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Ministry of Labor and Skills

# CULINARY ART

# LEVEL – I

## Based on March, 2022, Curriculum Version I



## Module Title: Using Basic Methods of Cookery

## Module Code: CST CUA1 M05 0322

## Nominal duration: 40 hours

**Prepared By: Ministry of Lobar and Skill**

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## Introduction to the Module

In culinary art filed; use basic method of cookery helps to use a range of basic cookery methods to prepare menu items for the kitchen of hospitality or catering operation.

This module is designed to meet the industry requirement under the Culinary Art occupational standard, particularly for the unit of competency: **Use Basic methods of Cookery.**

**This module covers the units**:

- Select and organize cooking equipment
- Basic methods of cookery
- Effect of heat on nutritional values of ingredients

**Learning Objective of the Module**

- Select and organize cooking equipment
- Use basic methods of cookery
- Understand effect of heat on nutritional values of ingredients

**Module Instruction**

For effective use this modules, trainees are expected to follow the following module instruction:

1. Read the information written in each unit
2. Accomplish the Self-checks at the end of each unit
3. Read the identified reference book for Examples and exercise

## Unit one: Selecting and organizing cooking equipment

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

- tools and equipment for cooking methods
- hygiene and safety of equipment

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Select appropriate tools and equipment for cooking methods
- Use equipment hygienically and safely

## 1.1. Equipments and Tools for cooking methods

A kitchen, is a room or part of a room (sometimes called "kitchen area" or a "kitchenette") used for food preparation and cooking.

Various types of equipment are used in a kitchen. The type, amount and size of equipment will depend on the type of menu being provided and number of people to dine. Kitchen equipment may be divided into three categories: large equipment's, Mechanical equipment, utensils and small equipment's.

### 1.1.1. Large equipment

Large equipment's include cooking ranges, electric ovens, microwave ovens, steamers, boiling pan, deep fat-fryers, sinks, and tables.

**A. Ranges and Ovens**

An oven is an enclosed compartment for heating, baking or drying. It is most commonly used in cooking and pottery.

There are two common kinds of modern ovens. These are:-

- Gas ovens and
- Electric ovens.

Ovens used in pottery are also known as kilns. An oven used for heating or for industrial processes is called a furnace or industrial oven.

In the past, cooking ovens were fueled by wood or coal. Modern ovens are fueled by gas or electricity. When an oven is contained in a complete stove, the burners on the top of the stove may use the same or different fuel than the oven.

Steam ovens introduce water (in the form of steam) into the cooking chamber. This can aid the formation of a crisp crust on baked goods and prevent the drying-out of fish and casseroles. The degree of humidity is usually selectable among at least several steps. Some steam ovens use water carried to the oven by the user in a container; others are permanently connected to the building plumbing.



Brick Oven



Modern 3 oven AGA cooker



Electric Trivection Oven



Gas Range on Oven

**Figure 1.1: range and oven**

More modern ovens, such as General Electric's Trivection oven, may also provide combined thermal and microwave cooking. This can greatly speed the cooking of certain types of food while maintaining the traditional characteristics of oven cooking such as browning.

Ovens also vary in the way that they are controlled. The simplest ovens may not have any controls at all; the several ovens simply run continuously at various temperatures. More-conventional ovens have a simple thermostat: which turns the oven on and off to maintain the required set temperature nearly constantly and selects the temperature at which it will operate. Set to the highest setting, this may also enable the broiler element. A timer may allow the oven to be turned on and off automatically at pre-set times. More sophisticated ovens may have complex, computer-based controls allowing a wide variety of operating modes and special features including the use of a temperature probe to automatically shut the oven off when the food is completely cooked to the desired degree for cleaning.

Some ovens provide various aids to cleaning. Continuous cleaning ovens have the oven chamber coated with a catalytic surface that helps break down (oxidize) food splatters and spills over time. Self-cleaning ovens use pyrolytic decomposition (extreme heat) to oxidize dirt. Steam ovens may provide a wet-soak cycle to loosen dirt, allowing easier manual removal. In the absence of any special methods, chemical oven cleaners are sometimes used or just old fashioned scrubbing.

## B. Steamers

There are basically **three** types of steaming ovens: Atmospheric; Pressure; and Pressure less.

There are also combination steaming ovens; pressure/ convection steam; pressure less/ fully pressurized; steaming/ hot air cooking; combination of hot air and steam; combination of hot air and steam with two settings.




Figure 1.1:.steamer

In addition, dual pressure steamers, switchable between low pressure and high pressure, and two pressure settings plus zero are available. Steaming ovens continue to improve and become more versatile.

The modern combination steamers which can be used for

- steaming,
- stewing,
- packing,
- braising,
- roasting,
- backing,
- vacuum cooking,
- gratinating,
- reconstituting,
- blanching
- defrosting.

They have electronic controls for easier setting and more precise time/ temperature controls. The advantage of the electronic control is that they assist in fuel efficiency. They are available in several sizes and process efficiencies.

## C. Boiling Pans

Many types are available in different metals – aluminium, stainless steel, etc – in various sizes (10, 15, 20, 30 and 40 litre capacity) and they may be heated by gas or electricity. As they are used for boiling or stewing large quantities of food, it is important that they do not allow the food to burn. For this reason the steam-jacket type boiler is the most suitable. Many of these are fitted with a tilting device to facilitate emptying the contents.




**Figure 1.2: boiling pan**

## D. Deep Fat-Fryers

A deep fat-fryer is one of the most extensively used items of equipment in many catering establishments. Fryers are heated by gas or electricity and incorporate a thermostatic control in order to save fuel, regulate temperature and prevent overheating. There is a cool zone below the source of heat into which food panicles can sink without burning, thus preventing spoiling of other foods being cooked. This form of heating also economizes fat consumption.




**Figure 1.3: deep fat fryer**

**E. Pressure Fryers**

Food is cooked in an air-right frying utensil enabling food to be fried a lot faster and at a lower oil temperature and pressure.

**F. Hot Air Rotary Fryers:**

These are designed to cook batches of frozen blanched chips or battered foods in 4-6 minutes without any oil. Computerized fryers are available which may be programmed to control automatically cooking temperatures and times, on and off switches, basket lifting and product holding times.

The fryer computes exact cooking times and an automatic signaling device indicates the end of a cooking period.

**G. Hot-Cupboards**

Hot-cupboards are used for heating plates and serving dishes and for keeping food hot. Care should be taken to see that the amount of heat fed into the hot-cupboard is controlled at a reasonable temperature. This is important, otherwise the plates and food will be too hot.



**Figure 1.4: hot cupboard**

**H. Bains-Marie:**

The bain-marie consists of a large container filled with a working liquid (usually water) and another, smaller container filled with the substance to be heated. The smaller container is partially immersed in

the larger container, and the larger container is heated. The temperature of the working liquid cannot normally exceed the boiling point of that liquid at the ambient atmospheric pressure, and so the temperature of the inner container can be brought to a known limit and held there by bringing the outer working liquid to a boil.

Bains-Maries are used for holding large quantities of food for service. It is generally used for servicing foods in commercial organizations such as hospitals, restaurants, canteens, hotels etc.

### I. Grills and Salamanders

A salamander grill is a culinary utensil used to cook food. Mainly used to grill, the utensil can also be used for browning food, such as a pastry or pudding, as a portable stove, or as a broiler.

The salamander or grill heated from above by gas or electricity probably causes more wastage of fuel than any other kitchen equipment through being allowed to bum unnecessarily for long unused periods. Most salamanders have more than one set of heating elements or jets and it is not always necessary to have them all turned on full.

Salamander bars and draining trays should be cleaned regularly with hot water containing a grease solvent such as soda. After rinsing they should be replaced and the salamander lit for a few minutes to dry the bars.

For under-fired grills to work efficiently they must be capable of cooking food quickly and should reach a high temperature 15-20 minutes after lighting, and the heat should be turned off immediately after use. When the bars are cool they should be removed and washed in hot water containing a grease solvent, rinsed, dried and replaced on the grill. Care should be taken with the fire bricks if they are used for lining the grill as they are easily broken.



**Figure 1.5: grill**

### J. Fry Plates & Griddle Plates

Griddles are flat plates of metal used for frying, grilling, and making pan breads (such as pancakes, injera, tortillas, chapatis, and crepes). Traditional iron griddles are circular, with a semicircular hoop fixed on opposite edges of the plate and rising above it to form a central handle. Rectangular griddles

that cover two stove burners are now also common, as are griddles that have a ribbed area that can be used like a grill pan. Some have multiple square metal grooves enabling the contents to have a defined pattern, similar to a waffle maker. Like frypans, round griddles are generally measured by diameter (20 – 30 cm).

