cause burns
Expensive equipment	Not everyone can afford(microwave) these devices

General Challenges in Using Heat to Process Food

Table 3.9: General Challenges in Using Heat to Process Food

Challenge	What It Means in Simple Terms
Maintaining safe and nutritious food	High heat kills germs but can remove vitamins
Environmental damage	Cooking needs fuel, which can pollute
Lack of tools in some places	Poor areas may not have good ovens or stoves
Unsafe cooking temperatures	If heat is too low or too high, food may be unsafe to eat.

What Heat Does to Food: Effects of Cooking

When we cook food, heat changes its shape, taste, smell and nutrition.

1. Proteins - Proteins change shape (called denaturing) and become firm.
   Example: Egg white becomes solid when cooked. Meat gets tender when grilled.
2. Carbohydrates (Sugars & Starch).
3. Gelatinisation – Starch (like in rice or flour) absorbs water and becomes soft.
4. Caramelisation – Sugar melts and turns brown.
5. Maillard reaction – this means heat gives food a brown, tasty crust.
   Example: Bread becomes golden and crispy when baked.
6. Fats- When fats are heated, they melt first. At higher temperatures, fats can break down and oxidise (react with air). This breakdown can cause:
   - Good effects – like creating pleasant flavours, e.g., the nutty smell of browned butter.
   - Bad effects – like producing unhealthy substances and burnt smells if overheated.

   Example: When sautéing vegetables, melted fats help transfer heat to the food. Adds flavour to the dish.

7. Vitamins - Vitamin C and B vitamins can be lost when cooked, especially in boiling water.

   Example: Boiling kontomire removes a lot of vitamin C.

8. Water - Water in food evaporates with heat. This can make food dry or more flavourful.
   Example: Roasted chicken gets crispy outside but juicy inside if cooked right.

Activity 3.6 Exploring Heat Effects and Cooking Challenges

This activity on cooking methods is a practical experiment. You will observe changes in the food you are cooking and reflect on the challenges of using a particular cooking method.

Organise yourselves into groups of four.

You will need the following tools and materials:

1. Cooking tools (frying pan, pot, microwave or grill – based on the method chosen)
2. Basic ingredients (eggs, vegetables, oil, meat)
3. Observation sheet or notebook for recording changes

Work in groups, each group will work with different food items (e.g., an egg, a piece of meat, or a vegetable).

In your group, choose one cooking method:

1. Frying (Conduction)
2. Boiling or Baking (Convection)
3. Grilling or Microwaving (Radiation)

Cook your food item using the method you chose and observe carefully what happens to the food. Answer these questions in your group and make a note of the answers for a class discussion:

- What changes did you see in the food (colour, texture, smell, moisture)?
- Which nutrient was affected most (protein, vitamins, or fat)?
- What challenges did you face using that cooking method (uneven heat, sticking, dryness, etc.)?

Share your findings with peers, each group will explain:

- What they did.
- What they observed.
- The challenges of the cooking method used.
- Any nutrient changes you saw (e.g., “kontomire’ turned olive green, that means vitamin C likely leached out.

REVIEW QUESTIONS 3

1. Choose **one** of the following methods of heat transfer and describe how yam, meat or pasta can be cooked using that method: Conduction, Convection or Radiation.
2. How do conduction and convection work together when cooking pasta in boiling water?
3. Describe how radiation heats food during grilling.
4. Explain how the following **two** heat transfer methods can affect the nutritional value of foods: Convection and Radiation.
5. Discuss how convection-based methods can improve cooking efficiency and the texture of food.
6. Discuss **three** reasons why it is important to use sustainable methods of cooking and processing.
7. Analyse how **one** cooking method affects the nutrient content of vegetables.
8. State **two** common challenges when using each of the following heat transfer methods: Conduction, Convection and Radiation?
9. Explain **two** ways in which the physical and chemical changes caused by heat during cooking affect the quality and nutritional value of food?

SECTION

4

FOOD ADDITIVES AND FLOUR COOKERY

FOOD PRODUCTION

Food Processing Techniques

INTRODUCTION

This section covers the following areas: food additives, condiments, preparation of food additives and condiments, natural food colours from natural food sources, types of flour used in flour cookery, and basic ingredients used in flour cookery.

The section will also include experiments with flour products and the enrichment and fortification of flour products.

KEY IDEAS

- The differences between food additives and condiments
- Natural food colours are pigments derived from natural sources such as plants, fruits, vegetables, and minerals.
- The types of flour used in flour cookery ranges from a variety of wheat flours to other types of flours such as cassava, rice, corn and beans.
- Flour products may include breads, cakes, pancake and "koose".
- Enrichment of flour products involves the use of substances to enhance the flavour, texture or appearance of food. Some of the enriching methods include fortification, bio-fortification, and use of natural ingredients.

FOOD ADDITIVES AND CONDIMENTS

The Concept of Food Additives in Food Processing

Food additives are substances added to food during processing, packaging or storage to improve food safety, freshness, taste, texture, appearance or nutritional value.

These substances can be natural or synthetic and are often used in small quantities.

Table 4.1: Types of Food Additives

Food Additives	Functions	Examples
Preservatives	Extend shelf life by preventing spoilage from microorganisms.	Sodium benzoate, nitrates.
Colourants	Enhance or restore colour of food.	Caramel colour and artificial colours.
Flavour enhancers	Boost the flavour of foods.	Monosodium glutamate (MSG).

Emulsifiers	Help mix ingredients that typically do not combine well, like oil and water.	Lecithin.
Sweeteners	Provide sweetness with or without added calories.	Sugar and aspartame.
Nutritional additives	Fortify foods with essential nutrients.	Vitamins and minerals.

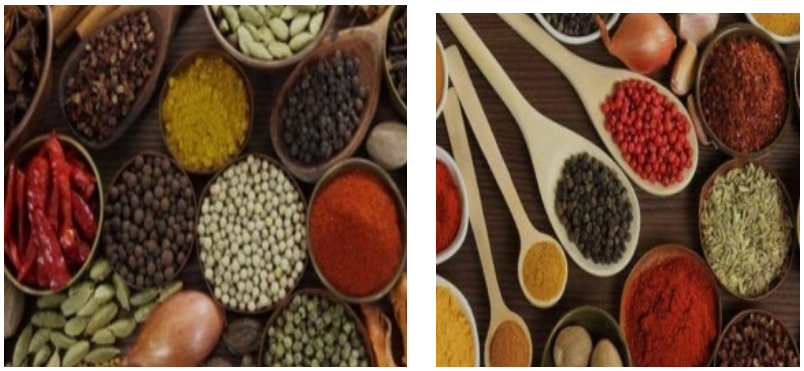


Figure 4.1: Food additives

The Concept of Condiments in Food Processing

Condiments are substances used to enhance the flavour, texture or appearance of food. They are often added at the table or during cooking. Condiments are typically consumed as part of the food and can be used in larger quantities.

Spices and herbs

Dried or fresh plant parts used to season food.
For example, black mint, bay leaves, black pepper, cloves, parsley and cinnamon.

Sauces and pastes

Liquid or semi-liquid flavour enhancers.
For example, soy sauce, ketchup, mayonnaise and mustard.

Fermented condiments

Foods that have undergone fermentation, adding a distinct flavour.

For example: vinegar. pickles and kimchi.

Figure 4.2: Types of condiment

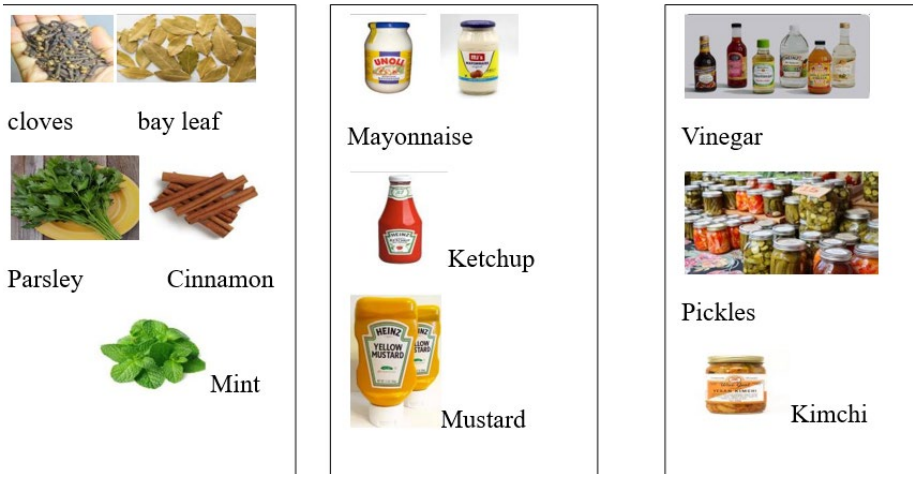


Figure 4.3: Herbs and spices/Sauces and pastes/Fermented products (Condiments)

Difference between Food Additives and Condiments

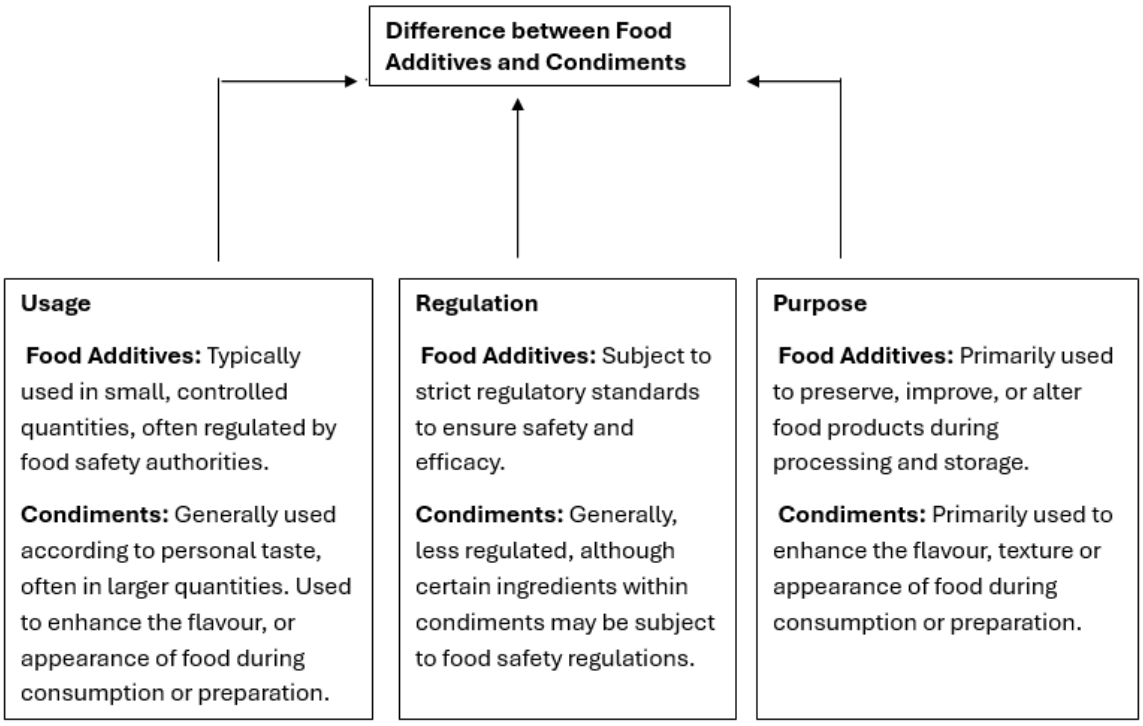


Figure 4.4: Difference between food additives and condiments

Importance of food additives and condiments in food production

1. **Food Additives**

Table 4.2: Importance of food additives

Importance	Application
Enhancing food safety and shelf life	• **Preservatives:** They help to prevent spoilage of food by inhibiting the growth of bacteria, moulds, and yeast. This helps to extend the shelf life of food products and reduce the risk of food-borne illnesses. • **Antioxidants:** These prevent the oxidation of fats and oils, which can lead to rancidity.
Improving sensory qualities	• **Colorants:** Natural and artificial colorants enhance the visual appeal of food, making it more attractive and appetising. • **Flavour enhancers:** Additives intensify the existing flavours of food without altering the nutritional content. This can enhance the eating experience, particularly in savoury dishes.

Nutritional Enhancement	• **Fortification:** Food additives are used to fortify foods with essential nutrients, such as vitamins and minerals. This helps to address nutritional deficiencies. For example, folic acid is added to cereals and flour, and vitamin A added to margarine.
Functional and Textural Benefits	• **Emulsifiers and stabilisers:** Food additives help maintain the desired texture and consistency of foods, such as in dairy products, sauces and salad dressings. They prevent separation of ingredients, ensuring a uniform product, for example, mayonnaise. • **Thickeners and gelling agents:** Used in foods like soups, sauces, and desserts to provide the desired thickness or gel-like texture. It improves the mouth feel and stability of the product. For example, corn flour.

2. Condiments

Table 4.3: Importance of condiments

Importance	Application
Flavour enhancement	• **Taste and aromatic qualities:** Condiments such as spices, herbs, sauces and pastes enhance the flavour, aroma and overall sensory experience of foods. They allow for creativity and personalisation in cooking, catering to diverse tastes and preferences. • **Cultural significance:** Many condiments are deeply rooted in cultural and culinary traditions, offering unique flavours and experiences that reflect regional cuisines.
Nutritional contributions	• **Micronutrient content**: spices and herbs are rich in vitamins, minerals, and antioxidants. For example, turmeric and cumin have anti-inflammatory properties, while garlic is known for its potential cardiovascular benefits. • **Health benefits:** condiments have various health benefits, including improved digestion, enhanced metabolism and anti-inflammatory effects. For example: vinegar, ginger and hot peppers
Versatility and convenience	• **Cooking and preparation:** Condiments enhance the flavour of dishes, making meal preparation more efficient. They can transform simple ingredients into flavourful and satisfying meals. • **Preservation and storage**: Many condiments can be used to preserve foods. For instance, in pickles

NOTE: It is important to consider factors such as dietary balance, moderation and the potential health impacts of certain additives and condiments, particularly those high in sodium, sugar or artificial ingredients.

Activity 4.1 Investigating Food Additives and Condiments

Organise yourselves into groups of four

1. You will need the following materials to help you work through the activities below: Research materials e.g. Internet, books, chart paper, markers.
   a. Research food additives and condiments.
   b. Search the internet, school library, ask your parents, community members and other sources, for information on added to meals to improve taste.
   c. Write down what you found out.
2. Use of food additives and condiments
   - Use, pictures, videos, realia to observe the use of additives and condiments in food preparation to improve flavour, colour, texture, or shelf life.
3. Write down what you found out
   - Distinguish between food additive and condiments.
4. In your groups discuss the differences between additives and condiments. Consider the following in relation to their importance.
   a. Usage
   b. Regulation
   c. Purpose
5. Write down what you found out. You can use the table below to distinguish between food additives and food condiments by listing examples of each, their usage and their purpose.

SN	ADDITIVES	CONDIMENTS	USAGE

6. Share your findings on the differences between food additives and condiments in a whole class discussion

EXPERIMENT ON NATURAL COLOURS FROM NATURAL FOOD SOURCES

Have you observed that there is a move towards the use of natural food colours in food preparation and cooking? This is because consumers are demanding healthy options. In this section we will identify the concept of natural food colours and examine their sources.

