Lipid and Protein Lab

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Lipids

Write up

Fatty acid: $C_{12}H_{24}O_2$

Glycerol: $C_3H_8O_3$

The fatty acid is a long chain of carbon atoms, with a carboxylic acid group at the end. They are saturated, since every carbon forms a single bond with one anther and is attached to the maximum number of hydrogen atoms.

The glycerol and 3 fatty acids combine to form a triglyceride through dehydration synthesis (removing OH from fatty acids and H from glycerol).

The chemical formula of this triglyceride is $C_{39}H_{74}O_6$.

Station 1

Lab work

The natural peanut butter is a hard, concentrated peanut with oil floating on top. The skippy is a gooey solid with no liquid.

The natural peanut butter has plant oil, while the skippy has hydrogenated oil.

Write up

The oil and peanut butter are separated in the natural peanut butter, while the peanut butter takes the form of a gooey solid in the Skippy. This is because the plant oil is unsaturated, containing some carbon double bonds that bend the fatty acid chain, making it harder

for the molecules to pack together (thus making it a liquid at room temperature). The hydrogenated oil is a solid because the double bonds have been removed, making the fatty acid chain straight.

The Skippy manufactuerer would want to hydrogenate the peanut oil so that the oil wouldn't separate from the peanut butter, making it easier to spread. Additionally, the hydrogenated butter would go rancid less quickly. However, excessively saturated fats are unhealthy.

Station 2

Lab work

The wax is melting and as it evaportates, it burns. The candle is burning, but the flame is only at the wick.

Write up

The wax is providing fuel for the flame instead of the wick, because it is being visibly used up. The wick simply turns black but doesn't get much shorter.

The candle can burn because wax is capable of storing lots of energy through its non-polar bonds, which have the potential to be broken and reformed into more stable bonds. When they burn, wax molecules break down and react with oxygen in the air. Thus the heat and light thus come from the formation of CO_2 and H_2O, which releases energy.

Station 3

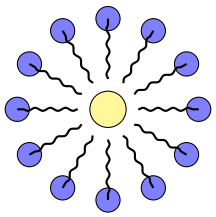
Lab work

The water does not mix with the oil at all. It flows right off and the hand remains oily. Howeever, with the added soap, the water begins to pick up oil.

Write up

Water does not mix with the oil because the oil is non-polar, while the water is highly polar and connected by hydrogen bonds. Water simply will bond with itself, thus excluding the oil.

Soap molecules have a hydrophilic head and a hydrophobic tail. When mixed then disturbed in the water, they naturally form micelles, which are small spheres with the hydrophobic tails pointing inwards, which can trap oil in the middle (see illustration).



Proteins

Station 1

Suppose that we're using Linda's blood (type A-). When anti-A and anti-B antibodies are added to the blood sample, the anti-A antibodies will react with the A antigens, causing the blood to clump. However, the anti-B antibodies will not do anything, because there are no B antigens in her blood.

Station 2

Deer tendons attach the muscle to the bones, allowing for movement. They are flexibile but not particularly elastic, allowing the joints to move but still providing stability. Dog hair helps to keep the dog warm and protect it from dust and dirt. Porcupine needles are used for defense. They are barbed, which makes them difficult to remove.

Collagen forms the deer tendons, keratin forms the dog hair and porcupine needles.

Station 3

Each amino acid has the formula, $C_2H_5O_2N$.

The amino acids join together through dehydration synthesis, where the OH from the carboxyl group of one amino acid and the H from the amino group of another amino acid are removed. A peptide bond if romed between carbon and nitrogen.

Station 4

The egg albumin dissolves and loses its structure. The process is irreversable even if the egg is transfrered to a neutral solution. This is because denaturation has occured, which is a process where the protein unfolds and loses its structure. It is very difficult to make the protein refold into its original shape.

Albumin in chicken eggs stores the amino-acids and proteins for the growing embryo.

Station 5

Lab work

The dog hair, when burnt, smells unpleasant. It differs from the smell of burning wax and sugar, which smell sweet.

Write up

The sulfur atoms from cysteine and methionine that are released when burning the dog hair might give off the foul smell, as they are usually associated with decaying matter.