Learning Outcome 2

Understand the properties of nutrients

(a) Primary structure

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(b) Secondary structure

Hydrogen bond

c) Tertiary structure

Heme

β polypeptide

(d) Quaternary structure–

α polypeptide
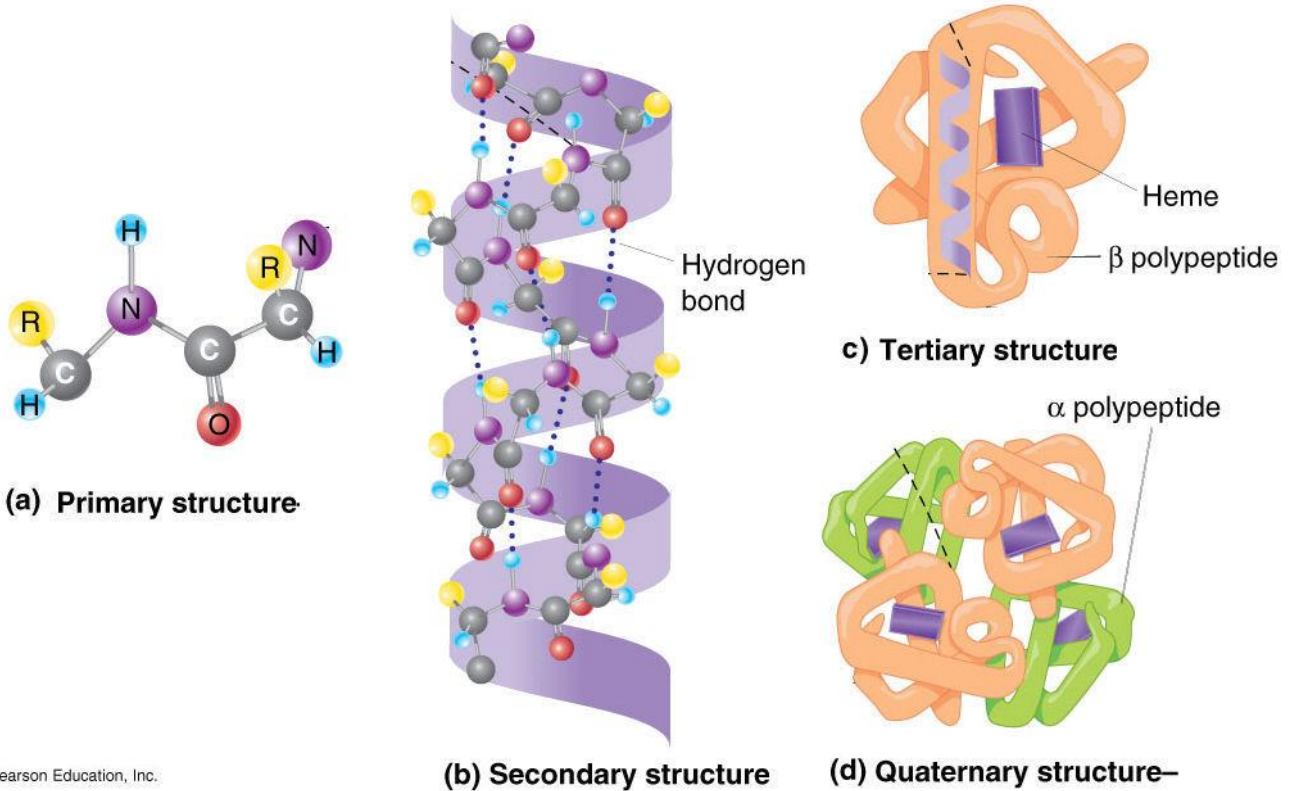
2.1 Explain how nutrients are structured

2.2 Classify the nutrients in food

2.3 Assess the impact of food production methods on nutritional value

Name …………………………………………   Form ………

Proteins

Proteins are long chains of ……………………… ……………………. which are joined by ……………………. bonds. This forms the ……………………… structure of protein. These long chains all contain the elements carbon, hydrogen, ……………………   and ……………………….. ; some proteins contain the elements ……………………………. and ……………………………………………..   The secondary structure of protein is when the chain ……………………. to form a helix or pleated sheet, this is held in place by ……………………….. ………………………………… bonds. The ……………………. structure is where the chain folds on itself to form a …………. structure, this is held in place by a ………………………………. of chemical bonds. The ……………………………………… structure is where …………….. or more proteins join together.

> Oxygen   Amino acids   variety   hydrogen   phosphorous   primary   weak   covalent   two   nitrogen   folds   sulphur   tertiary   3D   quarternary

Amino Acids

The structure of an amino acid looks like this:

There is a carboxyl group (COOH) at one end and an amino group (NH_2) at the other end of the molecule, the R group ………..

Amino acids bond like this:

This is known as a condensation reaction because …………………………………………………………………………………….

The link between the 2 amino acids is known as a …………………………………………………………………………………..

