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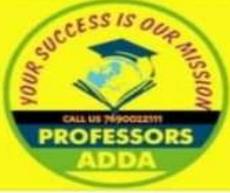
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BOOKLET NOTES

FEATURES



Complete syllabus coverage with All Topics & Break down of subtopics



10 Units prepared By Subject Experts Professors & toppers



Terminology explained with core concepts & Key thinkers



Updated 2025 Edition



Flowchart & mind maps / tables for Quick Revision



Multicoloure & Readable Pin Pointed notes

BENEFITS



Conceptual clarity with memory retentions

Recall Ready to use



Time saving & Money Saving



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Margdarshika Booklet UPDATED 2025 Edition

Margdarshika booklet what is this,

Why read this?

- It is a well-planned roadmap to simplify the vast and complex syllabus of UGC NET. It is like a Guru showing you the path to success in the subject. You do not need to depend on anyone.
- Its main aim is to give clear answers to questions like "what to read, where to start, and how deep to read". Focus points are explained.
- It gives a systematic direction to your preparation by dividing it into small (manageable) parts. It tells you what is the new trend of the exam these days.

What's that for?

- It is useful for students preparing for UGC NET, PGT, Asst Professor
- It is very useful for those who are preparing at home, those who are working, those who are not getting proper guidance, those who do not want to watch videos. It is a one stop solution for them

Key Features and Benefits

- **Benefits:** Explains important concepts, theories and examples of the subject.
- **Time saving:** Guides you in the right direction by saving you from unnecessary information. 100% exam oriented
- **Complete coverage:** Ensures that no important part of the syllabus is missed.
- **Increased confidence:** Having a clear plan reduces nervousness regarding preparation.

How to make best use of it?

- Make sure to remember the most important
- Follow the order given in the guide.
- Have a strong grip on the basics of each topic.
- While studying, focus on those topics in ProfessorsAdda Booklets.
- Try to establish a connection between different concepts.
- Solve MCQ practice questions and old question papers based on the guide. All this is given in ProfessorsAdda MCQ + PYQ booklet which is complete, quality updated.
- It works like your personal guide.

MARGDARSHIKA GUIDE

How to Study Home Science Unit-1

This unit provides a detailed introduction to the fundamentals of food science and nutrition. It lays the groundwork for understanding how food affects our health and how it is handled from the farm to our table. Here' s a suggested approach to help you effectively understand, remember, and apply the material, which is expanded up with more detail:

What to read:

The whole unit is important because the topics are interconnected, creating a holistic understanding of food science. However, it would be beneficial to focus on the specifics within each major area:

1. Cardinal principle:

- **Diet or Food and Nutrients:** Proceed from the basic definitions. Understand the classification of nutrients into macronutrients (proteins, whiteheads/carbohydrates, fats – providing energy and building blocks) and micronutrients (vitamins, mineral salts – essential for various bodily functions and regulation). Focus on the concept of "Proximate principles."
- **Nutrition, Good Nutrition, and Malnutrition:** Delve deeper into the implications of each situation. For malnutrition, understand the specific conditions mentioned such as kwashiorkor – mainly related to calorie deficit, though protein is also a factor) and marasmus (severe protein and calorie deficiency). Understand the concept that malnutrition includes both undernourishment (inadequate nutrition) and overnutrition (excessive nutrition) and their associated health consequences (e.g., deficiency diseases vs. obesity-related diseases).

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- **Dietetics:** Identify it as a practical application of nutritional science, which focuses on planning therapeutic regimens for individuals and groups, including their specific needs, health conditions, age, and lifestyle.

2. Food Properties and Quality:

- **Physical and chemical properties of food:** For physical properties, consider examples such as viscosity of liquids, the firmness of solids, and the role of water content in determining whether food is juicy or dry. For chemical properties, think about how the presence of specific compounds (e.g., enzymes, acids, alkaloids, pigments) affects the consistency, flavor, color, and safety of the food.
- **Quality Evaluation of Food:** Understand why both subjective (using human senses such as taste, smell, sight, touch) and objective methods are important. Subjective assessment is related to consumer acceptance, while objective methods provide quantitative data for quality control, research, and regulatory compliance.

3. Effect of Cooking and Processing:

- **Effect of cooking and processing techniques on nutrients and physical parameters:** This is an important section. Focus on specific changes: how starch is affected by cooking (e.g., gelatinization makes it digestible), proteins (denatured, coagulating, and potentially hardening upon overcooking), fats (melting, potentially breaking down at high heat leading to the formation of acrolein), and especially vitamins (sensitivity to water-soluble vitamins such as B and C, as opposed to the relative stability of fat-soluble vitamins) to heat and leaching). Consider that different cooking methods (boiling, frying, steaming, baking) have different effects.

4. Food Shielding:

- **Food Preservation - Principles and Different Methods:** Understand the basic principles: Controlling microbial growth (by reducing water activity, expelling oxygen, changing pH, using extreme temperatures) and inhibiting enzymatic activity. Pasteurization (e.g., for milk), canning (e.g., for fruits, vegetables, meat), dehydration (e.g., for fruits, herbs, milk powder), radiation (For methods

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such as irradiation), and the use of chemical preservatives, know the basic mechanisms and general food applications.

5. Food Composition:

- **Food Pigments and Additives:** For food pigments, appreciate their contribution to the visual attractiveness of food and their potential health benefits (e.g., chlorophyll in green vegetables, carotenoids in carrots, lycopene in tomatoes, anthocyanins in berries). For food additives, understand their diverse roles – increasing shelf life (preservatives), improving texture (emulsifiers, stabilizers), adding flavors (flavor enhancers), restoring lost nutrients (fortification), or improving appearance (color). Emphasize the importance of regulatory approvals and safe use levels.

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6. Food Safety and Standards:

- **Food Standards:** Identify these as benchmarks for quality, safety, and structure, which are critical to protecting consumer health and facilitating fair trade.

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- **Regulatory Bodies like FSSAI:** Understand the role of such entities (Food Safety and Standards Authority of India) in setting and enforcing these standards in a specific national context.
- **Microbial Safety of Food: Differentiate between** beneficial microbes (used in fermentation such as yogurt, cheese), spoiling microbes (spoilors of food), and pathogenic microbes (causing foodborne illness).
- **HACCP (Hazard Analysis & Critical Control Points): Think of it as a systematic,** preventative approach to food safety that identifies potential biological, chemical, and physical hazards in food production processes and designs measures to reduce these risks to safe levels.
- **Food Packaging:** Explore its multifaceted functions: prevention, protection from physical damage and environmental factors (light, oxygen, moisture), providing information (labels), ensuring convenience, and its role in marketing and branding.

7. Food Service Management:

- **Menu planning:** Consider the various factors that affect menu design, such as the target customer (age, dietary needs, preferences), budget constraints, availability of ingredients, staff skills, equipment, and type of establishment (e.g., hospital, School, Restaurant).
- **Food Cost Analysis:** Understand the critical role it plays in the financial viability of a food service operation, including the calculation of costs of materials, labor, and overheads to determine pricing and profitability.
- **New Product Development (Nanotechnology):** Identify it as an emerging field that has potential applications for increasing nutrient delivery, improving the texture and flavor of food, developing "smart" packaging that signals spoilage, and creating more effective antimicrobial agents.
- **Management of Food Service at Institutional Level:** Appreciate the unique challenges and complexities of large-scale food production and service in institutions such as hospitals (therapeutic diets, sanitation), schools (nutritious food for children), and canteens, including logistics, quality control, and meeting diverse needs.

8. Fundamentals of Research:

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- **Research Methodology:** Understand that a basic knowledge of research methods (types of research, steps involved) is essential for critically evaluating nutritional information, understanding scientific studies in food science, and for evidence-based practice.
- **Ethics in Research:** Emphasize the importance of ethical considerations such as informed consent, confidentiality, avoidance of bias, and accurate reporting of findings in any research involving human subjects or scientific inquiry.

How to study and study:

1. Start with the basics (strengthen the foundation):

- Start with the basic sections: "Diet or Food," "Nutrients," and "Nutrition." A solid understanding of these key definitions and concepts is paramount as all subsequent topics are based on them. Think of it like building a building – a weak foundation will compromise the entire structure. Make sure you can define each term and explain its significance before proceeding.

2. Proceed sequentially:

- The topics of this unit are generally arranged in a logical progression. Proceed in the order presented through the content, as the concepts are often interconnected. For example, understanding the "physical and chemical properties of food" will directly help in understanding "quality assessment" and "effects of cooking and processing". This sequential approach helps to create a connected web of knowledge rather than isolated facts.

3. Pay attention to definitions and classifications:

- This unit introduces a number of specific terms (e.g., proximate principals, pasteurization, HACCP) and classifications (e.g., six groups of nutrients, types of malnutrition, methods of food preservation, types of menus). Accuracy in their understanding in a scientific subject is crucial. Consider creating flashcards, a glossary of words, or a mind map to organize and remember these definitions and classifications.

4. Pay special attention to tables and summaries:

- The document includes several tables (tables) that are gold repositories of condensed information. Examples include:

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- Effect of Cooking and Processing Techniques on Nutritional Elements
 - Difference Between Malnutrition and Nutrition
 - Color value of food products
 - pH for various food products
- These tables are excellent for quick reviews, comparisons, and understanding the relationships between different concepts. Actively study them, don't just glance at them. Try reproducing them from memory.

5. Understand practical applications:

- Classes such as "The Impact of Cooking on Nutrients," "Food Preservation," "Food Packaging," and "Food Service Management" have direct, tangible real-world applications. Try to actively connect these concepts to your daily life, food choices, kitchen practices, or observations in the supermarket. For example, when you look at different types of milk packaging, think about the preservation principles involved. This makes learning more engaging and improves retention.

6. Key terminology notes:

- The document uses Hindi words, often given English equivalents in parentheses (e.g., Food Standards). Familiarize yourself with both. This bilingual understanding will not only aid your understanding of this specific unit but will also broaden your ability to consult other resources, research papers, or international guidelines that are often in English.

7. Break down complex parts into smaller parts:

- Some sections, such as "food preservation" (which details a number of methods) or "food service management" (covering various aspects from menu planning to institutional catering), may seem broad. Dispose of them in small, manageable pieces. Set mini-goals for each study session, for example, "Today I will figure out three ways of food preservation." This prevents heaviness and makes the learning process feel more achievable.

8. Summarize in your own words:

- After reading an important section or a complex topic, close the book/notes and try to explain the main concepts aloud or write a brief summary in your own words. It's a powerful active learning technique that forces your brain to process and

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synthesize information instead of simply passively absorbing it. If you can't explain it simply, you haven't understood it well.

9. Imagine the processes:

- For topics involving sequences or systems, such as the stages of HACCP, the process of food spoilage, or the steps of research methodology, try to visualize them. Create mental flowcharts or even simple diagrams. Visual teaching aids can make abstract concepts more concrete and easier to remember. For example, imagine the journey of a food item through a processing plant when studying HACCP.

10. Repeat regularly:

- Given the breadth and depth of information in food science and nutrition, continuous review is absolutely crucial for long-term retention. Don't cram! Instead, schedule short, regular review sessions. For example, do a brief review of today's topics at the end of the day, and a more comprehensive review at the end of the week. It combats the "state of forgetting" and helps transfer information from short-term to long-term memory.

By following these extended tips, you will be able to effectively learn, understand and apply the content of this unit on food science and nutrition.

How to Study Home Science Unit-1

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of water content in determining whether food is juicy or dry. For chemical properties, think about how the presence of specific compounds (e.g., enzymes, acids, alkaloids, pigments) affects the consistency, flavor, color, and safety of the food.

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(emulsifiers, stabilizers), adding flavors (flavor enhancers), restoring lost nutrients (fortification), or improving appearance (color). Emphasize the importance of regulatory approvals and safe use levels.

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HOME SCIENCE - UNIT 1 SAMPLE

Chapter 4: Effect of Cooking and Processing on Nutrients

- Cooking and processing are transformative processes fundamental to our diet.
- They make food safe by destroying harmful microorganisms.
- These processes also make food more digestible and appealing to our senses.
- However, heat, water, and oxygen involved in cooking can impact nutritional value.
- This results in both beneficial changes and the loss of certain nutrients.
- Understanding this dual effect is crucial to preserve the maximum nutritional quality of food.

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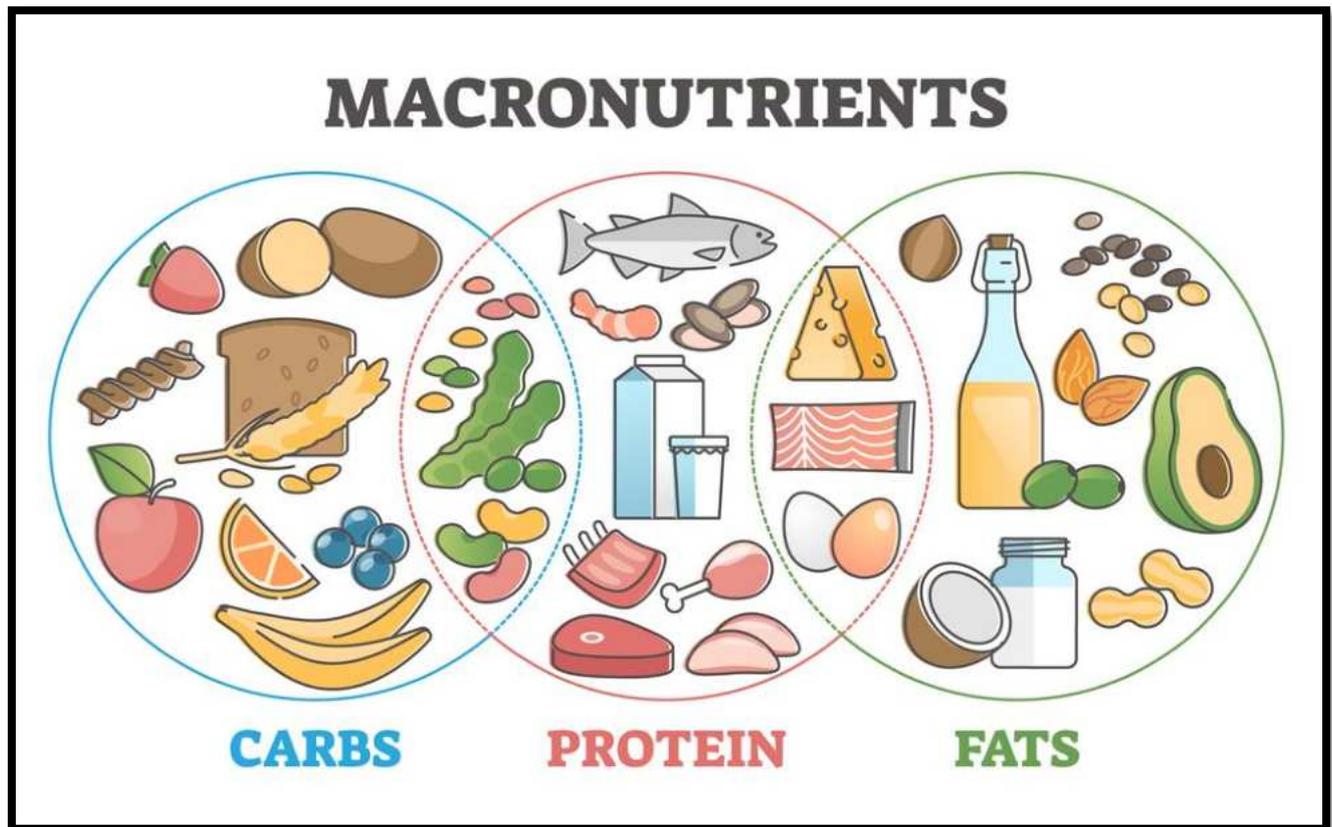
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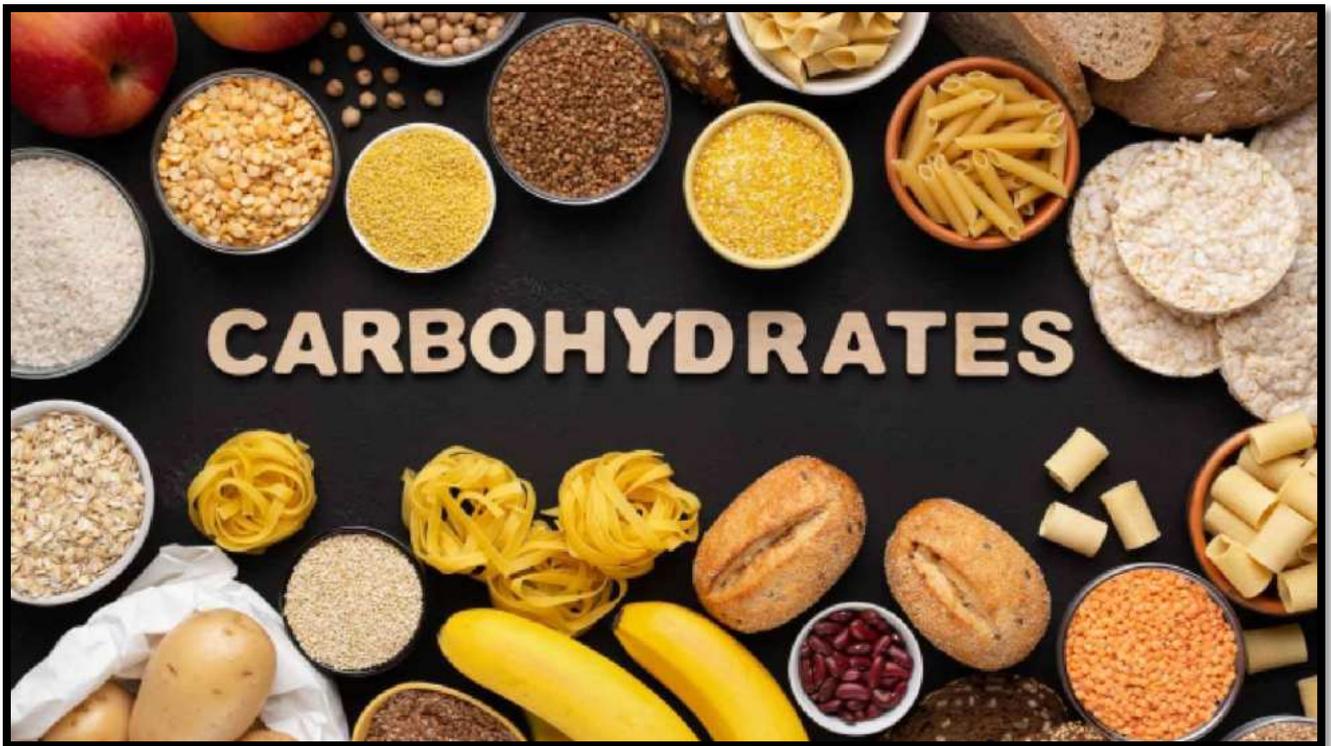
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Effect on Macronutrients

- Macronutrients are the energy-providing components of our food.
- Cooking initiates crucial chemical and physical changes in them,
- which largely determine their digestibility and function in the body.