Natural Colours from Natural Food Sources

Natural food colours have contributed to enhancing the appearance of food and thereby making it attractive to eat. They come from sources such as plants, fruits, vegetables, and minerals.

These are considered safe, edible sources found in nature. On the other hand, synthetic food colours are created using chemicals.

Table 4.4: Sources of natural food colours

Sources	Examples
Fruits and vegetables	Many fruits and vegetables have pigments for natural food colours. For example: beetroot give a deep red colour, carrots provide a bright orange colour, and spinach offers green colour.
Spices and herbs	Spices such as turmeric and saffron are excellent sources of orange and yellow colours. Paprika can add a rich red colour to foods.
Flowers	Some flowers like hibiscus can provide a deep red or pink colour, while butterfly pea flowers offer a striking blue colour.
Minerals	Certain minerals can also be used as natural food colours. For example: calcium carbonate can create a white colour and iron oxide can provide a red or brown hue.

Figure 4.5: Examples of natural food colours

Butterfly **Hibiscus** **Paprika**

Figure 4.6: Sources of natural food colours

Types of natural food colours and their sources

Table 4.5: Types of natural food colours

Type	Colour	Sources
Carotenoids: Lycopene	Red	Tomatoes, watermelon, beetroot, strawberries, paprika and hibiscus flowers.
Beta-carotene	Orange	Carrots, sweet potatoes, turmeric and pumpkins.
Lutein	Yellow	Saffron, turmeric, and marigold flowers.
Chrorophyll	Green	Spinach, matcha (green tea), and parsley.
Anthocyanins	Blue	Blueberries and butterfly pea flowers.
Betacyanins	Purple	Blackberries, purple sweet potatoes, and grapes.
Caramel	Brown	Cocoa, coffee and caramelised sugar.
Betaxanthins	Yellow-orange	Calcium carbonate.

Figure 4.7: Types of natural food colours

Importance of using natural food colours in food preparation

Table 4.6: Importance of using natural food colours in food preparation

Importance	Application
Health Benefits	Natural food colours are considered healthier alternatives to artificial colours.
Nutritional value	Many natural colorants come from healthy sources and add nutrition to food.
Eco-friendly	Natural food colours are better for the environment because they break down easily and are made with safer methods. Many come from healthy sources, adding nutrition to food.
Consumer demand	There is more demand for clean-label products, and natural colours help by making labels clearer.
Cultural and traditional significance	In many cultures, natural food colours have been used for centuries in traditional dishes and beverages, adding visual appeal and cultural value.

Methods of extracting natural food colours

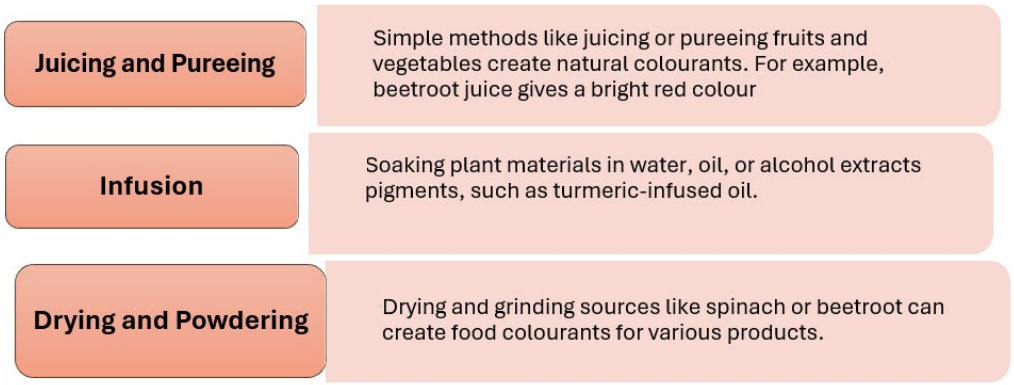


Figure 4.8: Methods of extracting natural food colours

Practical application of food colours in meal preparation

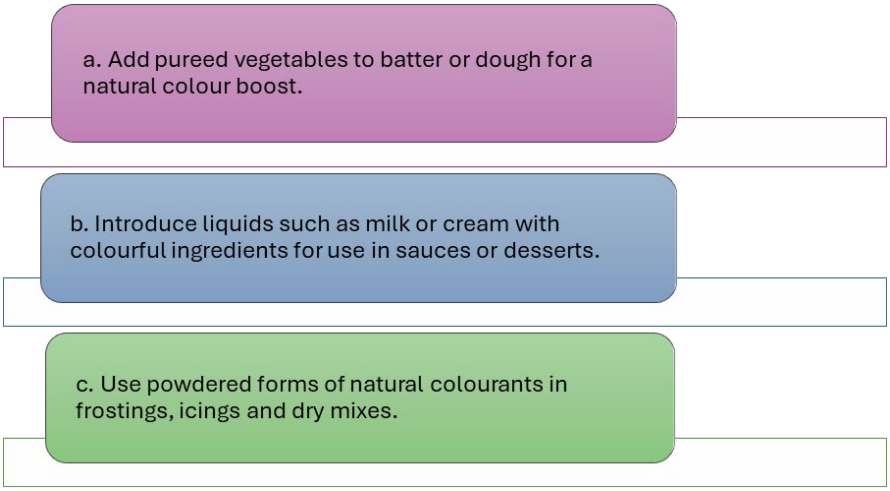


Figure 4.9: Application of food colours in meal preparation

Activity 4.2 Exploring Natural Colours from Foods

Organise yourselves into small groups of 3 members

1. For this activity you will carry out research at your local market
2. Visit your local market and talk to three market sellers of food colours.

Ask questions about natural colours:

- What plant gives this colour?
- Which part do you use? (roots, leaves, seeds?)
- What food do people use it in?

- How much does it cost?
- Take pictures of the colour sources (if they allow).

3. Using the research that you have conducted, write a report about food colours. You should include the information that you have learned from the market. You may also include pictures, photographs, PowerPoint or any information/research from the internet or any other source that demonstrates how to make colours from plants.
4. In your group, prepare to carry out experiments on natural food colours.

Experiment 1

Choose natural plants like:

- Beetroot (red)
- Turmeric (yellow)
- Kontomire (green)
- Hibiscus (purple)

5. Complete the following steps and observe the results
   a. Boil in water to bring out the colour.
   b. Add teaspoon vinegar to see what happens.
   c. Add teaspoon baking soda and observe the change.
6. Observe the following changes and write down what you noticed
   a. How strong the colour is
   b. If it changes over time
   c. If it affects the taste

Experiment 2

You will need these plants and materials:

1. Fresh tomatoes
2. Beetroot
3. Kontomire
4. Blender or juice maker
5. Strainer
6. Small bowls
7. Spoons and mixing bowls

1. Blend each food item separately with eight tablespoons of water.
2. Strain the mixture to obtain a smooth-coloured liquid. Make notes of this process and share your observations for a whole class discussion.
   - How you made the colours.
   - What surprised you.

- What you would do differently next time.

PREPARE FOOD ADDITIVES AND CONDIMENTS (1)

You will remember the differences between food additives and condiments. For this session you will produce or prepare some food additives and condiments.

Picture of Colour Obtained from Food Source

Figure 4.10: Picture of colour obtained from Food source

Produce or Prepare Food Additives And Condiments

Producing or preparing food additives and condiments from local food sources and labelling them.

Producing homemade ketchup

Ingredients

- 2 cups tomato paste
- 1/2 cup apple cider vinegar
- 1/4 cup honey or sugar
- 1 teaspoon salt
- 1 teaspoon onion powder
- 1/2 teaspoon garlic powder
- 1/4 teaspoon allspice
- 1/4 cup water

Procedure

1. Combine ingredients: In a medium saucepan, combine all the ingredients.
2. Simmer: Bring the mixture to a simmer over medium heat, stirring frequently.
3. Reduce heat: Reduce the heat to low and let it simmer for about 20 minutes, stirring occasionally until it thickens to the desired consistency.
4. Cool: Allow the ketchup to cool, then transfer it to a storage container.
5. Store**:** Store in the refrigerator.

Producing a simple food preservative (Lemon juice preservative)

Ingredients/Materials

- Lemons
- Water
- Squeezer
- Container

Procedure

1. Preparation: Wash the lemons thoroughly.
2. Juicing: Cut the lemons in half. Use a squeezer to extract the juice from the lemons.
3. Dilution (optional): For some applications, you might want to dilute the lemon juice with water.
4. Storage: Store the lemon juice in a clean, airtight container and refrigerate.
5. Usage: Use the lemon juice as a natural preservative in salads, fruits, and other food items to prevent browning and spoilage.

Making natural flavour enhancers (Herb and spice blends)

Ingredients/Materials

- Dried herbs (example, basil, oregano, thyme, rosemary)
- Spices (for example, cinnamon, nutmeg, black pepper, cumin)
- Mortar and pestle or spice grinder
- Small containers or jars
- Labels

Procedure

1. Select herbs and spices: Choose a combination of dried herbs and spices that complement each other. Common blends include Italian seasoning, curry powder, and pumpkin spice.
2. Grind the ingredients: If using whole spices, grind them in a mortar and pestle or spice grinder until they become a fine powder.
3. Mix the blends: Combine the ground spices and dried herbs in a bowl. Mix thoroughly to ensure an even distribution of flavours.
4. Store the blends: Transfer the spice blend into small containers or jars. Label the containers with the name of the blend and the date. Store in a cool, dry place for up to six months.

Creating natural preservatives (Pickling vegetables)

Ingredients/Materials

- Fresh vegetables (for example, cucumbers, carrots, bell peppers)
- Knife and cutting board
- Vinegar (white or apple cider)

- Water
- Salt
- Sugar (optional)
- Pickling spices (for example mustard seeds, dill, garlic)
- Glass jars with lids

Procedure

1. Prepare the vegetables: Wash and slice the vegetables into desired shapes (e.g., spears, slices).
2. Prepare the pickling solution: In a pot, combine equal parts vinegar and water. Add salt and sugar to taste (optional). Bring the mixture to a boil, then remove from heat.
3. Pack the jars: Place the sliced vegetables into glass jars. Add pickling spices to each jar.
4. Add the pickling solution: Pour the hot pickling solution over the vegetables, leaving some space at the top. Seal the jars with lids.
5. Store the pickles: Let the jars cool to room temperature. Store in the refrigerator for at least one week before consuming to allow flavours to develop. Pickles can be stored in the refrigerator for up to several months.

Figure 4.11: Safety tips when preparing food additives and condiments

Activity 4.3: Making and Packaging Food Additives

In this activity you will prepare and package natural additives and condiments.

Organise yourselves into small groups of 3.

Prepare and package the additives

Gather equipment required

- Blender or grinding stone
- Clean bowls and trays
- Labels and markers
- Containers with tight lids
- Spoons and sieves

- Information on preparing additives from the lesson notes

Gather local food items. Examples:

- Ginger
- Pepper
- Dawadawa
- Maize

Wash, dry, grind, and sieve the food item separately.

Package your product using clean containers or small sachets. Add a label to the package containing the following information

- Name of the product
- Ingredients used
- How to use it in food

Display your product alongside those of other groups from your class

1. Make notes of the information relating to your product and be prepared to share them with your classmates. You can use the following notes as a guide about the type of information to be included;
   a. Food source you used to make the product from.
   b. How it can be used in cooking.
   c. What meals will it enhance.
   d. What you like about the packaging.

   Ask others what they think about your product and make a note of their comments
2. In your group discuss the feedback from the class

   As a group decide what you can improve
   a. Packaging?
   b. Taste?
   c. Label design?

Make note of three things that your group will improve next time.

PREPARE FOOD ADDITIVES AND CONDIMENTS (2)

Figure 4.12: Picture of packed and labelled Additives

Making Natural Food Additives for Everyday Use

Additives from natural food sources can be used in cooking to add flavour, colour, sweetness and even improve how food looks and feels.

This a practical session where you will make condiments in powder form from local ingredients, package them and label them for storage and later use.

Activity 4.4 Making and packaging Condiments

Organise yourselves into small groups of 3.

Prepare and package the condiments

Gather equipment required

- Blender or grinding stone
- Clean bowls and trays
- Labels and markers
- Containers with tight lids
- Spoons and sieves
- Information on condiments from the previous lesson notes

Choose one local food (like pepper, ginger, turkey berries, or prekese) to turn into a condiment.

Wash, dry, grind, and sieve the food item.

Package your product using clean containers or small sachets. Add a label to the package containing the following information.

- Name of the product
- Ingredients used
- How to use it in food

Display your product alongside those of other groups from your class

1. Make notes of the information relating to your product and be prepared to share them with your classmates. You can use the following notes as a guide about the type of information to be included.
   - Food source you used to make the product from.
   - How it can be used in cooking.
   - What meals will it enhance
   - What you like about the packaging.

   Ask others what they think about your product and make a note of their comments
2. In your group discuss the feedback from the class

As a group decide what you can improve

- Packaging?
- Taste?
- Label design?

Make note of three things that your group will improve next time.

SCIENTIFIC PRINCIPLES UNDERLYING FLOUR COOKERY

Flour cookery is another interesting lesson in this section. It is very versatile and used in many everyday food products.

Types of flour used in flour cookery

Table 4.7: Types of flour used in flour cookery

Type	Description	Characteristics	Uses
Wheat flour • All-purpose flour • Bread flour/ hard or strong flour • Cake flour/ soft flour	It is a powder made from grinding wheat grains, used as a primary ingredient in baking, cooking, and food production.	It is unique among all the flour because of the gluten content. Versatile and suitable for most recipes. Higher protein content for yeast breads and chewy texture. Low protein content for tender cakes and delicate in texture.	Bread, cakes, pastries, pasta and general baking. Cakes and scones. Spring rolls and bread Cakes and biscuits
Cassava flour	It is made from the root of the cassava plant, (Manihot esculenta) also known as tapioca flour. It is gluten-free and has a neutral flavour.	Light texture, absorbs more liquid than wheat flour, and can be used in a 1:1 ratio as a substitute for wheat flour in some recipes.	Gluten-free baking, thickening soups and sauces, and making traditional dishes like Brazilian cheese bread.
Corn flour	It is also known as corn meal or maize flour. Made by grinding whole corn kernels into a fine powder. **Note:** Do not be confused with cornstarch, which is made from the starchy part of the corn kernel.	Yellow corn flour: Made from yellow corn, commonly used in baking. White corn flour: Made from white corn, often used in tortillas (Tortillas are thin, round flatbreads made from corn or wheat flour) and tamales (made by filling a dough (called *masa*) made from corn flour, adding meat, beans, or vegetables, and wrapping it in a corn husk or banana leaf. It is then steamed until cooked.).	Gluten-free baking, Cornbread, tortillas, tamales, and as a thickening agent in soups and sauces and "Bamfobese"

Rice flour	Made from finely ground white and brown rice.	White rice flour: Made from white rice, has a fine texture soft and fluffy, Light and airy and neutral flavour. Brown rice flour**:** Made from whole grain brown rice, has a firmer texture, more dense, heavy and more nutrients.	Gluten-free baking, rice noodles, as a thickening agent in soups and sauces, and in Asian cuisine.
Bean flour	Made from dried and ground beans, such as Garbanzo (chickpeas), lentils, or black beans. Bean flour is high in protein and fibre.	Chickpea flour (Gram flour): Made from chickpeas, commonly used in Indian and Middle Eastern cuisine. Black bean flour: Made from ground black beans.	Gluten-free baking, thickening soups and stews, savoury dishes, making tortillas, Vegan and vegetarian recipes and as a protein boost in various recipes. For example, "Koose" and "tubani"
Composite flour	Made from mixing wheat flour and other flours. For example, wheat flour and rice flour.	It is made from a mixture of wheat flour and other flours.	Bread, cakes, pastries, pasta and general baking.