Griddles with zone heating are useful when demand varies during the day. These reduce energy consumption in quiet periods while still allowing the service to be maintained.

**Barbecues**

Barbecues are becoming increasingly popular because it is easy to cook and serve quick tasty food on them and the outdoor location, smell and sizzle develop an atmosphere which many customers enjoy.

There are three main types of barbecue: traditional charcoal, gas (propane or butane) and electric. Remember that the charcoal fired type takes about an hour before the surface is ready. With gas and electricity the barbecue is ready to cook almost immediately.

### 1.1.2. Mechanical Equipment

Mechanical equipment includes peelers, mincers, mixers, refrigerators, dish-washers.

**A. Mincers**

Mincers are used for chopping vegetables or meat. Mincers are compact, hygienically designed machines capable of providing a cool, efficient mincing action without squashing or pulping the product.



**Figure1. 6: mincers**

**B. Mixers**

A mixer is a kitchen appliance intended for mixing, folding, beating, and whipping food ingredients. Mixers come in two major variations, hand mixers and stand mixers.

A hand mixer, as the name implies, is a hand-held mixing device. It typically consists of a handle mounted over a large enclosure containing the motor, which drives one or two beaters. The beaters are immersed in the food to be mixed.

A stand mixer is essentially the same as a hand mixer, but is mounted on a stand which bears the weight of the device. Stand mixers are larger and have more powerful motors than their handheld counterparts. They generally have a special bowl that is locked in place while the mixer is operating. Heavy duty commercial models can have bowl capacities in excess of 100 quarts (95 L). Typical home and commercial models are equipped with bowls of around 4 quarts (4 L). A typical home dick stand mixer will include a wire whip for whipping creams and egg whites; a flat beater for mixing batters; and a dough hook for kneading.



**Figure 1.7: mixers**

### C. Blender

A blender or liquidizer is a kitchen appliance used to mix ingredients or puree food. The blending container can be made of glass, plastic, or stainless steel, and often has graduated markings for approximate measuring purposes. At the top of the container is a lid to prevent ingredients from escaping during operation. At the bottom is a serrated blade assembly, sometimes removable for cleaning purposes.



**Figure 1.8: blender**

**D. Refrigerators**

A refrigerator (often called a "fridge" for short) is a cooling appliance comprising a thermally insulated compartment and a mechanism to transfer heat from it to the external environment, cooling the contents to a temperature below ambient.

Refrigerators are extensively used to store foods which deteriorate at ambient temperatures; spoilage from bacterial growth and other processes is much slower at low temperatures. A device described as a "refrigerator" maintains a temperature a few degrees above the freezing point of water; a similar device which maintains a temperature below the freezing point of water is called a "freezer". Freezers keep their contents frozen. They are used both in households and for commercial use. Most freezers operate at around -18°C (0°F).

## 1.1.3. Utensils and Small Equipments

Cutlery and utensils are tools used for everyday preparation and consumption of foods.

- **Utensils-** are instruments, implements, or containers used in the kitchen for food preparation.
- **Cutlery**- tools for cutting and eating food such as knives, forks, and spoons.

**Utensils and small equipment** includes pots, pans, whisks, bowls, spoons and ladles.

**A. Cookware and Bake ware**

Cookware and bake ware are types of food preparation containers commonly found in the kitchen. Cookware comprises cooking vessels, such as saucepans and frying pans, intended for use on a stove or range cooktop. Bake ware comprises cooking vessels intended for use inside an oven. Some utensils are both cookware and bakeware.

B. **Braising pans and roasting pans**

Braising pans and roasting pans (also known as braisers and roasters) are large, wide and shallow, to provide space to cook a roast (chicken, beef, or pork

Casserole pans (for making casseroles) resemble roasters and dutch ovens, and many recipes can be used interchangeably between them. Casseroles are commonly made of glazed ceramics or pyrex.

C. **Dutch ovens**

Dutch ovens are heavy, relatively deep pots with a heavy lid, designed to re-create oven conditions on the stovetop (or campfire).

They can be used for stews, braised meats, soups, and a large variety of other dishes that benefit from low heat, slow cooking. Dutch ovens are typically made from cast iron, and are measured by volume.

Fry pans with a gentle, rolling slope are sometimes called omelet pans. Grill pans are fry pans that are ribbed, to let fat drain away from the food being cooked. Fry pans and grill pans are generally measured by diameter (20–30 cm).

D. **Saucepans**

Saucepans (or just "pots") are vessels with vertical sides about the same height as their diameter, used for simmering or boiling. Saucepans generally have one long handle. Larger pots of the same shape generally have two handles close to the sides of the pot (so they can be lifted with both hands), and are called sauce-pots or soup pots (3–12 liters). Saucepans and saucepots are measured by volume (usually 1–8 L). While saucepots often resemble dutch ovens in shape, they do not have the same heat conduction characteristics.

E. **Sauté pans**

Sauté pans used for sautéing have a large surface area, like a fry pan, but with vertical sides, to prevent food from escaping during cooking.

Stockpots are large pots with sides at least as tall as their diameter. This allows stock to simmer for extended periods of time without reducing too much. Stockpots are typically measured in volume (636 L). Stock pots come in a large variety of sizes to meet any need from cooking for a family to preparing food for a banquet. A specific type of stockpot exists for lobsters, and an all-metal stockpot usually called a caldero is used in Hispanic cultures to make rice.

F. **Woks**

Woks are typically lens-shaped. This allows a small pool of cooking oil to be heated to a high heat using relatively little fuel, while the outer areas of the wok are used to keep food warm after it has been fried in the oil. In the Western world, woks are typically used only for stir-frying, but they can actually be used for anything from steaming to deep frying.

G. **Baking pans**

Baking pans are designed for use in the oven (for baking) and encompass a variety of different styles of bake ware such as :-

- cake pans
- pie pans

- loaf pans.

These are often made from light or medium gauge metal. The longest lasting baking sheets and pans are made with heavy-gauge steel or aluminum. They are heavier in weight which helps in heat distribution evenly and prevents the metal from warping.

H. **Cake pans**

Cake pans include square pans, round pans, and specialty pans such as angel food cake pans and spring form pans often used for baking cheesecake.

Sheet pans or cookie sheets are bake ware with large flat surfaces.




**Figure 1.9: pans**




**Figure 1.10: Pot, oven and casserole**



**Figure 1.11: chief's knife**

Table 1.1 **Tools And Utensils**

| | |
|---|---|
| 1. French Knife |  |
| 2. Vegetable Peeler |  |
| 3. Long Handled Fork |  |
| 4. Slotted Spoon/Cook's Fork |  |
| 5. Tong |  |
| 6. Sharpening Steel |  |
| 7. Strainer |  |

| | |
|---|---|
| 8. Colander |  |
| 9. Mixing Bowls |  |
| 10. Sauce pans |  |
| 11. Measuring cups |  |
| 12. Pancake Turner |  |
| 13. Measuring Glass |  |
| 14. Measuring Spoons |  |
| 15. Skillet |  |
| 16. Sauté Pan |  |
| 17. Can Opener |  |

| | |
|---|---|
| 18. Kitchen Scissor |  |
| 19. Cutting Boards |  |
| 20. Rubber Spatula/Scraper |  |
| 21. Pastry wheel |  |
| 22. Skimmer |  |
| 23. Wire Whip |  |
| 24. China Cup |  |
| 25. Sieve |  |
| 26. Food Mill |  |
| 27. Zester |  |
| 28. Box grater |  |
| 29. Pastry Bag and Tubes |  |

### 1.1.4. Cutting, Mashing, Grating & Grinding Tools

**Cutting -** A chef's knife, also known as a French knife, is a cutting tool used in food preparation. It is the primary general-utility knife for most Western cooks. A chef's knife generally has a blade eight inches (20 cm) in length and 1 and a half inches in width, although individual models range from six to 14 inches (15 to 36 cm) in length.

**Grater**- is a kitchen utensil used to grate foods into fine strips or crumbs. Several types of graters have different sizes of grating slots, and can therefore aid in the preparation of a variety of foods. They are commonly used to grate cheese and lemon or orange peel (to add zest), and can also be used to grate other soft foods. They are commonly used in the preparation of toasted cheese, Welsh rarebit, and macaroni and cheese.