Carbohydrates

Carbohydrates, especially starches and sugars, undergo dramatic changes when heated.

- **Starch:**

- **Gelatinization:** This is the most important change that occurs when starch is cooked with water or a moist heat.

- **Mechanism:** In their raw state, starch consists of tightly packed granules that are insoluble in cold water.
- When heated, these granules absorb water, begin to swell, and break apart, causing the mixture to thicken.

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- **Effect:** This process breaks down the complex structure of starch, making it soft and easily broken down by digestive enzymes.
- This significantly improves its digestibility and energy availability.

- **Examples:** The softening of rice and pasta when boiled, the thickening of a gravy or sauce when flour is added, and the soft interior of a baked potato.

- **Dextrinization:** This occurs when starchy foods are subjected to intense dry heat.
 - **Mechanism:** The long starch chains on the surface of the food break down into smaller, simpler sugar units called **dextrins**.
 - **Effect:** This process is responsible for the characteristic browning, crisp texture, and slightly sweet, nutty flavor of many baked and toasted foods.
 - **Examples:** The browning of toast, the crust of baked bread, and the nutty flavor of browned flour used in some recipes.

- **Sugars:**
 - **Caramelization:** When sugars are heated to high temperatures (typically above 160°C or 320°F), they break down and undergo a series of complex reactions.

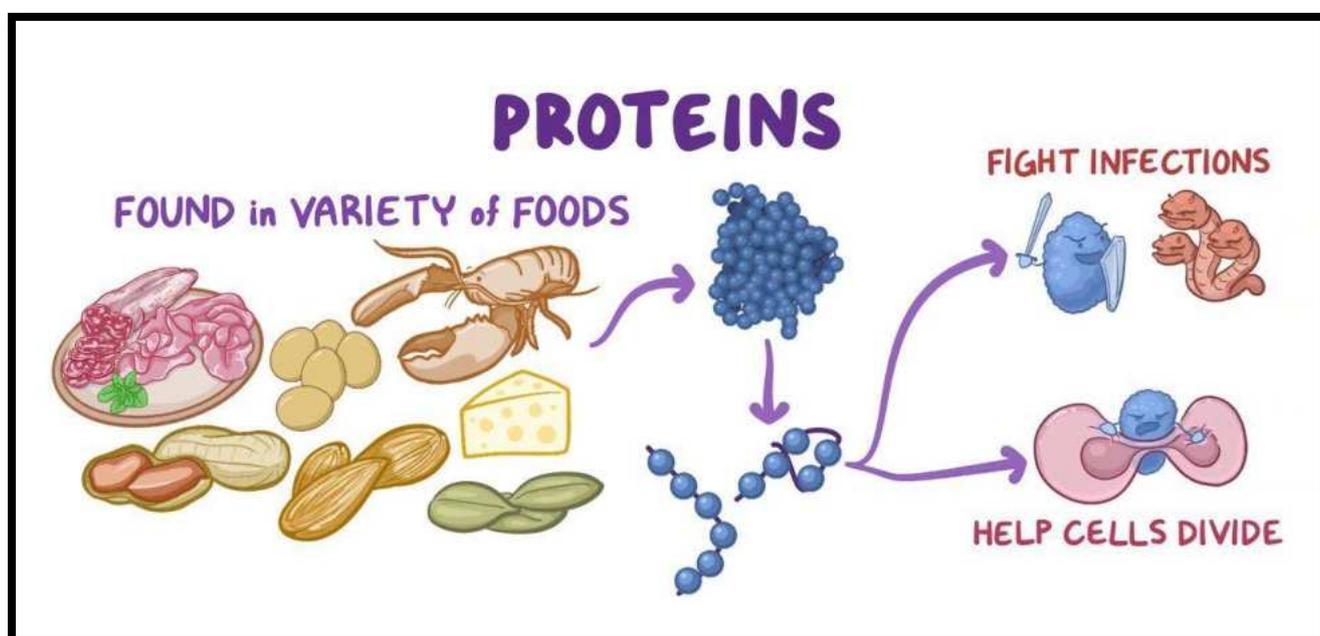
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- **Effect:** This process creates a deep brown color and a rich, complex "caramel" flavor and aroma. Unlike the Maillard reaction, it does not require the presence of proteins.
- **Examples:** Making caramel candy or toffee, the sweet brown topping of a crème brûlée, and the browning of onions when sautéed slowly.



Proteins

Heat profoundly alters the structure of proteins, which is essential for making them edible and digestible.

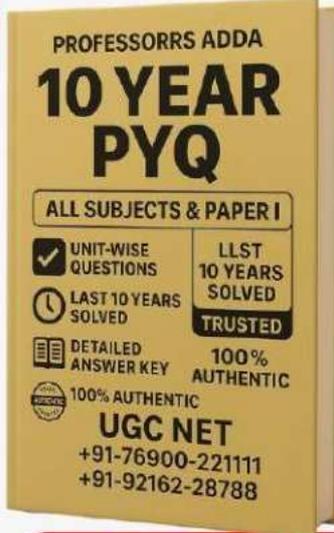
- **Denaturation and Coagulation:**
 - **Mechanism:** Heat causes the complex, folded three-dimensional structure of protein molecules to unravel and unwind, a process called **denaturation**.

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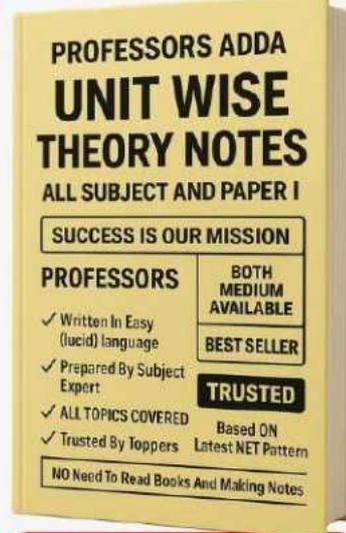
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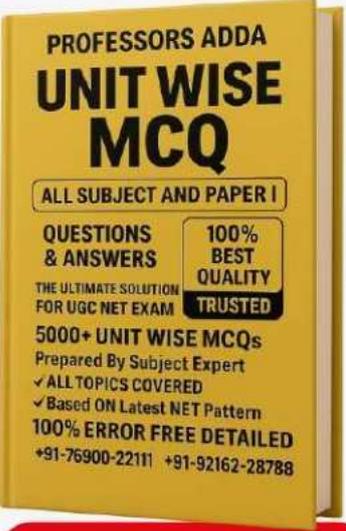
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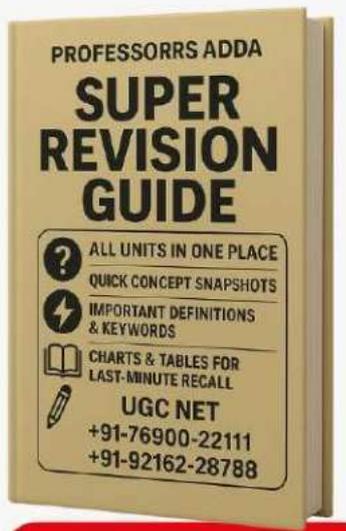
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- As heating continues, these unfolded protein strands tangle and bond together, becoming firm and solid in a process called **coagulation**.
- **Effect:** These changes generally improve digestibility because the unfolded protein chains are more exposed and accessible to our body's digestive enzymes.
- **Examples:** The transformation of a liquid egg into a solid boiled egg, the firming of meat as it cooks, and the setting of milk to form curd (paneer).

- **Overcooking:**
 - **Effect:** While some heat is beneficial, excessive heat causes the coagulated proteins to shrink, tighten, and squeeze out moisture.
 - This results in a tough, dry, and rubbery texture (like in an overcooked steak or chicken breast), making the protein less palatable and harder to digest.

- **Maillard Reaction:**
 - **Mechanism:** This is a chemical reaction between amino acids (from proteins) and reducing sugars that occurs when food is heated.
 - It is responsible for the development of complex flavors and a brown color.
 - **Effect:** It creates the desirable "roasting" or "seared" flavor profile.
 - However, it can slightly reduce the nutritional value by binding to certain essential amino acids

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(like lysine), making them unavailable to the body.

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Fats



Butter



Oil



Nuts



Avacados



Meats & Fishes



Chocolates

Fats

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Fats are also significantly affected by heat, especially at high temperatures.

- **Melting:**

- **Effect:** This is the most basic change. Solid fats, such as butter, ghee, or lard, turn into a liquid state upon heating, allowing them to coat food and transfer heat efficiently during cooking.

- **Breakdown at High Heat (Beyond the Smoke Point):**

- **Mechanism:** Every fat has a **smoke point**, the temperature at which it begins to break down and produce visible smoke.
- Heating a fat beyond this point causes the fatty acids to decompose.
- **Effect:** This breakdown not only ruins the flavor of the food but also leads to the formation of harmful substances.
- The most notable is **acrolein**, a compound that gives burnt food its sharp, acrid smell and is an irritant to the eyes and respiratory system.
- Repeatedly heating oil to high temperatures can also create other toxic compounds.

Effect on Micronutrients

Micronutrients (vitamins and minerals), while needed in smaller amounts, are vital for health and are often

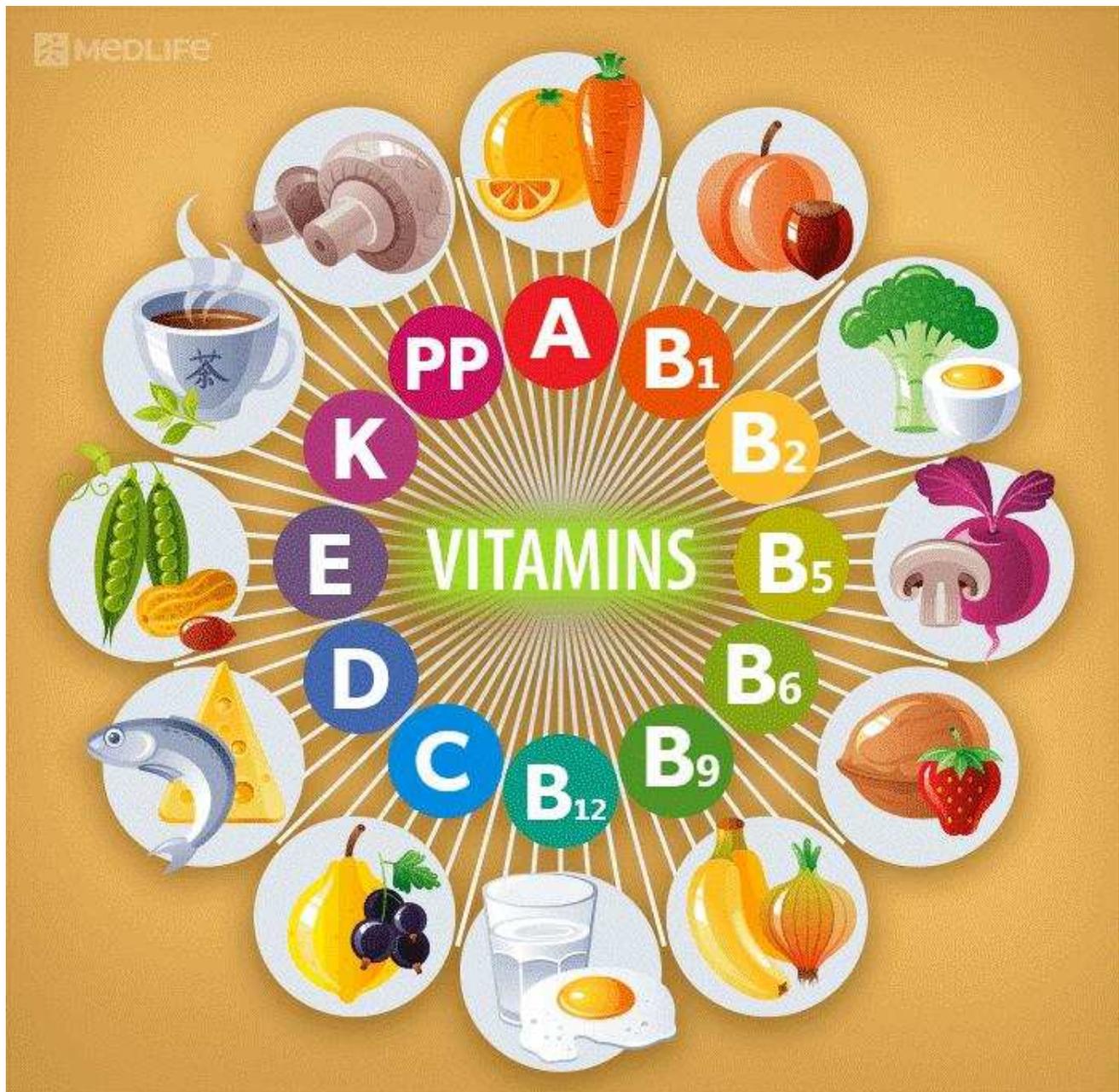
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more fragile and susceptible to loss during cooking than macronutrients.



Vitamins

The impact of cooking varies greatly between different types of vitamins.



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- **Water-Soluble Vitamins (B-complex group and Vitamin C):** These are the most vulnerable vitamins during food preparation.
 - **Destruction:** They are easily destroyed by several factors:
 - **Heat:** Prolonged cooking at high temperatures breaks them down.
 - **Light:** Exposure to light (especially sunlight) can degrade vitamins like riboflavin (B2).
 - **Oxygen:** Exposure to air causes oxidation, which destroys vitamins, particularly Vitamin C.
 - **Alkalinity (High pH):** The use of baking soda (sodium bicarbonate), often added to preserve the green color of vegetables, creates an alkaline environment that rapidly destroys thiamine (B1) and Vitamin C.
 - **Leaching:** Being soluble in water, these vitamins easily dissolve and escape from food into the cooking water.
 - If this water is discarded, a significant portion of these nutrients is lost forever.
 - **Retention Strategies:** To minimize their loss, use cooking methods like steaming, stir-frying, microwaving, or pressure cooking, which use minimal water and shorter cooking times.

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. Fat-Soluble Vitamins (A, D, E, and K):

- **Stability:** These vitamins are generally more stable to heat than their water-soluble counterparts.
- **Loss During Frying:** While they withstand heat better, they can be lost if the food is fried.
- The vitamins dissolve into the hot cooking oil, and if this oil is discarded after use, the vitamins are lost with it.
- **Oxidation:** Vitamin A and Vitamin E are particularly sensitive to destruction by oxidation, which is accelerated by high heat, light, and exposure to air.

