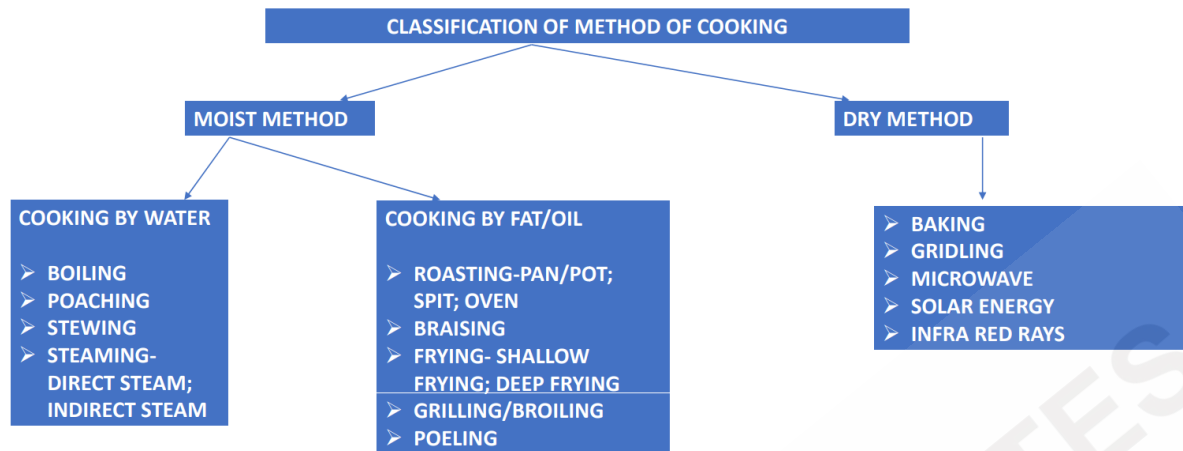


## Basic Principles of Cooking/ Methods of Cooking



To cook food means to heat it in order to make certain changes in it. Skilful cooks know exactly what changes they want to make and what they have to do in order to effect the changes. To learn these cooking skills, it is important to know how and why foods behave in a particular manner when they are heated.

### Effects of Heat on Food:

Foods are composed of protein, fats, carbohydrates and water plus trace elements like minerals, vitamins, pigments and flavour elements. It is important to understand how these elements react when heated and when mixed with each other. You must understand why foods behave as they do and then you can get them to behave, as you want them to.

### PROTEINS

1. Protein is a major component of meat, fish, poultry, egg and milk. It is present in smaller amounts in nuts, beans and grain.
2. As proteins are heated, they become firm and coagulate. As the temperature increases, they shrink, become firmer and lose more moisture. Exposure of proteins to excessive heat toughens them and makes them dry. Most proteins complete coagulation at 160-185F (71-85C).
3. Connective tissues are special proteins that are present in meats. Meats with a great deal of connective are tough, but some connective tissues dissolve when cooked slowly with moisture.
4. Acids such as lemon juice, vinegar and tomato help to speed coagulation and also help dissolve some connective tissues.

### CARBOHYDRATES

1. Starches and sugars are both carbohydrates. Both compounds are present in foods in many different forms. They are found in fruits, vegetables and grain plus

in beans and nuts. Meats and fish contain only very small amount of carbohydrates.

2. For a chef, the two most important changes in carbohydrates caused by heat are caramelization and gelatinization.

Caramelization is the browning of sugars. The browning of seared meats and the golden crusts of bread loafs are forms of caramelization.

Gelatinization occurs when starches absorb water and swell. This is a major principle in the making of sauces and the production of bread and pastries.

Acids inhibit gelatinization.

### **FRUITS & VEGETABLE FIBER**

1. Fiber is the name of a group of complex substances that give structure and firmness to plants. This fiber cannot be digested.

2. The softening of fruit and vegetables in cooking is the part breakdown of this fiber.

3. Sugar makes fiber more firm. Fruits cooked in sugar remain more firm.

4. Baking soda and other alkalis make fiber softer. Vegetables should not be cooked with baking soda because they become mushy and also lose their color and the vitamin content.

### **FATS**

1. Fats are present in meat, fish, poultry, eggs, milk products nuts and whole grain and to a lesser extent in vegetables and fruit. Fats are also important as a cooking medium and for frying.

2. Fats could either be solid or liquid at room temperature. Liquid fats are called oils. Melting points of solid fats vary.