Chinois fits on top of a deep container and mashes food when pressed through it.

Eggbeater used to beat mixture vigorously and homogenously.

**Mortar and pestle** is a tool used to crush, grind, and mix substances. The pestle is a heavy stick whose end is used for pounding and grinding, and the mortar is a bowl. The substance is ground between the pestle and the mortar.

Potato masher or bean masher is a food preparation utensil used to crush soft food for such dishes as mashed potatoes, apple sauce, or refried beans.

**Meat mallets**- tenderise or flatten meat. Made from wood or metal, they are typically two-sided, one flat with slight bumps, and the other with more pronounced protrusions. Meat mallets can be made from wood, plastic, or steel, but their use has lessened with the invention of cube steak machines and other electric tenderizers. Meat mallets can also be used to crush ice.

**Vegetable Peelers**

A peeler is a metal blade attached to a metal, plastic or wooden handle that is used for peeling vegetables, frequently potatoes.

There are **two** main varieties of peeler.

- The 'Yorkshire' (or sometimes called a Lancashire peeler) design involving the blade as an extension of a handle, in much the same way as the blade is attached to a knife.
- The second variety more closely resembles a safety razor (sometimes it is called a Y-peeler (due to its shape), Rex peeler, yoke peeler, or speed peeler), with the blade perpendicular to the handle, is used with a similar action to a razor, shaving off skin in strips parallel to the handle.

Most speed peelers have an 'eye gouger' beside the blade, a loop of metal used to dig out eyes and blemishes from the potato. Peelers can be used on citrus fruits, asparagus, eggplant, tomatoes and even mushrooms.




**Figure 1.12: Mashing, Grating and Grinding Tools**

### 1.1.5. Extracting and Straining Tools

**Cheesecloth**- This cloth is made of a tightly woven cloth and is used for straining fine particles from a liquid suspension

**Coffee filter-** is a coffee-brewing utensil, usually made of disposable paper, but recently stainless steel filters are in use. They are used to brew filter coffee, the form of coffee common in India.

**Colander Cooks**- use these to wash foods or to drain noodles or vegetables after boiling. Large metal ones are best.




**Figure 1.13: Extracting and Straining Tools**

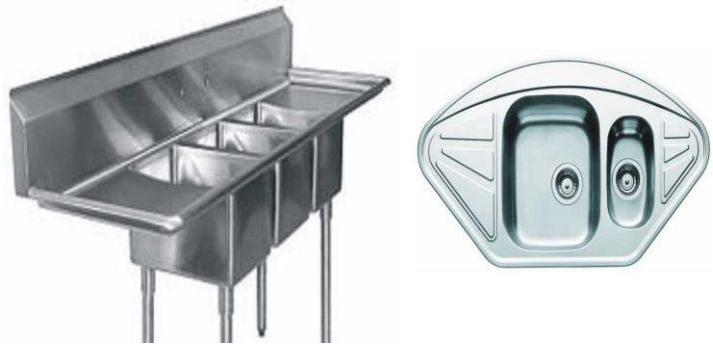


**Figure 1.14: sink**

### 1.1.6. Hygiene and safely of equipment

Select and assemble equipment and utensils means that workers must be able to select or choose the correct piece of equipment to do the job that is required.

When that is done the following must take in to consideration.

#### A. Cleanliness of items

Is the equipment clean and suitable for use? The Food Safety Plan should state that all equipment is clean after the last time that it was used.

Equally people must ensure that equipment is clean before use. This is a check in place to see if the Food Safety Plan is actually working.

Any observance of utensils being found not to be cleaned must be reported to Supervisor so checks can be made as to the reason why.

- **Cleaning of knives:**
  - ✓ Always wash and wipe the knife dry before use
  - ✓ Never leave knives in a sink with water
  - ✓ Never put wooden-handled knives through a dishwasher
  - ✓ Dry thoroughly with the blade pointing away from your hand
  - ✓ Place clean knives in a wrap protector and/or toolbox.



**Figure 1.15: Knifes safety and hygiene**

### *B. Maintaining clean equipment*

- Loosen food particles by soaking, scraping and pre-rinsing
- Wash equipment by using hot water with a cleaning agent (detergent), scrubbing or scouring and jet spraying
- Rinse with hot water to remove soil and detergent residue
- Sanitise by using a chemical sanitiser or immersing in boiling water. Dishwasher's final rinse cycle is above 80ºC which eliminates all airborne bacteria
- Drying equipment can be achieved by using clean kitchen cloths, air drying and heat drying methods.



**Figure 1.16: maintaining and cleaning equipment**

## C. Choice of correct type and size of equipment and utensils

When the equipment has been found to be clean the next step is to ensure that the equipment is the correct size and is suitable for the job required. When cooking large quantities of food it is important that there is enough room to stir the soup without spilling over the edge. When deep frying ensure that the basket is not overloaded. Collecting equipment and utensils in the necessary numbers

**How many of each piece of equipment will be needed to do the job.**

- When setting a function service point it is good practice to ensure that there is a serving spoon for every dish rather than just one spoon for 3 dishes
- To bake 20 cakes with 4 tins is tiresome and in efficient; purchase more tins.

**How much food is going to be produced?**

- To cook 400 (four hundred) chicken breasts you will need to have 20 trays to hold twenty (20) chicken breasts if all are to be cooked
- To cook 400 with 2 trays will take much longer.

### D. Ensuring safety of equipment and utensils

Is the equipment safe to use? Does the worker have the skills and knowledge to operate or use the particular piece of equipment?

It is the responsibility of the managers to ensure that staff have the knowledge to operate equipment safely before allowing staff to use the equipment.




Figure 1.17: Equipment usage

## 1.1.7. Use equipment safely

Accidents in kitchens are caused mainly by carelessness, lack of concentration or lack of equipment knowledge.

A good working knowledge of equipment is crucial. Certain key steps must be followed.

### A. Electrical equipment

**Check equipment before use:**

- Never put hands close to live electricity or the moving parts of the unit
- Switch equipment off after use
- Switch equipment off and remove power plugs prior to cleaning
- Do not use electrical equipment in wet areas
- Never place electrical items in water.

All electrical equipment should be clean and fully assembled when they were last used.

This is to ensure that all the parts have been cleaned and all the parts are there, and clean when it is re-assembled.

People should still check that the piece of equipment is clean before use because others may be lazy. Check every time.

### B. power Checking equipment

Government legislation; whether Local, State or National; requires employers to maintain equipment safely at all times. This entails regular maintenance and cleaning by staff or contractors.

Periodic safety checks should be conducted by qualified service technicians who follow a standard procedure that is easily monitored by owners:

- Use a checklist for items
- Record the date of service
- Record faults found on equipment
- Indicate repairs/maintenance required
- Record date of repair and name of repairer



**Figure 1.18: power checking equipment**

- Kitchen staff should report any unsafe or dangerous equipment immediately.
- The item should be clearly labelled and removed from the work area.

### C. Physically assemble equipment

Can the staff member assemble the required equipment safety to ensure efficient operation of that piece of equipment?

When purchasing equipment it is necessary to keep Instruction Manual on Correct Operation of machinery. Some people may tend to think this is not necessary so they can be filed in the wrong place and become lost.

It is good practice for managers to file copies of these manuals in office files until machinery is no longer used. All staff should have access to a copy of these manuals.

Modern communications allow for people to obtain copies of Operating Manuals from Manufacturers websites.

Students should look for Operating manuals for all equipment that are in their kitchens and store them on computer memory sticks.




**Figure 1.19: physical assembling equipment**

There is a need to use equipment in the kitchen according to manufacturer's instructions. There can be a need to:

- Keep, read and follow any instructions that accompany the delivery of a new piece of equipment. If you can't find the instructions then ring the manufacturer or supplier to get a copy or check the net
- Get the manufacturer to come and show you how to use the item of equipment – ask then for some on-site training.

There is also a need when handling equipment and utensils to do so without causing damage:

- The user manual will provide advice on this but you should also be guided by the advice given from the supplier.
- It should also be remembered failing to follow manufacturer's instructions in relation to the use, cleaning and maintenance of equipment can void warranties or guarantees.

Finally, check out any individual store practices:

The place where you work may have some special ways of using equipment or may prohibit a certain piece of equipment being used in a particular way.

| Self-check 1 | Written test |
|---|---|

Name…… ID…… Date…….....