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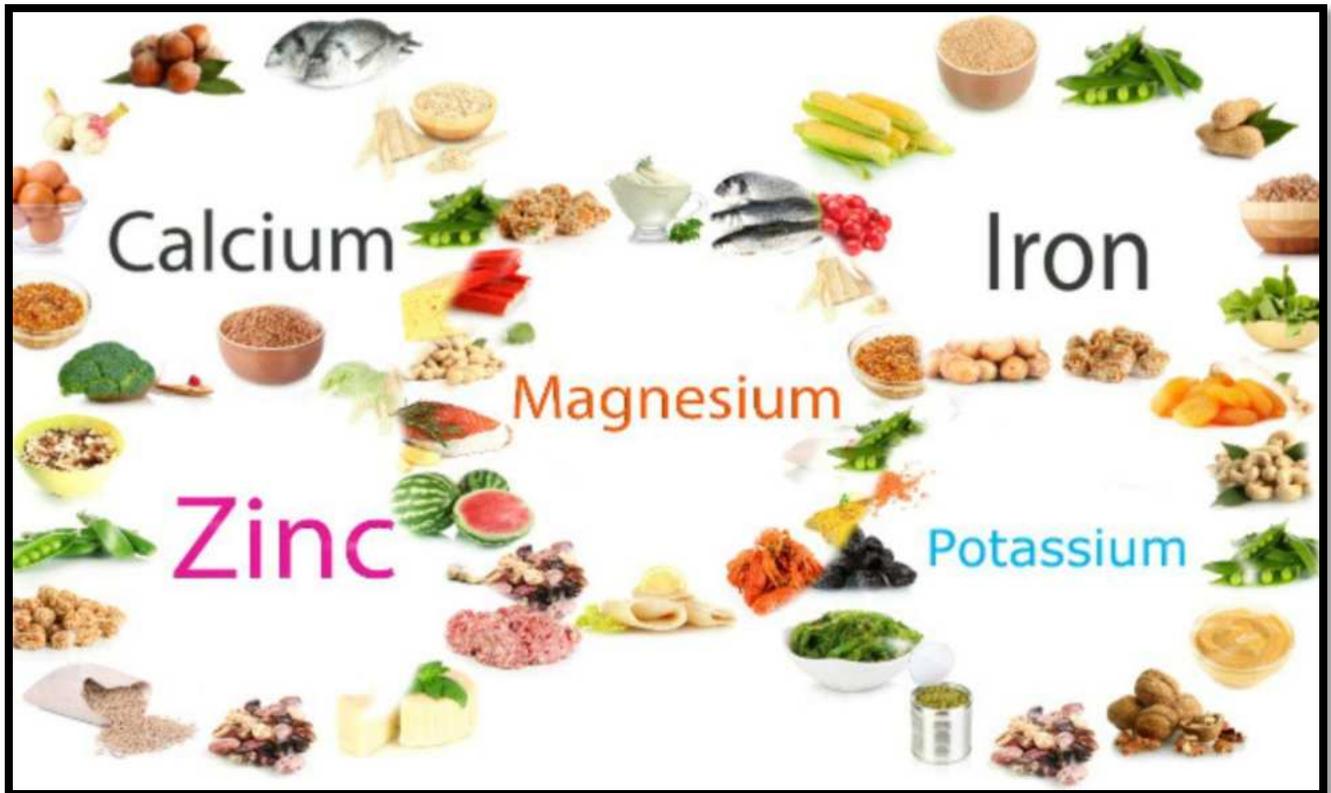
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Minerals

Minerals are inorganic elements and have different properties compared to vitamins.

- **Heat Stability:** Minerals are very stable to heat and are not destroyed by cooking, no matter how high the temperature.
- You cannot "burn away" calcium or iron.
- **Leaching:** The primary and most significant way minerals are lost is through **leaching**.
- Just like water-soluble vitamins, minerals can dissolve out of food (especially vegetables) and into the cooking water.
- Boiling vegetables in a large volume of water that is subsequently thrown away can lead to a substantial

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loss of important minerals like potassium and magnesium.

- The best way to conserve them is to use cooking methods that involve less water or to reuse the mineral-rich cooking liquid in other preparations like soups or gravies.

Nutrient	Effect of Cooking/Processing
Carbohydrates	Gelatinization, Dextrinization; improved digestibility.
Proteins	Denaturation, Coagulation; improved digestibility. Overcooking makes it tough.
Fats	Melts. Excessive heat leads to breakdown and acrolein formation.
Vitamin C	Highly unstable; destroyed by heat, air, light, alkali. Leaches into water.
Thiamine (B1)	Heat sensitive, especially in alkaline medium. Leaches into water.
Riboflavin (B2)	Sensitive to light. Leaches into water.
Vitamin A	Fairly stable to heat, but can be destroyed by oxidation (Examples , in frying).

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Minerals	Stable to heat but leach into cooking water.
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1. **Blanching:** A brief heating in boiling water or steam. It inactivates enzymes like polyphenol oxidase but causes leaching of water-soluble vitamins.
2. **Pasteurization:** Significantly reduces vitamin C content. It also destroys the enzyme phosphatase in milk, the absence of which is used as a test for pasteurization adequacy.
3. **Sterilization (Canning):** Causes major losses of thiamine (up to 50-75%) and vitamin C.
4. **Sprouting (Germination):** Increases the content of certain vitamins, especially Vitamin C and B-complex vitamins. It also reduces anti-nutritional factors like phytates.
5. **Fermentation:** Improves digestibility and bioavailability of nutrients. It can synthesize new vitamins (like B12) and break down anti-nutrients.
6. **Milling of Cereals:** Removes the bran and germ, leading to significant losses of B vitamins, minerals, and fiber.
7. **Parboiling of Rice:** A process of soaking, steaming, and drying paddy before milling. It helps drive nutrients from the bran into the endosperm, thus conserving B vitamins (especially thiamine).
8. **Ascorbic Acid Oxidase:** An enzyme present in some fruits and vegetables that accelerates the destruction of vitamin C when the plant tissue is damaged.
9. **Leaching:** The process by which water-soluble nutrients are lost in cooking water. Boiling causes the most

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leaching, while steaming causes the least.

10. **Oxidation:** The primary cause of destruction for Vitamin C and Vitamin A. It is accelerated by heat, light, and exposure to air.
11. **Alkaline pH:** The use of baking soda (sodium bicarbonate) to retain the green color of vegetables destroys thiamine and vitamin C.
12. **Acidic pH:** Acidity helps preserve vitamin C and thiamine. Adding tomatoes or lemon juice can help retain these vitamins during cooking.
13. **Lysinoalanine (LAL):** A toxic compound that can form when proteins are treated with severe heat in an alkaline environment.
14. **Acrylamide:** A potential carcinogen formed during high-temperature cooking methods like frying, roasting, and baking of starchy foods (**Examples**, potato chips).
15. **Polycyclic Aromatic Hydrocarbons (PAHs):** Harmful compounds that can form on meat and fish when they are grilled, smoked, or barbecued directly over a flame.
16. **Sunlight:** Riboflavin (Vitamin B2) in milk is highly sensitive to sunlight. Milk stored in clear glass bottles can lose a significant amount of riboflavin.
17. **Refining of Oils:** Can lead to the loss of Vitamin E (tocopherols).
18. **Extrusion Cooking:** A high-temperature, short-time (HTST) process used for products like pasta and breakfast cereals. It generally has good nutrient retention due to the short processing time.
19. **Microwave Cooking:** A fast cooking method that generally results in better retention of water-soluble vitamins

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compared to boiling due to less water usage and shorter cooking times.

20. **Pressure Cooking:** The high temperature reduces cooking time, which can help conserve heat-labile vitamins. However, significant thiamine loss can still occur.

Table 4.1: Effect of Different Cooking Methods on Vitamin Retention

Cooking Method	Vitamin C	Thiamine (B1)	Riboflavin (B2)	Vitamin A
Steaming	Good	Good	Good	Excellent
Microwaving	Good	Good	Good	Excellent
Stir-frying	Fair to Good	Fair to Good	Good	Good
Baking/Roasting	Fair	Fair to Good	Good	Good
Boiling	Poor to Fair	Poor to Fair	Poor to Fair	Good
Frying	Fair	Fair	Good	Fair

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Table 4.2: Comparison of Maillard Reaction and Caramelization

Feature	Maillard Reaction	Caramelization
Reactants	Reducing Sugars + Amino Acids	Sugars only
Temperature	Lower temp. required (~140-165°C)	Higher temp. required (>160°C)
pH	Favored by alkaline conditions	Favored by neutral to slightly acidic/alkaline conditions
Products	Melanoidins (brown pigments), various flavor compounds	Carmelan, Carmelen (brown pigments), flavor compounds
Food Examples	Browning of bread crust, roasted meat, fried potatoes	Caramel candy, browning of onions, toffee, crème brûlée topping

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Chapter 5: Food Preservation

- **Definition:** Food preservation is the science of treating and handling food through specific processes to stop or significantly slow down spoilage.
- **Goals:** The primary objectives are to prevent the loss of quality, edibility, and nutritional value, thereby extending the food's shelf life and ensuring it remains safe for consumption.

Principles of Food Preservation

All methods of food preservation are based on a few core scientific principles aimed at controlling microbial activity.

1. Asepsis (Keeping Microbes Out)

- This is the principle of preventing microorganisms from contaminating the food in the first place.
- It's a preventive measure that involves handling food in a clean environment and using sterile packaging like sealed bags, jars, or cans.

2. Removal of Microorganisms

- This principle involves physically eliminating microbes from the food.
- A common industrial example is **filtration**, where liquids like fruit juices, wine, or beer are passed

through fine filters that trap bacteria.

3. Inhibiting Microbial Growth

- This is a common strategy that creates an environment where microbes cannot multiply effectively.
- This is achieved by:
 - **Altering Temperature:** Using cold (refrigeration) or freezing temperatures.
 - **Reducing Water Activity:** Removing water (drying) or binding it with salt or sugar.
 - **Using Chemicals:** Adding natural or synthetic preservatives that interfere with microbial metabolism.

4. Killing Microorganisms

- This is the most definitive principle, aiming to destroy the microbes present in the food.
- This is achieved by using lethal treatments like:
 - **High Heat:** Pasteurization, sterilization, canning.
 - **Irradiation:** Using ionizing radiation to kill bacteria, yeasts, and molds.

Methods of Food Preservation

High-Temperature Treatment



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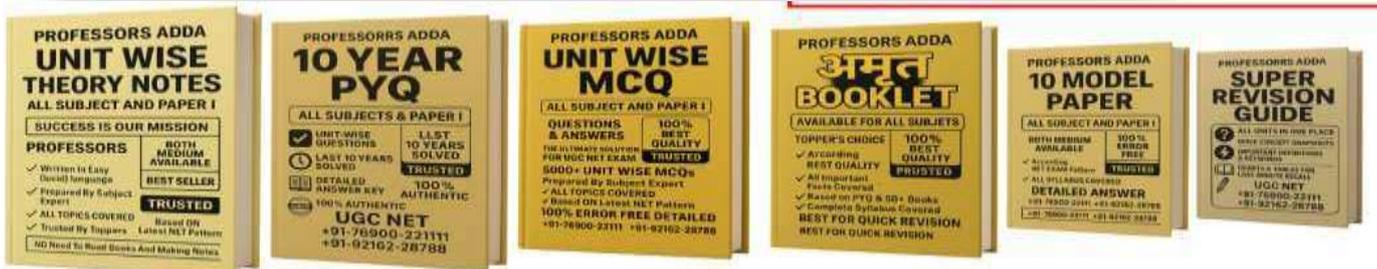
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- This method uses heat to destroy microorganisms and inactivate spoilage enzymes.
- **Pasteurization:**
 - Involves heating food to a specific temperature for a set period to kill pathogenic (disease-causing) bacteria and reduce the number of spoilage microbes.
 - It does not kill all microbes, so pasteurized products like milk still require refrigeration.
 - **Examples of methods:**
 - **Low-Temperature Long-Time (LTLT):** 63°C for 30 minutes.¹²
 - **High-Temperature Short-Time (HTST):** 72°C for 15 seconds (most common for milk).¹³
- **Canning:**
 - This process involves sealing food in airtight containers (cans or jars).¹⁴
 - The sealed containers are then heated to a high temperature to destroy microorganisms and inactivate enzymes that could cause the food to spoil.
- **Sterilization:**
 - This is the most intense heat treatment, designed to kill all microorganisms, including their heat-resistant spores.
 - Food is heated to very high temperatures (**Examples:** 121°C).

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- Sterilized food is shelf-stable and does not require refrigeration until opened (**Examples:** UHT milk, canned foods).

Low-Temperature Treatment

- This method slows down or stops microbial activity by reducing the temperature.¹⁷
- **Refrigeration (0-4°C):**
 - Slows down the growth and reproduction of most microbes and the activity of spoilage enzymes.¹⁸
 - It is suitable for the short-term storage of perishable foods like fresh produce, dairy, and meat.
- **Freezing (below -18°C):**
 - Stops microbial growth completely by making water unavailable (locking it away as ice crystals).
 - It is an excellent method for long-term preservation and preserves nutrients very well.

Dehydration (Drying)

- This method involves removing water from food, as all microbes need water to grow.
- **Methods include:**
 - **Sun Drying:** An ancient method using the sun's heat.
 - **Mechanical Dryers:** Using controlled heat and air circulation for a faster, more uniform result.

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- **Freeze-Drying (Lyophilization):** The highest quality method where food is frozen and then placed in a vacuum, causing the ice to turn directly into vapor (sublimation).

Use of Chemical Preservatives

- This involves adding substances to food that inhibit microbial growth.
- **Class I (Natural Preservatives):**
 - Includes common ingredients like **salt, sugar, vinegar (acetic acid), spices, and oil.**
 - **Salt and sugar** work by **osmosis**, drawing water out of microbial cells and making it unavailable for their growth. This is the principle behind salted fish and sugary jams.
- **Class II (Chemical/Synthetic Preservatives):**
 - Includes chemicals like **sodium benzoate, sorbates, and sulfites.**
 - These are used in small, legally regulated quantities to prevent the growth of mold, yeast, and bacteria in products like juices, sauces, and baked goods.

Irradiation

- Also known as "cold pasteurization" because it doesn't use high heat.

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- The process involves exposing food to controlled doses of ionizing radiation (like gamma rays or X-rays).
- This energy kills microbes, insects, and parasites and can also be used to inhibit the sprouting of vegetables like potatoes and onions.

Use of Fermentation

- This method uses beneficial microorganisms (bacteria and yeasts) to preserve food.
- These microbes consume sugars in the food and produce acids or alcohol as byproducts.
- These byproducts act as natural preservatives by creating an environment where spoilage microbes cannot survive.
- **Examples:** Making yogurt and cheese from milk, sauerkraut from cabbage, and pickles from cucumbers.

Use of Oil and Spices

- This method is commonly used in pickling.
- **Oil** works by creating a protective layer on top of the food, cutting off the oxygen supply for many spoilage microbes.
- **Spices** like turmeric, cloves, and mustard have natural antimicrobial properties that help inhibit bacterial growth.

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UGC NET Exam Focus Facts

- 1. Hurdle Technology:** A method of preservation where multiple factors (hurdles) are used together to inhibit microbes, even when each factor alone is not strong enough.
- 2. D-value (Decimal Reduction Time):** The time required at a specific temperature to kill 90% (or 1 log cycle) of a specific microorganism.
- 3. Z-value:** The temperature change required to change the D-value by a factor of 10.
- 4. F-value:** The time in minutes at a specific temperature (usually 121.1°C or 250°F) required to destroy a specified number of microorganisms.
- 5. UHT (Ultra-High Temperature) Processing:** A sterilization technique where food (like milk) is heated to 135-150°C for a few seconds. This allows for long-term storage at room temperature.
- 6. Quick Freezing vs. Slow Freezing:** Quick freezing produces small ice crystals, causing less damage to the food's cellular structure compared to slow freezing, which forms large, disruptive ice crystals.
- 7. Sublimation:** The principle behind **freeze-drying (lyophilization)**, where water is removed as vapor from frozen food under vacuum. This method provides the highest quality dried product.
- 8. Class II Preservatives (as per FSSAI):** Benzoic acid, Sulphurous acid (sulfites), Nitrates/Nitrites, Sorbic acid.
- 9. Sodium Benzoate:** An effective preservative in acidic foods (pH 2.5-4.0) like fruit juices, jams, and carbonated drinks.
- 10. Sulfites (Sulphur Dioxide):** Used to prevent browning in

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fruits and vegetables and inhibit microbial growth in wine and juices.

- 11. Nitrates and Nitrites:** Used in curing meats (like bacon and ham) to preserve color and prevent the growth of *Clostridium botulinum*.
- 12. Radappertization:** Commercial sterilization of food by irradiation (equivalent to thermal canning).
- 13. Radicidation:** Pasteurization by irradiation, aimed at killing non-spore-forming pathogenic bacteria like *Salmonella*.
- 14. Radurization:** Pasteurization by irradiation to enhance keeping quality by reducing spoilage microbes.
- 15. Controlled Atmosphere (CA) Storage:** The storage environment's gas composition (O₂, CO₂, N₂) is precisely controlled. Commonly used for long-term storage of apples.
- 16. Modified Atmosphere Packaging (MAP):** The atmosphere inside a package is altered to extend shelf life. The gas composition changes over time due to food respiration and package permeability.
- 17. Bacteriocins:** Antimicrobial proteins produced by bacteria that can kill or inhibit other closely related bacteria. **Nisin**, produced by *Lactococcus lactis*, is a permitted food preservative.
- 18. Osmotic Dehydration:** The process of water removal by immersing food, such as fruits, in a concentrated solution of sugar or salt.
- 19. Pickling:** Preservation in an acidic medium (vinegar) or through fermentation which produces lactic acid.
- 20. Jellying:** Preservation using high concentrations of

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sugar (at least 65% total soluble solids) and pectin, which binds water and inhibits microbial growth.

