

ZNOTES.ORG

UPDATED TO 2020-22 SYLLABUS

CAIE IGCSE

FOOD AND NUTRITION (0648)

SUMMARIZED NOTES ON THE THEORY SYLLABUS

1. An understanding of nutritional terms.

1.1. Definitions

- **Diet:** food a person normally eats.
- **Reasons for dieting:**
 - Restricting oneself to small amounts or special kinds of food for **weight loss**.
 - For **medicinal reasons**.
- **Balanced diet:** a diet providing the right amount of nutrients for the needs of an individual.
- **Metabolism:** chemical reactions that go on inside the body, controlled by enzymes.
- **Malnutrition:** incorrect or unbalanced intake of nutrients.
- **Undernutrition:** insufficient total intake of nutrients.
- **Overnutrition/ Hyperalimentation:** a form of malnutrition in which intake of nutrients is oversupplied.
- **Deficiency diseases:** caused by lack of an element in the diet. Usually, vitamins or minerals.
- **Nutrition:** a process of providing or obtaining food that is needed for health and growth.

2. Nutritive value of foods

2.1. Proteins

Sources	Functions
HBV: (All essential amino acids.)E.g.: Milk, Meat, Fish, Eggs, Cheese.	Growth (hair, nails, skin)
LBV:(lack some essential amino acids.)E.g.: Cereals, pulses, nuts, some vegetables.	Growth (hair, nails, skin)
Chemistry: Oxygen, Carbon, Hydrogen, Nitrogen, Sulphur, Phosphorus.	Body maintenance
Deficiency: Kwashiorkor, Marasmus, and Kidney disease.	Providing energy
Symptoms: Kwashiorkor: Diarrhoea, Fatigue, Enlarged Belly.	Repair
Marasmus: Growth failure, sunken eyes, "old man's" face.	Repair

2.2. Carbohydrates

- Sources: Milk, yogurt, bread, rice, beans, cereals.
- Classification:
- Monosaccharides:

(carbohydrates that can't be hydrolyzed to simpler carbohydrates.)

- Fructose, Glucose, Galactose.
- Disaccharides: (consists of two Monosaccharides.)
 - Sucrose, Maltose, Lactose.
- Polysaccharides: (many glucose molecules joined together.)
 - Starch, Cellulose, Glycogen, Dextrin.
- Functions:
 - Provide energy.
 - Aids fat metabolism.
 - Helps build body mass.
 - Prevents constipation.
- Chemistry:
 - Oxygen, Carbon, Hydrogen.
- Deficiency:
 - Marasmus.
 - Loss of stamina.
- Symptoms:
 - Marasmus:
 - Growth failure.
 - Loss of hair.
 - Shrunken body.
 - Ribs stick out.
 - Skin hangs loose.
 - Sunken Eyes.
 - "Old man's" face.

2.3. Fats

- Sources:
 - Visible fat: (easy to detect in food.)
 - E.g.: Butter, Cooking oils/fats, fat on meat.
 - Invisible fat: (difficult to detect in food.)
 - E.g.: Lean meat, egg yolk, oily fish, nuts, seeds, fruits, fried foods, sweets.
- Types:
 - Fats: Solid and Saturated.
 - Oils: Liquid and Unsaturated.
- Functions:
 - Provides energy.
 - Stores energy for later.
 - Protects vital organs.
 - Insulation.
 - Provides texture and flavor.
- Chemistry:
 - Oxygen, Carbon, Hydrogen.
- Deficiency:
 - Growth Failure.
 - Eczema of skin.
 - In Excess.
 - Obesity.
 - CHD (coronary heart disease).
 - Cancer.
 - High blood pressure.
 - Stress

2.4. Vitamins

- A:
 - Deficiency: Night blindness and Skin defections.
 - Sources: Vegetables & fruits, Milk, Liver & meats.
 - Functions:
 - Keeps skin & mucus membrane healthy.
 - Prevents night blindness.
 - Promotes growth.
- B:
 - Deficiency: Beri-Beri and Anaemia.
 - Sources: Eggs, Fish, Yeast, Broccoli, Lean meat.
 - Functions:
 - Releases energy from carbohydrates.
 - Healthy nervous system.
 - Healthy skin.
 - Aids in absorption.
- C:
 - Deficiency: Scurvy (Bleeding gums).
 - Sources: Citrus fruits, Berries, Vegetables.
 - Functions:
 - Improves immune system.
 - Aids in wound healing.
 - Aids in absorption.
- D:
 - Deficiency: Rickets (Soft bones & Dental decay).
 - Sources: Eggs, Fish, Yeast.
 - Functions:
 - Strong bones & teeth.
 - Maintain heart actions.
 - Maintains nervous system.
- E:
 - Deficiency: Sterility.
 - Sources: Cereals and nuts, Green Vegetables, Wheatgerm
 - Functions:
 - Maintains reproductive system.
 - Aids in fighting diseases.
- K:
 - Deficiency: Prolonged bleeding.
 - Sources: Cabbage, Spinach, Soybeans, Cauliflower.
 - Functions:
 - Clotting of blood.
 - Strong bones.

2.5. Vitamin B group

- Thiamine (B1)
 - Functions:
 - Circulation.
 - Blood formation.
 - Brain function.
 - Sources: Organ meats, Yeast, Peas, Beans.
- Riboflavin (B2)
 - Functions:
 - Blood formation.

- Production of anti-bodies.
- Sources: Meat, Poultry, Fish, Nuts, Liver.
- Nicotinic acid (B3)
 - Functions:
 - Circulation.
 - Healthy skin.
 - Aids the nervous system.
 - Sources: Meat, Nuts, Potatoes.
- Cobalamin (B12)
 - Functions:
 - Prevents anaemia.
 - Cellular longevity.
 - Digestion
 - Sources: Lamb, Beef, Eggs, Poultry, Liver.