Types of wheat flour

Figure 4.13: Hard flour Figure 4.14: Soft flour Figure 4.15: All-purpose flour

Figure 4.16: Types of cassava flour

Figure 4.17: Examples of corn flour

Figure 4.18: Examples of rice flours

Figure 4.19: Examples of bean flour

Figure 4.20: Composite flours

Activity 4.5 Exploring the World of Flour

Organise yourselves into groups of four

Classification of different types of flour

1. Watch videos, pictures, visit the market and observe real samples of different flours (wheat, cassava, corn, rice, beans). From your research make a note of what each flour is made from and their uses.
2. Classify the flours according to their sources. Complete the classification table using:
   a. Roots
   b. Grains/Cereals
   c. Legumes

Flour Type	Source Category	Where it comes from
Wheat flour	Grains/Cereals	Wheat grains
Cassava flour		
Corn flour		
Rice flour		
Bean flour		

1. Visit a bakery/ observe a demonstration from experts of how they prepare flour products. Whilst carrying out this activity ask them the following questions and make a note of the answers.
   a. What flour is being used? (feel the flour texture)
   b. What product is it being used for?
   c. How does the flour product stretch?
   d. How does the stretch affect the texture and the baked product?

Experiment on different types of flour

Get two types of flour:

   a. Strong flour
   b. Soft flour

2. In your group carry out the following experiment and observe the effects of the water on the quality of the flour product (gluten formation and gelatinisation)
   a. Mix 3 tablespoons strong flour + 1 tablespoon water (Do the same thing with the soft flour)
   b. Knead for 2 minutes
   c. Make one ball from each flour type
   d. Stretch each dough ball gently
   e. Observe which stretches more without breaking
   f. Record your findings in the table below

Complete the experiment table below

Flour Type	Texture	Dough Feels	Stretches	Good for
Strong flour				
Soft flour				

3. In your group, discuss
   a. Why strong flour stretches more?
   b. How gluten affects bread texture?
   c. Which flour would make the best bread and why?

Match each flour type with its best use:

4. Make a note of the correct answer by writing the corresponding alphabet in the table

Wheat Flour Type	What makes it special?	Best used for:
Soft flour	Low protein, fine texture	A. Bread making
Hard/Strong flour	High protein, strong gluten	B. Cakes, cookies
All-purpose flour	Medium protein, versatile	C. Any baking
Self-rising flour	Has baking powder added	D. Quick breads
Composite flour	Mix of different flours	E. Special recipes

BASIC INGREDIENTS USED IN FLOUR COOKERY

Basic Ingredients Used in Flour Cookery and Products

Flour cookery involves various techniques and processes to transform flour into a wide range of delicious and versatile products like bread, cakes, pastries, cereals, pasta, and more.

Flour, water or milk, fat, sugar, salt, and leavening agents are the basic ingredients used in flour cookery.

Examples of these ingredients and their function when combined with flour are provided below:

Table 4.8: Basic ingredients used in flour cookery

S/N	Basic ingredients	Types	Functions
a.	Flour	White whole wheat, All-purpose, bread/hard/ strong, cake/soft, pastry, whole wheat, and gluten-free flours and non-wheat flours.	It provides structure, leavening, browning, moisture retention and body to the product.
b.	Leavening agents	Chemical: Baking powder, baking soda, Ammonium bicarbonate. Biological: Yeast Mechanical: Whipping, beating and steaming.	It causes dough or batter to increase in volume, making them more tender and softer, creating a light and airy texture.
c.	Liquids	Water, milk, yogurt, buttermilk, cream, fruit juices and fat-based liquids (oil).	It helps develop gluten structure. It hydrates flour to form gluten. It helps bind ingredients together. Steam from liquid contributes to rising. It influences crumb structure, texture and adds flavour.
d.	Fats	Shortening: Butter, margarine, lard, oil, and palm oil.	It makes the product tender and adds flavour. It helps in structural formation and helps in aeration. It helps in It contributes to browning and retain moisture in the product.
e.	Sweeteners:	Granulated sugar, brown sugar, honey, molasses, syrups, fruit juices and purees, and confectioner's sugar.	It sweetens the product, balances flavour and feeds yeast. It helps in crust formation, contribute to browning and moisture retention.
f.	Egg	Chicken egg, duck egg, quail eggs, turkey egg, goose egg, guinea fowl egg and more.	It provides multiple functions and adding richness, moisture, and structure. It acts as a leavening agent and emulsifier to baked products.

g.	Salt	Coarse salt (Kosher), crystal salt and powdered salt.	It enhances flavour, balances sweetness, and regulates yeast growth. It helps in browning and strengthening gluten structure.
h.	Flavourings and additives	Vanilla, pineapple, orange, banana, strawberry extracts, spices, nuts, chocolate, and fruits.	It adds flavour and variety to the product.

Activity 4.6 Essential Ingredients in Flour Cookery

Organise yourselves into groups of four

1. Carry out research, the internet, library, visit a bakery, or any other source such as pictures (see below) to find out about other basic ingredients used in flour cookery and what they do. Take short notes so that you can complete the table below

2. Using your notes, discuss with other group members what each ingredient used in flour products does and complete the table.

SN	Ingredient	What it does
1.	Flour	
2.	Liquids	
3.	Fat	
4.	Sugar	
5.	Eggs	
6.	Raising agents	

3. Present your table to the class. Listen to other groups and add any new information to your notes.

PRODUCTS MADE FROM FLOUR

Flour is used in many everyday recipes. As you have seen there are many different types of flour which all have different purposes. You can experiment with these recipes at home and try them out on your friends and family.

Bread Rolls

Ingredients

- Flour (strong/hard) – 300g
- Yeast -1/2 tsp
- Salt -1 tsp
- Sugar -25g
- Fat -25g
- Water -1/4 pint
- Egg – 1 (Optional)

Instructions

- Sift flour and salt in a bowl.
- Rub in fat.
- Add sugar, yeast and liquid.
- Mix into a stiff dough and knead till smooth and elastic.
- Cut into even sizes and mould into round shapes.
- Place on slightly greased sheets and proof.
- Bake in the centre of the oven at 400°C for 20 to 30 minutes.
- Serve with beverages and soups

Figure 4.21: Bread rolls

Basic Creamed Cake Recipe

Ingredients

- Flour- 100g
- Margarine – 100g

- Sugar – 100g
- Baking powder 1/4tsp
- Vanilla essence – 1tsp
- Eggs – 2

Instructions

- Grease cake tin.
- Sift flour and baking powder.
- Cream fat and sugar until light and fluffy.
- Beat eggs well and add bit by bit to creamed mixture, creaming well between additions.
- Add the essence.
- Add flour and baking powder to the creamed mixture.
- Fold flour into the creamed mixture. Do not over mix.
- Spoon into the cake tin and bake at the top of the oven at 180^0C.
- Cool on racks when cooked.
- Serve with ice cream and beverages.

Figure 4.22: Examples of cream cakes

Pancake Recipe

Ingredients

- Flour- 100g
- Egg -1
- Milk- 1/2pint
- Fat and oil for frying – 10g
- Sugar – 50g
- Salt – pinch

Instructions

- Sieve flour and salt into a bowl.
- Make a well in the centre of the flour.
- Add the egg and the milk, mixing gradually from the centre until a smooth paste is obtained.
- Allow mixture to rest for about five minutes.
- Proof the frying pan (aluminum) by rubbing table salt in it over a heat source for few minutes, then clean the inside with a dry kitchen cloth.

- Pour a little oil into the frying pan and heat.
- Pour enough of the mixture into the frying pan to create a thin layer covering the bottom.
- Cook until golden brown and turn it over to cook the other side,
- Fold as desired.
- Fill the pancake with jam or fruit as desired.
- Serve with beverage.

Figure 4.23: Pancake

'Koose' Recipe

Ingredients

- Bean flour – 200g
- Onion (ground) - 50g
- Oil - ½ litre
- Pepper- tsp full
- Salt- pinch

Instructions

- Pour bean flour into a bowl.
- Add pepper, salt and onion.
- Beat the mixture until it becomes light and foamy (a drop of the mixture in water should float).
- Heat the oil until it becomes hot.
- Drop a few spoonful of the mixture into the oil. A good mixture should float on the oil.
- Deep fry until golden brown.
- Serve with porridge or a beverage.

Figure 4.24: "Koose"

Basic Recipe for Biscuits

Short Bread Biscuits

Ingredients

- Flour - 150g
- Salt – pinch
- Margarine - 100g
- Sugar – 100g

Instructions

- Sift flour and salt.
- Rub margarine into flour.
- Combine all ingredients into a smooth paste and knead.
- Roll carefully on a floured table to a desired shape.
- Place on a lightly greased baking sheet; prick with a fork and mark into desired shapes.
- Bake at 180- 200°C for 15- 20 minutes.
- Serve with beverages.

Figure 4.25: Shortbread biscuits

Koko Recipe

Ingredient

- Roasted corn flour – 100g
- Water – ½ litre
- Salt – pinch
- Sugar, milk, or spices to taste (optional)

Instructions

- Put roasted corn flour in a saucepan.
- Add water and salt and stir well.
- Cook over medium heat, stirring constantly.
- Reduce heat.
- Simmer for 10-15 minutes until it thickens.
- Stir in sugar, milk or spices to taste (optional).
- Serve hot with bread or "koose".

Jam Tartlets Recipe

Ingredients

- Margarine - 85g
- Flour - 150g
- Jam - 50g
- Water - 3tbs

Instructions

- Preheat the oven to 200°C.
- Rub together the margarine with the flour in a bowl until it resembles breadcrumbs.
- Stir in a few tablespoons of water to form a dough.
- Roll out on a lightly floured surface, use a pastry cutter to cut out circular shapes.
- Put each pastry case into an individual cupcake tray. Add a teaspoon of jam to each case. Cut pieces of dough and cover the jam to act as a lid.
- Bake tarts for 30mins or until the pastry has gone pale brown.
- Serve with beverages.

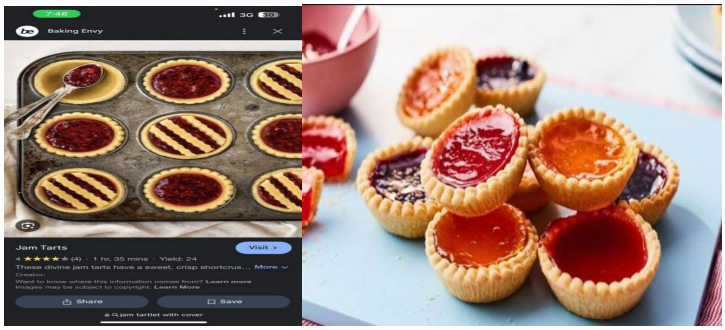


Figure 4.26: Jam tartlets

Basic Recipes in Flour Cookery

Flour is a major ingredient in preparing many dishes in Ghana and the world at large. The following recipes will guide you to explore different ways of using flour within your community.

Homemade bread ingredients:

- 3 1/2 cups bread flour
- 1 1/2 teaspoons sugar
- 2 teaspoons active dry yeast
- 1 teaspoon salt
- 1/4 cup warm water
- 2 tablespoons olive oil

Instructions

- Sieve flour into a large bowl.
- Combine flour, salt, and sugar in a large bowl.
- Dissolve yeast in warm water and let it sit for about 5 minutes, until it becomes frothy.

- Add the yeast mixture and olive oil to the flour mixture.
- Mix until a dough forms, then knead on a floured surface for about few minutes, until smooth and elastic.
- Place the dough in a greased bowl, cover with a damp cloth, and let it rise in a warm place for 1-2 hours, until it doubles in size.
- Preheat the oven to 375°F (190°C).
- Punch down the dough, shape it into a loaf, and place it in a greased loaf pan.
- Let it rise for another 30 minutes.
- Bake for 30-35 minutes, until golden brown and the bread sounds hollow when tapped.
- Cool before slicing.

Brazilian Cheese Bread

Ingredients

- 1 cup cassava flour
- 1/2 cup milk
- 1/4 cup water
- 1/4 cup olive oil
- 1/2 teaspoon salt
- 1/4 cups grated Parmesan cheese
- 1 beaten egg

Instructions

- Preheat the oven to 375°F (190°C).
- In a saucepan, combine milk, water, olive oil, and salt. Bring to a boil.
- Remove from heat and add the cassava flour, stirring until smooth.
- Let the mixture cool slightly, then stir in the Parmesan cheese and eggs until well combined.
- Scoop the batter into a greased mini muffin tin.
- Bake for 15-20 minutes, until golden brown.
- Serve warm.

Figure 4.27: Brazilian cheese bread

Cornbread

Ingredients

- 1 cup corn flour
- 1 cup all-purpose flour

- 1/4 cup sugar
- 1 tablespoon baking powder
- 1/2 teaspoon salt
- 1 cup milk
- 2 eggs
- 1/4 cup melted butter

Instructions

- Preheat the oven to 400°F (200°C).
- In a large bowl, mix corn flour, all-purpose flour, sugar, baking powder, and salt.
- In another bowl, whisk together milk, eggs, and melted butter.
- Pour the wet ingredients into the dry ingredients and mix until just combined.
- Pour the batter into a greased 9-inch baking dish.
- Bake for 20-25 minutes, until a toothpick inserted into the center comes out clean.
- Let it cool slightly before serving.

Figure 4.28: Cornbread

Gluten-free Pancakes

Ingredients

- 1 cup rice flour
- 1 tablespoon sugar
- 1 tablespoon baking powder
- 1/2 teaspoon salt
- 1 cup milk
- 1 egg
- 2 tablespoons melted butter

Instructions

- In a large bowl, combine rice flour, sugar, baking powder, and salt.
- In another bowl, whisk together milk, egg, and melted butter.
- Pour the wet ingredients into the dry ingredients and mix until just combined.
- Heat a lightly greased skillet over medium heat.
- Pour 1/4 cup of batter onto the skillet for each pancake.

- Cook until bubbles form on the surface, then flip and cook until golden brown.
- Serve with syrup or your favourite toppings.

