

- Formation of nucleic acids- E.g. DNA.
- Synthesis of lubricants- E.g. mucus, which consist of a carbohydrate and a protein.
- Synthesis of nectar- Nectar attracts insects to plants.

Fats are organic molecules that are generally soluble in organic solvents and generally insoluble in water. The elements present are carbon, hydrogen and oxygen in $C_{57}H_{110}O_6$. Fats may be either **solid** or **liquid** at **room temperature**, depending on their structure and composition. Fats are an efficient source and storage of energy. When 1g of fats is broken down, 32kJ of energy would be released. Fats are also an insulating material, especially beneath the skin, to prevent excessive heat loss. This is important for sea mammals as hair coverage is no longer an efficient insulator in water and there is a greater tendency to lose heat. Fats can be broken down into simpler substances by hydrolysis to form fatty acids and glycerol. 3 water molecules and 1 fat molecule are required for hydrolysis to take place where a glycerol molecule and 3 fatty acid molecules are produced. Lipase is required to break down fats. Sources of fats are butter, cheese fatty meat, olives, many nuts, peas, beans, seeds of castor oil and palm oil. Herring and salmon also have high fat content. Fats can be saturated, where its acid chain is straight. It is solid at room temperature. Unsaturated fats have a bend in their fatty acid chain. It is a liquid at room temperature. Cholesterol is usually found together with saturated fats, which if taken in great amounts can cause coronary heart disease. Unsaturated fats reduce cholesterol levels in the blood and it should replace animal fats in the diet as often as possible. Unsaturated fats may be converted to trans fats at high temperatures, which are very bad for health.

Functions of fats

- Source and storage of energy (1kg of fat provides 32 kJ of energy)
- Insulating material to prevent heat loss- Thick layer of fat (blubber) helps to reduce loss of body heat, through trapping a layer of air.
- Solvent for fat-soluble vitamins and many other vital substances- E.g. hormones.
- Essential part of formation of protoplasm, especially in cell membranes.
- Reduce water loss from the skin surface- Glands in the skin secrete oil, which forms a thin layer over the skin, reducing evaporation and heat loss.

Proteins are organic molecules made up of carbon, hydrogen, oxygen and nitrogen. They are one of the building blocks of body tissue, and can also serve as a fuel source. As a fuel, proteins contain 4 **kcal** per gram, just like **carbohydrates** and unlike **lipids**, which contain 9 kcal per gram.

Proteins are **polymer** chains made of **amino acids** linked together by **peptide bonds**. They are essential for growth and repair of worn-out body cells and also to synthesize enzymes and some hormones and to form antibodies. Each protein molecule is made of amino acids, which is made of an amino group ($-NH_2$), an acidic group ($-COOH$) and a side chain (R). R can be sulfur, acidic groups, amino groups or hydroxyl groups. There are 20 amino acids and they differ due to R. Amino acids are combined variously