3. When fats are heated, they begin to breakdown. When hot enough, they deteriorate rapidly and begin to smoke. The temperature at which this happens is called the smoke point and it varies for different fats and oils.

### **MINERALS, VITAMINS, PIGMENTS**

1. Minerals and vitamins are important to the nutritional quality of the food.

Pigments are important to a food's appearance.

2. All these components may be leached out, or dissolved away from foods during cooking.

3. Vitamins and pigments may also be destroyed by heat, by long cooking and by other elements present during cooking.

4. It is important, then, to select cooking methods that preserve, as much as possible, a food's nutrients and appearance. These will always be a consideration when cooking techniques are involved.

### **HEAT TRANSFER**

In order for food to be cooked, heat must be transferred from the heat source (such as a gas flame or heating element coil) to and through the food. Understanding the

way in which heat is transferred and the speed at which it is transferred helps to control the cooking process. Heat could be transferred by Conduction, Convection or Radiation.

**Conduction** – occurs in two ways:

1. When heat moves directly from one item to something touching it.
2. When heat moves from one part of something to an adjacent part of the same item.

Different materials conduct heat at different speeds. Heat moves rapidly through copper and aluminum, more slowly through stainless steel and slower yet in glass and porcelain. Air is a very poor conductor of heat.

**Convection** – Convection occurs when the movement of air, steam or liquid (including hot fat) spreads heat. There are two types of convection:

1. Natural. Hot liquids and gases rise, while cooler ones sink. Thus in any oven, kettle of water or deep fat fryer there is a constant natural circulation that distributes the heat.
2. Mechanical. In convection ovens and steamers, fans speed the circulation of heat. Thus the heat is circulated much faster and more evenly and thus the food cooks faster.

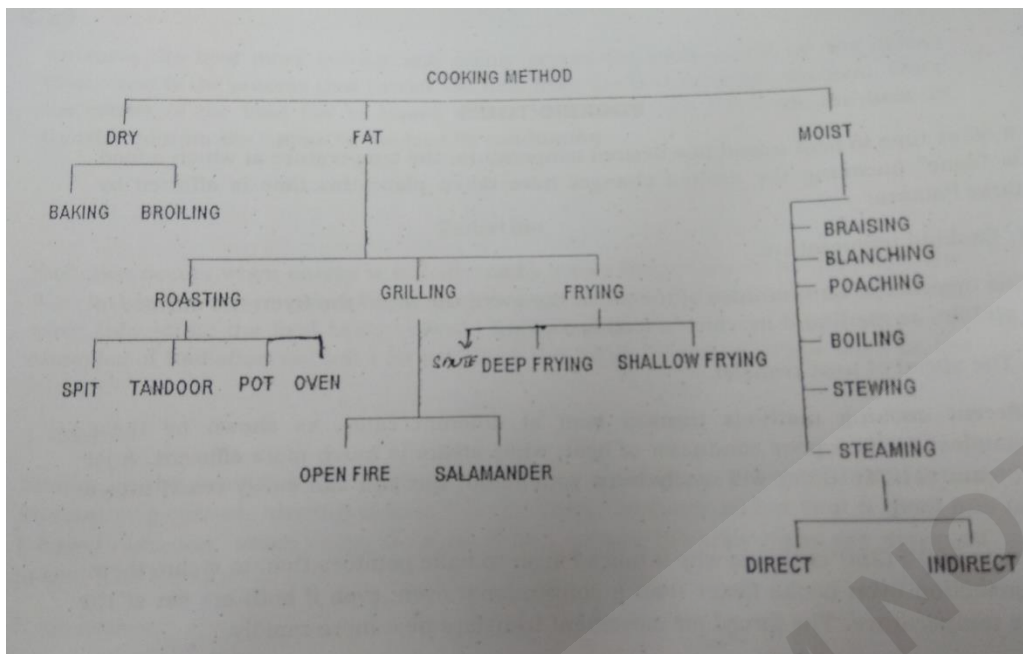
Stirring is a mechanical form of convection. Thick liquids cannot circulate as quickly as thin ones, so the rate of natural circulation is slower.

**Radiation** - Occurs when energy is transferred by waves from the source to the food. The waves themselves are not actually heat energy but are changed into heat energy when they strike the food being cooked. There are two types of radiation used in the kitchen:

**1. Infrared:** Broiling is the most familiar example in infrared cooking. In a broiler, an electric element or a ceramic element heated by a gas flame becomes so hot it gives off infrared radiation, which cooks the food. There are also high intensity infrared ovens, designed to heat food rapidly.