**Directions:** Answer all the questions listed below.

**Test I Short Answer Questions**

1. Define A kitchen? (2.5 pts)
2. List the three categories of Kitchen equipment? (2.5 pts)

**Test II Write true if the statement is correct and false if statement is incorrect**

1. Cutlery and utensils are tools used for everyday preparation and consumption of foods. (2.5 pts)
2. Utensils are instruments, implements, or containers used in the kitchen for food preparation (2.5 pts)
3. Personal hygiene is cleanliness relating to the body. (2.5 pts)
4. The human body carries dangerous germs and bacteria so good personal hygiene means fewer hygiene risks. (2.5 pts)
5. All clothing must be clean and uniforms should not be worn outside the workplace. (2.5)

***Note:*** **Satisfactory rating - 10 points** **Unsatisfactory - below 10 points**

You can ask you teacher for the copy of the correct answers

## Unit Two: Basic methods of cookery

This unit to provide you the necessary information regarding the following content coverage and topics:

- Basic categories of cooking methods
- Safety concerns
- prepare Dishes using a range of methods of cooking
- Seasoning and flavoring ingredients

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Understand basic categories of cooking methods
- Understand Safety concerns
- Prepare Dishes using a range of methods of cooking
- Apply Seasoning and flavoring ingredients

## 2.1. Basic categories of cooking methods

To ensure desired texture, taste, flavor and quality of cooked food, choosing correct method of cooking is very important. The characteristics desired in the finished product determine which method of cookery will have to be chosen for any given food. While correct preparation of ingredients and correct mixing are necessary, greater skill is needed in the actual cooking of the food.

The cooking of food involves heating it in a variety of ways to make it more palatable. The heat to cook the food comes from a variety of sources, including electric elements or hotplates; gas flame from a stove or barbecue; the heat from a conventional oven; and heat generated by a microwave oven.

Cooking methods are mainly classified as:

- Moist heat cooking method
- Dry heat cooking method

### 2.1.1 Moist heat cooking method

As the name indicates, moist heat cooking relies on the presence of liquid or steam to cook foods. This method can be used to make healthy dishes without any added fat or oil. It's also a great way to tenderize the tough fibers in certain cuts of meat, like beef chuck or brisket. When cooking fibrous vegetables and legumes, moist heat cooking softens the food until it reaches the perfect tenderness.

Which uses liquid cooking medium (like water, stock, milk, fruit juices).the liquid cooking medium is used to transfer heat to the food and cook by convection? E.g. of moist heat cooking method includes boiling, poaching, steaming, stewing etc.

**A. Boiling**

Boiling is a process of cooking food that mainly requires rapid movement of the cooking liquid. Foods that suit this method of cookery are pasta, rice, fresh vegetables and dried vegetables. Food is cooked by bringing liquid (usually water) to the boil quickly and maintaining it at a temperature of 100°C.

Boiling can be done in two ways: The food can be placed into already rapidly boiling water and left to cook.

The heat can be turned down and the food can be simmered; or the food can also be placed into the pot, and cold water may be added to the pot. This may then be boiled until the food is satisfactorily cooked.

The equipment used for boiling and simmering includes the stove, stockpots, electric stockpots, spiders, balers, ladles, chino is and filters. Very large stockpots have a tap at the base or a mechanical tilt to remove the stock.

Suitable foods for boiling include:

- **Green vegetables** start cooking process by adding to already boiling water. Refresh in cold water to retain color and texture. Refreshing stops the cooking process and helps the vegetables retain vitamins and minerals.
- **Root vegetables** start the cooking process in cold water. Cover with water and put the lid on.
- **Fresh meat and poultry** start in cold water and cover during the cooking process.
- **Cured meats, such as corned silverside** can be started in cold water. Keep the meat fully submerged during the cooking process.
- **Farinaceous foods, such as rice, pasta, grains** start cooking by adding to boiling water. Stir occasionally with the lid off. Cook pasta until 'al dente'. Refresh to separate once cooked.
- **Bones for stocks and bouillons** start in Coldwater. Skim off any scum. Simmer only. Blanch bones in boiling water first before cooking to produce a clear stock.

The equipment's used for boiling and simmering includes stove, stockpot, balers, ladles, filter.



Fig 2.1. Boiling

### B. Poaching

Poaching is the process of gently simmering food in liquid, generally water, stock or wine. Poaching is particularly suitable for fragile food, such as eggs, poultry, fish and fruit, which might easily fall apart or dry out. For this reason, it is important to keep the

heat low and to keep the poaching time to a bare minimum, which will also preserve the flavor of the food.

The poaching liquid is called *court bouillon* and a classical *court bouillon* consists of: an acid (wine, lemon juice), aromatic (*bouquet garni*), poaching liquid, and *mirepoix*. The temperature of the liquid should be around 160-185°F (70-85°C). Always remember that to serve chicken safely; it has to have reached a temperature of 165°F (74°C) in the core. Utensils and equipments for poaching are pots, saucepan, spoons, ladles, spatulas, baskets and fish kettles.



Fig 2.2. Poaching of Suitable foods for poaching

### C. Simmering

Simmering is a cooking technique in which foods are cooked in hot liquids kept at or just barely below the boiling point of water (at average sea level air pressure), 100°C (212°F).

To keep a pot simmering, one brings it to a boil and then adjusts the heat downward until just before the formation of steam bubbles stops completely. Water normally begins to simmer at about 94°C or 200°F.

### D. Blanching

Blanching is a process of food preparation wherein the food substance, usually a vegetable or fruit, is plunged into boiling water, removed after a brief, timed interval and finally plunged into iced water or placed under cold running water (shocked) to halt the continuing cooking process.



Fig 2.3.Blanching

**There are two ways of blanching in water:**

a. Place the item in cold water, bring to a boil and simmer briefly, Cool the item by plunging into cold water. The idea is to dissolve out blood, salt, and impurities from certain meats and bones.
b. Place the item in rapidly boiling water and return the water to the boil. Remove and cool in cold water. The purpose is to preserve the color and destroy harmful enzymes in vegetables, or to loosen skins of tomatoes, peaches and similar item for easier peeling.

E. **Steaming**

Steaming is a method of cooking using steam. Food is cooked in the steam produced by a boiling liquid (rather than placing the food itself in the boiling liquid). Steaming relies on the steam produced being under pressure. The amount of pressure produced is determined by the type of equipment used.



Figure 2.4: Steaming

### 2.1.2. Dry heat cooking method

Which doesn't require liquid cooking medium (like water, stock, milk, fruit juices).heat is transferred by direct contact(conduction) between heat source and the food. E.g. of dry heat cooking method includes roasting, grilling, baking etc.

There are four types of roasting: pit roasting, oven roasting, pot roasting and pan roasting.

**A. Broiling**

Broiling works by transferring extremely high heat onto food, usually directed from a radiant located above the food which cooks on one side at a time. Browning can occur very quickly with this method, sealing juices and flavor inside and leaving a crisp exterior. Because this cooking method is fast, it's

helpful to use a timer or check the doneness so foods don't become burnt or overcooked. In commercial kitchens, broiling can be performed with a salamander or broiler oven.

**Best foods for broiling:**

**Meats**: Broiling works best on thinner cuts of meat, like steaks, pork chops, or hamburger patties. Tender cuts are preferred because the dry heat will quickly evaporate moisture and dry out the meat.

**Poultry**: Use chicken or turkey cutlets, breast halves, quarters, and legs in the broiler for flavorful results.

**Fish**: Choose thick, sturdy fish, like salmon, that can handle high heat and won't dry out easily.

**Fruits and Veggies**: Broiling can even be used on fruits and vegetables. Try broiling peaches or grapefruit for a unique menu item.



Figure 2.5: Broiling

### B. Grilling

Grilling is similar to broiling, in that it uses radiant heat to cook foods quickly. Most commonly, grilling equipment will feature an open grate with a heat source located beneath the food. Flipping is required to cook foods on both sides and grill marks from the hot grate or rack are desirable.

**Best foods for grilling:**

**Burgers**: Ground hamburger meat is moist and cooks up very well on a hot grill. The high heat sears the outside of the patty for delicious charred flavor.

**Meats**: The dry heat from grilling will quickly remove moisture from meat so it's best to choose tender cuts or marinate the meat first. Ribeyes, porterhouses, t-bones, and strip steaks have higher fat content and marbling that produces a succulent grilled steak.