Table 5.1: Food Preservation Methods and Their Underlying Principles

Method	Principle of Preservation	Example(s)
Canning / Sterilization	Destruction of microorganisms by heat	Canned fruits, vegetables, meat
Pasteurization	Destruction of pathogenic microorganisms by heat	Milk, juices
Refrigeration	Inhibition of microbial growth at low temperatures	Fresh produce, dairy, meat
Freezing	Inhibition of microbial growth by low temperature and reduced water activity	Frozen peas, meat, ice cream
Drying / Dehydration	Inhibition of microbial growth by removal of water	Raisins, milk powder, dried fish
Salting / Curing	Inhibition of microbial growth by reducing water activity (osmosis)	Pickles, cured meats
Sugaring	Inhibition of microbial growth by reducing	Jams, jellies,

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	water activity (osmosis)	murabba
Pickling (with Acid)	Inhibition of microbial growth by low pH	Pickled cucumbers, onions
Irradiation	Destruction of microorganisms by ionizing radiation	Spices, onions, potatoes

Table 5.2: Temperature Ranges in Food Preservation

Temperature Range	Name / Process	Effect on Microorganisms
> 121°C (>250°F)	Sterilization (Canning)	Kills bacterial spores.
100°C (212°F)	Boiling	Kills most bacteria, yeasts, and molds (but not all spores).
63°C - 72°C (145-161°F)	Pasteurization	Kills pathogens and reduces spoilage microbes.
5°C - 63°C (41-135°F)	Danger Zone	Rapid growth and multiplication of most microorganisms.
0°C - 4°C (32-40°F)	Refrigeration	Slows down the growth of most spoilage and pathogenic microbes.

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< -18°C (< 0°F) Freezing

Stops all microbial growth; some microbes are killed but many survive.

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HOME SCIENCE UNIT 1 MCQ SAMPLE

Q1. Match List I with List II.

List I (Food Pigment)	List II (Chemical Group/Predominant Color)
(a) Anthocyanin	(i) Carotenoid
(b) Lycopene	(ii) Flavonoid
(c) Chlorophyll	(iii) Betalain
(d) Betanin	(iv) Porphyrin

Codes:

- (1) (a)-(ii), (b)-(i), (c)-(iv), (d)-(iii)
- (2) (a)-(i), (b)-(ii), (c)-(iii), (d)-(iv)
- (3) (a)-(iv), (b)-(iii), (c)-(i), (d)-(ii)
- (4) (a)-(ii), (b)-(iv), (c)-(i), (d)-(iii)

Answer: (1)

Explanation:

- This question tests the knowledge of different types of food pigments and their chemical classifications as mentioned in the syllabus under 'Food pigments and additives'.
- Anthocyanins, which give red, purple, and blue colors to many fruits and vegetables like berries and red cabbage, belong to the flavonoid group of polyphenols.
- Lycopene is responsible for the red color in tomatoes, watermelon, and pink grapefruit and is a bright red carotenoid pigment.
- Chlorophyll, the pigment that gives green color to plants and leafy vegetables, has a porphyrin ring structure at its core.
- Betanins are reddish glycosidic food dyes found in beets (beetroot), which belong to the betalain group of pigments.
- Understanding the classification of these pigments is crucial for food science as their color can be affected by pH, heat, and processing.

Q2. Assertion (A): The Hazard Analysis and Critical Control Point (HACCP) system is a preventive approach to food safety.

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Reason (R): HACCP focuses on identifying and controlling potential hazards at specific points in the food production process rather than relying on end-product testing.

Codes:

- (1) Both (A) and (R) are true and (R) is the correct explanation of (A).
- (2) Both (A) and (R) are true but (R) is NOT the correct explanation of (A).
- (3) (A) is true but (R) is false.
- (4) (A) is false but (R) is true.

Answer: (1)

Explanation:

- The syllabus explicitly mentions 'microbiological safety of food, HACCP' as a key topic.
- The assertion that HACCP is a preventive approach is the fundamental concept of this system.
- The reason correctly explains *why* it is preventive; its methodology is based on proactive identification and control of biological, chemical, and physical hazards.
- Unlike traditional quality control methods that test the final product, HACCP aims to prevent hazards from occurring in the first place.
- This system involves seven principles, starting with hazard analysis and identifying Critical Control Points (CCPs), which are steps where control can be applied.
- Therefore, the reason provides a direct and accurate explanation for the assertion, making it the core of the HACCP philosophy.

Q3. Which of the following statements about food preservation are correct?

- (a) Dehydration works by reducing the water activity (a_w) of the food.
- (b) Pasteurization is a sterilization technique that kills all microorganisms.
- (c) Canning creates an anaerobic environment to prevent the growth of spoilage microbes.
- (d) Pickling preserves food by lowering its pH to a level that inhibits microbial growth.
- (e) Irradiation uses non-ionizing radiation to preserve food.

Codes:

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- (1) (a), (b) and (c)
- (2) (b), (d) and (e)
- (3) (a), (c) and (d)
- (4) (c), (d) and (e)

Answer: (3)

Explanation:

- This question assesses understanding of different food preservation techniques and their applications, a core part of the syllabus.
- Statement (a) is correct; dehydration removes water, thus lowering water activity, which is essential for microbial growth.
- Statement (c) is correct; canning involves sealing food in a container and heating it to destroy microorganisms, creating an anaerobic (oxygen-free) condition that prevents the growth of most spoilage organisms.
- Statement (d) is correct; pickling involves fermentation or the addition of an acid like vinegar, which lowers the food's pH, creating an acidic environment unsuitable for many spoilage bacteria.
- Statement (b) is incorrect; pasteurization is a mild heat treatment that kills most pathogenic bacteria but not all microorganisms, especially spores, hence it is not sterilization.
- Statement (e) is incorrect; food irradiation uses ionizing radiation (like gamma rays or X-rays), not non-ionizing radiation, to destroy microbes and insects.

Q4. Match List I with List II.

List I (Food Preservation Method)	List II (Primary Principle)
(a) Salting	(i) Inactivation of enzymes
(b) Blanching	(ii) Lowering of pH
(c) Fermentation	(iii) Reduction of water activity
(d) Smoking	(iv) Deposition of antimicrobial compounds

Codes:

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- (1) (a)-(ii), (b)-(iv), (c)-(i), (d)-(iii)
- (2) (a)-(iii), (b)-(i), (c)-(ii), (d)-(iv)
- (3) (a)-(i), (b)-(ii), (c)-(iv), (d)-(iii)
- (4) (a)-(iii), (b)-(ii), (c)-(i), (d)-(iv)

Answer: (2)

Explanation:

- This question directly relates to 'food preservation and application' from the syllabus, focusing on the mechanisms of various methods.
- Salting (a) preserves food primarily by osmosis, drawing water out of microbial cells and reducing the overall water activity (aw) of the food (iii).
- Blanching (b) is a brief heat treatment, typically applied to vegetables before freezing, primarily to inactivate enzymes like polyphenol oxidase that cause browning and off-flavors (i).
- Fermentation (c) involves the conversion of carbohydrates into alcohol or organic acids by microorganisms, which lowers the pH of the food (ii), inhibiting the growth of spoilage microbes.
- Smoking (d) preserves food through a combination of effects, including dehydration and the deposition of antimicrobial and antioxidant compounds from the smoke (iv).
- Understanding these distinct principles is essential for selecting appropriate preservation methods for different food products.

Q5. Assertion (A): Menu planning in institutional food service requires careful consideration of food cost analysis.

Reason (R): The primary goal of all institutional food services, including hospitals and schools, is profit maximization.

Codes:

- (1) Both (A) and (R) are true and (R) is the correct explanation of (A).
- (2) Both (A) and (R) are true but (R) is NOT the correct explanation of (A).
- (3) (A) is true but (R) is false.
- (4) (A) is false but (R) is true.

Answer: (3)

Explanation:

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- The syllabus lists 'Perspectives of food service-menu planning, food cost analysis' and 'Food service management of institutional level'.
- The assertion (A) is true; managing food costs is a critical component of any food service operation, institutional or commercial, to ensure financial viability and operate within a budget.
- The reason (R) is false; while commercial restaurants aim for profit maximization, the primary goal of institutional food services like hospitals, schools, or social institutions is not profit.
- Hospital food services focus on providing therapeutic diets and nutrition for patients.
- School food services aim to provide nutritious meals to students, often on a subsidized or non-profit basis.
- Therefore, food cost analysis is crucial for budget adherence and efficiency, not necessarily for maximizing profit in these contexts.

Q6. Match List I with List II.

List I (Food Additive)	List II (Primary Function)
(a) Sodium Benzoate	(i) Emulsifier
(b) Lecithin	(ii) Sweetener
(c) Aspartame	(iii) Preservative
(d) Tartrazine	(iv) Coloring Agent

Codes:

- (1) (a)-(iv), (b)-(ii), (c)-(iii), (d)-(i)
- (2) (a)-(i), (b)-(iii), (c)-(iv), (d)-(ii)
- (3) (a)-(iii), (b)-(i), (c)-(ii), (d)-(iv)
- (4) (a)-(iii), (b)-(iv), (c)-(i), (d)-(ii)

Answer: (3)

Explanation:

- This question covers the topic of 'Food pigments and additives' from Unit 1.
- Sodium Benzoate (a) is a widely used preservative that inhibits the growth of bacteria, mold, and yeast, particularly in acidic foods (iii).

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- Lecithin (b), commonly derived from soybeans or egg yolks, is a classic emulsifier used to stabilize mixtures of oil and water in products like mayonnaise and chocolate (i).
- Aspartame (c) is a low-calorie artificial sweetener used in many diet foods and beverages to provide sweetness without the calories of sugar (ii).
- Tartrazine (d), also known as E102 or Yellow 5, is a synthetic lemon yellow azo dye used as a food coloring agent (iv).
- Knowledge of the specific functions of common food additives is fundamental for understanding food processing and labeling.

Q7. Which of these is a key application of nanotechnology in the area of food packaging?

- (1) Using nanoparticles to increase the caloric content of the package itself.
- (2) Employing nanoclays to create packaging with improved mechanical and barrier properties.
- (3) Reducing the size of the food product to nano-scale for easier packaging.
- (4) Using nano-pigments to make the packaging transparent.

Answer: (2)

Explanation:

- The syllabus specifically mentions 'New product development - nano technology' and 'food packaging'.
- Nanotechnology in food packaging often involves creating 'active' or 'smart' packaging by incorporating nanoparticles.
- Option (2) is a primary application; incorporating silicate nanoclays into polymer films enhances strength, temperature resistance, and barrier properties against oxygen and moisture, extending shelf life.
- Option (1) is incorrect; packaging is not designed to provide calories.
- Option (3) is nonsensical; food products are not shrunk to a nano-scale for packaging.
- Option (4) is incorrect; pigments, nano or otherwise, add color and reduce transparency. Nanocomposites can improve clarity, but the function described in (2) is a more prominent and established application.

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Q8. Match List I with List II.

List I (Quality Evaluation Test)	List II (Category of Evaluation)
(a) Triangle Test	(i) Objective Chemical Test
(b) Refractometer Reading	(ii) Objective Physical Test
(c) Shear Press Measurement	(iii) Subjective Difference Test
(d) pH Measurement	(iv) Subjective Affective Test

Codes:

- (1) (a)-(iii), (b)-(ii), (c)-(ii), (d)-(i)
- (2) (a)-(iv), (b)-(i), (c)-(ii), (d)-(i)
- (3) (a)-(iii), (b)-(i), (c)-(ii), (d)-(ii)
- (4) (a)-(iii), (b)-(ii), (c)-(iv), (d)-(i)

Answer: (1)

Explanation:

- This question addresses 'Quality evaluation of foods- objectives and subjective' from the syllabus.
- The Triangle Test (a) is a sensory (subjective) test where a panelist is given three samples, two identical and one different, and asked to identify the odd one out. This makes it a subjective difference test (iii).
- A Refractometer (b) is an instrument that measures the refractive index of a substance, often used to determine sugar concentration (Brix) in liquids. This is an objective physical test (ii).
- A Shear Press (c) is an instrument used to measure the texture of food, specifically its firmness or tenderness, by applying mechanical force. This is an objective physical test (ii).
- Measuring pH (d) uses a pH meter to determine the acidity or alkalinity of a food product, which is a quantitative chemical measurement. This makes it an objective chemical test (i).
- Distinguishing between subjective (sensory) and objective (instrumental) methods is a fundamental concept in food quality evaluation.

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Q9. A food service manager in a hospital is planning a menu for a cardiac patient. Which of the following considerations are most critical?

- (a) High sodium content for better taste
- (b) Low saturated and trans-fat content
- (c) High content of soluble fiber
- (d) Use of HACCP for food safety
- (e) Low cost of ingredients to maximize profit

Codes:

- (1) (a), (c) and (e)
- (2) (b), (c) and (d)
- (3) (a), (b) and (d)
- (4) (c), (d) and (e)

Answer: (2)

Explanation:

- This question combines concepts from 'Food service management of institutional level-hospital' and general nutrition principles relevant to therapeutic diets.
- Statement (b) is critical; diets for cardiac patients must be low in saturated and trans fats to manage blood cholesterol levels.
- Statement (c) is also critical; soluble fiber, found in oats and legumes, helps lower LDL ("bad") cholesterol, which is beneficial for heart health.
- Statement (d) is a universal requirement for all food service, especially in a hospital where patients are vulnerable, to prevent foodborne illness. Thus, it is a critical consideration.
- Statement (a) is incorrect; cardiac diets require strict sodium restriction to help manage blood pressure.
- Statement (e) is incorrect; while cost is a factor, the primary driver for a therapeutic menu is the patient's clinical need, not profit maximization.

Q10. Match List I with List II.

List I (Cooking/Processing Effect)	List II (Nutrient/Component Primarily Affected)
(a) Maillard Reaction	(i) Vitamin C (Ascorbic Acid)

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(b) Dextrinization	(ii) Proteins and Reducing Sugars
(c) Oxidation	(iii) Pectin
(d) Gelation	(iv) Starch

Codes:

(1) (a)-(iv), (b)-(i), (c)-(ii), (d)-(iii)

(2) (a)-(i), (b)-(iv), (c)-(iii), (d)-(ii)

(3) (a)-(ii), (b)-(iv), (c)-(i), (d)-(iii)

(4) (a)-(ii), (b)-(iii), (c)-(iv), (d)-(i)

Answer: (3)

Explanation:

- This question is based on 'Effects of cooking and processing techniques on nutritional components and other physical parameters'.
- The Maillard Reaction (a) is a non-enzymatic browning that occurs between amino acids (from proteins) and reducing sugars at high temperatures, responsible for the desirable flavor and color of baked and roasted foods (ii).
- Dextrinization (b) is the breakdown of starch molecules into smaller molecules called dextrans when subjected to dry heat, resulting in a slightly sweet taste and browning (iv).
- Oxidation (c) is a chemical process that leads to the degradation of many nutrients, but water-soluble vitamins like Vitamin C (ascorbic acid) are particularly susceptible to destruction by exposure to oxygen, light, and heat (i).
- Gelation (d) in the context of jam-making involves the formation of a gel structure. This is primarily achieved through the interaction of pectin, sugar, and acid under the right conditions (iii).
- Understanding these specific chemical and physical changes is essential for predicting the outcomes of various food processing techniques.