2.6. Mineral elements

- Calcium:
 - Deficiency: Osteomalacia and Rickets.
 - Functions:
 - Bones & teeth growth.
 - Nerve conduction/ muscle contractions.
 - Sources: Yoghurt, Milk, Cheese, Tofu.
- Iron:
 - Deficiency: Anaemia.
 - Functions:
 - Haemoglobin production.
 - Production of enzymes for metabolism.
 - Sources: Liver, Soya beans, Apricots, Leafy vegetables.
- Phosphorus:
 - Deficiency: Anorexia.
 - Functions:
 - For metabolism.
 - Bone development.
 - Muscles contraction
 - Sources: Fish, Milk, Meats, Nuts, Poultry.
- Potassium:
 - Deficiency: Hypokalaemia.
 - Functions:
 - For nerve impulses.
 - Fluid balance.
 - Normal heart function.
 - Sources: Potatoes, Beans, Fruits, Vegetables, Squash.
- Sodium:
 - Deficiency: High blood pressure.
 - Functions:
 - For nerve impulse conduction.
 - Muscle contraction.
 - Fluid balance
 - Sources: Salt, Canned food, Meat, Fish.
- Fluoride:
 - Deficiency: Tooth decay.
 - Functions:
 - Development of bones & teeth.
 - Aids teeth to be resistant to decay.
 - Sources: Tea, Seafood, Drinking water.
- Chloride:
 - Deficiency: Imbalance in blood P.H.

- Functions:
 - For salivary amylase activation.
 - For gastric acidity.
 - Regulation of osmotic pressure
- Sources: Eggs, Meat, Salt, Seaweed, Cheese, Celery, Olives.
- Iodide:
 - Deficiency: Goitre.
 - Functions:
 - For production of hormones.
 - Maintaining metabolic rate.
 - Sources: Yoghurt, Milk, Eggs, Seaweed.

2.7. Water

- Functions of water:
 - Forms saliva.
 - Regulates body temperature.
 - Flushes body waste; mainly in urine.
 - Prevents constipation.
 - Moistens oxygen for breathing.
 - Helps convert food to energy.
 - Protects body organs & tissues.
 - Lubricates joints.
 - Growth of cells.
 - Facilitates blood flow.
 - Keeps mucus membrane moist.
 - Helps dissolve minerals & nutrients.

2.8. NSP/ Dietary fiber

Sources and functions of non-starch polysaccharide (NSP)/dietary fiber:

- **Source:** Cellulose & Pectin.
- **Functions:**
 - Can't be digested.
 - Aid removal of water from the body by peristalsis.
 - Absorb water.

3. Digestion and absorption

3.1. Digestion stages

- Mouth:

Physical breakdown	Chemical breakdown
Teeth rip, tear & grind food to smaller pieces.	Protein & fat DO NOT break down here.
Tongue pushes food down the oesophagus.	Carbohydrate: Salivary amylase converts starch to maltose.
Salivary glands produce saliva and amylase to moisten food for easy swallowing.	

- Stomach:

Physical breakdown	Chemical breakdown
Peristalsis moves food around; helps to break it down.	Protein & fat DO NOT break down here.
Broken food pieces mix with gastric juices produced in the stomach.	Carbohydrate: Salivary amylase converts starch to maltose.
Chyme: term used to refer broken down food.	

- Duodenum:

Chemical breakdown only
Chyme mixed with bile (Bile produced from gall bladder) and pancreatic juice (from pancreas).
Protein: Trypsinogen (produced by pancreas) mix with enterokinase to form trypsin, <i>this continues to breakdown proteins to peptones.</i>
Trypsinogen + Enterokinase -> Trypsin
Fat: Bile emulsifies fats to disperse them to small droplets. Pancreatic lipase breaks fat to glycerol and fatty acids.
Carbohydrate: Amylase breaks down starch to maltose.

- Ileum:

Chemical breakdown only
Protein: Erepsin converts peptones to amino acids.
Fat: are broken by lipase further.
Carbohydrate: Maltase breaks down maltose to glucose. Invertase breaks sucrose to glucose + fructose. Lactase breaks lactose to glucose + galactose.

3.2. Enzymes in digestion

- **Amylase:** breaks starch to maltose.
- **Erepsin:** digest peptones to amino acids (found in intestinal juices).
- **Invertase:** breaks sucrose to glucose + fructose.
- **Lactase** breaks lactose to glucose + galactose.
- **Lipase:** breaks fats (found in pancreatic juices/intestinal).
- **Maltase:** breaks maltose to glucose.
- **Pepsin:** breaks proteins to peptides then to peptones then polypeptides.
- **Renin:** clots milk.
- **Trypsinogen:** breaks *proteins* to *peptones*.

3.3. Role of bile in fat emulsification

- The liver produces bile.
- Bile emulsifies fats.
- Breaks down fats to small droplets.
- Small droplets create larger surface area.

- Fat droplets are then digested by lipase.

3.4. Absorption of nutrients

Small intestine:

[Alcohol- the only substance that can be absorbed in the stomach.]

- Villi:
 - Tiny finger-like projections.
 - Surrounded by a wall of single cells.
 - Single cells allow nutrients to move through and reach the lacteal.
- Lacteal:
 - Connected to lymphatic system.
 - Surrounded by blood capillaries.
 - Monosaccharides, amino acids, water-soluble vitamins & minerals are absorbed into blood capillaries.
 - Glucose is used for immediate energy or converted to glycogen
- Converted glycogen is stored in the liver and muscles.
- Glycerol and Fatty acids are absorbed into the lacteal to form fats which is converted to soluble fats in the liver.

Large intestine (colon):

- Food residues and water products pass here in liquid state.
- Water is absorbed here making the food residues solid, forming faeces.
- All actions here are assisted by NSP.

4. Meal planning and dietary guidelines

4.1. Factors affecting food requirements

- Age.
- Gender.
- Health condition.
- Daily activity.
- Climate.
- Likes and dislikes.
- Time and facilities.
- Food availability.
- Financial ability.

4.2. Planning and serving of family meals

- Plan dishes and create a shopping list.
- Prepare dishes with a balanced portion of vegetables, meat, lentils in mind.

- Store leftovers and use them the next day instead of throwing them.