**Poultry**: Boneless cuts of chicken work best because they will grill more evenly. Whole chickens can be grilled, but spatchcocking is recommended.

**Fish**: Salmon, tuna, and swordfish steaks are sturdy enough for the grill and won't dry out quickly. It's possible to wrap fish in foil before placing it on the grates to prevent it from falling through.



Figure 2.6: Grilling

### C. Roasting

Roasting is performed inside an oven and uses indirect heat that cooks from all sides for even browning. This method of cooking works more slowly, coaxing flavors out of meats and vegetables. Roasting can

be performed at very low temperatures between 200 degrees and 350 degrees Fahrenheit for tougher cuts of meat, or higher temperatures up to 450 degrees Fahrenheit for more tender cuts.

**Best foods for roasting:**

**Meats**: Roasting cooks large cuts of meat slowly and evenly. Prime rib, beef tenderloin, pork butt or shoulder, and pork loin all benefit from roasting.

**Poultry**: Whole chickens or turkeys can be placed in a roasting pan or on a rotisserie spit and cooked for several hours for a moist and flavorful product.

**Fruits and Veggies**: Roasting is a great way to bring out the best qualities in fruits and vegetables. Grapes, cherries, and tomatoes can be roasted to intensify their flavors. Pumpkin, squash, eggplant, and cauliflower are also excellent candidates for roasting.



Figure 2.7: Roasting

### D. Baking

Baking and roasting both use indirect heat to surround foods and cook from all sides. The term roasting is used when cooking meats or vegetables, and baking is used when making bread, rolls, and cakes. Technically, these cooking methods are the same, but baking is usually performed at lower temperatures than roasting.

**Best foods for baking:**

**Baked Goods**: Baking transforms wet dough or batter into a final product with a firm texture. Bread, pastries, and cakes are all baked.

**Pizza**: As pizzas are baked in a hot oven, the dough becomes firm, a crust is formed, and the cheese topping melts.



Figure 2.8: Baking

### E. Sautéing (Dry-Heat Methods Using Fat)

Sautéing is performed over a burner in a hot, shallow pan and uses a small amount of oil or fat to coat food for even browning. This method cooks foods very quickly so it's best to keep the food moving by tossing or flipping. *Sauté* is a French word that translates to "jump". To achieve great results with sautéing, make sure the oiled pan is hot before adding any food, don't overcrowd the pan with too many items, and stir or toss frequently.

**Best foods for sautéing:**

**Meats**: Sautéing cooks quickly, so tender meats work best. Use ground beef, tenderloin, or medallions in a sauté pan. Small uniformly sized cuts of meat brown evenly.

**Poultry**: Boneless breasts, strips, or cutlets can be sautéed to sear in flavor.

**Vegetables**: Zucchini squash and leafy greens can all be sautéed in olive oil or butter. Carrots, celery, and onions can also be sautéed and often make a flavorful base for other dishes.



Fig 2.9. Sautéing of onion

### F. Frying

Frying is a method of cooking wherein the food to be cooked is brought directly in contact with hot fat. Frying techniques vary in the amount of fat required, the cooking time, the type of cooking vessel required, and the manipulation of the food. Stir frying, pan frying, shallow frying, deep frying are all standard frying techniques.



Fig 2.10. Stir frying



Fig 2.11.shallow fat frying



Fig 2.12.deep fat frying

Combination cooking utilizes both dry and moist cooking methods. Foods are cooked in liquids at low heat for an extended period of time, resulting in a fork tender product. This technique works with the toughest cuts of meat, gradually breaking down fibers until they melt into the liquid.

### A. Braising

During braising, foods are first seared in a hot oiled pan then transferred to a larger pot to cook in hot liquid. The foods are only partially submerged in simmering water, broth, or stock. Using low heat, the foods soften over an extended cook time and the liquid becomes reduced with intensified flavors. Braising is a great method for producing fork tender meats that fall off the bone.

**Best foods for braising:**

**Meats**: Braising is most commonly used with cheaper, tougher cuts of meat because it softens and tenderizes the muscle fibers. Choose pork shoulder, chuck roast, or lamb shank.

**Vegetables**: Vegetables can be braised along with meat to add more flavor, or they can be braised alone as their own dish. Root vegetables like potatoes, beets, and turnips are softened during braising. Celery and fennel also respond well to braising, absorbing liquid but maintaining a firm texture.

**Legumes**: Lentils, chickpeas, and green beans can be braised in broth or wine for a texture that's soft but not mushy.



Figure 2.13. Braising

### B. Stewing

The key difference between stewing and braising is that foods are completely submerged in hot liquid while stewing instead of being partially submerged. Smaller cuts of meat are used in a stew, but the method of slow cooking at low heat is the same. As the stew cooks, fibrous vegetables break down and fat and collagen from the meats melt away. The result is a thick, flavorful gravy filled with tender bites of meat and soft vegetables.

**Best foods for stewing:**

**Meats**: Meats that are rich in collagen and fat do well in a stew pot. Avoid lean cuts and choose brisket, oxtail, or chuck roast.

**Vegetables**: Vegetables add depth to your stews. Onions, carrots, potatoes, and celery are common choices for building a stew, but also consider parsnips, turnips, or rutabaga.



Figure 2.14. Steawing

## 2.2. Safety concerns

It is important to be aware of safe handling techniques for all utensils and equipment. For example, the handling of knives is an everyday occurrence in the food preparation area of hospitality industry businesses. Therefore it is essential to follow the rules for correct knife handling techniques.

Knowledge of safe work practices and procedures for working with heated surfaces is necessary to ensure staff are not harmed or burnt when working with hot surfaces. Many workspaces have hot areas with warning signs. This helps staff be aware of those particular areas.

A heat alert safety device can also be attached to a surface in order to warn individuals that the surface is hot. Some large appliances come fitted with warning lights as an added safety feature. However, if signs are not used within the workplace, a common sense approach is essential when working in food preparation areas.

### 2.2.1. Hygienic work practices

A. **Personal hygiene**

Personal hygiene is cleanliness relating to the body. The human body carries dangerous germs and bacteria so good personal hygiene means fewer hygiene risks. All clothing must be clean and uniforms should not be worn outside the workplace. Staff involved in food preparation and handling should wear protective clothing such as a chef's uniform. This includes enclosed leather shoes and hair covers.

Jewelers and ornate rings are not permitted All food handlers should wash and dry their hands according to correct procedure.

B. **Food hygiene**

Good food hygiene is achieved by ensuring that food preparation, handling and storage areas are kept clean, and food handlers maintain good standards of personal hygiene.

All foods should be cooked properly, especially meat. It is important that raw foods are prevented from cross contaminating ready-to-eat foods. Foods must be kept at the right temperature. Chilled foods must be kept at constantly low temperatures and hot foods cooled as quickly as possible and then chilled.

Food handling areas must be designed to permit food handlers to work hygienically and keep the premises clean. All areas should be adequately protected from pests. Food should be handled carefully to prevent contamination and handlers should avoid unnecessary handling of food.

## 2.3. Prepare dishes using a range of methods of cooking

Dishes to be prepared must use a range of commonly-found ccommodities including:

- Ddairy products: such as milk, butter, yoghurt, cheeses and alternatives
- dry goods: such as flours, sugars, pastas and ricestandard fruit and vegetables
- eggs
- meat, seafood and poultry: which may be fresh, frozen, preserved or pre-prepared, and mayalso include meat products such as standard cuts, sausages, hams, salami and other meat products
- general food items: such as oils, sauces, condiments and flavorings, garnishes, coatings andbatters.

Team building and effective teamwork are basic principles to ensure timely preparation and efficiency from the kitchen to the front of house to the customer.

Team building generally refers to the selection, development, and collective motivation of result-oriented teams. Features and characteristics of successful teamwork include:

- Identification of purpose and aim of team
- Goal setting

- Planning and organizing work routine cooperative working environment. This environment needs to include:
- Good communication
- Mutual respect
- Understanding roles and responsibility
- Positive working relationship
- Application of codes of conduct and work policies and procedures
- Teamwork

There are many negative consequences of not maintaining positive and effective working relationships. These include loss of business, loss of staff, accidents/ unsafe work practices and customer dissatisfaction. Therefore, it is necessary for the key areas of food production, food and beverage and front of house to have good relationships and an understanding of each key area's needs and expectations.

## 2.4. Seasoning and flavoring ingredients

Many ingredients are used to enhance the taste of foods. These ingredients can be used to provide both seasoning and flavouring.