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1. The traditional textile which is mordant and resist block printed on both sides (of the fabric) with geometrical motifs with a strong grid pattern in the shades of blue and red
- (a) Ajrakh
 - (b) Sanganeri
 - (c) Rogan
 - (d) Bagh
- Ans: (a)
2. One of the reasons due to which Extension programs fail is
- (a) Commitment to goals
 - (b) Recognition of limiting factors
 - (c) Authoritarian management
 - (d) Use of strategies for change
- Ans: (c)
3. The natural colourants used in food are
- (A) Annatto
 - (B) Carmosine
 - (C) Indigo carmine
 - (D) Betalaines
 - (E) Anthocyanins
- Choose the correct answer from the options given below
- (a) (B), (C), (D) Only
 - (b) (A), (D), (E) Only
 - (c) (A), (C), (D) Only
 - (d) (B), (C), (E) Only
- Ans: (b)
4. Which type of packaging method is used for extending the life of food products by changing the atmosphere surrounding the food inside the package
- (a) Aseptic Packaging
 - (b) Shrink Wrap Packaging
 - (c) Modified Atmospheric Packaging
 - (d) CPET Packaging
- Ans: (c)
5. Arrange the sequence of Erickson's stages of psychosocial development
- (A) Initiative Vs. Guilt
 - (B) Generativity Vs. Stagnation
 - (C) Identity Vs. Role Diffusion
 - (D) Ego Integrity Vs. Despair
 - (E) Trust Vs. Mistrust

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Choose the correct answer from the options given below

- (a) (E), (A), (C), (B), (D)
- (b) (A), (C), (E), (B), (D)
- (c) (C), (E), (D), (B), (A)
- (d) (B), (E), (A), (D), (C)

Ans: (a)

6. Match List-I with List-II

List-I (Name of theorist) List-II (Theory Name)

- | | |
|------------------------|----------------------------------|
| A. Urie Bronfenbrenner | I. Psychosocial Theory |
| B. Jean Piaget | II. Sociocultural Theory |
| C. Erick Erickson | III. Bioecological Theory |
| D. Lev Vygotsky | IV. Cognitive Development Theory |

Choose the correct answer from the options given below

- (a) (A)-(I), (B)-(II), (C)-(IV), (D)-(III)
- (b) (A)-(II), (B)-(IV), (C)-(I), (D)-(III)
- (c) (A)-(I), (B)-(II), (C)-(III), (D)-(IV)
- (d) (A)-(III), (B)-(IV), (C)-(I), (D)-(II)

Ans: (d)

7. Match List-I with List-II

List-I (Cost) List-II (Examples)

- | | |
|--------------------------------|---|
| A. Hidden Cost | I. Payroll payments |
| B. Semi-Variable Overhead Cost | II. Pilferage at delivery points |
| C. Food Cost | III. Loss due to repair and maintenance |
| D. Labour Cost | IV. Loss due to spillage |

Choose the correct answer from the options given below

- (a) (A) - (IV), (B) - (III), (C) - (II), (D) - (I)
- (b) (A) - (IV), (B) - (III), (C) - (I), (D) - (II)
- (c) (A) - (III), (B) - (II), (C) - (IV), (D) - (I)
- (d) (A) - (II), (B) - (I), (C) - (IV), (D) - (III)

Ans: (a)

8. Identify the leadership styles from the following

- (A) Laissez-fair
- (B) Autocratic
- (C) Interactive
- (D) Democratic
- (E) Bureaucratic

Choose the correct answer from the options given below

- (a) (B), (C), (D) Only
- (b) (A), (B), (D) Only
- (c) (A), (B), (C) Only
- (d) (B), (D), (E) Only

Ans: (b)

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9. एक चार्ट को डिज़ाइन करने के चरणों को क्रम में लगाए
- (A) Divide content into headings and subheadings.
 - (B) Research the topic from credible sources.
 - (C) Prepare a draft layout with text and visuals.
 - (D) Identify visuals and colour scheme.
 - (E) Design the final layout with text and visuals.
- Choose the correct answer from the options given below
- (a) (C), (A), (E), (D), (B)
 - (b) (D), (A), (C), (E), (B)
 - (c) (B), (A), (D), (C), (E)
 - (d) (B), (C), (A), (E), (D)

Ans: (c)

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10. Which of the following is not a characteristic of Extension Education
- (a) Heterogeneous learners
 - (b) Choice of subject matter is with learners
 - (c) Fixed curriculum
 - (d) Teaching with the help of local leaders

Ans: (c)

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11. Which one of the following is not a category of adopters?

- (a) Early Suggestors
- (b) Early Adopters
- (c) Early Majority
- (d) Late Majority

Ans: (a)

12. The period from conception to implantation of the embryo is called:

- (a) Conception stage
- (b) Embryonic stage
- (c) Fetal stage
- (d) Germinal stage

Ans: (d)

13. सुनियोजित बल (एक्सेंट) प्रकाश फोकस करता है:

- (a) Lighting source
- (b) Lighting fixture
- (c) On desired objects
- (d) On work surfaces

Ans: (c)

14. Match List - I with List-II.

List-I (Novelty Yarn)

List-II (Structure)

A. Flock Yarn

I. Short thick pile yarn with soft velvety appearance

B. Chenille Yarn

II. Single yarn in which small tufts of fibers are inserted at regular intervals

C. Core-spun Yarn

III. Base is heavy and coarse yarn. The effect yarn is curled up around the base and is held by the binder yarn

D. Loop Yarn

IV. Base yarn is completely covered or wrapped by another yarn

Choose the correct answer from the options given below:

- (a) (A) (I), (B) - (II), (C) - (III), (D) - (IV)
- (b) (A) (II), (B) - (I), (C) - (IV), (D) - (III)
- (c) (A) (IV), (B) - (III), (C) - (I), (D) - (II)
- (d) (A) - (III), (B) - (IV), (C) - (II), (D) - (I)

Ans: (b)

15. In static continuous exertions:

- (a) Blood flow is irregular
- (b) Blood flow is fast
- (c) Blood flow is normal
- (d) Blood flow is diminished

Ans: (d)

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16. Which one of the following is not a non-projected visual aid?

- (a) Chalk Board
- (b) Bulletin Board
- (c) Flip Chart
- (d) Puppet Show

Ans: (d)

17. Which of the following is the characteristic motif of the Kullu shawls?

- (a) Kalash
- (b) Swastika
- (c) Panbhat
- (d) Chinar leaf

Ans: (b)

18. According to the nature of personnel involved, which one of the following is not a type of channel in communication?

- (a) Personal localite
- (b) Impersonal localite
- (c) Personal cosmopolite
- (d) Impersonal cosmopolite

Ans: (b)

19. Which one of the following is not a criteria for effective learning?

- (a) Learning should be general in nature
- (b) Learning should engage maximum number of the senses of the learner
- (c) Learning should be challenging
- (d) Learning should result in functional understanding

Ans: (a)

20. Types of belts included under "Tie Belt" category:

- (A) Spaghetti
- (B) Straight tie ups
- (C) Bias belt
- (D) Contour belt
- (E) Rever belt

Choose the correct answer from the options given below:

- (a) (A), (B) and (C) only
- (b) (B), (C) and (E) only
- (c) (C), (D) and (E) only
- (d) (D), (C) and (A) only

Ans: (a)

21. The functions of a family therapist are:

- (A) Acts as a collaborator for the whole family
- (B) Acts as a collaborator for the whole family
- (C) Expresses empathic comments

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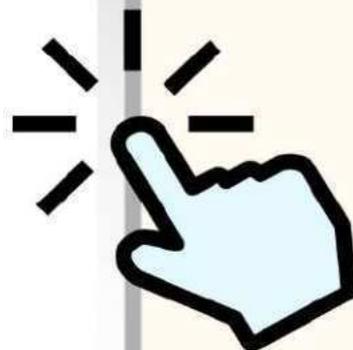
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Home Science Question Paper Analysis and Trend Pattern (Based on PDF 2016 – JAN 2025)

1. Variety in Question Formats:

- **Multiple Choice Questions (MCQs):** All questions are in the same format, with four options given. Some questions are straightforward factual, while others are based on concepts or applications.
- **Match based questions (Match List):** These questions are quite common. These consist of two lists matching concepts, nutrients/RDAs, principles, tools, techniques, scholars, textiles, design elements, etc.
- **Assertion & Reason - A/R:** These questions test conceptual understanding and logical ability. These types of questions have been asked from almost all areas of Home Science.
- **Statement-based questions:** In these, a number of statements (usually 3 to 5) are given and asked to choose a combination of true or false statements. It demands detailed knowledge and accuracy.
- **Sequence/Chronological Order:** Questions are asked arranging the stages of the processes (e.g. product development, garment production, research stage, design process, development stages) in the correct order.

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- **Passage-based questions:** Two passages are given (5 questions each). These passages often relate to contemporary issues, research findings or specific concepts (e.g. breastfeeding, SHG, back pain, adoption, waste management) and test comprehension, analysis and interpretation skills.

2. Balancing ideological versus factual questions:

- **Food Science, Nutrition Science, Human Development, Communication and Extension, Research:** A deep understanding of the principles, processes, classifications, and concepts in these areas is essential.
- **Textile Science, Apparel Designing, Resource Management, Housing:** In these areas factual information (e.g. properties of fibres, sewing machine parts, names of schemes, acts, standard values) as well as an understanding of processes and principles is important.

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- Factual questions like RDA values, specific tests, government schemes, acts, indices (like BMI) are asked directly.
- **Human Development:** Theories of growth and development (cephalocaudal, proximodistal), stages and characteristics of development (infancy to old age), major theorists (Piaget, Freud, Erikson, Kohlberg, Vygotsky, Gardner), personality, adjustment, developmental disorders.
- **Communication and Extension:** Communication models (Barlow), types and barriers of communication, teaching methods (Edgar del Cone), PLA techniques, community development programs and movements (NRLM, Chipko), leadership.
- **Research:** Types of Research, Research Design (Experimental, Quasi-Experimental, Survey), Sampling Techniques, Data Collection Instruments (Questionnaire, Rating Scale – Likert), Hypothesis Testing (Type I/II Error, F-Test, t-Test, Chi-Square, U-Test), Validity and Reliability.

3. Difficulty Level:

- The level of questions is moderate to difficult. Multiple-statement questions, matching and assertion-reason questions require in-depth understanding of the topic and analytical ability. There are also direct factual questions, but they alone are not enough for success.

Conclusion:

Success in UGC NET Home Science exam requires a balanced and in-depth study of all the units of the syllabus. The ability to understand concepts, know processes, remember factual information, and analyze different theories and viewpoints is important. Practicing previous years' questions will prove to be very helpful in understanding the pattern and giving right direction to the preparation.

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- **Nutrition and Food Science:** Nutrients (Classification, Functions, Deficiency Diseases, RDA - especially ICMR-NIN 2020), Food Safety, Food Preservation, Food Groups, Nutrition Assessment Methods (Anthropometry, Clinical, Biochemical), Diet Planning (for various conditions and diseases), Food Service Management.
- **Clothing and Apparel:** Fibers (classification, properties, identification), Yarns, Weaves, Finishing, Dyeing and Printing (types, processes), Traditional Indian Textiles and Embroidery, Sewing Machine and Garment Manufacturing, Fashion Terminology and Principles.
- **Resource Management and Habitat:** Management Process, Decision Making, Work Simplification, Family Life Cycle, Consumer Protection Act, Principles of Housing Design, Interior Design Elements, Energy Management, Waste Management.

Unit I: Food Science and Food Service Management

- **Question Type:** Definition and identification of concepts, steps in processes, questions based on nutritional value of foods, matching (e.g. cooking method, preservation method, food standards), assertion-reason, sequence arrangement (e.g. menu sequence, product development steps).

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HOME SCIENCE ONELINER SAMPLE

- Question:** The theory of 'Cognitive Development', which outlines four stages starting with the sensorimotor stage, was proposed by which Swiss psychologist?
Answer: Jean Piaget.
- Question:** The 'classes of change' in work simplification, which help in analyzing and improving work methods, were developed by which researcher?
Answer: Marvin Mundel.
- Question:** In which year was the Integrated Child Development Services (ICDS) scheme launched in India to improve the health and nutrition of mothers and children?
Answer: 1975.
- Question:** The 'germ theory of disease', which became foundational to food safety and hygiene, was scientifically established by which French chemist in the 19th century?
Answer: Louis Pasteur.
- Question:** The 'Ecological Systems Theory' of human development, proposing five environmental systems like microsystem and macrosystem, was developed by whom?
Answer: Urie Bronfenbrenner.
- Question:** The 'Consumer Protection Act', which established a framework for protecting consumer interests in India, was first enacted in which year?
Answer: 1986.
- Question:** The eight stages of 'Psychosocial Development',

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such as 'Trust vs. Mistrust', were formulated by which German-American psychoanalyst?

Answer: Erik Erikson.

8. **Question:** The process of heating milk to a specific temperature for a set period to kill pathogens, known as pasteurization, was developed by whom?

Answer: Louis Pasteur.

9. **Question:** The 'SMCR' model of communication, which stands for Source, Message, Channel, and Receiver, was developed by which communication theorist in 1960?

Answer: David Berlo.

10. **Question:** In textiles, the 'Jacquard loom', which simplified the process of manufacturing textiles with complex patterns, was invented by Joseph Marie Jacquard in which country?

Answer: France.

11. **Question:** The National Institute of Nutrition (NIN), a premier research institute in India, is located in which city?

Answer: Hyderabad.

12. **Question:** The concept of 'ergonomics', the science of designing the workplace to fit the user, was formally defined in which decade?

Answer: 1940s (specifically 1949).

13. **Question:** The 'attachment theory', explaining the importance of the bond between an infant and a primary caregiver, was developed by which British psychologist?

Answer: John Bowlby.

14. **Question:** The 'Food Safety and Standards Act' (FSSA) which consolidated all previous food-related laws in India was enacted in which year?

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Answer: 2006.

15. **Question:** The 'Kalamkari' style of hand-painted or block-printed cotton textile is traditionally associated with which Indian state?

Answer: Andhra Pradesh.

16. **Question:** Who is known as the 'Father of the Green Revolution' in India for his role in developing high-yielding wheat varieties?

Answer: M.S. Swaminathan.

17. **Question:** The 'PERMA' model of well-being (Positive emotion, Engagement, Relationships, Meaning, Accomplishment) was proposed by which founder of Positive Psychology?

Answer: Martin Seligman.

18. **Question:** In resource management, the decision-making process model involving steps like defining the problem and identifying alternatives was outlined by which thinker?

Answer: John Dewey.

19. **Question:** The deficiency of which B-vitamin causes Pellagra, a disease characterized by the "3 Ds" (dermatitis, diarrhea, dementia)?

Answer: Niacin (Vitamin B3).

20. **Question:** The 'Bandhani' tie-dye textile tradition is famously practiced in which two Indian states?

Answer: Gujarat and Rajasthan.

21. **Question:** The 'sociocultural theory' of development, emphasizing the fundamental role of social interaction, is the major contribution of which Russian psychologist?

Answer: Lev Vygotsky.

22. **Question:** The 'Right to Information' (RTI) Act, an

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important tool for consumer awareness and transparency, was enacted in India in which year?

Answer: 2005.

23. **Question:** 'HACCP' (Hazard Analysis and Critical Control Points) is a systematic preventive approach to food safety first developed in the 1960s for which US program?

Answer: NASA space program.

24. **Question:** The 'Moral Development' theory, proposing six stages across three levels (pre-conventional, conventional, post-conventional), was developed by whom?

Answer: Lawrence Kohlberg.

25. **Question:** The 'Kantha' stitch, a traditional form of embroidery, originated in which region of the Indian subcontinent?

Answer: Bengal region (West Bengal and Bangladesh).

26. **Question:** In management, the 'fourteen principles of management', including concepts like unity of command and division of work, were given by which theorist?

Answer: Henri Fayol.

27. **Question:** The deficiency of Vitamin A can lead to a condition of night blindness, technically known as what?

Answer: Nyctalopia.

28. **Question:** The 'Diffusion of Innovations' theory, which explains how ideas and technologies spread, was popularized by which communication scholar in his 1962 book?

Answer: Everett Rogers.

29. **Question:** The 'Phulkari' embroidery tradition, characterized by the use of darn stitch on coarse cotton, belongs to which Indian state?

Answer: Punjab.

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30. **Question:** The book *Silent Spring*, published in 1962, which raised awareness about the environmental impact of pesticides, was written by whom?

Answer: Rachel Carson.

31. **Question:** The concept of 'object permanence', the understanding that objects continue to exist even when they cannot be seen, is a key development during which of Piaget's stages?

Answer: Sensorimotor stage.

32. **Question:** The 'AGMARK' certification mark ensures the quality and purity of which category of products in India?

Answer: Agricultural products.

33. **Question:** The 'Maslow's Hierarchy of Needs', a motivational theory in psychology, was proposed by which American psychologist?

Answer: Abraham Maslow.

34. **Question:** The 'Brocade' weaving technique, known for its rich, decorative shuttle-woven fabrics, is famously associated with which Indian city?

Answer: Varanasi (Banaras).

35. **Question:** The 'Mid-Day Meal Scheme', a school meal programme in India, was launched as a nationwide programme in which year?

Answer: 1995.

36. **Question:** The 'Ikat' dyeing technique, which involves resist dyeing on the yarns prior to weaving, is a specialty of which Indian state?

Answer: Odisha (and Telangana/Gujarat).

37. **Question:** In which year was the 'Juvenile Justice (Care and Protection of Children) Act' enacted in India to address the needs of children in conflict with the law?

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Answer: 2000 (later amended).

38. **Question:** 'Ergonomics' is also known by what other term, particularly in the United States?

Answer: Human Factors.

39. **Question:** The Food and Agriculture Organization (FAO), a specialized agency of the United Nations, has its headquarters in which city?

Answer: Rome, Italy.

40. **Question:** The 'Patola' silk sari, a double ikat woven sari, is a traditional craft of which city in Gujarat?

Answer: Patan.

41. **Question:** The 'operant conditioning' theory, based on reinforcement and punishment, was developed by which American psychologist?

Answer: B.F. Skinner.

42. **Question:** The 'Prevention of Food Adulteration Act' was a major food law in India for many decades after its enactment in which year?

Answer: 1954.

43. **Question:** The 'Programme Evaluation and Review Technique' (PERT), a project management tool, was developed in the 1950s by which organization?

Answer: The United States Navy.

44. **Question:** The 'Chikankari' style of delicate white embroidery on fine muslin cloth is a traditional art form of which Indian city?

Answer: Lucknow.

45. **Question:** The 'Swachh Bharat Abhiyan' (Clean India Mission), a nationwide cleanliness campaign, was officially launched by the Government of India in which year?

Answer: 2014.

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46. **Question:** The 'Tri-component Attitude Model' (affective, behavioral, cognitive) is a foundational concept in which field of study?