Figure 4.29: Gluten-free pancakes

Cowpea Flour Cake

Ingredients

- 1 cup chickpea flour
- 1/2 teaspoon salt
- 1/2 teaspoon cumin
- 1/2 teaspoon turmeric
- 1/2 cup water
- 1 small onion, finely chopped
- 1 small carrot, grated
- 1/4 cup chopped cilantro
- Oil for frying

Instructions

- In a bowl, combine cowpea flour, salt, cumin, and turmeric.
- Gradually add water, whisking until smooth.
- Stir in the onion, carrot and green pepper.
- Heat oil in a skillet over medium heat.
- Drop spoonful of the batter into the hot oil, flattening slightly.
- Fry until golden brown on both sides, about 2-3 minutes per side.
- Drain on paper towels and serve warm with porridge.

Note: The mixture for cowpea flour cake can also be baked.

Figure 4.30: Fried cowpea flour cake

Figure 4.31: Baked cowpea flour cake

Activity 4.7 Exploring Leavening Agents

Experiment on the role of leavening agents

Organise yourselves into small groups of 3 or 4.

1. In your group, visit a bakery, observe a demonstration by a resource person or watch a video on how basic ingredients like flour, fat, sugar, and leavening agents are mixed to make baked products. As you watch, write down how each ingredient is added and what it does in the mixture.
2. Choose three leavening agents:
   - Yeast
   - Baking powder
   - Baking soda
3. Label four small bowls (1, 2, 3, 4) and add the following ingredients to each bowl:
   - Bowl 1: 2 tablespoons flour + 1 teaspoon baking powder
   - Bowl 2: 2 tablespoons flour + 1 teaspoon baking soda
   - Bowl 3: 2 tablespoons flour + 1 teaspoon yeast
   - Bowl 4: 2 tablespoons flour = (control sample)
4. Mix each bowl separately with the same amount of water
5. Observe what happens immediately to each bowl
6. Record your first observations

Heat test

7. Place all three mixtures in a warm place
8. Watch for 10 minutes
9. Measure height changes using a ruler and record for each bowl
10. Observe the texture and record your notes
11. Complete the Experiment Table:

S/N	Mixture	What happened immediately?	After 10 minutes	Height change	Texture
1.	Flour + Baking powder				
2.	Flour + Baking soda				
3.	Flour+ Yeast				
4.	Flour only				

In your group discuss the following:

1. Which mixture rose the most?

2. Which stayed flat?
3. Why do we need leavening agents?
4. What would happen to bread without them?

Activity 4.8 Practical on basic ingredients in flour

Work in your groups. You will need these materials to complete the task ahead: Basic baking ingredients (flour, baking powder, baking soda yeast, milk etc), measuring tools, mixing bowls, cooking equipment, recipe books.

1. Select one flour product to make:
    a. Simple pancakes (uses baking powder)
    b. Basic bread rolls (uses yeast)
    c. Gingerbread (uses baking soda)
2. Prepare your ingredients according to the recipe:
    a. Read recipe together as a group
    b. List all ingredients needed.
    c. Assign roles to the group members: mixer, measurer, timer, cleaner
3. Follow your recipe step-by-step:

    Example - Simple Pancakes:

    a. Mix dry ingredients: 1 cup flour + 1 tsp baking powder + pinch salt
    b. Mix wet ingredients: 1 egg + ¾ cup milk + 1 tbsp oil
    c. Combine wet and dry – do not overmix
    d. Cook in a hot pan for 2-3 minutes each side
    e. Observe how the leavening agent makes pancakes fluffy

    During cooking, observe and note:

    a. How does the mixture change when heated?
    b. What role does your leavening agent play?
    c. What happens to texture and volume?

Test your products:

a. Taste for flavour.
b. Check texture - light or heavy?
c. Measure thickness/height.

Compare with products from other groups

Complete the table by underlining the assessment choice for your product

Our Product:	Assessment
Appearance	Good/Fair/Needs work
Texture	Light and Fluffy/Dense/Just right
Taste	Delicious/Good/Okay
Rise/Volume	Rose well/Little rise/No rise
What you learned Write two things you discovered in your experiment	…… …… …… ……

In your group, present your product and explain what you learned about leavening agents.

FLOUR PRODUCTS AND WAYS TO ENRICH/ FORTIFY THEM

The Concept of Food Enrichment and Fortification in Food Processes

Enriching or fortifying food involves adding essential nutrients to enhance its nutritional value.

Food enrichment: Involves adding back nutrients that are lost during processing, storage or transportation.

Food fortification: Involves adding one or more nutrients to a food product to prevent deficiency or disease.

The methods of food enrichment and fortification include:

Fortification with vitamins and minerals

Table 4.9: Fortification with vitamins and minerals

S/N	Vitamins/minerals	Importance
i.	Iron fortification	Iron is essential for healthy red blood cells. Adding iron to foods like flour, rice, and cereals will prevent anaemia. For example: iron can be added in the form of ferrous sulphate or ferric pyrophosphate.

ii.	Vitamin D fortification	It is added to dairy products like milk, yogurt, and plant - based milk alternatives as well as cereals and orange juices to help with bone health and immune function.
iii.	Iodine fortification	It is added to table salt and bread to prevent iodine deficiency and related thyroid issues.
iv.	Calcium fortification	It is crucial for bone health, adding calcium to products such as orange juice, cereals, and plant-based milk will support bone health.
v.	Folic acid fortification	It is added to foods like cereals, bread and pasta to help the development of the fetal during pregnancy.
vi.	Vitamin A	Important for vision, immune function, and skin health. It is fortified in foods like milk, margarine and cereals.
vii.	Vitamin C	It is fortified in foods like fruit juices and cereals, and it helps boost the immune system.

Biofortification: It involves using various techniques to enhance the nutritional content of crops. Biofortification includes genetic engineering and conventional breeding.

1. Genetic Engineering

> Introducing genes from other organisms to enhance nutrition and develop crop varieties. For example, biofortified cassava is genetically modified to produce vitamin A and iron.

2. Conventional breeding

> 1. **Selective breeding: Breading crops with desired traits. For example pearl millet enriched with iron.**
> 2. **Cross-breeding: Combing different crops varieties to enhance nutrition. For example, iron-rich beans or zinc-enriched wheat local varieties.**
> 3. **Mutation breeding: including genetic mutations to create new traits. For example, vitamin A enriched potatoes induced mutation increased beta- carotene content.**

Figure 4.32: Biofortification

Use of Natural Ingredients

Table 4.10: Use of natural ingredients

S/N	Natural ingredient	Uses
i.	Spirulina	It adds nutrients like protein to smoothies, energy bars, beverages, baked goods, and snacks.

ii.	Nutritional Yeast	Often used as a cheese substitute in vegan diets, it supports immune system function. It is rich in protein, fiber, B vitamins and mineral.
iii.	Flaxseeds and Chia Seeds	Added to bread, cereals, and smoothies to increase omega-3 fatty acids, fiber, antioxidant, protein content and support digestive health.

Figure 4.35: Flax seeds

Figure 4.36: Chia seeds

Fortification with probiotics and prebiotics: the aim is to promote gut health and overall well-being

i. Probiotics: Live microorganisms (bacteria and yeast) that enhance health benefits when added to yogurt, kefir, cereals and fermented foods to improve gut health, immune system and mental health.

ii. Prebiotics: Non-digestible fibres that serve as food for beneficial microoganisms (probiotics)in the gut, to promote a healthy gut microbiome. Added to foods like cereals, bars, and dairy products.

Figure 4.37: Fortification with probiotics and prebiotics

Protein fortification: A process of adding protein to food products to enhance their nutritional value.

Animal protein: Whey, casein, egg and collagen are added to beverages, snacks and meal replacements to increase protein content.

ii. Plant protein: Soy protein, pea protein, wheat protein and rice protein are added to various food products to enhance protein intake, especially in vegetarian and vegan diet.

Figure 4.38: Protein fortification

Enrichment with healthy fats

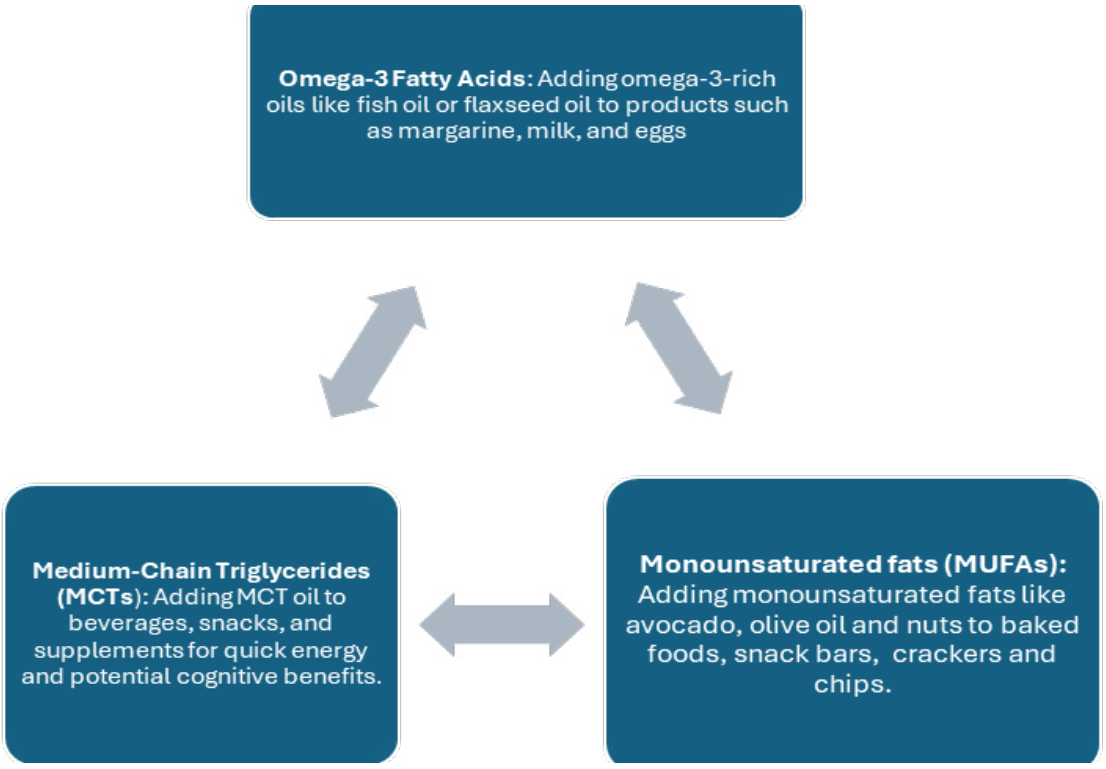


Figure 4.39: Enrichment with healthy fats

Fibre fortification: Fibre fortification is the process of adding dietary fiber to food products to enhance their nutritional value and to improve digestive health.

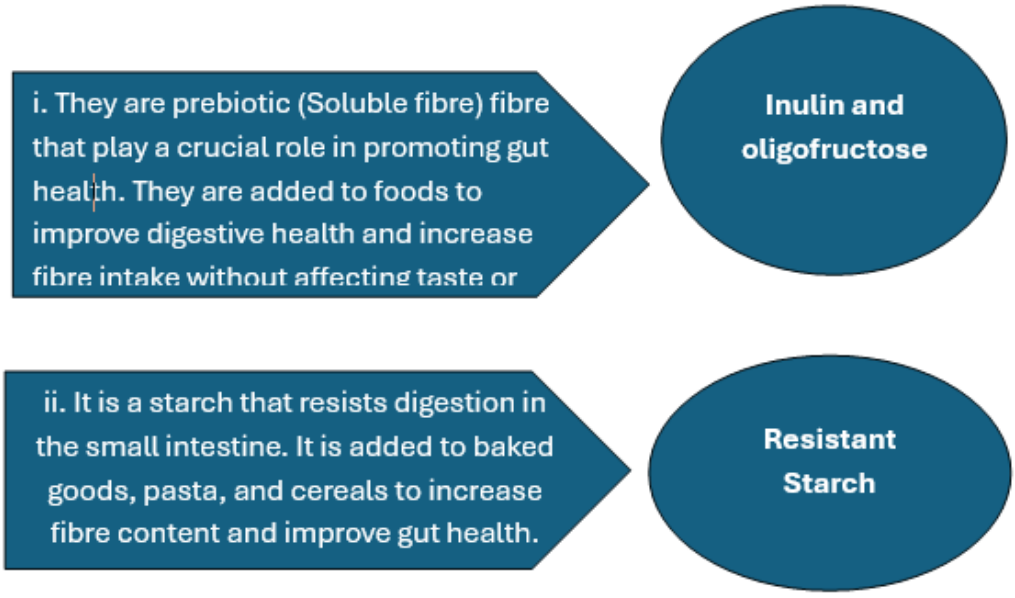


Figure 4.40: Fibre fortification

Enrichment with antioxidants: adding antioxidants to food products to enhance their nutritional value and provide health benefits.

Table 4.11: Enrichment with antioxidants

S/N	Antioxidant	Explanation
i.	Natural extracts	Adding extracts from fruits like grape seed, blueberries, pomegranates and acai berries to foods to increase their antioxidant content. Carrot, turmeric, ginger, black pepper, rice added to food to increase their antioxidant content.
ii.	Synthetic antioxidants	Enhancing the oxidative stability and shelf life of foods by incorporating man- made compounds that neutralise free radicals.

Key Differences between Food Enrichment and Fortification

Enrichment focuses on restoring lost nutrients, while fortification aims to add new nutrients to prevent deficiencies or enhance the food's nutritional profile.

Enrichment is often used when nutrients are lost during processing (refining grains), whereas fortification is used to address public health needs (preventing rickets with vitamin D).

Visual comparison

Table 4.12: Visual comparison of food enrichment and fortification

S/N	Aspect	Enrichment	Fortification
a.	Definition	Restoring lost nutrients during processing. Replenishing nutrients to original levels.	Adding nutrients that were originally not present or increasing existing ones.
b.	Purpose	Restore original nutrient levels, for example, enriched flour, with vitamin B1,2,3 and D.	Prevent deficiencies and enhance nutrition, for example, Iodized salt, fortified milk.
c.	Application	It is added after nutrient loss in processing.	To address public health issues.

Activity 4.9 Enriching and Fortifying Flour Products

1. Organise yourself into groups of 3 or 4. Discuss Food Enrichment and Fortification with your group. Make notes about what you understand by the terms and what the differences are between the two. Examples are provided below.
   a. Food Enrichment means adding back nutrients that were lost during food processing.
      Example: Adding vitamin B to white flour.
   b. Food Fortification means adding extra nutrients that were not there before.
      Example: Adding iron or iodine to salt.

You can use the table below to differentiate between Food Enrichment and Fortification

SN	Food Enrichment	Food Fortification

2. In your groups, visit a bakery, community members who bake or other sources that make flour products like bread, biscuits, or pastries.

   Ask questions like:

   a. What nutrients are lost during processing?
   b. Do you add any nutrients to your flour products?
   c. What ingredients do you use to enrich or fortify your products?
   d. Do you use any special raising agents or extra vitamins?