Using seasonings and flavorings correctly is a skill that develops over time. Tasting foods throughout the cooking process will help you develop this skill. Both seasonings and flavorings improve or strengthen the natural flavor of foods.



Figure 2.15. Seasoning and flavoring ingredients

**A seasoning** is an ingredient that intensifies or improves food without changing the food‘s natural flavor. If a seasoning is used correctly, the individual flavor of a seasoning cannot be tasted in the food product itself.

Some seasonings are called flavor enhancers. A flavor enhancer increases the way you perceive the food‘s flavor without changing the actual flavor of the prepared dish. They do not add flavor to a dish. Flavor enhancers do this by affecting your taste buds. Monosodium glutamate Or MSG is an example of a flavor enhancer. It intensifies the flavor of savory foods.

A flavoring, on the other hand, is an ingredient that actually changes the natural flavor of the foods to which it is added. This enhances the experience of tasting the dish.

Flavorings have their own distinct, or separate and unique, flavors. An ***extrac***t, or a concentrated flavor such as almond and vanilla, are flavorings.

A wide variety of ingredients can be used as seasonings, flavorings, and flavor enhancers. Salt and pepper are two of the most common seasonings that are used. A more detailed description of these ingredients follows:

## Salt

Salt is the most commonly used food seasoning today. It can be added to most foods, even somesweet foods, to heighten flavor. Salt has a more distinctive taste on cool foods than on hot foods. Table salt is the most common type of salt used in both food preparation and to season food atthe table. There are other types of salt used in the foodservice industry as well. Rock salt usuallyis used as a bed during baking for foods such as clams, oysters, and potatoes.

Sea salt is preferred by some chefs because it has a strong, distinctive flavor. Kosher salt iscoarse and free of iodine or other additives.

It has a milder flavor. Chefs also like to use kosher salt to season food during preparation.
The amount of salt that is added to food depends on the food that is being cooked. It also depends on the preference of the diner.Taste food before you add more salt to a dish.

You can always add more salt, but you cannot remove it. Too much salt can ruin a dish.

## Pepper

Pepper is the most widely used spice in the world. A spice is an aromatic vegetable product that blends with the natural flavor of foods. Pepper has been used since ancient times, in civilizations from Ancient Egypt to Ancient Rome to India. In the middle Ages, pepper was widely traded andcommonly used as a form of currency.

Pepper is usually used in its ground form rather than as whole peppercorns. Ground pepper brings out the flavor of many foods.

Whole or cracked pepper, however, is large enough to be detected on its own in the flavor of the food when it is added. A wide variety of peppers are used in the foodservice industry.

### Black Pepper

Black pepper comes from the dried, unripe berries of the pepper plant. It is slightly hot, but not bitter. It is the most common pepper used. Black pepper stimulates juices in the stomach lining. This helps with digestion.

### White Pepper

White pepper comes from the kernel of ripe pepper plant berries. It is an all- purpose seasoning that blends easily with most food, yet maintains a distinctive flavor. White pepper is a little hotter than black pepper

### Green Peppercorns

Green peppercorns come from un ripened berries. They are preserved in brine until they darken, and have a fresh flavor. Green peppercorns are expensive. They are used only in special recipes, such as grilled veal tenderloin with a delicate brown sauce.

### Red Pepper

Red pepper is not like black, white, or green pepper. Instead, it comes from the capsicum plant and is related more closely to the bell pepper family. Red pepper is used to add flavor to food, such as soups and sauces, without altering the food‘s natural flavor.



**Figure 2.16. types of pepper**

## Hot Pepper

Hot peppers are commonly referred to as chills. They vary in their degree of hotness, color, and flavor. They can be used fresh, dried into flakes, or ground into powder. Hot peppers are often added to Indian and Asian foods for spice and flavor.

## Onion

Onions are a flavoring that can be added to just about any food dish. The onion family also includes scallions, leeks, shallots, chives, and garlic. All of these flavorings have a strong aroma and flavor, especially when they are uncooked. Onions form part of the base for many stocks andsoups. Onions are also used as part of a mirepoix, which can be used in braising meats as well as stocks and soups.

When you use foods from the onion family, keep in mind that, unlike herbs, fresh onions have a stronger flavor than dried ones.

Depending on the form you use, you may need to adjust the amount of onion flavoring that you add to the food.

## Lemon

The zest, or rind, of the lemon is another type of flavoring. The zest contains the flavorful oil of the lemon. It is usually peeled or scraped carefully off the top layer of the lemon. It is added to dishes such as fish, meats, vegetables, and desserts to give a citrus flavor.

When you cook with lemon, use only the juice or the zest. Do not use the pith, or the white membrane that is just underneath the zest. The pith is bitter. You can avoid the pith by not scraping too deeply through the zest.

## When to Season

As a general rule, you can season food at any time during the cooking process. However, certain forms of food lend, or adapt, themselves to adding seasoning at certain times.

For example, when you cook a dish such as soup, in which the seasoning can mingle easily with the food, you can add seasonings during the entire cooking process. However, you should wait until the end of the cooking process before you add salt.

On the other hand, when you cook large pieces of food, such as a roast, you should add yourseasonings at the beginning of the cooking process. If you add the seasonings early enough in thecooking process, it allows enough time for the seasonings to be absorbed effectively throughoutthe food. A roast has a long cooking time, so it will have plenty of time to absorb the seasonings You may choose to add your seasonings throughout the cooking process. However, you must besure to taste the food and evaluate its flavor. Over seasoning can overpower and ruin the naturalflavor of food. Dried seasonings should be added earlier in the cooking process than freshseasonings



Figure 2.17. Dried seasons

## Adding Flavor

Flavorings also can be added to food during the cooking process. However, the effects of flavorings on prepared food will depend on the length of the cooking time. You need to know how long the food must cook before you can decide when to add any flavorings.

Flavorings need heat to release their flavors.
They also need time to blend with the natural flavors of the food to which they are added. For example, whole spices, such as ginger or whole peppercorns, take longer to be absorbed into food than ground spices. You will need to think about this timing when you add flavorings to foods during cooking. Flavorings should not be overcooked, however. Overcooked flavorings quickly lose their effect.

Some flavorings are considered blends. A blend is a combination of herbs, spices, and seeds. Chili powder, curry powder, and garlic salt are examples of blends. These are readymade dried products that can be purchased from a supplier or created in a commercial kitchen. Blends can be created ahead of time, or on the spot. Some foodservice businesses have their own signature blends. Customers may sometimes purchase containers of these blends to take home for use in their own kitchens.

When herbs are used together with spices in the form of a blend, they complement each other by enhancing the flavor of the food and of each other. Enhancing food is a learned skill. It will take a great deal of practice to learn how to season and flavor food without overpowering the food. Practice combining flavors to see what affects you can achieve constantly taste food to determine the right level of seasoning for each dish.

Knowing how to use seasonings and flavourings skillfully provides cooks and bakers with an arsenal with which they can create limitless flavour combinations.

Flavouring and seasoning ingredients include wines, spirits, fruit zests, extracts, essences, and oils. However, the main seasoning and flavouring ingredients are classified as herbs and spices.

Knowing the difference between herbs and spices is not as important as knowing how to use seasonings and flavourings skillfully. In general, fresh seasonings are added late in the cooking process while dry ones tend to be added earlier. It is good practice to under-season during the

cooking process and then add more seasonings (particularly if you are using fresh ones) just before presentation. This is sometimes referred to as “layering.” When baking, it is difficult to add more seasoning at the end, so testing recipes to ensure the proper amount of spice is included is a critical process.

| Self-Check 2 | Written test |
|---|---|

Name…… ID…… Date…….....