When 2 amino acids join together they are called a ………………………………………………. when many amino acids join together they are called ………………………………………………………..

Examples of proteins are ……………………………………………….. which is found in red blood cells, elastin, which is found in ligaments, collagen which is found in muscle, …………………………………… which is found in eggs and …………………………………….. which is a hormone that regulates sugar in the blood.

Carbohydrates

These are made up of the elements ……………………………… , …………………………………. and …………………………….

$6CO_2$ + $6 H_2O$ ⟶

Photosynthesis

Carbohydrate

Monosaccharides   Disaccharides   Polysaccharides
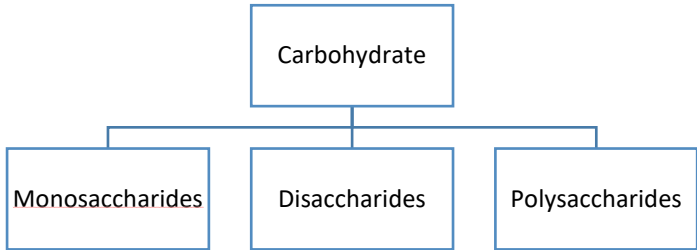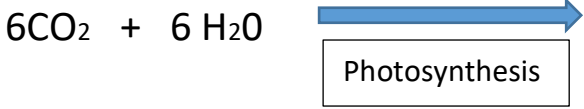
Monosaccharides include ……………………………………………

……………………………………………………………………………………

Disaccharides include ……………………………………………

……………………………………………………………………………………

Polysaccharides include ……………………………………………

……………………………………………………………………………………
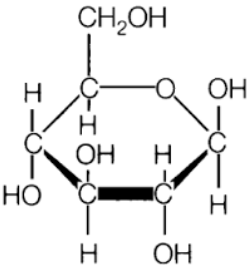
Glucose is a simple sugar found in …………………………………………………………………………………………….

It is a six sided molecule (hexose) with 6 carbon atoms in a ring

Glucose molecules join like this:
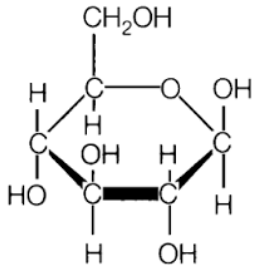
Dissacharides are double sugars – made when 2 monosaccharides join together. They include:

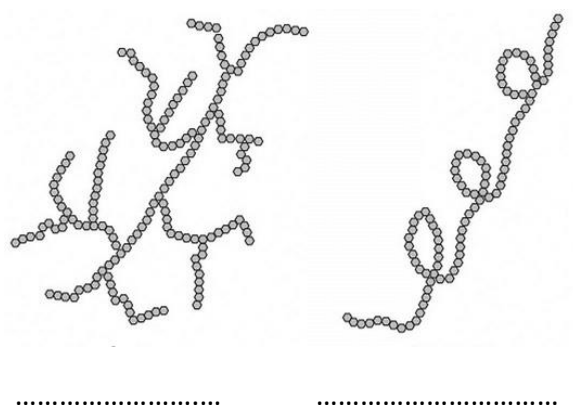Glucose + Glucose = …………………….   Glucose + Fructose = ……………………   Glucose + Galactose = …………………….

Polysaccharides are long chains of ……………………………………………………………………. Starch is the most common polysaccharide in foods; there are 2 common types of starch:

A ……………………………………………… is ……………………………………..

………………………………………………………………………………………………

A……………………………………………………. is ……………………………………

………………………………………………………………………………………………

………………………   …………………………….

Lipids

STRUCTURE OF A TRIGLYCERIDE

Glycerol
- Fatty acid
- Fatty acid
- Fatty acid

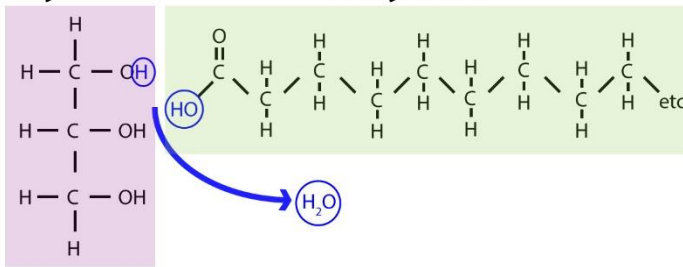Lipids are made up of one unit of ……………………………………… and 3 ………………………………………
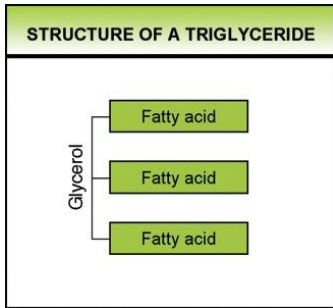
Fatty acids can be saturated in which case they look like this: -C-C-C-C-C-C-H

Or unsaturated in which case they look like this: :   -C-C-C-C-C-C-H

Glycerol   Fatty acid

When a fatty acid joins to a unit of glycerol a unit of water is produced (H_2O) so it is called a ………………………………… reaction.

