YR9 Knowledge Organiser: Topic 1-The Functional and Chemical Properties of Food (Food Science)

Why Understanding Functional and Chemical Properties Matters
Understanding how ingredients behave during cooking helps improve cooking skills, accuracy, and confidence in the kitchen.

It helps:
- Select the right ingredients for desired textures and results.
- Understand what happens during cooking and why recipes work.
- Solve problems when dishes go wrong (e.g., soggy pastry, flat bread).
- Create and adapt recipes using scientific knowledge of ingredients.

Carbohydrates - Gelatinisation
Gelatinisation is the process that thickens liquids when starch is heated with a liquid.
- For gelatinisation to occur, you need starch, a liquid, and heat.
- As the mixture heats (60°C , starch granules begin to absorb water and swell.
- At around 80°C, the granules burst and release starch, thickening the liquid.
- At 100°C gelatinisation is complete.
- On cooling, the mixture solidifies and forms a gel.

Examples of dishes using gelatinisation:
- Sauces (e.g., cheese sauce, gravy)
- custards
- pie fillings
- soups.

How it works:
- Flour in a roux absorbs liquid
- swells and thickens as it heats
- this creates the desired sauce consistency.
- The higher the starch content, the thicker the liquid.

Proteins- Gluten Formation
Where is gluten found?
- wheat
- rye
- barley

Gluten is made up of a mixture of the two proteins
- glutenin
- gliadin.

It is formed when water is added to a flour that contains glutenin and gliadin.

When water is added this creates a gluten network e.g. a bread dough contains gluten network.

Gluten Formation in bread making.

- Kneading stretches gluten strands, which trap gases produced by yeast.
- The gluten network strengthens as kneading continues and the strands of gluten become longer and stronger.
- During baking, gluten sets and provides the structure of the bread.
- Gluten makes dough elastic, stretchy, and shapeable.
- Gluten is essential in bread making to create a firm, well-risen, chewy product.

Fats- Shortening

Shortening is the process where fat is rubbed into flour to coat it and reduce water absorption.
- Prevents gluten formation and creates a short, crumbly texture.
- Used in pastries, biscuits, and scones.

Techniques:
- Rubbing-in method (by hand) or machinery to combine fat and flour.
- Especially important in pastry to keep the texture short and crisp.

How it works:
- Fat coats the flour particles.
- reduces the formation of gluten when water is added.
- Resulting texture: tender, crumbly, and light.

Examples of shortening:
- Shortcrust pastry
- shortbread
- scones.

Raising Agents
Raising agents are ingredients or methods that incorporate air into mixtures.This makes food rise by creating gas bubbles in mixtures. These gases expand when heated (cooked), giving a light texture.

Some products use more than one raising agents examples are:
- Victoria sponge: Mechanical (creaming) + Chemical (baking powder)
- Swiss roll: Mechanical (whisking) + Chemical (self-raising flour)

Understanding the type of raising agent helps with selecting the right technique and ingredients.

Types of raising agents:

1. Chemical raising agents: Produce gas through chemical reactions (e.g., baking powder, self-raising flour and bicarbonate of soda)
   - Examples: Cakes, muffins, scones, biscuits

2. Mechanical raising agents: Physically incorporate air through methods like whisking, beating, folding, sieving
   - Examples: Swiss roll (whisking eggs), puff pastry (folding), creamed sponge

3. Biological raising agents: Yeast produces carbon dioxide
   - Examples: Bread, pizza dough, buns

Cooks

Macarooni Cheese: Food skills
- Creaming.
- Folding in
- Using the oven.

Swiss roll: Food skills
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Focaccia: Food skills
- Weighing
- Steaming
- chopping

Toad in hole: Food skills
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Mini Quiche: Food skills
- Weighing
- Steaming
- chopping

IMPORTANT!!- Always check the classroom for your set ingredients and what practical you have.

Key words

Functional properties

Chemical properties

Gelatinisation

Viscosity

Gluten Formation

Kneading

Shortening

Rubbing-in

Raising agent

Plasticity

Revision Questions

1. What is gelatinisation and what ingredients and conditions are needed for it to occur? Name two dishes that include gelatinisation as part of the cooking process.
2. Explain how gluten is formed during bread making. What role does gluten play in the structure and texture of bread?
3. What is shortening and how does the rubbing-in method prevent gluten formation? List two products where shortening is important.
4. Name and describe the three types of raising agents. Give one example of a food that uses each type.
5. How can a food product like a Victoria sponge or Swiss roll include more than one type of raising agent? Explain your answer.
6. Why is it important to understand the functional and chemical properties of food when cooking and developing recipes?