**Directions:** Answer all the questions listed below.

**Test I Short Answer Questions**

1. Write the classification of cooking method? (2.5pts)
2. List the two ways of blanching in water:? (2.5 pts)
3. What is Steaming? (2.5 pts)
4. What does mean Frying? (2.5 pts)
5. List the four types of roasting? (2.5 pts)
6. What are three common seasoning and flavouring ingredients?(2 pts)
7. What seasoning ingredients are most important?(2 Pts)
8. When should you add seasoning and flavouring? (2 pts)

**Test II Write true if the statement is correct and false if statement is incorrect**

1. Boiling is a process of cooking food that mainly requires rapid movement of the cooking liquid. (2.5 pts)
2. Food is cooked by bringing liquid (usually water) to the boil quickly and maintaining it at a temperature of 75°C. (2.5 pts)
3. Heat is transferred by direct contact(conduction) between heat source and the food. (2.5 pts)
4. Sautéing is a method of cooking food that uses a small amount of fat in a shallow pan over relatively high heat. (2.5 pts)
5. Personal hygiene is cleanliness relating to the body. (2.5 pts)
6. The human body carries dangerous germs and bacteria so good personal hygiene means fewer hygiene risks. (2.5 pts)
7. All clothing must be clean and uniforms should not be worn outside the workplace. (2.5)

***Note:*** **Satisfactory rating - 15 points** **Unsatisfactory - below 15 points**

You can ask you teacher for the copy of the correct answers

## Unit Three: Effect of heat on nutritional values of ingredients

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

- methods of heat transfer
- Nutritional values of ingredients
- Effects of heat on nutrients

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Understand Various heat transfer methods
- Identify Nutritional values of ingredients
- Understand Effects of heat on nutrients

## 3.1. Methods of Heat Transfer

Heat naturally moves from hot surfaces to cooler surfaces. The movement of heat is commonly referred to as heat transfer. There are three methods of heat transfer: conduction, convection, and radiation. Cooking of food usually uses a combination of these methods.

### A. Conduction

Conduction transfers the heat using direct contact; food is heated directly in a metal pan, in a liquid, or surrounded by air. Dropping an egg into a pan of boiling water is a good example.

The heat from the water is transferred to the egg. As the outside of the egg becomes warm, the heat moves into the center of the egg, continuing inward until the entire egg is heated to the desired temperature. The efficiency of the heat transfer depends on the conductivity of materials in contact with the food. Copper is one of the best conductors of heat. Heat transfers quickly from the heat source into the food through the copper cookware. In contrast, water, stainless steel, and the food itself, are poor conductors of heat.

### B. Convection

Convection heat transfer occurs faster than conduction. Convection occurs by the movement of air, liquid, or steam around the food. For example, as a pan of soup heats up on the stove, heat moves from the bottom of the pan. This movement of hot and cool liquids or gases combines. Stirring the pan redistributes the heat from the bottom of the pan throughout the other ingredients. Convection is the reason frozen foods thaw more quickly when placed under cold running water. Convection can also occur mechanically by means of a fan that circulates the air in an oven. A convection oven can reduce the cooking time by 25 percent over standard ovens. It also increases browning of the food because of the concentrated heat on the surface of the food.

### C. RADIATION

Radiation heat transfer occurs when microwave (light waves) or infrared energy (heat waves) are spread into the food. As the microwaves penetrate the food, they bump into molecules of

water and fat, causing them to vibrate rapidly. This vibration creates friction, which creates heat that cooks the food. The larger the piece of food, the more unevenly the microwaves penetrate, so microwave cooking has some limitations.




**Figure 3.1:** methods of heat transfer

## 3.2. Nutritional Values of Ingredients

**Nutritional value** or **nutritive value** as part of food quality is the measure of a well-balanced ratio of the essential nutrients carbohydrates, fat, protein, minerals, and vitamins in items of food or diet concerning the nutrient requirements of their consumer. Several nutritional rating systems and nutrition facts label have been implemented to rank food in terms of its nutritional value. International and national guidelines exist to inform consumers about optimal nutrient intake from their diets.

On a biological scale, nutritive value of food may vary for different health conditions (leading to dietary recommendations and particular diet foods), seasonal differences, age, sexual differences, and interspecies or taxonomic differences.

The seven major classes of nutrients are carbohydrates, fats, fiber, minerals, proteins, vitamins, and water. Nutrients can be grouped as either macronutrients or micronutrients (needed in small quantities). Carbohydrates, fats, and proteins are macronutrients, and provide energy. Water and fiber are macronutrients but do not provide energy. The micronutrients are minerals and vitamins.

### 3.2.1. Types of nutrients

- . Nutrient: is a substance that is needed to keep living things alive and to help it to grow.
- Nutrition: is the process by which living things receive the food necessary for them to grow and be healthy.

**A. Protein**

- It is necessary for the proper growth of body.
- To repair and replace cells which have become worn out.
- Is used as secondary sources of
  - ✓ energy sources: Animal sources –meat, fish, cheese, eggs, milk
  - ✓ Vegetable sources –soya beans, nuts, cereals, pulses



**Figure 3.2.1. Food which contain protein**

**B. Carbohydrate**

- It provides the energy we need to keep fit and active.
- Cellulose contains dietary fiber although it is not a food.

Sources:

- ✓ sugars- sugar, treacle syrup, jam, honey , fruit
- ✓ Starches- flour, other cereals, potatoes
- ✓ Cellulose- fruit, vegetables, bran, whole meal bread, whole cereals



**Figure: 3.2.2. Foods which contain carbohydrate**

**C. Fat**

- Is a very good source of energy for all our activity
- is a layer of fat insulates the body, preventing the loss of heat /kidneys are protected by fat/
- Animal fat it contains vitamin A and D keeps you feeling full after a meal.
- It has a high satiety value.
  - ✓ Sources: Animal- milk, butter, cream, cheese, suet, fatty meat, oily fish
  - ✓ Vegetable – margarines, salad or cooking oil



**Figure: 3.2.3 Food which contain fat**

D. **Mineral**

Are used in the body growth, activity and general health

- Iron: needed to form the red blood cells which carry the necessary oxygen to all parts of the body. /Lack of iron may cause anemia.

  **Sources**: liver, kidney, red mat, corned beef, green vegetables, bread, cocoa, treacle, Dried fruit
- Calcium: development of strong bones and teeth, together with phosphorus, vitamins D, C and A needed for clothing of blood.

  Sources: milk, cheese, eggs, fish bones e.g. salmon added to white bread.
- Phosphorus- strong bones and teeth

  Source –present in most proteins



**Figure: 2.2.4 Food which contain mineral**

**E. Vitamin**

**a)** Vitamin A /retinol/ -it is fat soluble.

Used for normal growth of children, especially bones and teeth.

**Sources**: Animal –fish-liver oil, oily fish, liver, dairy foods, margarine

Plant foods – as carotene, in orange/ yellow fruit and vegetables, green vegetables.

**b)** Vitamin D /calciferol/- it is fat soluble

- Works with calcium and phosphorus to form strong teeth and bones.
- Prevents rickets.

  Sources: foods –margarine, oily fish, cod-liver oil, eggs sunlight acting on the fat layer under the skin forms vit. D

C) Vitamin B complex:

B1 Thiamin –for growth of children and good health

- helps liberate the energy from carbohydrate foods,
- Healthy nervous system.

Sources –found in a variety of natural unprocessed foods, whole meal flour, whole cereals, yeast, yeast extracts/marmite/ meat liver, eggs

B2 riboflavin –Similar to B2 and

Sources: similar to B 2 and also useful amount of milk.

B3 Niacin or Nicotinic acid –Similar to B1 and B2

Sources: similar to B1 and B2 but milk products do not provide much

D) Vitamin C /Ascorbic acid/- used:

- Used for normal growth of children
- clear skin, healthy tissues, healing of wounds healthy teeth and gums.
- helps absorption of iron
- Prevents scurvy.

Sources- Fruit-black currants, rosehip syrup

- Citrus fruits- oranges lemons grapefruit, tomatoes, potatoes, fresh green vegetables.



Figure: 3.2.5 Food which contain vitamins

## 3.3. Effects of Heat on Nutrients

When heat is added to food, it causes changes in color, texture, flavor, shape, and nutritional value. Heat affects protein, carbohydrates (sugars and starches), fats, and water in different ways.

Careful selection of the cooking method based on the contents of the food and the desired outcome will lead to the best quality product.

### A. Coagulation

Proteins are denatured or coagulated by heat or a change in pH. The proteins change from a semisolid to a solid state during cooking. An example includes cooking an egg white. This process occurs between 160° to 185°F. The heat causes the unfolded protein chains to become entangled and lump together. The same coagulation occurs when an acid such as lemon juice or vinegar is added to milk. The pH is altered and the casein (milk protein) denatures and coagulates into spongy lumps. In meats, excessive heat will cause meat proteins to lose moisture and become tough.

### B. Gelatinization

Gelatinization is the thickening of liquids. Starch, in the presence of water, gelatinizes when heated. The starch granules absorb water. When heated, the starch granules swell and then burst, leaking starch into the surrounding liquid. Swelling is usually complete at 190 to 195°F. Excessive or prolonged heat, not enough heat, inadequate dispersion of dry starch in melted fat or cold water, and excessive agitation may interrupt proper starch gelatinization.

