

Topic 3: Organic and Biological Chemistry

1.

(a) $C_{15}H_{22}O_3$

(b) ester

(c)

(i) reflux

(ii) Water enters at B and leaves at A. This fully surrounds the hot gases and cools them, condensing them back into a liquid so they aren't lost during the reaction.

(iii) 2-ethylhexan-1-ol

(iv) Increases the yield of octyl salicylate (shifts the equilibrium position to the right).

2.

(a) oxidation

(b) primary

(c)

(i) CH_3COO^-

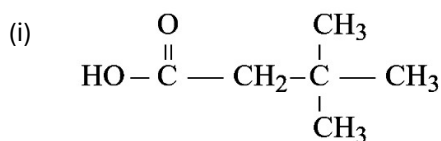
(ii) Acidified dichromate is a strong oxidising agent that will oxidise both the unreacted ethanol (primary alcohol) and the produced ethanal (aldehyde) into ethanoic acid. Therefore, it would change colour even if no ethanal is present.

(iii) monosaccharide

(iv) It is not polyhydroxy.

(v) Glucose in solution forms an equilibrium with a form that has an aldehyde group. It will therefore react with Tollens' reagent (produce a silver mirror) even if there is no ethanal present.

(d)



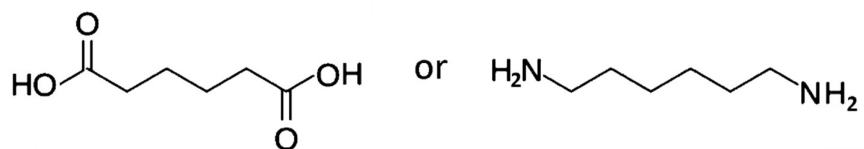
(ii) 3,3-dimethyl butanoic acid

3.

(a)

(i) When two organic molecules combine to form a larger molecule and a small molecule.

(ii)



(iii) It is not an amino acid

(b)

(i) amide

(ii) hydrogen bonding

(iii) The activation energy is too high.

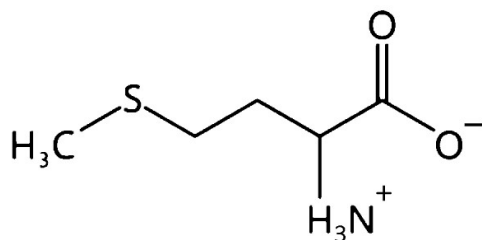
(iv) hydrolysis

(c)

(i) covalent

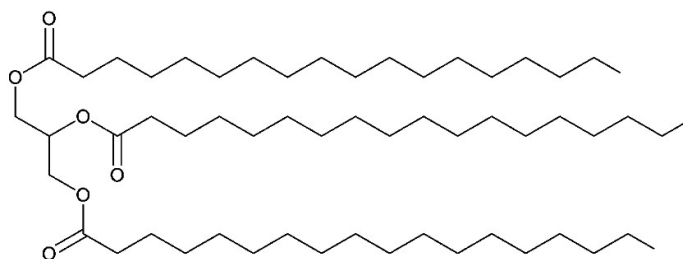
(ii) Low pH increases H^+ concentration which will cause the NH to be protonated. The hydrogen bonding there will be replaced with stronger ion-dipole forces, which could alter the spatial arrangement of the protein. Since the protein's function depends on its unique spatial arrangement, this will reduce its effectiveness.

(iii)



4.

(a)

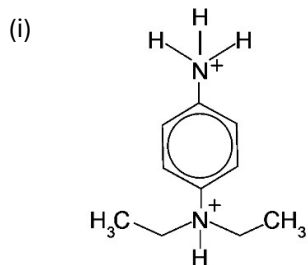


- (b) Glyceryl stearate has a higher melting point than glyceryl oleate (glyceryl stearate is a solid at room temperature, while glyceryl oleate is a liquid). This is because stearic acid chains are saturated and straight, allowing them to pack tightly together and maximize dispersion forces whereas oleic acid chains contain a C=C double bond (alkene group) preventing this.
- (c) Add a drop of bromine or iodine water. The glyceryl oleate mixture will decolourise whereas the glyceryl stearate mixture will remain orange/brown.
- (d) X
- (e)
- (i) 5
- (ii) Not likely to dissolve in water. It mainly consists of large nonpolar chains (that will exhibit dispersion forces between molecules of the compound) and cannot form effective hydrogen bonds with water.
- (iii) Add a small amount of distilled water to the separating funnel and observe which layer increases in volume. The layer that expands is the aqueous layer.
- (iv)
- (A) ethanoic acid
- (B) $2\text{CH}_3\text{COOH} + \text{Na}_2\text{CO}_3 \rightarrow 2\text{CH}_3\text{COONa} + \text{H}_2\text{O} + \text{CO}_2$
- (C) effervescence / bubbling / fizzing

5.

(a) primary

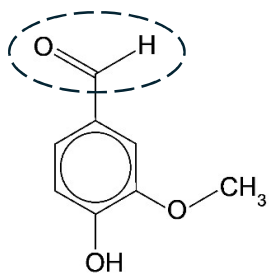
(b)



- (ii) More soluble. The amine groups were able to exhibit hydrogen bonding with water, but this new form can form ion-dipole interactions with water, which are stronger.

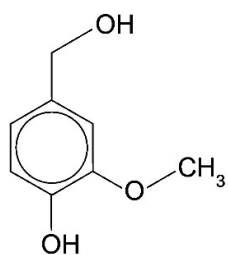
6.

(a)



(b)

(i)



(ii) Orange to green

(iii) To prevent the vanillin being further oxidised (aldehyde to carboxylic acid)

(iv) The sample containing vanillin will form a silver mirror coating on the inside of the test tube, whereas the mixture containing the organic reactant in part (i) will not.

7.

(a) triglyceride

(b) H_2

(c) hydrogenation

(d) alkene

(e) high pressure

(f)