Each of the 3 fatty acids joining the glycerol is different which means that the fat is 'plastic' ie it melts over a range of temperatures, this gives the fat the property of being

cis-fatty acid
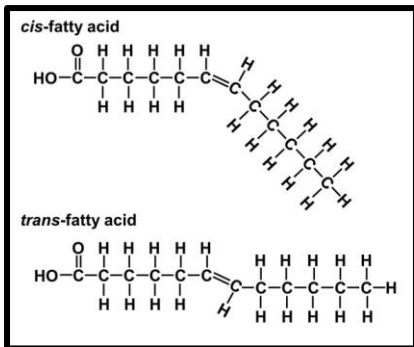
trans-fatty acid

Cis fatty acids …………………………….

…………………………………………………

Trans fatty acids …………………….

…………………………………………………

The term 'saturated means ………………………………………………………………

………………………………………………………………………………………………………

Examples of saturated fats are …………………………………………………………

The term monounsaturated means ……………………………………………………

………………………………………………………………………………………………………

Examples of monounsaturated fats are ……………………………………………

The term polyunsaturated means …………………………………………………….

………………………………………………………………………………………………………

Examples of polyunsaturated fats are …………………………………………………

Explain the difference between saturated and unsaturated fats giving examples

………

………

………

………

………

………

Classify the nutrients in food

In this section we need to consider the different ways we can classify the nutrients in food.
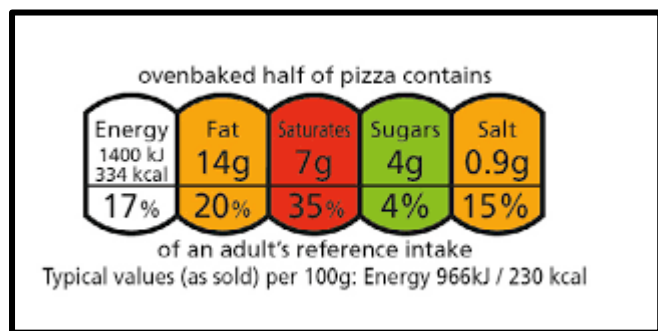
Explain the following terms:

Biological value ………..

………

Glycemic Index………

………

Nutrient Density ……

………

Complementary action of nutrients (and give examples) …………………………………………………………………………

………

………

………

How does a food label help a consumer to classify/understand the nutrients in this product?

How does this information help consumers to make healthy choices?

How could consumers use recipes to inform them about the nutrients in their food?

………

………

………

Impact of production methods on nutritional value

Discuss how the following methods affect the nutritive value of foods, consider both micro and macro nutrients.

Boiling	Roasting
Steaming	Deep fat frying

How do the following storage methods affect the nutritional value of food?

Vacuum packaging	Cold Store	Aseptic food processing and packaging (AFP)

How do the following preservation methods affect the nutritive value of food?

Freezing	Jamming	UHT

What is meant by the term fortification? ………

…….

What foods are fortified by law?……

What foods are fortified voluntarily ? ……

Glossary of terms

Fortification

Glycemic Index

Biological value

Nutrient density

Lipids

Proteins

HBV

LBV

Carbohydrates

NSP

Soluble fibre

Insoluble fibre

Traffic light labels

Condensation reaction

Monosaccharide

Disaccharide

Polysaccharide

Amino Acid

Dipeptide

Polypeptide

Exam Style Questions

1. What are the arguments for and against the fortification of foods, give examples to support your answers? (6 marks)

2. Compare the chemical structure and characteristics of simple and complex carbohydrates (6 marks)

3. Describe the effects of cooking on the water soluble vitamins giving examples in your work (6 marks)

4. Explain the meaning of the following terms:

   a. Glycemic index (2 marks)

   b. Biological value (2 marks)

5. Compare roasting and deep fat frying on the nutrient content of foods (4 marks)

6. Explain the difference between saturated and polyunsaturated fats (6marks)

7. Explain how simple sugars join to make polysaccharides (6 marks)

8. Assess how food production methods impact on the nutritional value of food products, giving examples (8 marks)

9. Which foods are fortified

   a. By law

   b. Voluntarily

10. Why would a food manufacturer choose to fortify foods?

11. Explain the complimentary action of nutrients

    a. LBV proteins

    b. Calcium and vitamin D

    c. Iron and vitamin C

12. Explain how jamming can affect the nutritional value of a food (4 marks)

13. Describe, using a diagram, how amino acids join together to make proteins

14. Name the most common proteins in Eggs, meat, milk

15. Explain the impact of freezing on the nutritional value of foods

16. What does the term nutrient density mean and how can it help consumers to choose a healthy diet?

17. What is the R group in an amino acid?

18. Describe how fatty acids and glycerol bond to make a triglyceride

19. Explain the complementation of protein, giving a variety of examples

20. How do traffic light labels help consumers to make healthy choices?