4.3. Meals for different ages, occupations, cultures, and religions

Who?	Meals (summary)
Lacto-Ovo	No meat. Consume fish products BUT Will eat dairy.
Lacto-vegans	No meat, fish, or eggs BUT Will eat other dairy products
Vegans	No animal-based foods/products. No dairy products.
Vegetarians	No meat, fish, and poultry. Consume dairy products. Fruits/vegetables. Soya drinks/ yoghurt.
Religious groups	Foods eaten according to religious beliefs.
Cultures	Foods eaten according to cultural occasions.
Allergies	Foods must be checked for allergy-containing ingredients. Should read labels on packaged food products.
Coeliac disease	Foods that do not contain gluten: Most dairy products, fruits/vegetables, Rice, Potatoes.
Food intolerant	Should check labels on packaged foods and check for food intolerant ingredients.
Pregnant/ lactating women	Fruits/vegetables. Whole grains. Lean protein. Avoid raw foods (e.g., eggs or fish).
Diabetics	Carbohydrate and fiber-rich foods: Fruits/vegetables, Whole grains, Beans/ lentils.
Infants	Breastfeeding. Bottle feeding. Weaning.
Toddlers	Protein foods. Calcium. Fluoride & Iron foods
School-aged	Foods should contain energy and nutrients for healthy growth.
Adolescents	Protein. Iron. Calcium, Vitamin D
Adults	Iron. Water & Sodium chloride. Energy-rich foods.
Seniors/ Elderly	Less energy-rich foods. Vitamin D. NSP/ Dietary fiber.

Who?	Meals (summary)
Convalescents	Vitamin D & C . Carbohydrates. Water.

4.4. Packed Meals

- Should supply 1/3 of the daily intake of nutrients and energy.
- Meal should be well obtained.
- Easy to eat.
- Should be carefully packed.
- Must be placed in sufficient temperature.
- Has variety of texture & flavours.
- Meal should include a drink

4.5. Special occasions & Festivals

- When preparing foods for special occasions, celebrations, or festivals, consider the following:
 - Where the food will be served?
 - Why is it being served? (if there is a special meaning behind the occasion.)
 - What should be served?
- Examples of occasions:
 - Birthdays: can prepare a light meal as a starter then introduce the main course that could be a cake or a heavier meal with beverages.
 - Religious feast: food is prepared with tradition and culture being of main importance.
 - Festivals: no special preparation needed as festivals usually have food stalls with beverages.

4.6. Snacks & beverages

- Snacks are small portions of foods eaten in between meals, throughout the day.
- Beverages are drinks.
- Snacks and beverages should be consumed limitedly as this can reduce hunger.
- Excess consumption of snacks can cause problems such as weight gain, elevated cholesterol levels, elevated sugar levels.
- Eat healthy snacks like fruit salads, flavored yoghurt, mixed nuts, etc.
- Lessen the consumption of carbonated and sugary beverages.
- Drink water, milk, or fresh fruit juices as healthy alternatives to beverages.

4.7. Use of Herbs and Spices

- Herbs:
 - Garlic - Stews, salads, soups.
 - Mint - Drinks, salads, ices.
 - Oregano - Pizza's, pasta.
 - Parsley - Good source of vitamin C.

- Thyme - Used for stuffing.
- Basil - For salads
- Spices:
 - Chilies - Spicy, used in curries.
 - Cinnamon - In cakes, pies, biscuits.
 - Vanilla - For essence, in cakes.
 - Turmeric - In curries, for coloring.
 - Paprika - Not very spicy, used to season dishes.
 - Ginger - In cakes, meat dishes.

4.8. Attractive presentation of food

- Used in food advertising.
- To make food visually appealing.
- Presentation should take account of all senses.
- Presentation should make food look appetizing.
- Colour, design & decoration should be considered.

4.9. DRV and RDI

- **Dietary reference value:** is a term for a set of reference values used to plan and assess nutrient intakes of healthy people.
- **Reference daily intake:** is the daily intake level of a nutrient considered to meet the requirements of 97-98% of healthy people.

4.10. Use of nutritional tools

- **ABC's of healthy eating:** aim to achieve and maintain a healthy body weight.
- **RDI's:** Based on average needs of people of different age groups.
- **Healthy diet pyramid:** Pictorial presentation helps children to understand better.
- **Food composition tools:** Can be compared with RDA.

5. Composition of food

5.1. Eggs

- Good source of HBV.
- Easily digested.
- No carbohydrates in eggs.
- Poor source of calcium.
- **Free-range:**
 - Hens allowed to roam loose in farmyards.
 - Eggs laid in a hen house.
- **Battery farms:**
 - Hens kept in cages.
 - Eggs laid on a belt.
 - **Class A:** good quality.
 - **Class B:** unclean shells.
 - **Class C:** weak shells.
- **Structure:**
 - Shell.

- Egg white.
- Egg yolk.
- **Shell:**
 - Calcium and protein
 - Is porous.
 - Contains air space.
- **White:**
 - Thin white/albumin nearest to shell.
 - Thick white/albumin nearest to yolk.
 - Consists of water, protein, B vitamins, fat, ovalbumin, mucin.
- **Yolk:**
 - Protein, fat, water, vitamin ADEK, minerals, lecithin.
 - Colour depends on the diet of the hens.
- **Testing for freshness:**
 - Place egg in jug of brine.
 - If it sinks, its fresh.
 - If it floats, its stale.
- **Effect if heat:**
 - Ovalbumin coagulates at 60 C- 65 C.
 - Until egg white is opaque.
 - Protein in egg yolk coagulates at 70 C till it gets hard.
 - Protein now becomes tough.
 - If egg is boiled iron sulphide is formed around the yolk.
- **Uses of eggs:**
 - Binding.
 - Coating.
 - Glazing.
 - Garnishing.
 - Trapping air.
 - Thickness.
 - Emulsifying.
- **Storing eggs:**
 - In refrigerator (away from strong-smelling foods).
 - Should not be washed.
 - Can be preserved by pickling.
 - Can't freeze whole.
 - Keep out for one hour before use.