Answer: Social Psychology (Consumer Behavior).

47. **Question:** In which year did the World Health Organization (WHO) officially declare the eradication of smallpox?

Answer: 1980.

48. **Question:** The 'Paithani' sari, characterized by a peacock design on the pallu, is a traditional handloom craft from which Indian state?

Answer: Maharashtra.

49. **Question:** The concept of the 'family life cycle' as a tool for financial planning was popularized by which scholars?

Answer: Evelyn Duvall and Reuben Hill.

50. **Question:** The 'National Food Security Act', which aims to provide subsidized food grains to a majority of the Indian population, was enacted in which year?

Answer: 2013.

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1. Nicolas Appert (1749–1841)

Introduction

- A French confectioner and chef, famously known as the "Father of Canning."
- He was the inventor of the method of preserving food by sterilization in sealed containers.
- His work was a direct response to a prize offered by the French government under Napoleon for a new method to preserve food for the army and navy.
- He was a pioneer in food science, working decades before Louis Pasteur explained the scientific reasons why the method worked.
- His invention revolutionized food preservation and laid the groundwork for the modern food processing industry.



Key Concepts / Contributions

- **Invention of Canning (Appertization):** He developed the fundamental process of sealing food in airtight glass jars, heating them in boiling water for a specific period, and then sealing the container completely to prevent spoilage.
- **Airtight Sealing:** Appert correctly identified that the exclusion of air was a critical factor in preservation, even without understanding the role of microbes.
- **Heat Sterilization:** He discovered that applying a specific amount of heat to the sealed food was essential to stop decomposition. This process destroyed or inactivated the microorganisms responsible for spoilage.
- **Wide Range of Foods:** He successfully applied his preservation method to a vast array of foods, including soups, vegetables, juices, dairy products, jellies, and meats.
- **Glass Jars:** His initial method used thick, wide-mouthed glass jars sealed with cork and sealing wax, which were then reinforced with wire to withstand the pressure during heating.
- **Empirical Method:** Appert's work was based entirely on careful observation and experimentation. He meticulously documented the cooking times required for different types of food.
- **Foundation for Food Industry:** His invention made it possible to store food for long periods, transport it over long distances, and ensure food availability out of season, which was critical for military campaigns and urban populations.

Key Books with Publication

- **The Art of Preserving All Kinds of Animal and Vegetable Substances for Several Years (L'Art de Conserver, pendant plusieurs années, toutes les substances animales et végétales) (1810):** This was the first cookbook of its kind, detailing the modern methods of food preservation. In this book, Appert published his

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invention and explained his step-by-step process for the benefit of the public.

Fact

- For his groundbreaking invention, Nicolas Appert won the 12,000-franc prize from the French government in 1810 on the condition that he make his process public, which he did by publishing his famous book the same year.

2. Louis Pasteur (1822–1895)

Introduction

- A French biologist, microbiologist, and chemist renowned for his discoveries in the principles of vaccination, microbial fermentation, and pasteurization.¹
- He is regarded as one of the "Fathers of Microbiology" and made foundational contributions to food science.
- His work disproved the long-held theory of spontaneous generation, proving that microorganisms cause fermentation and disease.
- He developed the process of pasteurization, which is named after him and is a cornerstone of food safety today.
- His discoveries bridged the gap between chemistry and biology and had an immense impact on public health and the food and beverage industry.



Key Concepts / Contributions

- **Germ Theory of Fermentation:** Pasteur demonstrated that fermentation is caused by the growth of living microorganisms (like yeast and bacteria) and not by a purely chemical process.
- **Pasteurization:** He invented this process to prevent the spoilage of wine, beer, and milk. It involves heating the liquid to a specific temperature for a set period to kill most of the harmful bacteria without significantly altering the taste.
- **Disproof of Spontaneous Generation:** Through his famous swan-neck flask experiments, he conclusively demonstrated that microorganisms come from other microorganisms and do not spontaneously arise from non-living matter.
- **Anaerobiosis:** He discovered that some microorganisms can live and grow in the absence of air (anaerobic conditions), a concept he termed "anaerobiosis."
- **Control of "Wine Diseases":** He applied his knowledge to the French wine industry, showing that unwanted microorganisms were responsible for causing wine to sour. His pasteurization process saved the industry.
- **Yeast and Fermentation:** He proved that yeast was responsible for converting sugar into alcohol in fermentation, a key process in making bread, beer, and wine.
- **Food Microbiology:** His work laid the absolute foundation for the field of food microbiology, linking microbes to food spoilage and foodborne illness.
- **Vaccination:** While more related to medicine, his work on developing vaccines (for anthrax and rabies) stemmed from his understanding of how to weaken or attenuate microbes, a principle also relevant in food science (e.g., in creating starter cultures).

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Key Books with Publication

- **Studies on Fermentation (Études sur la Bière) (1876):** This book details his discoveries about fermentation, the role of yeast, and the principles of pasteurization, particularly as applied to beer. It is a foundational text of microbiology and food science.

Fact

- Louis Pasteur was a talented artist in his youth. His pastel portraits of his family and neighbors, made when he was a teenager, are preserved and show considerable artistic skill.

3. Clarence Birdseye (1886–1956)

Introduction

- An American inventor, entrepreneur, and naturalist who is considered the founder of the modern frozen food industry.
- He developed the "quick-freezing" method, which revolutionized food preservation by maintaining the quality of frozen foods.
- His innovations were inspired by his experiences as a fur trapper and naturalist in Labrador, Canada, where he observed that fish frozen almost instantly in the frigid air tasted fresh when thawed.
- He held hundreds of patents for his inventions in food technology and other fields.
- His work made a wide variety of high-quality, nutritious foods available to consumers year-round.



Key Concepts / Contributions

- **Quick-Freezing Process:** Birdseye's key insight was that rapid freezing at very low temperatures produced small ice crystals, which did not damage the cell structure of the food. This was a major improvement over slow freezing, which created large ice crystals and resulted in a mushy, unappealing product when thawed.
- **Invention of the Double Belt Freezer:** To commercialize his process, he invented the "double belt freezer," where packaged food was pressed between two refrigerated metal belts, freezing it quickly and efficiently.
- **Frozen Food Packaging:** He recognized that the packaging was as important as the freezing process itself. He developed and pioneered the use of waterproof cellophane and cardboard cartons suitable for frozen foods.
- **Creation of a System:** Birdseye's success was not just the invention of a process but the creation of an entire system, including the technology for freezing, packaging, and the "cold chain" for transportation and retail storage.
- **Retail Innovation:** He worked to persuade retailers to invest in frozen food display cases, which were essential for selling his products to the public.
- **Consumer Education:** He launched campaigns to educate consumers on how to store and cook frozen foods, overcoming public skepticism about their quality.

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- **Broad Product Line:** He applied his method to a wide variety of products, including fish fillets, fruits (like raspberries and strawberries), and vegetables (like peas and spinach), creating the basis for the modern frozen food aisle.

Key Books with Publication

- Clarence Birdseye was an inventor and businessman, not an academic author. His primary "publications" were his numerous patents and the commercial products themselves. His company, **Birdseye Seafoods, Inc.** (founded in 1924), and later **General Foods Corporation**, which bought his company, published many cookbooks and pamphlets to promote frozen foods.

Fact

- Clarence Birdseye was an incredibly curious and prolific inventor beyond food. His patents included a specialized harpoon for whaling and an improved incandescent light bulb.

4. Auguste Escoffier (1846-1935)

Introduction

- A legendary French chef, restaurateur, and culinary writer who popularized and updated traditional French cooking methods.
- He is a monumental figure in the history of modern professional cooking and food service management.
- He is famous for simplifying and codifying the elaborate cuisine of Marie-Antoine Carême.
- He revolutionized the organization of professional kitchens by developing the "Brigade de Cuisine" or kitchen brigade system.
- His philosophy was to make cuisine lighter, more elegant, and focused on seasonal ingredients, moving away from the heavy garnishes of the past.



Key Concepts / Contributions

- **The Kitchen Brigade System (Brigade de Cuisine):** His most influential contribution to food service management. This system organizes the kitchen into a strict hierarchy with specialized roles (e.g., saucier, poissonnier, pâtissier), ensuring efficiency, consistency, and clear lines of responsibility.
- **Codification of French Cuisine:** He classified the five "mother sauces" (Béchamel, Espagnole, Velouté, Hollandaise, and Tomate) that form the basis of thousands of other sauces and are fundamental to classic culinary training.
- **Emphasis on Seasonality and Simplicity:** He advocated for using fresh, seasonal ingredients and simplifying dishes to highlight the natural flavor of the food.
- **Menu Development:** He revolutionized the menu, moving from the practice of serving all dishes at once (service à la française) to serving them in courses (service à la russe), which is the standard in modern restaurants.
- **Kitchen Hygiene and Professionalism:** Escoffier insisted on high standards of

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cleanliness and hygiene in the kitchen. He also demanded that his staff be professional, quiet, and sober, raising the social status of the chef.

- **Partnership with César Ritz:** His famous partnership with hotelier César Ritz led to the opening of some of the most famous luxury hotels in the world, including the Savoy in London and the Hôtel Ritz in Paris, where he managed the kitchens.
- **Culinary Innovation:** He is credited with inventing many famous dishes, most notably the Pêche Melba (Peach Melba), created in honor of the Australian soprano Nellie Melba.

Key Books with Publication

- **Le Guide Culinaire (The Culinary Guide) (1903):** This is Escoffier's magnum opus and remains a major reference work for professional chefs. It contains over 5,000 recipes and codifies the principles of classic French cuisine.
- **Le Livre des Menus (1912):** A book providing menus for various occasions, further illustrating his philosophy of menu planning and course progression.
- **Ma Cuisine (1934):** A simpler cookbook aimed at the domestic cook, making his cuisine more accessible to the public.

Fact

- During the Franco-Prussian War, Auguste Escoffier served as a chef in the French army, where he first had to apply his organizational skills to the challenge of feeding troops in difficult conditions, an experience that likely influenced his later development of the efficient kitchen brigade system.

5. Antoine Lavoisier (1743-1794)

Introduction

- A prominent French chemist who was a central figure in the 18th-century Chemical Revolution.
- He is widely regarded as the "Father of Modern Chemistry" and also the "Father of Modern Nutrition."
- He recognized and named the elements oxygen and hydrogen.
- Through his pioneering experiments on metabolism, he was the first to explain the chemical process of respiration.
- His work moved the study of nutrition from simple observation to quantitative, scientific measurement.

Key Concepts / Contributions

- **Respiration as Combustion:** Lavoisier's most critical contribution to nutrition science was demonstrating that respiration is a slow form of combustion, where the body "burns" organic matter using inhaled oxygen to produce heat, water, and carbon dioxide.
- **Conservation of Mass:** He established the law of conservation of mass, which states that mass is neither created nor destroyed in a chemical reaction.² He used this principle to quantitatively measure inputs (food, oxygen) and outputs (carbon dioxide, water, heat).
- **Invention of the Calorimeter:** Along with Pierre-Simon Laplace, Lavoisier invented



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the calorimeter, a device to measure the amount of heat produced by a chemical reaction or a living organism.

- **Metabolism Experiments:** Using the calorimeter, he placed a guinea pig in the device and measured its heat production, comparing it to the heat produced by burning carbon. This was the first quantitative experiment in animal metabolism.
- **Role of Oxygen:** He identified oxygen's crucial role in both combustion and respiration, overthrowing the long-held "phlogiston theory."
- **Foundation of Nutritional Energetics:** His work laid the scientific foundation for understanding energy metabolism, the concept of the calorie, and the energy value of foods.
- **Quantitative Method:** Lavoisier's insistence on precise, quantitative measurement transformed chemistry and laid the groundwork for the scientific study of nutrition.
- **Relationship between Food, Respiration, and Work:** He correctly deduced that oxygen consumption and heat production increase with food intake and physical exercise, establishing the basic relationship between energy intake and expenditure.

Key Books with Publication

- **Elementary Treatise of Chemistry (Traité Élémentaire de Chimie) (1_78_9):** Considered the first modern chemistry textbook, it presented a unified view of the new chemical theories, defined the concept of an element, and established the law of conservation of mass. While a chemistry book, it contains the principles that underpin his nutritional discoveries.

Fact

- Antoine Lavoisier was a nobleman and a tax-collector for the French monarchy. During the French Revolution's Reign of Terror, he was accused of treason, tried, and executed by guillotine. The judge at his trial famously remarked, "The Republic has no need of scientists."

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1. Nicolas Appert (1749–1841)

Category	Details
Short Introduction	French inventor known as the "father of canning."
Key Concepts	- Preservation of food using airtight containers
Key Books	- L'Art de conserver pendant plusieurs années toutes les substances animales et végétales (1810)
Facts	- Developed canning method that laid foundation for modern food preservation.

2. Louis Pasteur (1822–1895)

Category	Details
Short Introduction	French biologist, microbiologist, and chemist known for his discoveries in vaccination and pasteurization.
Key Concepts	- Germ theory of disease - Pasteurization - Vaccination
Key Books	- Études sur la bière (Studies on Beer, 1876)
Facts	- His work saved countless lives and had profound impact on medicine and food safety.

3. Clarence Birdseye (1886–1956)

Category	Details
Short Introduction	American inventor and entrepreneur who developed modern methods of freezing food.
Key Concepts	- Quick-freezing technique - Industrial frozen food systems
Key Books	- Patents and articles on quick-freezing (1920s–1930s)
Facts	- Founded Birds Eye company; revolutionized frozen food industry.

4. Auguste Escoffier (1846–1935)

Category	Details
Short Introduction	French chef, restaurateur and culinary writer; redefined French cuisine.
Key Concepts	- Brigade de cuisine system - Haute cuisine - Menu planning
Key Books	- Le Guide Culinaire (1903) - Ma Cuisine (1934)
Facts	- Standardized kitchen operations and brought professionalism to culinary arts.

5. Antoine Lavoisier (1743–1794)

Category	Details
Short Introduction	French chemist known as the "Father of Modern Chemistry."
Key Concepts	- Law of Conservation of Mass - Role of oxygen in combustion

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Key Books	- Traité Élémentaire de Chimie (Elementary Treatise of Chemistry, 1789)
Facts	- His systematic methods influenced food chemistry and nutrition science.

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UGC NET Home Science

1. **M.S. Swaminathan**: An eminent Indian geneticist and administrator, known as the "Father of the Green Revolution in India" for his role in developing high-yielding wheat varieties.
2. **C. Gopalan**: A pioneering Indian nutritionist, founder of the National Institute of Nutrition (NIN), Hyderabad. His work on nutritional deficiencies has been monumental.
3. **Krause's Food & the Nutrition Care Process** - L. Kathleen Mahan & Sylvia Escott-Stump: A standard international textbook for dietetics and nutrition, often called the "bible of dietetics."
4. **Nutrition Science** - B. Srilakshmi: A comprehensive and widely used textbook in India covering the fundamentals of nutrition science.
5. **Jean Piaget** (Theory of Cognitive Development): A fundamental theory in human development that describes four stages of cognitive growth: Sensorimotor, Preoperational, Concrete Operational, and Formal Operational.
6. **Erik Erikson** (Theory of Psychosocial Development): Proposed eight stages of psychosocial development, each presenting a crisis that must be resolved, from "Trust vs. Mistrust" in infancy to "Integrity vs. Despair" in old age.
7. **Urie Bronfenbrenner** (Ecological Systems Theory): A theory in human development that views the child's development within a nested system of relationships (Microsystem, Mesosystem, Exosystem, Macrosystem, Chronosystem).
8. **Developmental Psychology: A Life-Span Approach** - Elizabeth B. Hurlock: A classic textbook that provides a comprehensive overview of human development from conception to death.
9. **Mundel's Classes of Change**: Developed by Marvin Mundel, these are five levels of change in hand and body motions used in work simplification to make tasks more efficient.
10. **Ergonomics**: The scientific discipline concerned with the understanding of interactions among humans and other elements of a system, aiming to optimize human well-being and overall system performance.¹
11. **Textiles** - Sara J. Kadolph: A standard textbook that covers fiber science, yarn, fabric structures, coloration, and finishing.
12. **Principles of Design**: The guiding rules of aesthetics. The key principles are **Balance** (Symmetrical, Asymmetrical, Radial), **Rhythm**, **Emphasis**, **Proportion**, and **Harmony**.
13. **Elements of Design**: The basic components used to create a design. The key elements are **Line**, **Shape/Form**, **Colour**, **Texture**, and **Space**.
14. **Everett Rogers** (Diffusion of Innovations): A theory that explains how, why, and at what rate new ideas and technology spread. It identifies five adopter categories: Innovators, Early Adopters, Early Majority, Late Majority, and Laggards.
15. **Aristotle's Model of Communication**: One of the earliest communication models, focusing on the speaker, speech, and audience, and emphasizing persuasion (ethos, pathos, logos).
16. **Shannon-Weaver Model of Communication**: A linear model that introduced the concepts of sender, encoder, channel, noise, decoder, and receiver, forming the basis of

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modern communication theory.