**2. Microwave:** In microwave cooking, the radiation generated by the oven penetrates part way into the food, where it agitates the molecules of water. The friction caused by this agitation creates intense heat, which cooks the food. Because microwave radiation affects only water molecules, a completely waterless material will not heat up in the microwave. Plates become hot only because of the conduction of heat from the food. Also, because microwaves penetrate no more than 2" into the foods, heat is transferred to the centre of large pieces by conduction.

## CLASSIFICATION OF COOKING METHODS:



## COOKING TIMES

It takes time to heat a food to the desired temperature, the temperature at which food is done (meaning the desired changes have taken place). This time is affected by three factors.

### 1. Cooking temperature

This means the temperature of the air in the oven, the surface of the griddle, or the liquid in which the food is cooking.

### 2. The speed of heat transfer

Different cooking methods transfer heat at different rates. Frying and sautéing are faster than roasting.

### 3. Size, Temperature and individual characteristics of the food

For example –

A small piece of meat cooks faster than a large one.

A chilled piece of fish takes longer to broil than one at room temperature.

Seafood cooks faster than lamb and chicken.

Because there are so many variables, it is impossible to determine the cooking time in a recipe. The chef must use his or her judgement to make the final evaluation of the doneness of the food.

## COOKING METHODS

Cooking methods are classified as 'moist heat' and 'dry heat'

Moist-heat methods are those in which the heat is conducted to the food product by water (liquid) or steam.

Dry-heat methods are those in which the heat is conducted without moisture, that is, by hot air, hot metal, radiation or hot fat. We usually classify dry heat methods into two categories: with fat and without fat.

Different cooking methods suit different kinds of foods. For example, some meats are high in connective tissue and will be tough unless the tissue is broken down slowly by moist heat. Other meats are low in connective tissue and are naturally tender. They are at their best and juiciest when cooked with dry heat.

There are many factors to consider when choosing a method of cooking for meat, fish, poultry and vegetables, such as the flavor and appearance imparted by browning, the flavor imparted by fats and the firmness and delicacy of the product.

## **MOIST HEAT METHODS**

### **POACH, SIMMER & BOIL**

To poach, simmer and boil all means to cook a food in water or a seasoned liquid like stock or even milk. The temperature of the liquid determines the method.

1. To boil means to cook in a liquid that is bubbling rapidly and is greatly agitated. Water boils at 212°F (100°C) at sea level. No matter how high the burner is turned, the temperature of the liquid will go no higher. Boiling is generally reserved for vegetables and certain starch products. The high temperature would cause protein foods to toughen (meats and fish) and the rapid bubbling would break up delicate products.

2. To simmer means to cook in a liquid that is bubbling very gently. Temperatures are generally 185 - 205°F (85 - 96°C). Most foods cooked in a liquid are simmered. The high temperatures and agitation are detrimental to most foods.

3. To poach means to cook in a liquid, usually a small amount that is hot, but not actually bubbling. Temperature is about 160 - 180°C (71 - 82°). Poaching is used to cook delicate foods such as fish and eggs. It is also used to partially cook variety meats to get rid of odors and undesirable flavors which can be eliminated by poaching and which will firm up the product before the actual cooking.

4. To blanch means to cook an item very briefly, usually in hot water, but sometimes, as in the case of French fries, in hot fat. There are two ways of blanching in water:

a. Put the item in cold water and simmer for a few seconds and then plunge into cold water.

b. Place the item in rapidly boiling water, bring the water back to a boil, remove the

item and cool rapidly.

A rule of thumb, for when a food has to be simmered or poached, the liquid should first be brought to a boil to compensate for the loss in temperature when the food is introduced. The heat is then adjusted to maintain a steady temperature.

## STEAMING

To steam means to cook foods by exposing them directly to steam.