3. After your visit, work with your group to write a short report. Include

   a. What you learned about enrichment and fortification
   b. Ingredients used in the bakery
   c. Any new things you found interesting

4. Present your report to the class. You can include a poster or pictures from your visit (if allowed)

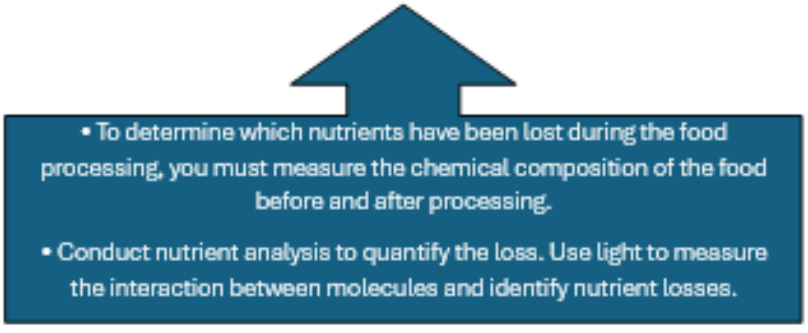
WAYS OF PREPARING FLOUR PRODUCTS TO ENRICH/FORTIFY THEM

Steps in food enrichment and fortification

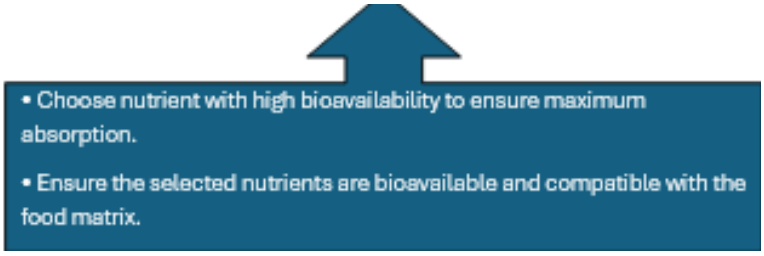
Food enrichment and fortification involve a lot of steps to ensure that the added nutrients are effective, safe and well-integrated into the food products.

Food Enrichment Steps

1. Identification of nutrient loss



2. Selection of nutrient sources



3. Formulation

4. Testing and Quality Control

5. Regulatory Approval

6. Production and monitoring

Figure 4.41: Food enrichment steps

Food Fortification Steps

Table 4.13: Food fortification steps

S/N	Food fortification	Steps
i.	Assessment of nutritional needs	It involves assessing dietary patterns, health status, and lifestyle factors to determine the prevalence of nutrient deficiencies. It involves analysing food consumption habits to identify opportunities for fortification.
ii.	Selection of fortificant	Consider nutrient type and form, for example, vitamin D2 and D3, bioavailability and absorption rate, stable in various temperatures and moisture levels. It involves compatibility with food matrix, ingredients, and sensory impact (taste, texture, colour)
iii.	Dosage determination	It involves calculating the optimal amount of a nutrient or fortificant to add to the food product to achieve the desired nutritional benefit. The interaction with other nutrients and ingredients, average daily consumption of the fortified food and risk of adverse effects in vulnerable population, for example children.
iv.	Formulation and integration	It combines fortificants with food ingredients to create a nutrient-enriched product without altering its taste, texture, or appearance.

Use appropriate technology to mix and distribute the nutrients evenly

Table 4.14: Use of technology to mix and distribute nutrients

S/N	Technique	Application
i.	Testing and quality control	Test control involves checking to ensure the nutrients remain effective throughout the product's shelf life and labelling meets regulatory adherence. Check whether packing material and design meets standards, then monitor shelf-life and storage condition. Allow consumers to evaluate products in a controlled environment, their homes, or an online survey where consumers provide feedback through online questionnaires.
ii.	Regulatory compliance	Ensure that fortified processes, standards, guidelines of food safety and labelling regulations meet national and international laws. Receive regulatory approval notification.

iii.	Pilot testing	Start by testing the fortification process on a small scale to see if it works well and is safe. Gather information about how well nutrients are kept by using lab tests, nutrient analysis software, and taste tests. To check product quality, do tests on shelf life, bacteria levels, and texture. You can also get feedback from consumers through surveys, online reviews, ratings, and home testing.
iv.	Scale-up and production	Before you can increase production, it is important to ensure that all regulations are met. You should also develop a plan for scaling up, establish quality control and assurance processes, and provide training for the staff. Keep checking the nutrient levels and quality of the fortified food while it is being made.
v.	Consumer education	Inform consumers on the benefits of the fortified food to help them accept, buy, use and consume the product. Provide information on the labelling and packaging about the added nutrients and their health benefits.
Vi	Monitoring and evaluation	It involves tracking and assessing their quality, safety, and effectiveness of the product. Adjust the fortification levels, if necessary, based on ongoing research and population health data collected.

Activity 4.10 Enriching and Fortifying of Flour Products

Organise yourselves into groups of 3 or 4

Experiment with Enriching and Fortifying

Research the internet, library for how to enrich or fortify products (e.g., adding carrots, moringa, milk powder, eggs, etc.).

1. Choose one flour product (Pancakes, bread, or buns).
2. Find a recipe for your chosen product.
3. Write down the ingredients, steps, and how each added ingredient helps.

Cooking and reporting on enriching and fortifying flour products

1. Prepare the product using the basic recipe step by step.
2. Prepare a second product by adding enriching or fortifying ingredients such as powdered milk or eggs to add protein and calcium, groundnuts, or vitamin-rich ingredients like orange juice (for vitamin C).
3. Observe differences in texture, colour, taste, and rising ability between the normal and enriched/fortified products.
4. Record your observations.

Present your findings and share with the class explaining:

1. What products you prepared and how you enriched/fortified them.
2. Differences that you noticed during the experiment.
3. Why enriching and fortifying flour products is important.

QUALITY OF FLOUR PRODUCT

To determine how good a flour product is, we must evaluate four key areas: texture, appearance, taste, and nutritional composition. Each area tells us something important about the product's quality.

Texture

Texture refers to how the product feels when touched or eaten. It affects how enjoyable the product is.

1. **Softness**: Gently press the product. A good product should feel soft but not soggy.
2. **Crumbliness**: Break the product (e.g., cookies or biscuits). It should crumble without falling apart too easily.
3. **Density**: Press lightly on cakes or bread. They should spring back and feel light, not too heavy or compact.

Appearance

Appearance influences how appealing the product looks.

1. **Colour**: The colour should be even, with no burnt or undercooked parts.
2. **Shape**: Products should have a consistent shape and size, making them look neat and attractive.
3. **Crust and Crumb** (for bread): The crust should be golden and slightly firm. The crumb (inside part) should be soft, airy, and evenly structured.

Taste

Taste includes the flavour and overall eating experience.

1. A good product should have a pleasant, balanced flavour, not too sweet or bland.
2. Ingredients should be well combined, with no odd aftertaste.

Nutritional Composition

This tells us how healthy the product is.

1. **Extra Ingredients**: Additions like oats, wheat, milk, and eggs improve nutrition by increasing fibre, protein, and minerals.
2. **Fibre Content**: More fibre helps with digestion. Fiber levels can be tested in a food lab.
3. **Micronutrients**: Important nutrients like iron, zinc, and B vitamins can be measured using scientific tests.

Conclusion

Evaluating flour products helps ensure they are not just tasty and good-looking, but also nutritious and enjoyable to eat. Always check for good texture, appealing appearance, balanced taste, and a strong nutritional profile.

Activity 4.11 Making and Evaluating flour products

Organise yourselves into groups of 3 or 4.

Prepare a flour product

1. Choose a flour product to prepare (e.g., cake, bread, pie, pancakes) and search for the recipe in books at the library or research the internet.
2. Gather the ingredients and follow the steps to make the product.
3. Make sure your product is well cooked and nicely presented.
4. Write down what you did.

Display your product for a class exhibition with other groups

1. Display your product on a table for a class exhibition.
2. Visit each group's table to see and taste their products.
3. Use a score sheet to judge each product based on see example scoresheet below:
   a. **Texture** (How it feels when eaten)
   b. **Appearance** (How it looks)
   c. **Taste** (How it tastes)
   d. **Nutritional Value** (What healthy ingredients it has)
4. Provide feedback to other groups on their product and accept feedback on yours

SN	Quality Aspect	Your Observation	Score (1–5)
1.	Texture	Is it soft, chewy, crumbly, fluffy?	
2.	Appearance	Is the colour, shape, and surface appealing?	
3.	Taste	Is the flavour pleasant and balanced?	
4.	Nutritional Composition	What healthy ingredients does it have?	

How to use feedback to improve your product

1. Read or listen to the feedback your group got during the exhibition.
2. Talk with your group about what can be improved (e.g., more flavour, better texture).
3. Write a short improvement plan:
   a. What you will change
   b. Why you will change it.

EXTENDED READING

- Adigbo, E. C & Maddah, C. K. (2011). *A complete course in Food and Nutrition.* Kwadwoan publishing: Accra. Pg. 359- 410.
- 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 4

1. Compare the functions of preservatives, colorants, and nutritional additives in food processing. Give one example for each and explain how they contribute to the quality of food.
2. A food company wants to create a fortified breakfast cereal. Propose a combination of **food additives** they might use and justify how each additive improves the product's safety, appearance, and nutrition.
3. Explain how food additives and condiments both contribute to improving food, but in different ways. Include one example of each to support your explanation.
4. Based on your research and experimentation into local food dyes, write a report explaining the advantages of using natural food colours over synthetic ones in food preparation, and recommend **two** local ingredients that could be promoted for commercial use in Ghanaian food industries.
5. You are tasked with preparing two food additives or condiments using local food sources for a school project. The choices are natural food colour and homemade ketchup. Describe the steps you will follow, how you will package and label them, and explain how they can be used in meal preparation. After producing and packaging a natural flavour enhancer (herb and spice blend) and a natural preservative (pickled vegetables), reflect on the importance of hygiene and safety practices during preparation. Suggest how improper handling could affect the final product and consumer health.
6. You have been asked to prepare and package one food additive in powder form using a local ingredient (e.g., Prekese, turkey berries, aniseed, or karadafa leaves). Outline the complete process you would follow, including safety and hygiene practices. Explain how the final product can be used in cooking.
7. Imagine you are creating a natural flavouring using vanilla beans. After steeping and straining, how would you package and label the product to ensure safety, usability, and clear identification? What cooking uses would you recommend for this additive, and how does this process reflect real-world food production standards?
8. Describe two types of flour used in cookery, including their sources and unique characteristics.
9. Compare wheat flour and bean flour in terms of their characteristics and identify at least one flour-based product each can be used to prepare.
10. List five basic ingredients used in flour cookery and explain the function of each when combined with flour.
11. In making homemade bread with wheat flour, why is it important to let the dough rise before baking, and what will happen if you skip this step?
12. Imagine you are part of a food production team aiming to address iron deficiency

in a rural population. Design a detailed food fortification plan using wheat flour as the base product.

Your plan should include the choice of fortificant, integration method, testing and quality control, regulatory compliance, and strategies for consumer education and feedback.

13. Critically compare biofortification and food fortification as strategies for addressing micronutrient deficiencies in low-income populations. Discuss their long-term impacts on health, cost-effectiveness, sustainability, and implementation challenges. Support your response with examples.

14. Our school wants to start a project to make moringa bread for the community to help fight vitamin A deficiency. Using the steps of food enrichment or fortification, explain the following:

a. How you will plan and prepare the bread, so it has enough vitamin A.

b. The natural ingredient(s) you will add and why.

c. How you will test the bread to make sure it is safe, nutritious, and still tastes good.

15. After baking a batch of muffins, describe how you would assess their quality based on the following criteria:

a. Texture

b. Appearance

c. Taste

ANSWERS TO REVIEW QUESTIONS 1

1. A balanced diet includes a variety of foods that supply the body with all the essential nutrients in the right amounts. The main components and their roles are:

- **Carbohydrates**

  Role: Provide energy. The body breaks carbohydrates down into glucose, which fuels physical activities and brain functions.
- **Proteins**

  Role: Help in building and repairing body tissues, especially muscles. They are essential for healing wounds and maintaining overall body strength.
- **Fats and Oils**

  Role: Provide energy, help in hormone production, protect organs, and keep the skin healthy. However, consuming too much unhealthy fat (e.g., saturated and trans fats) can lead to heart disease.
- **Vitamins**

  Role: Support various body functions and prevent diseases. For example: Vitamin C prevents scurvy, and Vitamin D helps prevent rickets and supports bone health.
- **Minerals**

  Role: Maintain strong bones, carry oxygen in the blood, and support nerve function. For example: iron prevents anaemia, and calcium helps prevent osteoporosis.
- **Water**

  Role: Keeps the body hydrated, supports digestion and metabolic activities, helps regulate body temperature, and maintains kidney function.

2. **Advantages of Processed Foods for Individual Health**

- Convenience: Processed foods save time in meal preparation, which is helpful for people with busy lifestyles.
- Fortification: Some processed foods are enriched with essential nutrients (e.g., iodized salt, fortified cereals), helping to prevent nutrient deficiencies.

Disadvantages of Processed Foods for Individual Health

- Increased Risk of Chronic Diseases: Excessive consumption of processed and sugary foods can lead to obesity, diabetes, and heart disease.
- Nutritional Deficiencies: Many processed foods lack important nutrients like fibre, vitamins, and minerals, which are essential for good health.

3. **Positive Effects of Processed Foods on Family Meal Preparation and Health**

- Easier Meal Preparation: Processed and ready-to-eat foods save time, making it easier for families to prepare meals quickly, especially during busy schedules.
- Variety and Accessibility: They provide a wide range of food options and ensure food availability in all seasons, helping families access different nutrients.

Negative Effects of Processed Foods on Family Meal Preparation and Health

- Health Complications: Regular consumption of processed foods high in sugar, salt, and unhealthy fats can lead to obesity, diabetes, and other health issues, especially in children.
- Loss of Traditional Practices: Dependence on processed foods may reduce home cooking and lead to the loss of traditional food preparation methods, which often promote healthier eating habits.

4.

a. Skipping breakfast, relying on processed foods like chips and energy drinks, and consuming too much sugar and unhealthy fats.

b. Her frequent use of processed foods led to poor nutritional habits in the household, especially affecting Nana Yaw's growth and health.

c. Start including home-cooked meals with more fruits, vegetables, and whole grains.

   i. Reduce intake of sugary and processed foods.

   ii. Encourage regular physical activity like walking, biking, or sports.

   iii. Make time for family meals that promote healthy eating habits.

d. Convenience should not replace nutrition.

   i. Parents' food choices directly influence children's health.

   ii. Balanced diets and active lifestyles are essential to prevent lifestyle-related diseases like diabetes.

5. Three Roles of Education in Nutritional Interventions:

- Promotes Healthy Eating Habits:
  Education helps individuals and families understand the importance of a balanced diet, encouraging them to choose nutritious foods and avoid unhealthy options.
- Improves Meal Planning and Food Preparation Skills:
  Through nutrition education, people learn how to plan balanced meals, cook using healthy methods, and make the best use of available food resources.
- Raises Awareness of Nutrient Deficiencies and Prevention:
  Education informs communities about common nutrient deficiencies (like iron or vitamin A) and how to prevent them through proper diet, supplementation, or fortified foods.