17. **ICDS (Integrated Child Development Services)**: A flagship programme of the Indian government for early childhood care and development, providing services like supplementary nutrition, health check-ups, and pre-school education.
18. **RDA (Recommended Dietary Allowance)**: The average daily level of intake sufficient to meet the nutrient requirements of nearly all (97%-98%) healthy² people.
19. **HACCP (Hazard Analysis and Critical Control Points)**: A systematic preventive approach to food safety that identifies and controls³ biological, chemical, and physical hazards in⁴ the food production process.
20. **Food Fortification**: The process of adding micronutrients (vitamins and minerals) to food to improve its nutritional quality and address public health deficiencies.
21. **Consumer Protection Act, 2019**: The primary legislation in India to protect the interests of consumers, which established consumer councils and redressal agencies.
22. **Work Simplification**: The process of making work easier and more efficient by eliminating unnecessary steps, rearranging sequences, or improving tools and equipment.
23. **Basic Weaves**: The three fundamental ways threads are interlaced to form a fabric: **Plain Weave**, **Twill Weave** (with diagonal lines), and **Satin Weave** (with a lustrous surface).
24. **Traditional Indian Textiles**: Includes a vast range of heritage textiles like **Brocades** of Varanasi, **Patola** of Gujarat, **Ikat** of Odisha, **Kalamkari** of Andhra Pradesh, and **Phulkari** of Punjab.
25. **PRA (Participatory Rural Appraisal)**: A group of approaches used in development work to enable local people to analyze their living conditions, share outcomes, and plan their own projects.
26. **Maslow's Hierarchy of Needs**: While a psychological theory, it is fundamental to resource management and family studies for understanding how families prioritize needs from basic physiological and safety needs to higher-level needs like esteem and self-actualization.
27. **PERMA Model of Well-being** - Martin Seligman: A theory of well-being from positive psychology based on five elements: **Positive Emotion**, **Engagement**, **Relationships**, **Meaning**, and **Accomplishment**.
28. **Color Wheel & Harmonies**: Key tools in design. Harmonies include **Monochromatic**, **Analogous**, **Complementary**, and **Triadic** color schemes.
29. **Food Exchange Lists**: A system of grouping foods based on their carbohydrate, protein, and fat content to allow for flexible meal planning, especially in diabetic diet management.
30. **Growth Charts**: A standard tool used to monitor a child's physical growth (height, weight, head circumference) against a standardized reference, essential for assessing nutritional status.

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1: Macronutrients – Functions and Sources

Macronutrient	Key Functions in the Body	Major Food Sources
Carbohydrates	Primary source of energy (4 kcal/g); spares protein; essential for brain function; provides dietary fiber.	Simple: Sugar, honey, fruits. Complex (Starch & Fiber): Cereals (wheat, rice), millets, pulses, root vegetables.
Proteins	Body building and repair of tissues; synthesis of enzymes, hormones, and antibodies; provides energy (4 kcal/g).	Milk and milk products, meat, fish, eggs, pulses, legumes, nuts, soybeans.
Fats	Concentrated source of energy (9 kcal/g); provides essential fatty acids; carrier for fat-soluble vitamins; provides insulation and protects organs.	Oils, ghee, butter, nuts, oilseeds, fatty fish, milk products.

2: Key Vitamins – Deficiency and Sources

Vitamin	Type	Deficiency Disease	Key Functions	Rich Food Sources
Vitamin A	Fat-Soluble	Night Blindness, Xerophthalmia, Bitot's spots.	Vision, immune function, growth, reproduction.	Carrots, sweet potatoes, spinach, liver, milk, eggs.
Vitamin D	Fat-Soluble	Rickets (in children), Osteomalacia (in adults).	Calcium and phosphorus absorption, bone health.	Sunlight exposure, fortified milk, fatty fish, egg yolk.
Vitamin C (Ascorbic Acid)	Water-Soluble	Scurvy (bleeding gums, poor wound healing).	Antioxidant, collagen synthesis, iron absorption.	Amla, guava, citrus fruits (orange, lemon), bell peppers.
Vitamin B1 (Thiamine)	Water-Soluble	Beriberi (wet and dry).	Energy metabolism, nerve function.	Whole grains, legumes, nuts, pork.
Vitamin B9 (Folate)	Water-Soluble	Megaloblastic Anemia; Neural Tube Defects (in newborns).	DNA synthesis, new cell formation.	Leafy green vegetables, legumes, fortified cereals.
Vitamin B12 (Cobalamin)	Water-Soluble	Pernicious Anemia, neurological damage.	Red blood cell formation, nerve function.	Animal products only: meat, fish, eggs, milk.

3: Key Minerals – Functions and Deficiency

Mineral	Type	Key Functions	Deficiency Disorder	Rich Food Sources
Calcium (Ca)	Major	Bone and teeth	Osteoporosis,	Milk and milk

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		formation, muscle contraction, blood clotting.	Rickets.	products, ragi, small fish, leafy greens.
Iron (Fe)	Trace	Component of hemoglobin (oxygen transport), energy metabolism.	Iron Deficiency Anemia.	Leafy green vegetables, dates, jaggery, organ meat.
Iodine (I)	Trace	Synthesis of thyroid hormones, which regulate metabolism.	Goitre, Cretinism (in children).	Iodized salt, seafood, dairy products.
Zinc (Zn)	Trace	Immune function, wound healing, growth and development.	Growth retardation, poor immunity, delayed wound healing.	Meat, shellfish, legumes, seeds, nuts.

4: Food Preservation Principles & Methods

Principle	Method(s)	How it Works (Mechanism)
High Temperature	Pasteurization, Sterilization, Canning, Blanching.	Kills or inactivates microorganisms and enzymes by applying heat.
Low Temperature	Refrigeration, Freezing.	Slows down or stops the growth of microorganisms and enzymatic activity. Does not kill them.
Dehydration (Removal of Water)	Sun Drying, Mechanical Drying, Freeze Drying.	Removes water necessary for microbial growth, making the environment unsuitable for spoilage.
Use of Preservatives	Class I (Natural): Salt, Sugar, Vinegar, Spices. Class II (Chemical): Benzoates, Sorbates.	Creates an environment (high osmotic pressure, low pH) that inhibits microbial growth.
Irradiation	Exposing food to ionizing radiation (e.g., gamma rays).	Kills microorganisms without significantly raising the temperature of the food.

5: Food Quality Control and Adulteration

Food Item	Common Adulterant	Simple Detection Test
Milk	Water / Starch	Water: A drop of milk on a polished, slanting surface will flow quickly without leaving a mark. Starch: Add a few drops of iodine solution; a blue color indicates starch.

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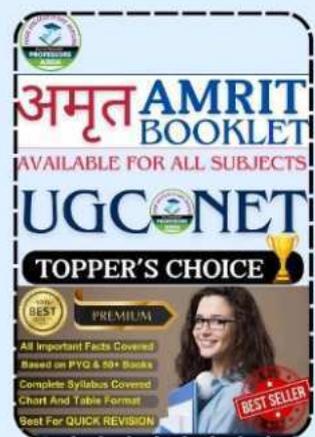
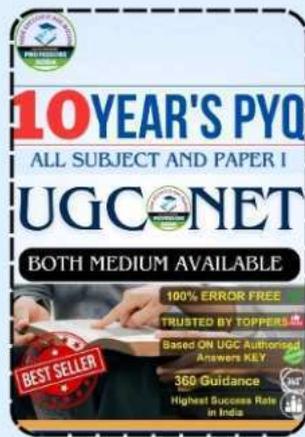
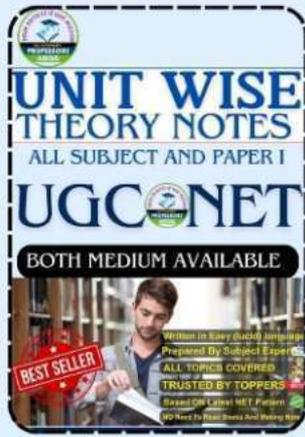
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Turmeric Powder	Metanil Yellow (a non-permitted color)	Add a few drops of hydrochloric acid (HCl); a magenta or pink color indicates adulteration.
Mustard Seeds	Argemone Seeds	Argemone seeds are rougher in texture and black, while mustard seeds are smooth and brownish-black. When crushed, argemone seeds are white inside.
Ghee / Butter	Vanaspati (hydrogenated fat)	Take a spoonful in a test tube, add a pinch of sugar and some HCl. Shake well. A crimson or red color in the lower layer indicates vanaspati.
Black Pepper	Papaya Seeds	Papaya seeds are shrunken, oval, and greenish-brown or blackish. They will float in alcohol, while black pepper will sink.

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1. Which of the following is a macronutrient?

- (a) Vitamin C
- (b) Iron
- (c) Protein
- (d) Iodine

Correct Answer: (c) Protein

Explanation:

1. **Macronutrients:** Nutrients required by the body in relatively large amounts for energy and structure.
2. **Three Main Macronutrients:** These are carbohydrates, fats (lipids), and proteins.
3. **Protein Function:** Essential for building and repairing tissues, making enzymes, hormones, and other body chemicals.
4. **Micronutrients:** Vitamins (like Vitamin C) and minerals (like Iron, Iodine) are needed in smaller amounts.
5. **Energy Source:** Proteins provide energy (4 kcal/gram), similar to carbohydrates.
6. **Dietary Sources:** Found in foods like meat, poultry, fish, dairy products, legumes, and nuts.
7. **Essential Amino Acids:** Proteins are made of amino acids, some of which are essential and must be obtained from diet.

2. Rickets is caused by the deficiency of which vitamin?

- (a) Vitamin A
- (b) Vitamin B1 (Thiamine)
- (c) Vitamin C
- (d) Vitamin D

Correct Answer: (d) Vitamin D

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Explanation:

1. **Rickets:** A condition affecting bone development in children, causing soft and weak bones.
2. **Vitamin D Role:** Vitamin D is crucial for calcium and phosphorus absorption, essential for bone mineralization.
3. **Deficiency Impact:** Lack of Vitamin D impairs calcium absorption, leading to inadequate bone hardening.
4. **Symptoms:** Include bone pain, poor growth, and skeletal deformities like bowed legs.
5. **Sources of Vitamin D:** Obtained from sunlight exposure (skin synthesis), fortified foods (milk, cereals), and fatty fish.
6. **Osteomalacia:** The equivalent condition in adults (softening of bones) is called osteomalacia.
7. **Prevention:** Adequate sunlight exposure and dietary intake/supplementation of Vitamin D can prevent rickets.

3. Which of the following is a natural cellulosic fibre?

- (a) Silk
- (b) Wool
- (c) Cotton
- (d) Nylon

Correct Answer: (c) Cotton

Explanation:

1. **Fibre Classification:** Fibres are broadly classified as natural or man-made (synthetic).
2. **Natural Fibres:** Derived from plants (cellulosic) or animals (protein).
3. **Cellulosic Fibres:** Derived from plant sources; the main component is cellulose.
4. **Cotton Source:** Cotton fibre comes from the seed pod of the cotton plant (*Gossypium* species).

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5. **Other Cellulosic Fibres:** Include linen (from flax), jute, hemp, and ramie.
 6. **Protein Fibres:** Silk (from silkworms) and wool (from sheep) are natural protein fibres.
 7. **Synthetic Fibres:** Nylon is a man-made synthetic fibre derived from petrochemicals.
4. The primary colours in the pigment colour wheel are:
- (a) Green, Orange, Violet
 - (b) Red, Yellow, Blue
 - (c) Red, Green, Blue
 - (d) Yellow, Magenta, Cyan

Correct Answer: (b) Red, Yellow, Blue

Explanation:

1. **Pigment Colour Wheel:** Used by artists and designers dealing with paints, inks, dyes (subtractive colour model).
 2. **Primary Colours:** These are the foundational colours from which all other colours can theoretically be mixed.
 3. **RYB Model:** In the traditional pigment (RYB) model, the primary colours are Red, Yellow, and Blue.
 4. **Secondary Colours:** Mixing two primary colours creates secondary colours: Green (Blue+Yellow), Orange (Red+Yellow), Violet/Purple (Red+Blue).
 5. **Tertiary Colours:** Mixing a primary and an adjacent secondary colour creates tertiary colours (e.g., Red-Orange).
 6. **Subtractive Model:** Called subtractive because pigments absorb (subtract) certain wavelengths of light.
 7. **Contrast with Light:** Differs from the additive primary colours of light (RGB: Red, Green, Blue).
5. What does 'GDP' stand for in economics?
- (a) Gross Domestic Product

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- (b) General Development Plan
- (c) Growth Development Programme
- (d) Government Development Policy

Correct Answer: (a) Gross Domestic Product

Explanation:

1. **Economic Indicator:** Gross Domestic Product (GDP) is a fundamental measure of a country's economic activity.
2. **Definition:** Represents the total monetary or market value of all finished goods and services produced within a country's borders.
3. **Time Period:** Typically calculated over a specific period, usually quarterly or annually.
4. **Scope:** Includes production by both domestic and foreign-owned companies located within the country.
5. **Measure of Size:** Commonly used to estimate the size and growth rate of an economy.
6. **Calculation Methods:** Can be calculated using the production (output), income, or expenditure approach.
7. **Nominal vs. Real:** Nominal GDP uses current prices, while Real GDP adjusts for inflation using constant prices.

6. Jean Piaget is famous for his theory of:

- (a) Psychosocial Development
- (b) Cognitive Development
- (c) Moral Development
- (d) Behavioural Learning

Correct Answer: (b) Cognitive Development

Explanation:

1. **Theorist:** Jean Piaget (1896-1980) was a Swiss psychologist known for his work on child development.

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2. **Theory Focus:** His theory explains how children's thinking processes (cognition) develop through distinct stages.
3. **Stages:** Proposed four major stages: Sensorimotor (birth-2 yrs), Preoperational (2-7 yrs), Concrete Operational (7-11 yrs), Formal Operational (11+ yrs).
4. **Key Concepts:** Introduced concepts like schemas, assimilation, accommodation, and equilibration to explain cognitive growth.
5. **Constructivism:** Viewed children as active learners who construct their understanding of the world through interaction.
6. **Influence:** Piaget's theory profoundly influenced developmental psychology and education.
7. **Other Theories:** Psychosocial (Erikson), Moral (Kohlberg), Behavioural (Skinner, Pavlov).

7. Which element of communication refers to the medium through which a message travels?

- (a) Sender
- (b) Receiver
- (c) Channel
- (d) Feedback

Correct Answer: (c) Channel

Explanation:

1. **Communication Model:** Basic communication models involve several key elements.
2. **Channel Definition:** The channel is the means or medium used to transmit the message from the sender to the receiver.
3. **Examples:** Channels can be verbal (spoken words), written (letters, emails), visual (images, gestures), or electronic (phone, internet).
4. **Sender/Receiver:** The sender initiates the message, and the receiver decodes it.
5. **Message:** The information or idea being conveyed.
6. **Feedback:** The receiver's response to the message, indicating understanding.

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7. **Importance:** The choice of channel can significantly affect the message's clarity and effectiveness.

8. An 'Abstract' in a research paper provides:

- (a) Detailed methodology
- (b) A list of references
- (c) A brief summary of the entire paper
- (d) Acknowledgements

Correct Answer: (c) A brief summary of the entire paper

Explanation:

1. **Purpose:** An abstract is a concise overview of a research paper, thesis, or report.
2. **Placement:** Usually placed at the beginning of the document.
3. **Content:** Typically summarizes the research purpose, methods, key findings, and main conclusions.
4. **Length:** Generally kept brief, often within a specific word limit (e.g., 150-250 words).
5. **Function:** Allows readers to quickly understand the paper's main points and decide if it's relevant to their interests.
6. **Stand-Alone:** Should be understandable on its own, without needing to read the full paper.
7. **Not Methodology/References:** Detailed methodology and references are found in the main body and bibliography, respectively.