5.2. Meat

- **Collagen:**
 - Main component of tendons.
 - Less flexible than elastin.
 - Converted to gelatine when heated.
 - Increased tenderness.
- **Elastin:**
 - Main component of ligaments.
 - Able to stretch and return to original form.
 - Insoluble protein.
 - Not much influence on toughness of meat.
- **Connective tissue:** Made up of collagen and elastin (both are proteins).
- **Fat** is found *under the skin* and around vital organs, between bundles of muscle fibres.
- **Marbling** in lean meat is required when meat is graded.
- Fat helps provide flavour, moisture, and texture.

- Colour of meat is mainly due to **myoglobin** and **haemoglobin**.
- **Choosing meat:**
 - Value for money.
 - Cheaper cuts of meat and should be fresh.
 - Not much visible fat seen.
 - There shouldn't be too much bone.
 - Appearance should be moist but not dripping blood.
 - Slightly springy to touch.
 - Lean meat should have marbled appearance.
- **Effect of heat:**
 - Proteins denature at **40 C**.
 - As this happens, meat tightens + becomes firmer.
 - Protein of muscle fibres may toughen during cooking.
 - Connective tissue gets tender.
 - Meat shrinks in size.
 - **Collagen** converts to **gelatine** in presence of moisture.
 - Elastic softens slightly.
- **Changes during cooking:**
 - Fat melts and penetrates the meat.
 - This increases energy value of meat.
 - May make meat appear juicier.
 - Colour changes from red to brown.
 - **Oxymyoglobin** changes to haemachrome.
 - Extractives give meat taste in dry cooking liquids in moist cooking methods.
- **Importance of meat in diets:**
 - Good source of protein, fat, minerals and water.
 - Main source of HBV.

5.3. Fish

- **Classified by:**
 - Their origin (seawater or freshwater).
 - Their fat content (oily or white fish).
- **Choosing fish:**
 - Bright eyes.
 - Plump eyes.
 - Bright scales.
 - Moist skin.
 - Fresh sea smell.
 - Bright red gills.
- **Mineral elements:**
 - Calcium and Fluoride.
 - Potassium and Phosphorus.
 - Iodine.
 - Iron.
 - Sodium.
 - Chlorine.
- **Methods of cooking:**
 - **Whitefish:** grilled, fried, steamed, poached.
 - **Oily fish:** bake, fry, grill, poach.
 - **Shellfish:** as starter.
- **Storage:**
 - Should be eaten as soon as possible.
 - Stored in the coldest part of the refrigerator.
 - Well wrapped.

5.4. Soya

- HBV source.
- Extracted protein resembles texture of meat.
- TVP: textured vegetable protein.

5.5. Cereals

- A staple food source.
- Growth conditions vary on type of cereal.
- Wheat & Barley are grown in the temperate regions of Europe & Asia.
- Rice is grown in paddies in wet, warm temperate.
- Rye & Oats are grown in Northern & Eastern Europe

Advantages:

- Cereals are good sources of quick energy.
- Inexpensive.
- Easy to preserve and store.
- Can be used in preparation of variety of other products like biscuits and flour.

Wheat:

- Grown for milling into flour.
- Types of flour produced:
 - **Soft flour (8-11% protein):** for cakes & biscuits.
 - **Strong flour (11-18% protein):** for bread & puff/flaky pastry.
 - **Wholemeal flour:** for bread.
- **Barley:**
 - Rich in starch & sugar.
 - Low in fat & protein.
 - Nutty flavour.
 - Requires to be soaked overnight.
 - Once roasted, it changes to **malt**.
 - Malt is used in the brewing/distilling of vinegar.
- **Maize (corn):**
 - Whole corn is processed for breakfast cereal.
 - Fully ripened maize is processed into corn flour.
 - Can also produce oil suitable for cooking.
- **Rye:**
 - The dough produced from rye flour has sticky dense consistency.
 - Baked bread with this flour, is dark in colour.
- **Oats:**
 - High protein & fat.
 - No gluten, so not suitable for bread making.
 - Used in making oat cakes and porridge.
- **Rice:**
 - Contains high values of starch & protein, fat & minerals.
 - Eaten after removal of barn & germ.
 - Types of rice:
 - Long grain: narrow and for boiled rice.
 - Medium grain: all-purpose rice.
 - Short grain: short, round & suitable for porridge.

- Brown rice: whole grain of rice with only outer husk removed.

- **Millet:**
 - Non-glutinous.
 - Contains high amount of fiber & minerals
 - Used to make flatbread.
- **Oats:**
 - High protein & fat.
 - No gluten, so not suitable for bread making.
 - Used in making oat cakes and porridge.

5.6. Pulses & Nuts

- **Pulses:** Edible seed that comes from the family of legumes.
 - Examples:
 - Chick-peas.
 - Mung beans.
 - Red and yellow lentils.
- **Nuts:** single-seeded, dry, and hard-shelled fruits of trees. edible soft kernels with hard or brittle shells, such as peanuts, almonds, and walnuts.
- Sold as whole nuts, raw, dry-roasted or oil roasted.
- Can be salted, sugared, or spiced.
- Nuts have a high fat content so they brown easily and can be made into oils.
- Nuts are good sources of protein, calcium, B vitamins, magnesium, and vitamin E.

5.7. Fruits and Vegetables

- Both are naturally low in fat and calories and high in dietary fibre.
- **Nutritional value:** potassium, folate (folic acid), vitamin A, vitamin C, and dietary fibre.
- Various textures.
- Different flavours.
- Can be used to make smoothies and fruit salads.
- Great for weight loss.
- Helps with improving skin.
- Helps in maintaining basic body necessities.

5.8. Fats and Oils

- **Fats:** A nutrient essential for body energy, insulation, and protection of internal organs.
- **Oils:** fats that are liquid at room temperature.
- **Saturated fat:** has single bonds; usually origins from animals and is solid at room temperature, e.g.: butter and cheese.
- **Unsaturated fat:** has one or more double bonds; liquid at room temperature and usually origins from plants, e.g.: sunflower oil and corn oil.
- **Monosaturated fats:** subdivision of unsaturated fats; can be semi-solid or liquid at room temperature e.g.: olive oil.
- **Polyunsaturated fats:** subdivision of unsaturated fats; usually semi-liquid at room temperature, e.g.:

mayonnaise.