6. Two Examples of Dietary-Based Interventions and How They Help Improve Nutrition:

- Balanced Diet Promotion: This intervention encourages people to eat a variety of nutritious foods including fruits, vegetables, whole grains, lean proteins, and healthy fats. It helps improve overall health by providing the body with essential nutrients needed for growth, energy, and disease prevention.
- School Feeding Programs: These programs provide nutritious meals to children during school hours. They help improve children's nutritional status, support their physical and mental development, and enhance their concentration and academic performance.

7. Household-based nutritional interventions are actions taken within individual families to improve nutrition. They focus on home-level practices such as meal planning, home gardening, breastfeeding education, food preservation, and the use of fortified foods or supplements.

   Community-based nutritional interventions, on the other hand, are larger-scale efforts that target groups of people or entire communities. They include programs like school feeding, nutrition awareness campaigns, community gardens, support for local farmers, food banks, and public health policies aimed at improving overall food security and nutrition.

8. To address the rise in obesity in the community, a combination of household and community-based interventions can be implemented:

   Household-Based Interventions:

   - Meal Planning and Balanced Diets: Encourage families to plan meals using a variety of nutritious foods such as fruits, vegetables, whole grains, and lean proteins while reducing sugary and fatty foods.
   - Nutrition Education: Educate family members on healthy cooking methods (e.g., boiling, steaming, grilling instead of frying) and portion control to reduce overeating.
   - Limiting Processed Foods: Reduce the intake of processed and fast foods by encouraging home-cooked meals using local, fresh ingredients.
   - Physical Activity Promotion at Home: Encourage daily physical activities such as walking, gardening, or exercise routines for all family members.

   Community-Based Interventions:

   - School Feeding and Health Programs: Introduce or improve school meal plans to ensure they are nutritious and not high in sugar or fat. Include physical education in school activities.
   - Community Nutrition Campaigns: Run awareness programs through local media, churches, and community centres on the dangers of obesity and the importance of a healthy lifestyle.
   - Community Gardens and Farmers' Markets: Support initiatives that increase access to affordable fresh produce to encourage healthy food choices.
   - Policies and Regulations: Advocate for public health policies that limit the marketing of junk food, especially to children, and regulate food labelling to help people make healthier choices.

9. Some common challenges faced when implementing household and community-based nutritional interventions include:

   - **Food Insecurity and Poverty:** Many families cannot afford or access enough nutritious food due to low income or lack of food availability.
   - **Cultural and Traditional Beliefs:** Certain food taboos and customs may discourage the consumption of nutrient-rich foods, especially for women and children.
   - **Limited Resources and Funding:** There may be a lack of financial support, equipment, or trained personnel to carry out nutrition programs effectively.
   - **Lack of Awareness and Education:** Some individuals and families may not

understand the importance of proper nutrition or how to apply healthy practices in daily life.

- **Low Community Participation:** People may be reluctant to participate in programs due to mistrust, stigma, or lack of interest.
- **Poor Infrastructure:** Inadequate transportation, storage, or food distribution systems can hinder the success of interventions, especially in rural areas.

10. Household Eating Habits Questionnaire

Purpose

To collect information about the food choices, frequency of meals, and nutritional practices in local households.

Instructions

Tick [✓] the appropriate boxes or write short answers where necessary.

Section A: Household Information

Number of people in your household:

Age groups present (tick all that apply):

☐ Children (0–12) ☐ Teenagers (13–19) ☐ Adults (20–59) ☐ Elderly (60+)

Section B: Food Consumption Patterns

How many meals does your household eat per day?

☐ One ☐ Two ☐ Three ☐ More than three

How often do you eat the following foods?

Food Type	Daily	Weekly	Rarely	Never
Fresh fruits	☐	☐	☐	☐
Fresh vegetables	☐	☐	☐	☐
Protein foods (meat, fish, beans, eggs)	☐	☐	☐	☐
Processed or packaged foods	☐	☐	☐	☐
Sugary foods/drinks	☐	☐	☐	☐

Does your household usually cook meals at home?

☐ Yes ☐ No

If no, where do you mostly get your meals? _____

Section C: Food Storage and Preservation

How do you usually store leftover or perishable food?

☐ Refrigerator ☐ Freezer ☐ Dry storage ☐ Other: _____

Do you grow any of your own food (e.g., vegetables, fruits, herbs)?

☐ Yes ☐ No

If yes, what do you grow? _____

Section D: Beliefs and Preferences

Are there any foods your household avoids due to cultural or religious beliefs?

☐ Yes ☐ No

If yes, please mention: _____

How important is nutrition when planning your family's meals?

☐ Very important ☐ Somewhat important ☐ Not important

11.

a. Steaming

Reasons for Recommendation: Steaming cooks food with minimal water and avoids direct contact with heat, reducing the loss of water-soluble vitamins such as Vitamin C and B vitamins.

Best Suited Foods:

i. Leafy vegetables (e.g., spinach, kontomire)
ii. Carrots and broccoli
iii. Fish fillets and chicken breast

Nutrient Benefit: Preserves most vitamins and minerals, enhances natural flavour and colour without adding fat.

b. Poaching

Reasons for Recommendation: Poaching uses low temperatures and gentle cooking in a small amount of liquid, which prevents breakdown of delicate nutrients.

Best Suited Foods:

i. Eggs
ii. Fish
iii. Chicken pieces
iv. Fruits like pears or apples (for desserts)

Nutrient Benefit: Retains protein quality and avoids fat while protecting heat-sensitive vitamins.

c. Grilling

Reasons for Recommendation: Grilling cooks' food quickly at high temperatures without water, minimising nutrient loss and reducing the need for added fats or oils.

Best Suited Foods:

i. Meat and fish
ii. Vegetables like bell peppers, mushrooms, and zucchini
iii. Plantain

Nutrient Benefit: Helps preserve protein and minerals while giving food a distinct flavour with minimal oil use.

12.

1. **Improved Nutritional Intake**

Nutrient-retaining methods preserve important micronutrients such as Vitamin C, B-complex vitamins, and minerals like iron and calcium. These are essential for:

i. Growth and development
ii. Strengthening the immune system
iii. Preventing common childhood deficiencies such as anaemia and stunted growth

For example, steaming vegetables in school meals helps maintain their vitamin content, ensuring children get the full benefits of the food served.

2. **Enhanced Cognitive Function and Academic Performance**

Proper nutrition, especially through well-preserved food, supports:

i. Better concentration

ii. Improved memory

iii. Increased energy levels

This leads to improved learning outcomes and participation in class activities. Children who are well-nourished are more likely to attend school regularly and perform better academically.

13. It is necessary to consider the nutritional requirements of each family member when planning meals for the following reasons:

- **Different age groups have different needs:** Each family member is at a different stage of life, children, adolescents, adults, pregnant women, and the elderly and they all require varying amounts and types of nutrients. For example, children need more calcium for bone development, while older adults may need more fibre and less fat.
- **To promote good health and prevent diseases:** Planning meals that meet the specific nutrient needs of family members helps prevent deficiencies (like anaemia or rickets) and reduces the risk of nutrition-related diseases such as diabetes, obesity, and hypertension.
- **Supports growth and development:** Nutritionally balanced meals are essential for the physical and mental development of children and adolescents, helping them perform well in school and grow healthily.
- **Ensures energy and productivity:** Meals planned according to nutritional needs ensure that all family members have enough energy for their daily activities, work, and responsibilities.
- **Meets special dietary needs:** Some family members may have specific health conditions (e.g., allergies, diabetes, high blood pressure) or dietary preferences (e.g., vegetarianism), which must be considered to keep them healthy and safe.
- **Improves quality of life:** Providing nutritious meals tailored to each person's needs contributes to their overall well-being, happiness, and family harmony.

14. Factors to consider when planning meals for a family

- Good nutrition. Different food needs of individual family members will determine the nutrients they require, and this should be considered when planning meals for individual family members.
- Financial/ economic stability of family. The amount of money is determined by family size, family values, ages of family members, income, time available
- Equipment and cooking facilities such as fuel, space and storage. Access to ovens fridges/freezers will influence how frequently you cook
- Individual health problems influence food needs.
- Food preferences may be determined by ethnic origin, religious beliefs, socio-economic status, education, background etc.

15. Serving size and dietary restrictions are important when planning meals for a family because they help ensure that each family member receives the right amount of nutrients according to their age, health condition, and activity level.

a. Serving Size: Helps to control portion sizes so that no one eats too little or too much. This is essential to prevent problems such as malnutrition or overweight and obesity, especially in children and the elderly.

b. Dietary Restrictions: Some family members may have special dietary needs, such as diabetics, vegetarians, or those with allergies or intolerances (e.g., gluten or lactose intolerance). Considering these restrictions prevents health complications and ensures everyone can enjoy safe and nutritious meals.

16. One-Day Meal Plan for a Family of Four (Including One Vegetarian)

a. Breakfast

i. Menu: Oatmeal with sliced bananas, groundnuts, and soy milk

ii. Beverage: Fresh orange juice

Nutritional Benefits

- Provides complex carbohydrates for energy (oats, banana)
- Protein and healthy fats from groundnuts and soy milk
- Orange juice offers vitamin C, boosting immunity
- Suitable for both vegetarians and non-vegetarians

b. Lunch

i. Menu (Main Dish): Jollof rice with mixed vegetables (carrots, peas, green beans)

ii. Protein Options

- Grilled chicken (for non-vegetarians)
- Boiled black-eyed beans (for the vegetarian)

iii. Side: Garden salad with avocado

Nutritional Benefits

- Balanced meal with carbohydrates (rice), protein (chicken/beans), and fibre (vegetables)
- Avocado provides healthy fats
- Beans offer plant-based protein for the vegetarian

c. Dinner

i. Menu: Yam and garden egg stew

ii. Protein Options:

- Fried eggs (for the vegetarian)
- Grilled fish (for non-vegetarians)

iii. Beverage: Warm cocoa drink made with milk or soy milk

Nutritional Benefits:

- Yam is a good source of energy and fibre
- Garden eggs are rich in vitamins and antioxidants
- Eggs and fish provide high-quality protein
- Cocoa drink contributes calcium and a comforting end to the day

How This Meal Plan Meets Nutritional Needs

- Energy needs: Met through starchy foods (oats, rice, yam)

- Protein: Provided from both animal (chicken, fish, eggs) and plant sources (beans, soy milk, groundnuts)
- Vitamins and minerals: Supplied by a variety of vegetables, fruits, and fortified drinks
- Special diet: Vegetarian family member receives equivalent plant-based proteins and dairy alternatives

Balanced intake: Each meal includes a variety of food groups ensuring nutritional adequacy.

17. Planning meals for someone with hypertension (high blood pressure) involves choosing foods that help control blood pressure and avoiding those that make it worse.

Key Planning Tips: Choose low-sodium foods: Avoid salty foods and reduce the use of table salt.

a. Add potassium-rich foods: Such as bananas, oranges, potatoes, and leafy greens.
b. Include whole grains: Brown rice, whole wheat bread, and oats.
c. Use healthy fats: Like olive oil, avocado, and nuts (in small amounts).
d. Avoid processed and fried foods: These often contain hidden salt and unhealthy fats.
e. Increase fruits and vegetables: Aim for colourful variety each day.
f. Limit red meat: Choose lean meats, fish, or plant-based proteins (beans, lentils).

Sample Day's Plan

- Breakfast: Oatmeal with banana slices and a boiled egg.
- Lunch: Brown rice with grilled fish and steamed vegetables (carrots, green beans).
- Dinner: Vegetable soup with beans and whole grain bread.
- Snacks: Fresh fruit or unsalted nuts.

2. Cooking the Meal

Cooking Tips for Hypertensive Individuals

- Use herbs and spices instead of salt for flavour (e.g., garlic, ginger, onion, pepper, parsley).
- Boil, grill, steam, or bake foods instead of frying.
- Avoid using seasoning cubes that contain MSG or too much sodium.
- Use fresh ingredients over canned or packaged ones.
- Skim fat from meat or broth before serving.

3. Serving the Meal

- Serve in right portion sizes to avoid overeating.
- Make the meal colourful and attractive with fruits and vegetables.
- Ensure water is served instead of sugary or carbonated drinks.
- Encourage slow, mindful eating to support digestion and satisfaction.
- Avoid adding extra salt at the table.

18.

a. Pregnant Women

Nutritional Requirements

i. **Folic Acid (Vitamin B9):** Essential for preventing birth defects in the baby's brain and spine.

ii. **Iron:** Needed to produce extra blood for the mother and baby, and to prevent anaemia.

iii. **Calcium:** Supports the development of the baby's bones and teeth while maintaining the mother's bone health.

iv. **Protein:** Important for the growth of foetal tissues, including the brain, and helps with uterine and breast tissue development.

v. **Energy:** Increased caloric intake is needed to support the baby's growth and the mother's changing body.

Explanation

Pregnant women need more nutrients to support the growing baby, maintain their own health, and prevent complications such as low birth weight and anaemia.

b. Infants (0–2 years)

Nutritional Requirements

- Breast milk: Provides complete nutrition and antibodies for the first 6 months.
- Protein and fat: Support rapid growth and brain development.
- Iron and zinc: Important for immune function and cognitive development.
- Vitamin D: Supports bone development and helps in calcium absorption.

Explanation

Infants experience rapid growth and development, so they need nutrient-rich foods, especially after 6 months when complementary feeding starts, to avoid malnutrition and support brain and body growth.

c. The Elderly

Nutritional Requirements

i. Calcium and Vitamin D: To prevent bone loss and fractures (osteoporosis).

ii. Fibre: Promotes healthy digestion and prevents constipation.

iii. Vitamin B12: Important for nerve function and reducing the risk of anaemia.

iv. Low-fat protein: Helps maintain muscle mass while reducing risk of heart disease.

v. Water: Older adults may have a reduced sense of thirst and need to be reminded to stay hydrated.

Explanation:

As people age, metabolism slows down, and the body becomes less efficient in absorbing nutrients. Nutrient-dense meals are needed to maintain strength, immune function, and bone health.

19. For the cultural dinner event, I would choose the family-style meal service, which is common in many Ghanaian homes. In this style, food is served in large dishes placed at the centre of the table, and guests serve themselves.

This method reflects our Ghanaian culture of togetherness, sharing, and hospitality. In many local settings, meals are not only about eating but about bonding, storytelling, and connection. By using family-style service, guests feel relaxed and involved, which promotes cultural appreciation.

Additionally, this method meets the needs of guests with different dietary preferences, as they can choose what and how much to eat. It also helps reduce food waste since everyone serves themselves based on their appetite.

20. Here is a step-by-step guide for laying a formal dining table, with explanations:

- Spread a clean tablecloth or placemats
  Reason: A neat base creates a clean, attractive appearance and protects the table surface.
- Place the dinner plate in the centre of each setting
  Reason: This forms the focal point for the rest of the items and helps organize space.
- Lay the forks to the left of the plate (salad fork outside, dinner fork inside)
  Reason: It follows the order of use, from outside in, and maintains proper etiquette.
- Place the knife to the right of the plate, with the blade facing inwards
  Reason: The knife's position is both safe and easy for right-handed users.
- Put the spoon to the right of the knife (if soup or dessert will be served)
  Reason: Prepares the diner for the appropriate course without confusion.
- Set the drinking glass above the knife (upper right)
  Reason: It ensures easy access to beverages and maintains symmetry.
- Add the napkin (folded nicely) to the left of the forks or on the plate
  Reason: Adds decoration and is readily available for use, enhancing hygiene.
- Place a dessert spoon or fork above the plate if needed
  Reason: Prepares for later courses without cluttering the main area.
- Add any additional items like bread plates, butter knives, or name cards if needed
  Reason: Enhances formality and personalizes the dining experience.