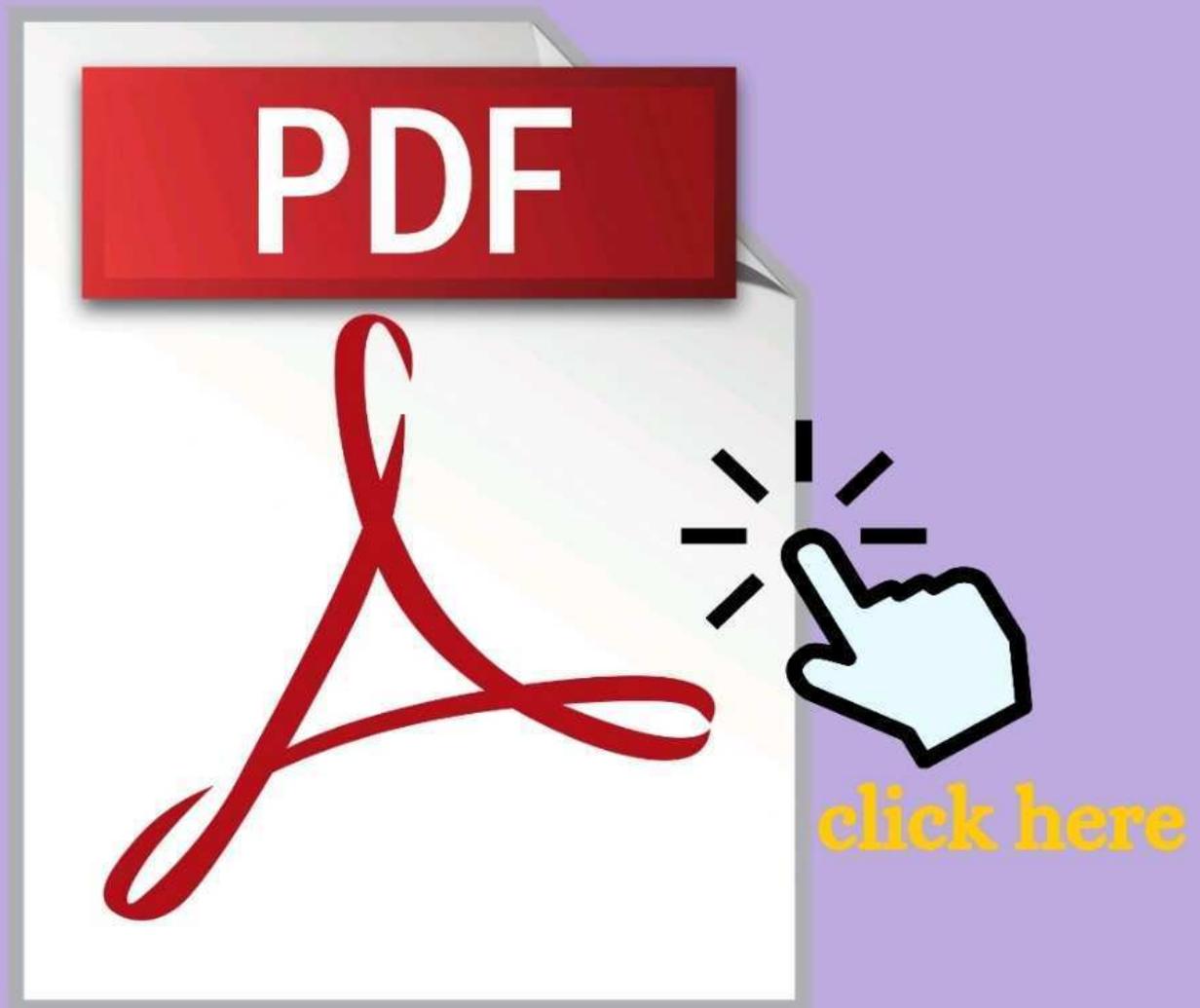
9. Match List-I (Nutrient) with List-II (Rich Food Source):

List-I (Nutrient)	List-II (Rich Food Source)
(A) Vitamin C	(I) Milk
(B) Calcium	(II) Spinach
(C) Iron	(III) Carrots
(D) Vitamin A (Beta-carotene)	(IV) Citrus Fruits (e.g., Orange)

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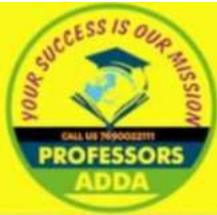
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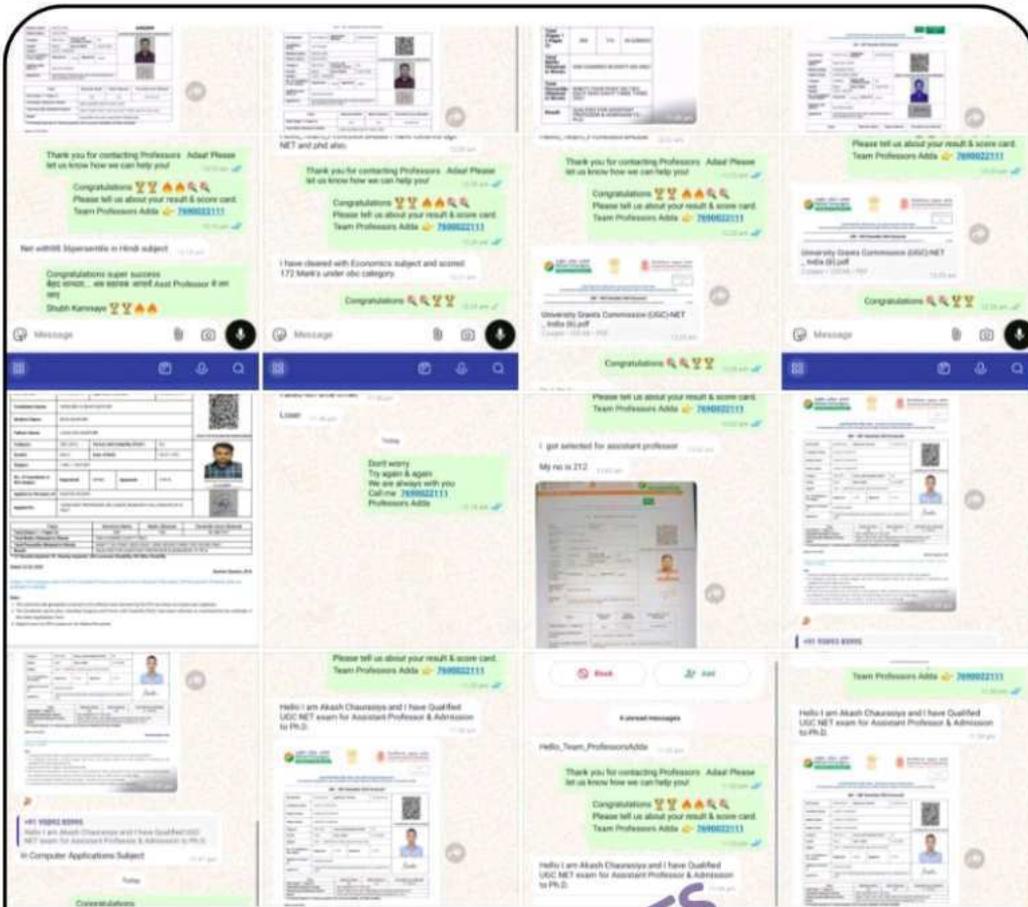


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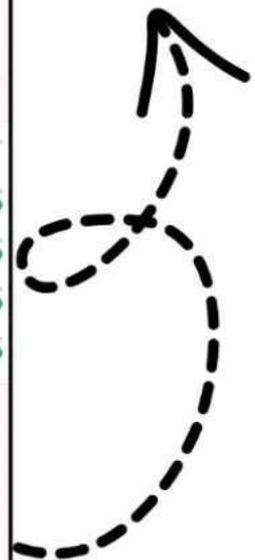
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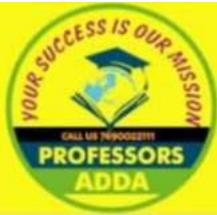
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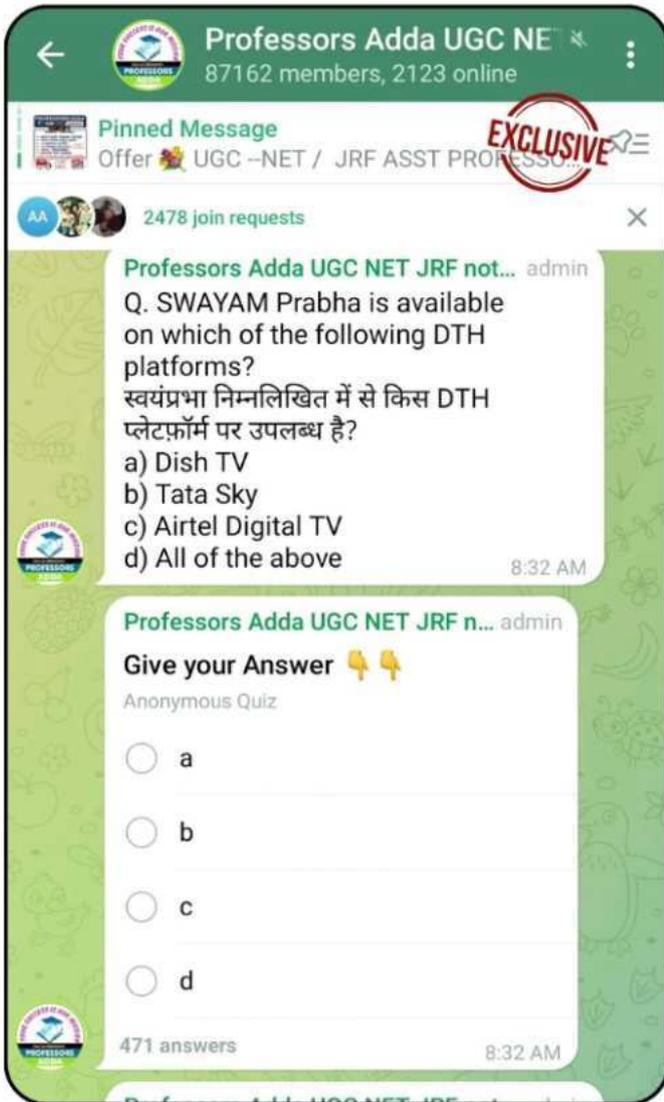


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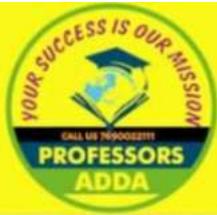
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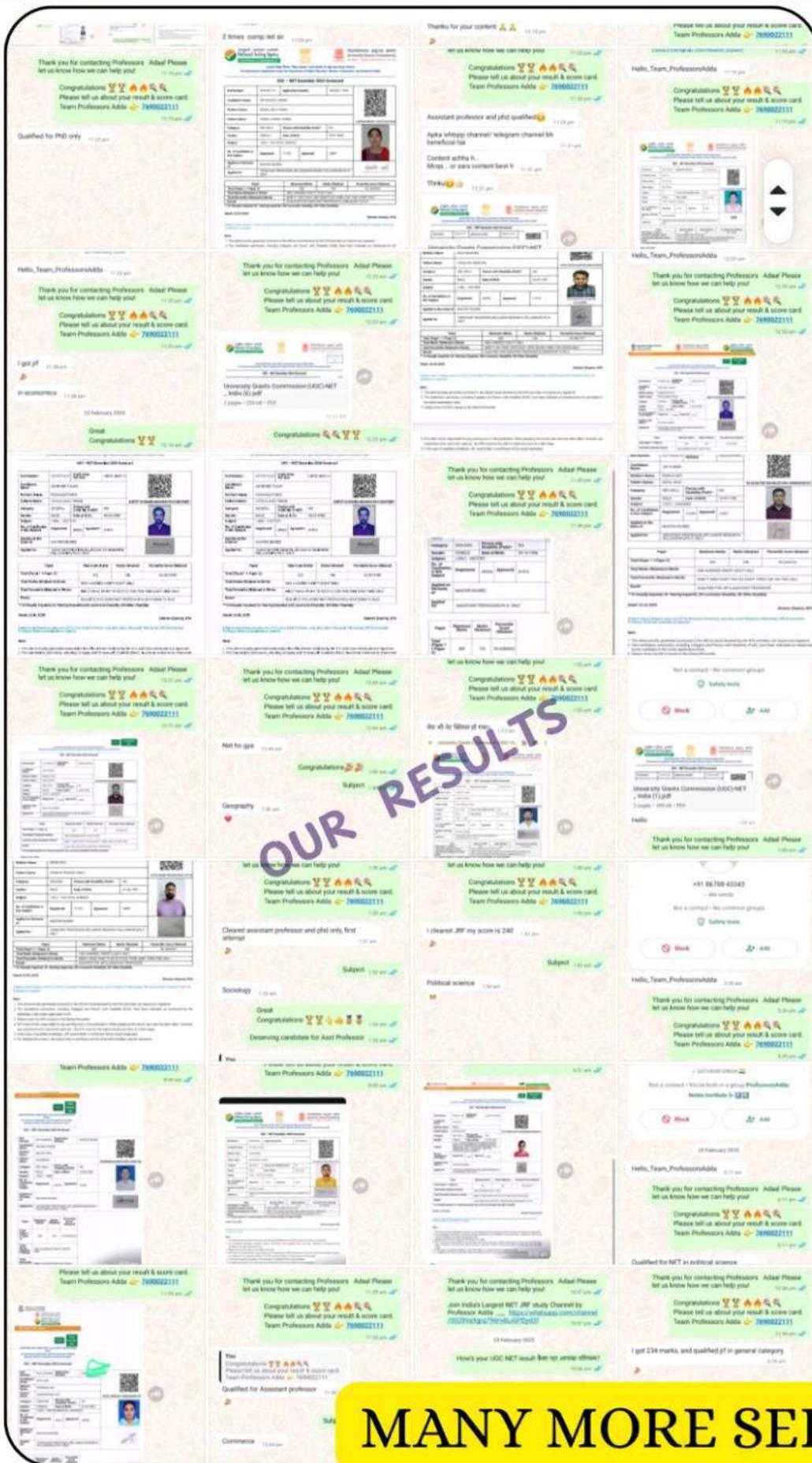


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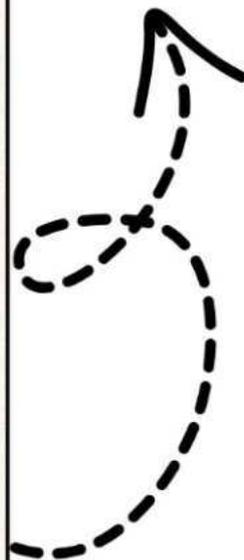


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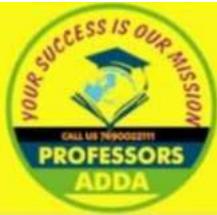
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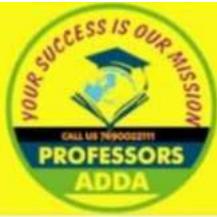
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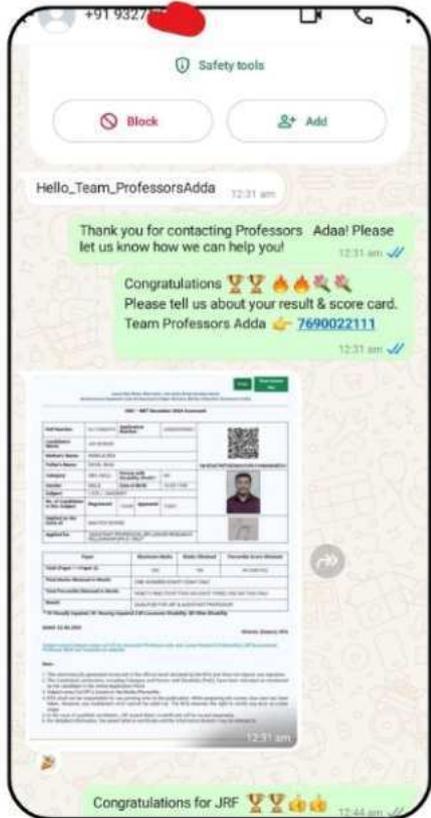
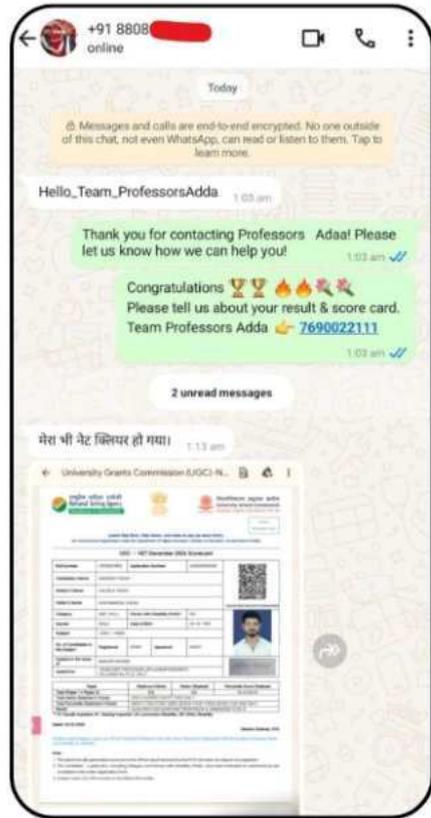
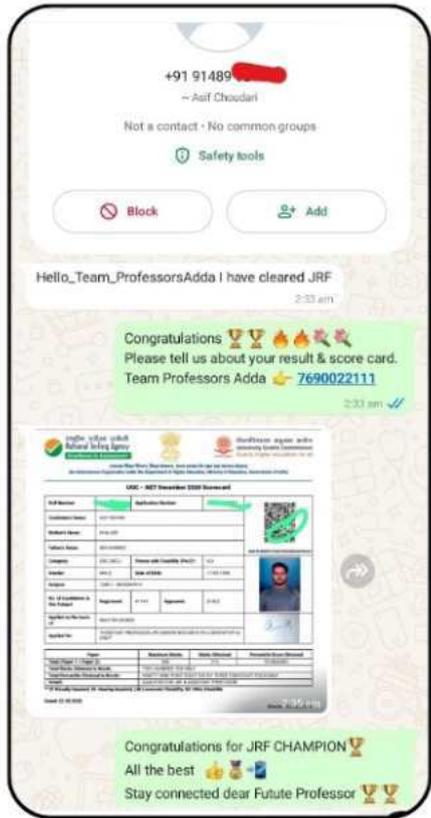
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