- **Trans fat:** unsaturated fat molecule chemically changed to be a solid fat. Is used in processed foods mostly.
 - Has longer shelf life.
 - Cheap.
 - Disadvantage is that it can cause coronary heart disease.
- **Cholesterol:** substance found in the blood that produces hormones and is essential to many internal body processes like digestion however only present in animals, not plants.
- **High-density lipoprotein:** good cholesterol that moves excess cholesterol to the liver.
- **Low-density lipoprotein:** bad cholesterol that moves cholesterol from liver to blood. Too much LDL causes heart attack due to build-up of cholesterol in arteries.

5.9. Dairy products

- Dairy products are produced by the processing of milk.
- E.g.: Cheese, yogurt, butter, ice-cream etc.
- Good source of proteins, calcium, riboflavin, vitamin D and A and potassium.
- **Lactose intolerant:** unable to digest lactose in milk causing problems like diarrhoea and bloating.

6. Cooking of Food

6.1. Transfer of heat

Conduction	Convection	Radiation
Molecules start vibrating through solids by contact. Adjoining molecules vibrate. E.g.: ovens, pans, wooden spoons, frying, stewing, boiling.	Through liquids & gases. Molecules rise when heated colder molecules fall. Convection currents created. E.g.: boiling, steaming, semi-liquid foods.	No medium, through space or vacuum. Rays from source of heat falls on food in path. Food needs to be turned. E.g.: grilling, roasting, infra-red, grills, microwave ovens.

6.2. Methods of cooking

- **Boiling:** water is usually heated to a boiling point then heated is lowered.
- **Simmering:** foods cooked in hot water but require gentler treatment than boiling to prevent toughing.
- **Poaching:** cooking food in water just below the temperature used for simmering.
- **Steaming:** food that is steamed without direct contact with water.
- **Pressure cooking:** at normal a.t.p, water boils at 100 C. If pressure is increased the water will boil at a high temperature forcing steam through food to cook rapidly.

- **Braising:** a combination of stewing and roasting.
- **Stewing:** slow method – like boiling but cooked below boiling point.
- **Roasting:** cooking of meat & vegetables in the oven.
- **Baking:** cooking foods (like flour mixtures) by convection in the oven.
- **Frying:** involves high temperatures – solid fats / oils are used.
- **Microwave cooking:** used to defrost and reheat pre-cooked meals.
- **Grilling:** involves dry heat being applied to surface of a food.
- **Slow cooking:** a cooking pot used for cooking foods at low temperatures for a long time.
 - **Advantages:** Improves flavour of food being cooked; avoids meat to dry and it's hands-off, so no need for supervision.

6.3. Reasons for cooking food

- To kill harmful bacteria
- To destroy natural toxins.
- To preserve.
- To aid in digestion.
- To aid in absorption.
- To make food more attractive.
- To make food easier to eat.
- To develop flavour.
- Smell stimulates appetite.
- To provide hot food in cold weather.
- To reduce bulk.
- Create new dishes.
- Add variety to diet.
- Necessary for cooking process.

6.4. Sensory properties of food

- Sensory properties of food include properties apart from taste.

E.g.: Smell, texture, appearance etc.

- **Appearance:**
 - Consistency.
 - Presentation.
 - Portion.
- **Texture:**
 - Smooth.
 - Lumpy.
 - Graininess.
- **Smell:** The aroma of the food while it's being cooled and after

it's cooked.

- **Flavour:** Combination of tastes and takes other sensory properties into account.

- **Taste:** Detects if food is spicy, sweet, tangy, bitter, sweet etc.

6.5. Effect of heat on proteins, fats, oils, sugar, starches, and vitamin

	<i>Dry heat</i>	<i>Moist heat</i>
Proteins	Denature & digestibility may reduce.	Coagulates. Hydrolysis of bacterial proteins.
Fats	Breaks to glycerol & fatty acids.	-
Sugar	Melts – caramelizes - burns – leaves black residue.	Dissolves – caramelizes – burns when water has evaporated.
Starch	Changes to dextrin	For rice: Grains soften- absorb water- swell – rupture- dissolves to form a paste.
Vitamins	Baking/roasting etc, have very little effect on loss of vitamins.	Water-based cooking causes greater loss of vitamins in food

6.6. Terms

- **Caramelization:** when sugar molecules become golden brown due to exposure to heat.
- **Coagulation:** change in the structure of protein by heat.
- **Dextrinization:** when food changes colour, texture, aroma & flavour.
- **Millard reaction:** non-enzymatic browning process.
 - If foods containing protein or carbohydrates undergoes dry heat, a reaction occurs between the two.
 - Appearance changes to brown colour.
- **Gelatinization:** when carbohydrates undergo heat.
- **Rancidity:** unpleasant odours and flavours in foods resulting from spoilage.
- **Smoking point:** the temperature at which food being cooked sends out smoke signals and also when fat burns.

6.7. Preparation & cooking of foods to preserve nutritive value

- **Freezing:** best if food not used completely and needs to be preserved for next time.
- Use the microwave; has less effect on nutritive value.
- Use less water while cooking to prevent loss of vitamins.
- Don't apply too much heat on food. Can destroy enzymes and cause loss of nutrition.

6.8. Economical use of food, equipment, fuel, and labour

- Buy small equipment that last long, e.g.: microwave.

- Buy proper sized pots and pans that trap heat well to prevent wastage of heat from fuel.
- Switch of electrical appliances that are not in use.
- Switch of lights in the kitchen when not in use.
- Buy ingredients in bulk.
- Meal prep to save time and labour.
- Cook in batches
- Buy foods that have longer shelf life.
- Buy foods that are easy to store and don't take up much space in the kitchen.

7. Convenience Foods

7.1. Types

- Dehydrated
- Ready-to-eat
- Canned foods
- Cook-chill foods
- Snacks.
- Bakery.