21.

a. Chosen Meal Service Style: French Banquet Service

b. Justification:

   i. This style reflects formality and elegance, suitable for honouring ambassadors.

   ii. Food served from the guest's left by skilled servers shows respect and hospitality.

   iii. It accommodates cultural differences because guests are served individually and do not need to self-serve, which may align with formal dining etiquette in their cultures.

c. Table Setting Plan:

   i. Dinnerware: Charger plate with dinner plate on top; salad plate placed to the top left.

   ii. Flatware:

- Left side – Salad fork (outermost), dinner fork (closest to plate)
- Right side – Dinner knife (closest to plate, blade facing in), soup spoon to the right of the knife

iii. Glassware:

- Water glass directly above the dinner knife
- White wine glass to the right and slightly below water glass
- Red wine glass above the white wine glass

iv. Napkin: Folded neatly and placed on the dinner plate

v. Additional Items:

- Bread plate above forks with butter knife laid horizontally
- Centre piece of low flowers (so guests can see each other)
- Salt, pepper, and culturally relevant condiments evenly spaced

22. Special Group Considerations:

- Ensure table height allows easy access for wheelchair users.
- Use lightweight plates and easy-grip cutlery for elderly guests.
- Arrange utensils consistently for visually impaired guests and describe the placement verbally.

ANSWERS TO REVIEW QUESTIONS 2

1. Matching

Principle	Method
Temperature control	Pickling
Moisture reduction	Addition of antioxidants
Acidity control	Freezing
Oxidation prevention	Drying

2.

a. Freezing

Freezing lowers the temperature of food to levels where microbial activity slows down significantly or stops completely. This helps prevent the growth of bacteria, yeasts, and moulds that cause food spoilage.

b. Pasteurisation

Pasteurisation involves heating food (especially liquids like milk or fruit juice) to a specific temperature for a short time to kill harmful microorganisms. It extends the shelf life of the food while keeping most of its nutrients intact.

3.

a. Reduces Food Waste

By preserving food, the community can store food for longer periods without spoilage. This reduces the amount of food that is thrown away, especially in markets and homes.

b. Supports Food Availability During Scarcity

Food preservation helps communities store seasonal foods for use during times of shortage. This ensures a steady supply of nutritious food throughout the year, especially in areas without consistent food production.

4.

a. Microbial Growth

Cause: Microorganisms such as bacteria, yeasts, and moulds feed on food, leading to spoilage, foul smells, slime, and potential foodborne illnesses.

Preservation Method: **Freezing** – It slows down microbial activity by lowering the temperature, preventing growth and spoilage.

b. Enzymatic Activity

Cause: Naturally occurring enzymes in food cause changes such as ripening, browning, and softening. This can make food unappealing or inedible.

Preservation Method: **Blanching** – Briefly boiling or steaming food (especially vegetables) to inactivate enzymes before freezing or drying.

c. Oxidation

Cause: Oxygen exposure causes chemical changes in food, such as browning in fruits, rancidity in fats, and loss of vitamins.
Preservation Method: Vacuum Packaging – Removes air around the food, reducing oxygen contact and slowing oxidation.

5. Salting and sugaring preserve food by creating a high osmotic environment. This means they draw moisture out of both the food and any microorganisms present. Without moisture, bacteria, yeasts, and moulds cannot grow or multiply. As a result, food stays safe and fresh for a longer period.

Example: Salting is used for preserving fish or meat; sugaring is common in jam and fruit preserves.

6. Microbial Growth: The warm and humid environment encourages the growth of bacteria, mould, and yeast, leading to quick spoilage.

Food Contamination: Open containers expose food to dust, flies, insects, and airborne contaminants, which can cause foodborne illnesses.

Nutrient Loss: Exposure to heat and air can degrade nutrients, especially vitamins like Vitamin C.

Unpleasant Taste and Odour: Spoilage organisms can alter the taste and smell of food, making it unpalatable.

Economic Loss**:** Spoiled food leads to waste and loss of income for the vendor.

Issue	Improvement	Preservation Method
Exposure to air and insects	Store food in airtight containers or cover with clean lids	Physical barrier method
Warm environment	Keep food in coolers or refrigerators	Cold storage (refrigeration)
High humidity	Use dehumidifiers or store in dry places	Dry storage method
Microbial growth	Reheat food to safe temperatures regularly or store hot foods above 60°C	Heat preservation
Short shelf life	Process and preserve food using drying, canning, or vacuum sealing	Dehydration, canning, vacuum packaging

7. Antioxidants help prevent or slow down oxidation, a chemical reaction that causes food spoilage, especially in fatty foods. Oxidation can lead to rancidity, loss of flavour, colour changes, and nutrient loss (e.g., Vitamin C). Antioxidants such as Vitamin E (found in palm oil), Vitamin C, and citric acid protect food by reacting with oxygen before it can damage the food. This extends the shelf life and maintains the nutritional quality of the food.

8.

a. Fish

Preservation Methods

i. **Salting and drying** – Removes moisture and creates conditions that prevent microbial growth.

ii. **Smoking** – Adds flavour and antimicrobial compounds while reducing spoilage.

iii. **Canning** – Preserves fish by sealing and heat treating to destroy bacteria and spores.

b. Cassava

Preservation Methods

i. **Drying** – Slices of cassava can be sun-dried or oven-dried to reduce moisture.

ii. **Fermentation** – Used in making gari or fufu flour; fermentation reduces toxins and enhances shelf life.

iii. **Freezing** – Grated or parboiled cassava can be frozen to retain freshness.

c. Pepper

Preservation Methods

i. **Drying** – Sun or oven drying reduces moisture content to prevent mould and decay.

ii. **Freezing** – Fresh peppers can be frozen to maintain colour and nutrients.

iii. **Pickling** – Preserving in vinegar lowers pH and prevents microbial growth.

9. Appropriate packaging is essential after food preservation because it:

i. Protects the preserved food from recontamination by air, moisture, microorganisms, dust, insects, and physical damage.

ii. Extends shelf life by maintaining the effectiveness of the preservation method (e.g., keeping dried foods dry or preventing oxidation in canned goods).

iii. Maintains food quality, including taste, colour, texture, and nutritional value.

iv. Makes handling, transportation, and storage easier, especially for commercial sale or long-term use.

v. Provides product information such as expiry dates, ingredients, and usage instructions.

10.

a. Enhancing preservation efficiency and safety

Technology helps to control preservation conditions more precisely, making the process more effective and safer. For example:

- **Refrigeration and freezing units** use sensors and thermostats to keep food at the right temperatures, reducing microbial growth without altering taste or nutrients.

b. Enabling large-scale and longer storage

Modern machines allow mass preservation, reducing food waste and improving food availability. For example:

- **Freeze-drying machines** remove moisture under vacuum, producing lightweight, long-lasting foods that retain nearly all their nutrients and flavour ideal for export or emergency storage.

11.

a. Heat Application

Heat is used to destroy microorganisms and enzymes that cause food spoilage. In Shito, ingredients like onions and tomatoes are cooked thoroughly to ensure

safety and flavour. In jam making, boiling helps soften the fruit, release pectin, and evaporate excess water to help the jam set.

b. Moisture Reduction

By cooking the ingredients for a long period, water is reduced. In both Shito and jam, reducing moisture prevents microbial growth, helping the preserve last longer.

c. Use of Preserving Agents (e.g., Sugar or Oil)

i. **Sugar** in jam binds with water, making it unavailable for microbes to grow.

ii. **Oil** in Shito forms a barrier that protects the mixture from air and microbial contamination.

12.

a. Thermometer Method

Use a sugar thermometer to measure the temperature. Jam sets at 110°C (220°F). Once this temperature is reached during boiling, the setting point is likely achieved.

b. Cold Plate or Saucer Test

Place a small amount of hot jam on a cold saucer and let it cool. Push it gently with your finger. If the surface wrinkles and feels firm, the jam has reached the setting point and is ready for bottling.

13.

a. Target Customers

i. Local households and families who enjoy natural, fruity spreads.

ii. Health-conscious individuals looking for homemade, chemical-free jam.

iii. Local school snack vendors and small shops.

b. Promotion Strategy

i. Use word-of-mouth marketing and free tasting samples at community markets.

ii. Promote on social media platforms like WhatsApp and Facebook.

iii. Partner with local shops and food bloggers to recommend your product.

c. Pricing

i. Sell at a moderate price, such as GHS 20 for a 250g jar, to remain affordable while covering production costs and earning profit.

ii. Offer discounts for bulk purchases or loyalty cards (e.g., “Buy 5, Get 1 Free”).

d. One Sustainable Packaging Idea

i. Use recycled glass jars or returnable containers that customers can bring back for a refill.

ii. This reduces plastic waste and encourages eco-friendly habits in the community.

14. Honesty and truthfulness ensure customer trust, food safety, and respect for community health. These values help you produce quality products that people can rely on.

Example 1

- Do not use artificial preservatives like formalin to extend shelf life. Though it may make the jam last longer, it is harmful to health.

Example 2

- Use fresh and safe ingredients, not spoiled fruits or recycled sugar. Selling jam made from old or rotten mangoes is dishonest and can make consumers sick.

15. Preparation of Pineapple Jam at Home

Ingredients

- Pineapple – 800g
- Sugar – 800g
- Water – 2 pints
- Ginger – 1 medium root

Method

- Wash and peel the pineapple to remove all dirt and outer skin.
- Grate the pineapple into a fine pulp using a grater.
- Wash and grate ginger and mix with the grated pineapple.
- Add water and the fruit mixture into a clean saucepan.
- Simmer gently on low heat for about 1½ hours until the fruit is soft.
- Warm the sugar in a separate container to help it dissolve quickly when added.
- Add the warm sugar to the cooked fruit mixture and stir until it fully dissolves.
- Boil the mixture rapidly, stirring occasionally to avoid burning and remove any foam (scum) on the surface.
- Test for setting point by putting a small drop of jam on a cold plate; if it wrinkles when touched, it is ready.
- Sterilise the bottles in boiling water or by heating in an oven.
- Pour the hot jam carefully into the warm, sterilised bottles.
- Seal the bottles tightly with clean lids while still hot.

Packaging

- Use sterilised glass jars with tight-fitting lids.
- Label the jars with the name of the product, date of production, and expiry date.
- Consider decorating the jars with a cloth cap or ribbon for marketing appeal.

Challenges likely to be faced

- Lack of proper equipment, such as sterilising jars or a sugar thermometer, can affect food safety or setting point.
- Inaccurate measurements of sugar or fruit may result in poor taste or spoilage.
- Inconsistent heat due to poor stove control can cause the jam to burn or not set well.
- Shortage of good packaging materials, such as clean jars and lids, may delay bottling or reduce shelf life.
- Time management, since preparation requires patience and close attention to avoid

burning or poor consistency.

16. Non-toxic materials must be used in food packaging to ensure the safety and health of consumers. Toxic materials can leach harmful chemicals into the food, especially when exposed to heat or moisture, leading to food contamination. This can cause food poisoning, long-term health issues like cancer, or allergic reactions. Using non-toxic materials ensures that the packaged food remains safe, clean, and suitable for consumption.

17.

a. **Physical Principle**
Packaging must protect against mechanical damage (shocks, crushing, puncture). Tin cans excel here due to rigidity; glass jars resist compression but are fragile; plastic pouches provide minimal resistance to crushing.

b. **Chemical Principle**
Packaging should prevent undesirable chemical interactions and protect food from oxygen, moisture, or light. Glass jars are fully inert; tin cans rely on internal coating to prevent reactions; plastic pouches vary depending on the polymer quality and film thickness.

c. **Biological Principle**
Packaging should prevent contamination from microorganisms. Tin cans and glass jars both achieve this through airtight seals and sterilisation; plastic pouches rely on sealing and are better suited to short-term storage unless combined with vacuum sealing or MAP (Modified Atmosphere Packaging).

18. **Comparison Table: Packaging Types vs. Principles**

Packaging Type	Physical Principles (Protection, Containment, Structure)	Chemical Principles (Resistance, Non-toxicity)	Biological Principles (Sanitation, Pest Control)
Tin (Metal Can)	**High** – Strong, rigid walls resist dents, crushing, and impacts during transport; withstand stacking in warehouses.	**High** – Lacquer-coated interior prevents metal–food reaction; resists moisture and oxygen penetration.	**High** – Airtight seal prevents entry of microorganisms; heat sterilisation during canning kills existing microbes.
Glass Jar	**Moderate** – Rigid but brittle; resists compression but can break easily if dropped.	**Excellent** – Completely inert; no chemical interaction with food; impermeable to gases and moisture.	**High** – Airtight metal lid with vacuum seal prevents microbial entry; sterilisation process ensures safety
Plastic Pouch	**Moderate–Low** – Flexible, lightweight, resists dents but can be punctured or torn more easily.	**Variable** – High-quality food-grade plastics provide moisture and oxygen barrier; lower-grade plastics may allow slow gas exchange.	**Moderate** – Heat-sealed edges reduce microbial entry but less durable than rigid containers; suitable for short shelf-life or refrigeration.

ANSWERS TO REVIEW QUESTIONS 3

1.

Conduction example: Conduction cooks yam by transferring heat directly from the hot surface of the pot or pan to the yam. The heat moves from the metal surface into the yam, making it soft and ready to eat.

Convection example: Convection cooks pasta in boiling water by moving hot water around the pasta. The heat carried by the moving water surrounds and cooks the pasta evenly.

Radiation example: Radiation cooks meat when it is placed under a grill or in an oven. The heat waves travel from the heat source and directly warm the meat's surface, cooking it from the outside in.

2. Conduction happens when the pot touches the stove and gets hot. The pot then heats the water. Convection takes over as the hot water moves around the pasta, transferring the heat and cooking it evenly from all sides.

3. Radiation heats food by sending heat waves from the grill's heat source directly onto the surface of the food. These waves heat the outer layer of the food, which then spreads inside, cooking the entire piece.

4.

a. Boiling (Convection): May reduce water-soluble vitamins like vitamin C because they leach into the water.

b. Grilling (Radiation): Can keep nutrients better by cooking quickly, but high heat can destroy some sensitive vitamins if not done carefully.

5. Convection cooks food faster by moving hot air or liquid around it, reducing cooking time. It also helps cook food evenly, giving pasta a uniform softness or making baked goods light and fluffy.

6.

a. Saves energy: Using methods like steaming uses less fuel or electricity.

b. Reduces waste: Cooking only what is needed and preserving leftovers reduces food waste.

c. Keeps food nutritious: Gentle methods like poaching retain more nutrients, making meals healthier.

7. Boiling vegetables can cause a loss of nutrients like vitamin C and B vitamins because they dissolve in the water and are thrown away. However, steaming keeps these nutrients in the vegetables, making them healthier to eat. Choosing the right method helps keep food more nutritious.