### C. Caramelization

Caramelization or browning occurs when sugar and proteins are combined and exposed to high heat. This applies to both natural sugars in food and sugar added to foods. Excessive caramelization may result in an unappealing dark color or burned flavor.

### D. Evaporation

Most foods contain water. As the water in foods reach 212°F, the water turns to steam and evaporates. Heat that is too high or prolonged cooking may dry out the product through excessive evaporation of moisture.

Cooking food improves digestion and increases the absorption of many nutrients. For example, the protein in cooked eggs is 180% more digestible than that of raw eggs

However, some cooking methods reduce several key nutrients.

The following nutrients are often reduced during cooking:

- **water-soluble vitamins:** vitamin C and the B vitamins — thiamine (B1), riboflavin (B2), niacin (B3), pantothenic acid (B5), pyridoxine (B6), folic acid (B9), and cobalamin (B12)
- **fat-soluble vitamins:** vitamins A, D, E, and K
- **minerals:** primarily potassium, magnesium, sodium, and calcium

Although cooking improves digestion and the absorption of many nutrients, it may reduce levels of some vitamins and minerals.

### A. Boiling, simmering, and poaching

Boiling, simmering, and poaching are similar methods of water-based cooking.

These techniques differ by water temperature:

- **poaching:** less than 180°F (82°C)
- **simmering:** 185–200°F (85–93°C)
- **boiling:** 212°F (100°C)

Vegetables are generally a great source of vitamin C, but a large amount of it is lost when they're cooked in water. In fact, boiling reduces vitamin C content more than any other cooking method. Broccoli, spinach, and lettuce may lose up to 50% or more of their vitamin C when boiled. Because vitamin C is water-soluble and sensitive to heat, it can leach out of vegetables when they're immersed in hot water. B vitamins are similarly heat sensitive. Up to 60% of thiamine, niacin, and other B vitamins may be lost when meat is simmered and its juices run off. However, when the liquid containing these juices is consumed, 100% of the minerals and 70–90% of B vitamins are retained. On the other hand, boiling fish was shown to preserve omega-3 fatty acid content significantly more than frying or microwaving.

While water-based cooking methods cause the greatest losses of water-soluble vitamins, they have very little effect on omega-3 fats.

### B. Grilling and broiling

Grilling and broiling are similar methods of cooking with dry heat. When grilling, the heat source comes from below, but when broiling, it comes from above. Grilling is one of the most popular cooking methods because of the great flavor it gives food. However, up to 40% of B vitamins and minerals may be lost during grilling or broiling when the nutrient-rich juice drips from the meat.

There are also concerns about polycyclic aromatic hydrocarbons (PAHs), which are potentially cancer-causing substances that form when meat is grilled and fat drips onto a hot surface.

However, researchers have found that PAHs can be decreased by 41–89% if drippings are removed and smoke is minimized. Grilling and broiling provide great flavor but also reduce levels of B vitamins. Also, grilling generates potentially cancer-causing substances.

## C. Microwaving

Microwaving is an easy, convenient, and safe method of cooking. Short cooking times and reduced exposure to heat preserve the nutrients in micro waved food. In fact, studies have found that microwaving is the best method for retaining the antioxidant activity of garlic and mushrooms.

Meanwhile, about 20–30% of the vitamin C in green vegetables is lost during microwaving, which is less than most cooking methods.

## D. Roasting and Baking

Roasting and baking refer to cooking food in an oven with dry heat. Although these terms are somewhat interchangeable, roasting is typically used for meat while baking is used for bread, muffins, cake, and similar foods. Most vitamin losses are minimal with this cooking method, including vitamin C. However, due to long cooking times at high temperatures, the B vitamins in roasted meat may decline by as much as 40%.

Roasting or baking does not have a significant effect on most vitamins and minerals, except for B vitamins.

## E. Sautéing and stir-frying

With sautéing and stir-frying, food is cooked in a saucepan over medium to high heat in a small amount of oil or butter. These techniques are very similar, but with stir-frying, the food is stirred often, the temperature is higher, and the cooking time is shorter. In general, this is a healthy way to prepare food. Cooking for a short time without water prevents the loss of B vitamins, and the addition of fat improves the absorption of plant compounds and antioxidants. One study found that the absorption of beta carotene was 6.5 times greater in stir-fried carrots than in raw ones. In another study, blood lycopene levels increased 80% more when people consumed tomatoes

sautéed in olive oil rather than without it. On the other hand, stir-frying has been shown to significantly reduce the amount of vitamin C in broccoli and red cabbage.

Sautéing and stir-frying improve the absorption of fat-soluble vitamins and some plant compounds, but they decrease the amount of vitamin C in vegetables.

## F. Frying

Frying involves cooking food in a large amount of fat — usually oil — at a high temperature. The food is often coated with batter or bread crumbs. It's a popular way of preparing food because the skin or coating maintains a seal, which ensures that the inside remains moist and cooks evenly. The fat used for frying also makes the food taste very good. However, not all foods are appropriate for frying. Fatty fish are the best sources of omega-3 fatty acids, which have many health benefits. However, these fats are very delicate and prone to damage at high temperatures. For example, frying tuna has been shown to degrade its omega-3 content by up to 70–85%, while baking causes only minimal losses. In contrast, frying preserves vitamin C and B vitamins, and it may also increase the amount of fiber in potatoes by converting their starch into resistant starch. When oil is heated to a high temperature for a long period of time, toxic substances called aldehydes are formed. Aldehydes have been linked to an increased risk of cancer and other diseases. The type of oil, temperature, and length of cooking time affect the amount of aldehydes produced. Reheating oil also increases aldehyde formation. If you're going to fry food, don't overcook it, and use one of the healthiest oils for frying.

Frying makes food taste delicious, and it can provide some benefits when healthy oils are used. It's best to avoid frying fatty fish and minimize the frying time of other foods.

## G. Steaming

Steaming is one of the best cooking methods for preserving nutrients, including water-soluble vitamins, which are sensitive to heat and water Researchers have found that steaming broccoli, spinach, and lettuce reduces their vitamin C content by only 9–15%. The downside is that steamed vegetables may taste bland. However, this is easy to remedy by adding some seasoning and oil or butter after cooking.

Steaming is one of the best cooking methods for preserving nutrients, including water-soluble vitamins.

## H. Tips to maximize nutrient retention during cooking

Here are 10 tips to reduce nutrient loss while cooking:

1. Use as little water as possible when poaching or boiling.
2. Consume the liquid left in the pan after cooking vegetables.
3. Add back juices from meat that drips into the pan.
4. Don't peel vegetables until after cooking them. Better yet, don't peel at all to maximize their fiber and nutrient density.
5. Cook vegetables in smaller amounts of water to reduce the loss of vitamin C and B vitamins.
6. Try to eat any cooked vegetables within a day or two, as their vitamin C content may continue to decline when the cooked food is exposed to air.
7. Cut food after — rather than before — cooking, if possible. When food is cooked whole, less of it is exposed to heat and water.
8. Cook vegetables for only a few minutes whenever possible.
9. When cooking meat, poultry, and fish, use the shortest cooking time needed for safe consumption.
10. Don't use baking soda when cooking vegetables. Although it helps maintain color, vitamin C will be lost in the alkaline environment produced by baking soda.

There are many ways to preserve the nutrient content of foods without sacrificing taste or other qualities.

It's important to select the right cooking method to maximize the nutritional quality of your meal. However, there is no perfect cooking method that retains all nutrients.

In general, cooking for shorter periods at lower temperatures with minimal water will produce the best results. Don't let the nutrients in your food go down the drain.

| Self-Check 3 | Written test |
|---|---|

Name…… ID…… Date…….....

**Directions:** Answer all the questions listed below.

**Test I Short Answer Questions**

1. How to transfer heat from the source to the food? (2.5 pts)
2. Write types of nutrients and its usage. (2.5 pts)

3. What nutrients are often reduced during cooking? (2.5 pts)

4. Describe the difference between Boiling, simmering, and poaching? (2.5pts)

***Note:*** **Satisfactory rating - 10 points** **Unsatisfactory - below 10 points**

You can ask you teacher for the copy of the correct answers

## Reference

Waye Gisslin (2010), Professional cooking, 7th edition.

John Campbell (2011), Practical cookery, 11th edition.

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