7.2. Advantages & Disadvantages

Advantages	Disadvantages
Quick, easy.	Expensive.
Saves time.	May limit NSP intake.
Saves energy.	Servings may not be adequate.
Saves fuel.	Nutrients may be lost.
Easy to store	May contain high levels of fat and sugar
Kept for emergencies.	
Variety available.	
Little waste.	
Extra nutrients added.	

7.3. Food additives

- Antioxidants:
 - Extends shelf life.
 - Slows down rate of fat & oils that cause foods to go rancid.
- Preservatives:
 - Prevents growth of microbes.
- Flavouring:
 - Enhances original taste of food.
- Emulsifiers:
 - Prevents from ingredient separation.
 - Makes general appearance, structure & texture more appealing.

Packaging importance:

- Improves shelf life.

- For marketing food products.

Type of materials for food packaging:

- **Aluminum:** for cans, foils, trays etc. Helps maintain the freshness and thermal temperature of food.
- **Steel:** for tin cans and lids. Helps prevent food contact with oxygen to give longer shelf life.
- **Paper/ Kraft bags:** for flour, sugar, dried fruits etc.
- **Plastic bags:** low cost and great for storing fruits and vegetables.
- **Net bags:** for onions, garlic etc.
- **Glass:** used commonly for its strength, hygiene, quality, transparency and thermal properties.

Disadvantages of packaging:

- Can be deceptive.
- Good quality packaging not cheap so plastic is used more often which is non-biodegradable.
- Can cause safety and hazard problems to children and wildlife.
- Encourages pollution.

Importance of labels:

- Help consumer make informed decisions on what to buy and store.
- Information on nutritional value provided.

Information found on labels:

- Name of food.
- List of ingredients.
- Percentage of ingredients present.
- Instructions to use/ store.
- Production and expiry dates.
- Country of origin/ production.
- Manufacturer details.
- Calories in set portions.
- Barcodes.

8. Basic proportions and methods of making

8.1. Methods of baking

- **Creaming:**
 - Requires thorough creaming or blending of butter & sugar before any other ingredient is added.
 - It is important to keep going until the butter and sugar mix is pale, light & creamy.
- **Melting:**
 - Butter is melted together in a pot before the eggs, then the dry ingredients are added.
 - A chemical raising agent is added.
 - No beating or whisking.
- **One-stage:**

- Requires the wet mixture (eggs & sugar) to be whisked to incorporate air.
- Dry ingredients are sieved very well and then folded gently.
- **Rubbing-in:**
 - Butter usually is worked into the flour by rubbing pieces through the fingers creating sand-like texture.
- **Whisking:**
 - All the ingredients are combined at once.

8.2. Pastries

- **Shortcrust:**
 - Basic pastry of fat, flour, and liquid to hold it together.
 - Dough is used as a crust for pies and tarts.
- **Rough puff pastry:**
 - Made with butter.
- **Flaky puff pastry:**
 - Made with butter.

8.3. Sauces

- **Uses + examples:**
 - Enhance flavour- chocolate sauce.
 - Provide texture- tomato paste.
 - Provides contrasting flavour-cheese sauce & cauliflower.
 - Binding ingredients-fish cakes.
 - Add colour to a dish (jam sauce with pudding).
 - Contribute nutritional value of a dish.
 - Reduce excessive richness of food-orange sauce & roast duck.
 - Add variety and interest to a meal.
 - Can be served as a coating for vegetables or fish.
 - Part of a meal (casserole of meat).
 - Can be an accompaniment- mint sauce & roast lamb.
- **Pouring sauce:**
 - Should just glaze the back of a spoon when cooking.
- **Coating sauce:**
 - Should just glaze the back of a spoon when cooking and should be used as soon as it's ready.
- **Binding sauce:**
 - Should be thick enough to bind dry ingredients.
- **Blending sauces** is a method of making sauce by stirring little portions of a type of starch (e.g.: flour or corn starch) and liquid (e.g.: milk) together almost to a boiling point.
- The starches are blended with cold liquid, then poured into the hot base and stirred until it thickens.

8.4. Roux sauce

Roux sauce – old method:

- Melt fat in pan, add flour-stir well on gentle heat.
- Remove the pan from heat and add the liquid while stirring to avoid lumps and form a smooth paste.
- Return to heat and stir constantly.

- Bring to a boil and cook for 2 min.
- Remove from heat.

<i>25g flour, 25g fat, 275ml milk or stock</i>	Plain white consistency and sauce thickened by starch (e.g.: corn-starch)
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Roux sauce – All in one method:

- Place all ingredients in pan.
- Heat gently and stir all the time till boil starts.
- Cook till thick and glossy.

8.5. Methods of thickening sauces

- By **coagulation** of protein (e.g.: Egg custard sauce):
 - Mix egg & milk.
 - Add sugar.
 - Pour in a bowl over a pan of boiling water.
 - Stir all the time till egg coagulates.
 - Remove from heat.
- By **emulsification** of fat (e.g.: Mayonnaise):
 - Beat fry ingredients into egg yolk to stabilise emulsion.
 - Add oil drop by drop.
 - Continue adding oil till thickening starts.
 - Add vinegar drop by drop for consistency.
 - Serve.
- **Pureeing** (e.g.: apple sauce):
 - Peel and slice apples.
 - Stew in water & butter till soft.
 - Puree and add sugar.

8.6. Batters

- A mixture of flour, liquid & eggs.
- 2 types:
 - **Thin batter** – usually 275ml liquid – used in puddings & pancakes.
 - **Coating batter** – usually 150ml liquid -used in deep-fried fish.

8.7. Sweet & savoury yeast products

- **Savoury:** flavourful and tasty. Opposite to salty and sweet.
- **Sweet:** food made with sugar like biscuits or cakes.
- Changes in bread making:
 - Dough rises as CO₂ expands in heat.
 - Yeast activity decreases as temperatures rises.
 - Fermentation stops as yeast is killed at 55C.
 - Water is absorbed by starch granules in the flour.
 - Gluten starts to coagulate at 70 C.
 - H₂O, CO₂ & alcohol escape during baking.
 - Sugars caramelize.