8.

a. Conduction

- Uneven cooking if food is not turned or moved.
- Food may burn if the pan gets too hot.

b. Convection
   - Food can dry out if cooked too long.
   - Cooking can be uneven if the fan or heat is not steady.

c. Radiation
   - Risk of burning the outside while the inside remains undercooked.
   - Needs careful monitoring since heat is direct and intense.

9.

a. Texture and flavour change (Physical): Heat softens food, making it easier to chew and digest. It also enhances taste and smell through browning or caramelisation.

b. Nutrient changes (Chemical): Heat can destroy some nutrients like vitamin C, but it can also make others like lycopene (in tomatoes) more available to the body.

ANSWERS TO REVIEW QUESTIONS 4

1.

a. Preservatives like sodium benzoate help prevent spoilage by stopping the growth of harmful microorganisms. This extends the shelf life and ensures food safety.

b. Colorants such as caramel colour make food look more attractive by restoring or enhancing its appearance, which can increase consumer appeal.

c. Nutritional additives like vitamins and minerals improve the nutritional value of food, helping to prevent nutrient deficiencies (e.g., vitamin A added to margarine).

2. To produce a fortified cereal, the company can use:

a. Preservatives (e.g., nitrates) to increase shelf life and reduce spoilage risk.

b. Colorants (e.g., natural caramel colour) to make the cereal visually appealing to consumers.

c. Nutritional additives (e.g., folic acid, iron, and vitamin B12) to improve the nutritional content, helping to address common deficiencies in the population.

d. Together, these additives enhance safety, appearance, and health benefits, making the product more effective and marketable.

3. Food additives are usually added in small amounts during processing to improve safety, nutrition, or appearance. For example, lecithin is an emulsifier that helps mix oil and water in salad dressings, improving texture and stability. Condiments, on the other hand, are added during cooking or at the table to improve flavour. For instance, soy sauce is a condiment used to enhance the taste of stir-fried dishes. While additives improve technical qualities like shelf life or nutrient content, condiments focus more on taste and cultural value.

4. Advantages of using natural food colours

a. **Health Benefits**

Natural food colours are considered healthier alternatives to artificial colours as they are sourced from plants and do not contain chemicals

b. **Nutritional value**

Many natural colorants come from healthy plant sources and add nutrition to food.

c. **Eco-friendly**

Natural food colours are better for the environment because they break down easily and are made with safer methods.

d. **Consumer demand**

There is more demand for clean-label products, and natural colours help by making labels clearer.

e. **Cultural and traditional significance**

In many cultures, natural food colours have been used for centuries in traditional dishes and beverages, adding visual appeal and cultural value.

Any two from the following or other local ingredients: Beetroot , Turmeric, Kontomire, Hibiscus.

5. Chosen Products

- Natural food colour (from beetroot)
- Homemade ketchup

Steps for Natural Food Colour

- Wash and peel beetroot
- Chop and blend with a small amount of water
- Strain the liquid using cheesecloth
- Store in a small airtight bottle
- Label as Beetroot Natural Colour – Prepared on [Date]
- Use in icing, sauces, and smoothies

Steps for Homemade Ketchup

- Combine tomato paste, vinegar, sugar, salt, onion and garlic powder, allspice, and water in a saucepan
- Simmer for 20 minutes until thick
- Cool and transfer to a sterilized container
- Label as "Homemade Tomato Ketchup – Prepared on [Date]"
- Use as a condiment for fries, sandwiches, and burgers

6. Reflection on Hygiene and Safety

- During preparation, hands, surfaces, and utensils must be clean to avoid contamination.
- Jars and containers must be sterilized to prevent bacterial growth, especially in pickles.
- Herbs and spices must be dry before grinding to avoid mould formation.
- Pickling solutions must be properly boiled to ensure safety and preservation.

Risks of Improper Handling

- Poor hygiene may lead to spoilage, mould growth, or foodborne illnesses.
- Inadequate sealing or sterilization in pickled vegetables may cause fermentation issues or bacterial contamination.

7. Chosen Additive: Turkey berry powder

Process

- Clean and sort the turkey berries to remove dirt and unfit ones.
- Dry them thoroughly under the sun or using a dehydrator until moisture is completely removed.
- Blend the dried berries into a fine powder using a clean, dry blender.
- Store the powder in an airtight container.
- Label the container with: "Turkey Berry Powder – Packed on [Date]".

Safety and Hygiene

- Wash all tools and surfaces before use.

- Dry berries completely to prevent mould.
- Follow safety practices when using sharp tools and electric blenders.
- Use gloves or clean hands to handle ingredients.

Usage in Cooking

Turkey berry powder can be added to stews, soups, or porridge for its rich iron content and bitter, medicinal flavour, supporting blood health and boosting immunity.

Packaging and Labelling

- Pour the strained vanilla extract into small, sterilized glass bottles with tight-fitting lids.
- Label each bottle with:
  - **Name:** Natural Vanilla Extract
  - **Ingredients:** Vanilla beans, vodka (or glycerine)
  - **Prepared on:** [Date]
  - **Use by:** [6–12 months later]
  - **Storage:** Keep in a cool, dark place

Cooking Uses

- Add to cakes, cookies, ice cream, puddings, and beverages for rich vanilla flavour.

Connection to Real-World Standards

- Following hygiene, accurate labelling, and proper storage practices reflects food safety laws.
- Packaging in clean, sealed containers protects the product from spoilage.
- Labelling ensures consumer trust, allergy safety, and traceability in real food industries.

8.

a. Cassava Flour

i. **Source:** Made from the root of the cassava plant (Manihot esculenta).

ii. **Characteristics:** Gluten-free, neutral flavour, light texture, and absorbs more liquid than wheat flour.

iii. **Uses:** Ideal for gluten-free baking, thickening soups, and making traditional dishes like Brazilian cheese bread.

b. Rice Flour

i. **Source:** Made from finely ground white or brown rice.

ii. **Characteristics:** White rice flour has a soft, fluffy texture and is neutral in flavour, while brown rice flour is denser with more nutrients.

iii. **Uses:** Commonly used in gluten-free baking, rice noodles, and as a thickener in soups and sauces.

9.

a. Wheat Flour

- Contains gluten, making it elastic and suitable for baking.

- All-purpose flour is versatile, bread flour is high in protein (good for yeast bread), and cake flour is low in protein (for tender cakes).
- **Product Example:** Bread or cakes.

b. Bean Flour

- Made from dried and ground beans like chickpeas or black beans. It is high in protein and fiber and naturally gluten-free.
- Common in vegetarian and vegan recipes.
- **Product Example:** Koose or tubani (local dishes).

10.

a. Flour: Provides structure, leavening, browning, moisture retention, and body to the product.
b. Leavening agents: Cause the dough or batter to rise, making products tender and light in texture.
c. Liquids (water, milk): Hydrate the flour to form gluten, bind ingredients, and affect texture and flavour.
d. Fats (butter, oil): Add tenderness, flavour, and moisture, and help with browning and aeration.
e. Sugar: Sweetens the product, balances flavour, feeds yeast, and aids crust formation and browning.

11. Letting the dough rise allows the yeast to produce gas, making the bread light and fluffy. If you skip this step, the bread will be dense and heavy.

12. To address iron deficiency, we can fortify wheat flour using **ferrous sulphate** due to its high bioavailability.

a. Integration Method: Use dry mixing techniques to evenly distribute the fortificant during flour processing.
b. Testing and Quality Control: Conduct lab tests to ensure the iron content remains stable during shelf life, does not alter the taste or texture, and meets national fortification standards.
c. Regulatory Compliance: Submit the formulation for approval from national food regulatory bodies and ensure labelling clearly states the added iron and health benefits.
d. Consumer Education: Develop packaging that highlights the purpose and benefits of iron fortification. Partner with health educators and media to raise awareness in the target population.
e. Feedback: Conduct community taste tests and use surveys and interviews to collect feedback and make improvements.

13. **Biofortification** involves enhancing the nutrient content of crops through genetic engineering or conventional breeding. It's cost-effective long-term because it doesn't require repeated external inputs once developed. For example, orange-fleshed sweet potatoes are biofortified with Vitamin A and grown in several African countries. However, biofortification may face acceptance issues, longer development timelines, and regulatory hurdles.

Food fortification, in contrast, involves adding nutrients during food processing, such as adding iodine to salt or vitamin D to milk. It can be quickly implemented and targets specific nutrient deficiencies. However, it requires ongoing investment, robust supply chain management, and monitoring systems.

In conclusion, biofortification offers sustainability and wide reach in agricultural communities, while fortification is more flexible and faster to deploy, especially in urban settings. The best public health strategy might combine both, depending on context.

14.

a. Plan and Preparation

- Find out how many people in the community have vitamin A deficiency.
- Choose bread as the product because most people eat it regularly.
- Decide to add moringa leaf powder during bread-making to increase vitamin A content.
- Create a recipe that balances moringa with wheat flour, so the bread still tastes good.

b. Natural Ingredient(s) and Why

- **Moringa leaf powder** – it is rich in vitamin A, grows locally, is affordable, and easy to process into powder.

c. Testing the Bread

- Bake a small batch of moringa bread.
- Check its colour, taste, and texture.
- Send a sample for nutrient testing to make sure it contains enough vitamin A.
- Ask a small group of people to taste it and give feedback.

Encouraging Acceptance

- Hold a tasting event at school and in the community.
- Explain through posters, talks, and local radio how vitamin A helps eyesight and overall health.
- Print "Rich in Vitamin A – Good for Your Eyes and Body" on the bread's packaging.

15.

a. **Texture**: I would press the muffins gently to check for softness. They should feel light and springy, not hard or dense. If I break one, it should hold together but still be slightly crumbly.

b. **Appearance**: I would check for even colour with no burnt spots. The muffins should have a uniform shape and rise evenly, showing an attractive dome.

c. **Taste**: I would taste the muffin to ensure it's not too sweet or bland. The ingredients should blend well, with no unpleasant or overpowering flavours.

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GLOSSARY

Air-Blast Freezing	A method where very cold air is blown onto food to freeze it quickly.
Antioxidants	Additives like vitamin C (ascorbic acid) that stop fats and oils from going bad (rancid).
Balanced Diet	A diet that contains all food nutrients in their right proportion to meet an individual's nutritional needs.
Boiling	Cooking food in water or broth at 100°C until fully done.
Canning	A method of preserving food by sealing it in airtight containers and heating to destroy microbes.
Caramelisation	When sugar is heated and turns brown, giving a sweet, rich flavour.
Cold Storage	Keeping food at low temperatures (refrigeration or freezing) to slow spoilage.
Colorants	Natural or artificial dyes used to make food look more appealing.
Composting	Turning food waste into natural fertilizer for plants.
Conservative Cooking Methods	Gentle cooking techniques like steaming, poaching, and boiling that help preserve nutrients in food.

Cultural Significance	The traditional and cultural importance of condiments in different regions and cuisines.
Denaturation	When proteins change shape due to heat, making them firm (e.g., cooked egg whites).
Dietary Related Diseases	Health conditions caused by poor nutrition, unbalanced diets, unhealthy eating habits (e.g., obesity, diabetes, hypertension, malnutrition).
Drying	A method of food preservation that removes moisture to inhibit microbial growth.
Emulsifiers	Additives that help oil and water mix well in foods like mayonnaise or salad dressing.
Fermentation	A preservation method that uses beneficial microbes to convert sugars into acids or alcohols.
Fermented Condiments	Flavourful condiments made by fermentation (e.g., vinegar, kimchi, pickles).
Flavour Enhancement	Improving taste and smell of food using condiments like spices and sauces.
Food Additives	Substances added to food to improve safety, taste, appearance, or shelf life.
Forced-Air Oven	An oven that uses fans to move hot air for even cooking.
Fortification	Adding nutrients like vitamins and minerals to food (e.g., folic acid in flour).
Freezing	A method of preserving food by storing it at temperatures below 0°C to stop microbial activity.
Gelatinisation	When starch absorbs water and swells during cooking, making food soft (e.g., rice, flour).
Gelling Agents	Additives that make food jelly-like or help it set (e.g., used in desserts).
Grilling	Cooking food using direct dry heat from below or above, often on a metal grate.
Health Benefits	Positive effects of condiments on health (e.g., ginger aids digestion; hot pepper boosts metabolism).
Herbs	Fresh or dried leaves used for flavouring (e.g., bay leaves, black mint).
Jam	A sweet preserve made from crushed or chopped fruit and sugar, cooked to a thick consistency.
Jelly	A clear fruit spread made from fruit juice and sugar, firmed with pectin.
Maillard Reaction	A chemical reaction between proteins and sugars during cooking that gives browned food its flavour (e.g., roasted meat crust).
Marmalade	A preserve made from citrus fruit, especially oranges, including the peel.
Meal Planning	The process of organising meals in advance to ensure they are nutritious, balanced and meet dietary needs and preferences.
Meal Service	The process of preparing, presenting and serving food.
Meal Type	The kind of meal served (e.g., breakfast, lunch, dinner).
Menu	A list of dishes or food items planned for a meal.
Micronutrients	Small but essential nutrients like vitamins and minerals found in some condiments (e.g., turmeric, garlic).

Non-toxic Material	Packaging material that is safe for food contact and does not release harmful substances into food.
Nutrient Loss	When heat destroys vitamins or minerals during cooking.
Nutrient Retention	The ability of food to keep its vitamins, minerals, and other nutrients after cooking.
Nutritional Interventions	Strategies and actions designed to improve nutritional status and prevent or manage diet-related diseases at individual, family and community levels.
Packaging	The process of enclosing or protecting food for distribution, storage, sale, and use.
Poaching	Cooking food gently in water or broth at low temperature (below boiling).
Portion Control Cooking	Preparing the right amount of food to reduce waste.
Preservation	The process of treating and handling food to slow down spoilage and extend its shelf life.
Preservatives	Chemicals like sodium benzoate or nitrates that prevent food spoilage by stopping bacteria and mould.
Preserve	A food product made from fruit, vegetables, or condiments, treated to last longer (e.g., jam, jelly, marmalade, shito).
Shito	A Ghanaian spicy condiment made from pepper, dried fish or shrimp, oil, and spices, preserved by cooking and storing in sealed containers.
Sous-Vide	Cooking food in a sealed bag in warm water to control temperature and keep flavour.
Spray Drying	Turning liquids (like milk) into powder using hot air in food processing.
Steaming	Cooking food using steam from boiling water without the food touching the water.
Sustainable Cooking	Using methods that save energy, reduce waste, and protect the environment.
Sustainable Fuels	Clean energy sources for cooking, like solar, biomass, or efficient stoves.
Table and Setting/ Laying	The arrangement of tableware for a meal, ensuring functionality and aesthetics.
Thermal Processing	Using heat in factories to make food safe and preserve it longer.
Upcycling Food Scraps	Reusing leftover parts of food to make new dishes or products.
Vacuum Sealing	A method where air is removed from the packaging to prevent oxidation and microbial growth.

ACKNOWLEDGEMENTS

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This book is intended to be used for the Year Two 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)

ISBN 978-9-98-895860-2