1. In quantity cooking, this is usually done in special steam cookers. These are designed to accept special pans. Steaming can also be done on a rack above boiling water. This method is more cumbersome.
2. Steaming also refers to cooking an item tightly wrapped or in a covered pan, so that it cooks in the steam formed by its own moisture. This method is usually referred to as en papillote, where the food is wrapped in parchment or foil. 'Baked' potatoes wrapped in foil are actually steamed.
3. Steam at normal pressure is 212°F (100°C), the same as boiling water. However, it carries much more heat than boiling water and cooks very rapidly. Cooking times must be carefully controlled to avoid overcooking.
4. A pressure steamer is a pressure cooker that holds steam under pressure. The temperature of the steam then goes higher than 212°F (100°C)

Steaming is widely used for vegetables. It cooks them rapidly without agitation and minimizes the nutrient, color and flavor loss normally associated with boiling.

## BRAISING

To braise means to cook covered in a small amount of liquid, usually after preliminary browning. Then cooking could be done on a bed of vegetables and most often, the liquid used for the cooking is served with the foodstuff as a sauce.

1. Braised meats are normally browned first using a dry heat method such as pan frying or searing. This gives a desirable appearance and colour and flavour to the product and to the sauce.
2. Braising also refers to cooking some vegetables such as cabbage and leeks, without the preliminary browning.
3. Food being braised is not completely covered with liquid during the cooking process. The top of the product is normally cooked by steaming.
4. Braising is done on the range top or could even be done in the oven. Oven braising has two advantages: 1. Uniform cooking, as the heat penetrates the food from all sides and not just the bottom. 2. Less attention is required. In the oven the foods will cook slowly and gently without having to be checked frequently.
5. In the braising of meats, usually large joints or whole birds (like chicken, duck) are cooked in this method.

## STEWING

To stew means to cook pieces of meat or fish or vegetables using fairly large amounts of liquids.

1. The food items are normally cut into small cubes. Tougher cuts of meat and harder vegetables are cooked by this method.
2. The liquid is normally at simmering point and is enough to just cover the entire foodstuff.
3. In stewing, a lot of the nutrients, flavour and taste of the food item is transferred to the liquid.

Stewing is almost the same as simmering and the principles are the same. Simmering refers to a preliminary method of cooking whereas stewing refers to the making of a dish.

## **DRY HEAT METHODS**

### *ROAST & BAKE*

To roast and to bake means to cook foods by surrounding them with hot dry air, usually in the oven. Cooking on a spit is also referred to as roasting.

Roasting usually applies to meat and poultry.

Baking applies to bread, pastries and cakes & cookies. Fish could also be baked.

1. Cooking uncovered is essential to roasting. Covering holds in steam, changing the process from dry to moist heat cooking.
2. Meat is usually roasted on a rack. This rack prevents the meat from simmering in its own juices and fat. It also allows hot air to circulate around the meat. A rack of roughly cut vegetables could also be used.
3. When roasting in a conventional oven, the cook should allow for uneven temperatures in the different parts of the oven by occasionally shifting the position of the product. Usually the back of the oven is hotter as heat is lost near the door.

### *BROILING*

To broil means to cook by radiant heat from above.

The terms broiling, griddling and grilling are sometimes confused. Grilling is often called broiling and griddling is called grilling. For purposes of clarity, broiling is done on a broiler, griddling on a griddle plate and grilling on a griller!

1. Broiling is a rapid high heat cooking method that is usually used only for tender meats, poultry, fish and a few vegetable items.
2. The following rules should be applied while broiling:
  - a. Turn the heat on full. Cooking temperature is controlled by moving the rack nearer or further from the heat source.

- b.** Use lower heat for larger and thicker items and for items that have to be well done. Use higher heat for thinner pieces and for pieces to be cooked rare. This is done so that the inside and the outside cook at the same time.
  - c.** Preheat the broiler. This helps to sear the product faster and the hot broiler will make the desired marks on the food item.
  - d.** Dip the food item in oil to prevent sticking and to minimize drying. But be careful as too much oil could cause a fire.
  - e.** Turn the food over only once, to cook from both sides and to avoid overhandling.
3. A low intensity broiler is called a salamander and is used for browning the top of dishes and provides some melting before the service.

### *GRILLING, GRIDDLING & PAN BROILING*

Grilling, Griddling and Pan-broiling are all dry heat methods of cooking that use heat from below.