9. Raising Agents

9.1. Air

- **Sieving:** air gets between fine particles.
- **Creaming:** air is trapped in the form of tiny bubbles.
- **Whisking:** egg white and sugar can trap large volumes of air.
- **Folding & rolling:** air is trapped between the layers.
- **Rubbing in:** when fat is rubbed in the flour.

9.2. Carbon dioxide

- Carbon dioxide is incorporated by using leaving agents like **bicarbonate of soda** or **baking powder** or **bicarbonate of soda + an acid** or by **yeast** in the baking process.
- The bubbles formed in the dough are carbon dioxide which is released by the leaving agents.
- This gives the dough structure and consistency.

9.3. Water vapour

- Expands as heat is in contact.
- Quick to raise dough.
- Allows hydration of gluten and starch molecules.
- Can spray water to dough before baking to incorporate steam/water vapour in order to aid with the baking process.

10. Food storage and spoilage

10.1. Action of enzymes, bacteria, yeast & moulds

- **Enzymes:**
 - Oxidation: oxidase enzymes cause the destruction of certain nutrients.
 - Browning: if foods get cut or bruised, the surface will discolour due to the activity of enzymes.
 - Ripening: change in colour by the presence of enzymes.
- **Bacteria:**
 - Reproduce under suitable conditions of:
 - Temperature.
 - Moisture.
 - Food supply.
- **Moulds:**
 - Grow best in warm moist conditions & will grow slowly in cool places.
 - Spores are released into the atmosphere and land on food to germinate.
- **Yeasts:**
 - Can grow in acidic, salty, and sugary concentrations and can grow without oxygen but they need water to

reproduce.

10.2. Personal food & kitchen hygiene

- Food and kitchen hygiene needs to be regularly maintained and obeyed in both personal and public kitchens.
- Always keep hair tied or covered way before cooking.
- Cut your nails short.
- Wear a clean apron to avoid stains.
- Don't wear jewellery such as rings.
- Clean the cutting boards before using.
- Wash dishes instead of letting them pile up.
- Wash hands and kitchen equipment before using.
- Use a decent sized dustbin or reuse plastic shopping bags to save money.
- Separate raw meats from the cooked to avoid cross-contamination.
- Use separate cutting boards for meat and fruits and vegetables.
- Clean the kitchen sink frequently to avoid bad odour spreading.
- Keep a clean and organized fridge.
- Keep electrical appliances away from the sink or water.
- Wear gloves when washing sharp blades or knives to avoid cuts.
- Disinfect or clean the kitchen counters.
- In shops, especially when maintaining ice, use an ice scoop to transfer or change ice.
- Change ice on regular basis.

10.3. Storage at home

- Label containers.
- Separate raw food from cooked.
- Store foods at required temperatures.
- Use airtight containers to store products like flour, sugar etc.
- Use a bread box/container to store bread safely.
- Bread should be stored at room temperature.
- Use the kitchen cabinets to store canned foods.
- Tighten lids of bottles or any liquid container to avoid drips in the fridge or counter.
- Store eggs in the fridge.
- Foods like onions and potatoes should be stored in dry places.
- Don't store any food items under the sink area.

10.4. Waste disposal

- Don't waste food scraps; instead, recycle to make plant compost.
- Avoid plastics, or reuse plastics that you already have at home instead of throwing them away.
- Buy food with minimum packaging.
- Invest in a good and decent sized bin.

- Alternatively, you can reuse big shopping bags as waste bags to reduce plastic waste.
- Clean the waste bin at least once a week to avoid bad odour in the house.
- Don't wait for the waste bin to be full and then dispose of it. This can lead to growth of bacteria in the kitchen.

11. Food preservation

11.1. Reasons for preserving food

- Making goods available out of season.
- To make use of food when it's cheap and use it later.
- To vary the diet by preserving foods to make new foods.

11.2. Preservation methods

- Heating.
- Dehydrating.
- Freezing.
- Chemical preservation.
- Irradiation.
- Removal of air.

11.3. Milk pasteurisation & sterilisation

- **Sterilisation:** eliminating/killing microorganisms.
- **Pasteurisation:** mild heat (less than 100 C) used to eliminate pathogens to extend shelf life of packed milk.
- **Evaporated milk:** homogenized milk with around 60 % water removed then is chilled, sterilized, and packaged.
 - Retains vitamins and minerals.
 - No need to refrigerate.
 - Can be used in desserts, tea, dressings, etc.
- **Condensed milk:** made from evaporated milk with sugar and water is removed.
 - Mostly found as sweetened condensed milk.
 - Used in desserts.
- **Dried milk:** also called powdered milk.
 - No need for refrigeration.
 - Longer shelf life than any other type of milk.
 - Used to make fresh milk, can be used in soups too.
- **Production of UHT milk:** involves high temperatures (135–150°C) for short times (a few seconds) to produce product that is commercially sterile.
- Raw milk -> undergoes pasteurisation -> is homogenised -> sterilised -> packaging.

11.4. Manufacturing of cheese & yoghurt

- Both are made from milk.
- **Cheese** making steps:
 - Milk is thickened.
 - Curd formed is separated from whey (the liquid).

- Curd is made into cheese.
- **Yogurt** is made with milk and good bacteria.
- **Nutritional value:**
 - Protein for growth and repair.
 - Calcium and phosphorus for strong bones and teeth
 - Vitamin A and B for growth and health.
- Yogurt is low in fat and sodium. Cheese is the opposite.

12. Kitchen planning

12.1. Parts of kitchen

- Cabinets for dry storage.
- Counter space for cutting and mixing.
- Sink.
- Dishwasher.
- Food disposal.

12.2. Types of kitchens

- U-shaped:
 - Most efficient layout.
 - Versatile.
 - lot of cabinets and counter space.
- L-shaped:
 - Two workstations on one wall
 - The third on an adjacent wall.
 - Adapts well to a variety of room layouts.
 - Things to consider about design of kitchen:
- Colour scheme.
 - Size.
 - Price.
 - Shape.
 - Layout.
 - Space and efficiency.

12.3. Flooring

- Should consider colour of tiles.
- Should consider design of tiles.
- Should consider size of tiles.
- Should consider spot for drainage.
- Should consider material for flooring.
- Should consider texture of flooring material.

12.4. Walls and wall coverings

- Types of wall and wall coverings:
 - Paint.
 - Wallpaper.
 - Metal wall covering.
 - Stainless steel wall covering.
 - Glass wall covering.
 - Wooden panels.
 - Fabric wall coverings.
 - Tiles.

- Must consider ventilation area.
- Must consider the price.
- Must consider material.

12.5. Lighting

- Types:
 - Decorative lighting.
 - Main/ centre/ room lighting
 - Must consider shape of light (if it's dome-shaped, round, etc).
 - Must consider price.
 - Must consider height.
 - Must consider colour (warm or white).

12.6. Ventilation

- Maintains a balance between air that's removed and fresh air that's returned to the kitchen.
- Types of common ventilation:
 - Natural ventilation.
 - Exhaust ventilation.
- Natural ventilation requires no mechanical energy and involves movement of air.
- Exhaust ventilation creates airflow by forcing air out using a fan.
- Advantage to using an exhaust fan is that its efficient in increasing the airflow.
- Disadvantage to using exhaust fan is it uses mechanical energy so high costs and additional maintenance costs.

12.7. Organisation of cooking area

- Keep all cleaning equipment under the sink area.
- Keep a drying rack for dishes near the sink area.
- Keep all spices in closed containers to avoid moisture.
- Store pots and pans in a cabinet stacked or hung.
- Store utensils in a drawer neatly with spoons, knives and forks organised.
- Keep all electrical equipment together on one side of the kitchen next to their plugs.

13. Kitchen Equipment

13.1. Choice of equipment

Modern cooker vs traditional cooker:

Modern cooker	Traditional cooker
Very little supervision required but more time needed to reach optimum pressure.	Supervision required to count whistles but reaches optimum pressure quicker than digital.
Have built in heating element.	No built-in heating element.

Modern cooker	Traditional cooker
Modern cookers have a dial that controls pressure and no weight.	Traditional cookers have a natural opening method in which the cooker is removed from the heat source causing the pressure to reduce naturally.
No excessive steam released.	Have a lid lock and weight for pressure.
Less time for built in pressure to be released.	Excessive steam released.
More expensive.	Cheaper.

• **Thermostatic controlled and automatic time-controlled ovens:**

Thermostatic controlled	Automatic time-controlled
Has a thermostat that regulates oven temperatures.	Oven that has a timer and range input.
	Has a controller to monitor temperature.

- **Microwave ovens advantages:**
 - Easy to use.
 - Easy to clean.
 - Multi-purpose; can defrost, reheat, bake, etc.
 - Doesn't burn the food.
- **Microwave ovens disadvantages:**
 - Emits radiation.
 - Consume space.
 - Consumes lot of electricity.
 - Not all materials are safe to put into a microwave oven.
- **Slow electric cook pots:**
 - Use little energy.
 - Its low-temperature cooking allows meats to tenderize well.
 - Improves flavour of food being cooked.
 - It's hands off, no need for supervision.
 - Disadvantage is that it takes a long time to finish cooking food, so you need to plan when to use it.
- **Refrigerators and freezers:**
 - Main difference is temperature.
 - Freezer temperature usually 0 degrees.
 - Refrigerator temperature usually below 40 degrees.
 - Big so take up space.
 - Price can vary.
 - Must be cleaned at least once in three months, inside and behind too.
- **Small kitchen equipment:**
 - Knives must be stored in a block or by mounting on a magnetic strip.
 - Knives should be washed carefully; safer to use gloves while doing the dishes.
 - Pans and lids can be stored in a dry cabinet.
 - You can also hang pans by their handles.

- You can stack pans and lids.
- Pans should be thoroughly washed, especially if used to cook with oil.
- Utensils like bowls and plates can be stacked or placed in a rack.
- **Electrical equipment:**
 - Should not be kept in proximity with water.
 - Food processors can be stored in a rack or dry cabinet.
 - Food processor blades should be washed safely, with a washing glove if possible.
 - Food processor blades can be stored by stashing them in the colander or processor's container.
 - Never leave water in the electric kettle.
 - Turn off electric kettle when not in use.
 - After washing kettle, immediately dry with cloth.

14. Kitchen safety

14.1. Potential danger in the kitchen

- Getting knife cuts.
- Placing electrical appliances close to water.
- Blade cuts from appliances like blenders.
- Slipping.
- Tripping on wires from electrical appliances.
- Having too many people in the kitchen.
- Head injuries by cabinets.
- Carrying or lifting things in the kitchen.

14.2. Safety precautions

- Keep a first aid kit in arms reach.
- Use gloves when washing sharp electrical appliances.
- Make sure to clean the kitchen floor to avoid slipping.
- Keep appliances high in place.
- Organise wires from electrical appliances.
- Keep appliances away from the sink.
- Learn to hold knives in a safe manner.

14.3. First aids

- **Cuts, scalds, and burns:**
 - Rinse wound with water.
 - Apply pressure with a cloth or gauze.
 - When the bleeding stops, apply a clean band-aid.
- **Electric shock:**
 - Separate the person from the source.
 - Check if they're breathing or having a pulse.
 - If not, start CPR till help arrives.
 - If patient is vomiting or is turning pale, elevate their legs and feet slightly for blood flow.
 - If burns present, let water flow, and clean the burn, then cover with a gauze if possible or a clean cloth.
- **Shock:**
 - Lay patient down; elevate legs slightly for blood flow.

- Loosen any tight materials on body.
- Don't move the patient unnecessarily.
- Do CPR if shock is serious till medical help arrives.
- Don't let patient eat or drink anything.
- **Fainting:**
Check if patient is breathing or having a pulse.

Remove anything tight, like a watch or belt.

Lift feet up slightly or if patient can't lie down, face head down for blood flow.

Fainting can happen due to lack of ventilation, so open windows to allow fresh air in.

CAIE IGCSE

Food and Nutrition (0648)

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