1. Grilling is done on an open grid over a heat source, which may be charcoal, an electric element or gas heated. Moving the food items from hotter to cooler places on the grill regulates cooking temperatures. Grilled items must be turned over once during the cooking process to ensure even cooking.
2. Griddling is done on a solid cooking surface called the griddle, with or without small quantities of fat. To prevent sticking. The temperature is adjustable and is around 350°F/177°C. this is much lower than on a grill. In addition to meats, items such as pancakes and eggs can be cooked on a griddle. Grooved griddles have a solid top with raised ridges and are designed to cook like grills and leave desirable marks on the surface of the food. Although they may appear the same as food cooked on the grill, meats cooked on the griddle do not have the charcoal-grilled flavor imparted while cooking on a grill.
3. Pan – broiling is like griddling, except it is done on a frying or sauté pan or skillet instead of on a griddle surface. Fat must be poured off as it accumulates, or the process would become pan-frying.

### **DRY HEAT METHODS USING FAT**

#### *SAUTE*

To sauté means to cook in small amounts of fat.

1. The French word sauter means 'to jump', referring to the action of tossing small pieces of food on a sauté pan. However, larger slices of meat or vegetables could be sautéed without actually tossing.
2. Note these two important principles:



- a. Preheat the pan before adding the food to be sautéed. The food must be seared quickly, or it will begin to simmer in its own juices.
- b. Do not overcrowd the pan or else the temperature will lower.

3. Meats to be sautéed are often dusted with flour to prevent sticking and help achieve uniform browning.

4. After sautéing, a liquid such as stock or even wine or water is swirled in the pan to dissolve browned bits of food sticking to the base or the sides. This is called deglazing. The liquid becomes part of the sauce that is served with the foodstuff.

### **PAN FRYING**

To pan – fry means to cook in a moderate amount of fat in a pan over moderate heat.

1. Pan-frying is similar to sautéing, except that more fat is used and the cooking time is longer. Larger items are used and it not possible to toss them.
2. Pan-frying is normally done over lower heat than sautéing, because larger pieces are being cooked.
3. The amount of fat used depends on the food being cooked. Only a small amount will be required for eggs, but meat and fish items would require a bit more.
4. Most food items would be required to be turned over at least once for even cooking.

### **DEEP FRYING**

To deep fry means to cook food submerged in hot fat. Quality in a deep fried product is characterized by the following properties:

- minimum fat absorption
- minimum moisture loss (i.e. not overcooked)
- attractive golden color
- crisp coating or surface
- no off flavors (sometimes imparted by the frying fat)

Many foods are dipped in a breading or in a batter before frying. This forms a protective coating between food and fat and helps give the product crispness, color and flavor.

#### **Guidelines for deep frying:**

1. Fry at proper temperatures. Most foods are fried at 350 to 375°F (170 to 190°C). Frying at too low a temperature usually causes excessive greasiness in fried in fried foods.
2. Don't overload the baskets. Doing so greatly lowers the fat temperature.
3. Use good quality fat. The best fat for frying has a high smoke point.
4. Replace 15 – 20% of the fat with fresh amounts after daily use.

5. Discard spent fat. Old fat loses frying ability, browns excessively and imparts an off flavor.
6. Avoid frying strong and mild flavored foods in the same fat, if possible. French fries should not taste like fried fish.
7. Fry as close to the service time as possible. The food moisture quickly makes the breading or the batter soggy.

8. Protect fat from the following:

- Heat: turn off the fire after frying or to a lower holding temperature.
- Oxygen: keep fat covered in between use.
- Water: remove excess moisture from food before frying.
- Salt: never salt the food over the fryer.
- Food particles: dust off loose crumbs before frying and skim the fat often.

### **PRESSURE FRYING**

Pressure frying means deep-frying in a special covered fryer that traps the steam given off by the food being cooked and increases the pressure inside the kettle. Pressure frying requires accurate timing, because the product cannot be seen while it is cooking. In a standard fryer, even though the fat may be at 350°F (175°C) the temperature inside the food will not rise above 212°F (100°C), the boiling point of water. In a pressure fryer, this temperature is raised and cooks the food much faster without excessive browning. At the same time, the fat temperature could be lower (325°F/165°C).

### **SOUS VIDE**

French for "under vacuum", is a method of cooking in which food is vacuum-sealed in a plastic pouch and then placed in a water bath or steam environment for longer than normal cooking times (usually 1 to 7 hours, up to 48 or more in some cases) at an accurately regulated temperature much lower than normally used for cooking (typically around 55 to 60 °C (131 to 140 °F) for meat, higher for vegetables). The intent is to cook the item evenly, ensuring that the inside is properly cooked without overcooking the outside, and to retain moisture.