(f) *(a)* Crosslinking holds polymer strands together. Any deformation of the slime is restored by the crosslinkages between polymer strands.
(b) Crosslinking bonds are broken by sharp pulling of the polymer.
(c) Sharp force on the slime breaks all the crosslinkages along the line of force, leaving the slime broken with a sharp surface.
(d) As the slime passes gently through the hole of the funnel, some crosslinkages are broken and reformed, leaving the polymer with a new shape.
(e) The presence of an acid hydrolyzes the interchain crosslinking bonds, resulting in the slime turning into a liquid.

INVESTIGATION 2.2.1 PREPARATION OF POLYESTER—A CONDENSATION POLYMER

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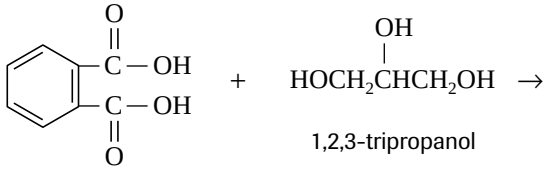
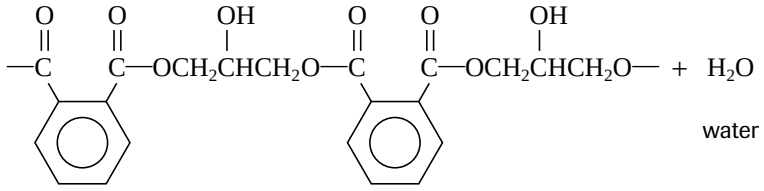
Prediction

(a)



1,2,3-tripropanol

orthophthalic acid



water

glyptal

(b) The hydroxyl group on carbon 2 in glycerol provides opportunity to form ester bonds with orthophthalic acid, forming strong crosslinkages; therefore, you can predict a hard plastic which does not soften on heating. It will be insoluble in water, but may be soluble in an organic solvent such as acetone.

Analysis

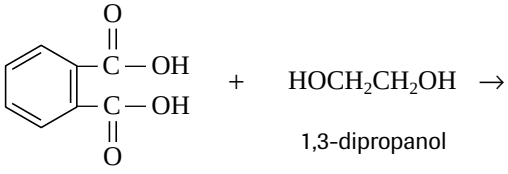
(c) Sample properties: hard, clear, strong solid; insoluble in water but soluble in acetone (paint thinner or nail polish remover).
(d) It hardens quickly to form a protective coating that is insoluble in water. It is miscible with organic solvents that may be present in paints.

Evaluation

(e) Heating two component monomers together will produce a polymer with the desired properties.

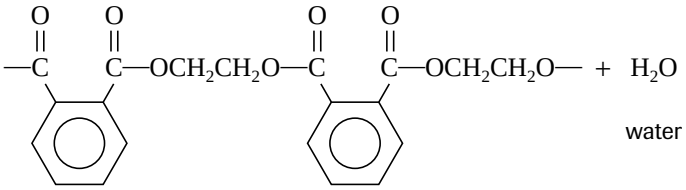
Synthesis

(f) 1,2-ethandiol does not contain the extra hydroxyl group that is present on carbon 2 of glycerol. Thus, it is not capable of forming strong covalent bonds as crosslinkages between polymer chains. The prediction should be that this product is not as strong and hard as Glyptal, and softens on heating.



1,3-dipropanol

orthophthalic acid



water

polymer

ACTIVITY 2.7.1 MAKING SOAP

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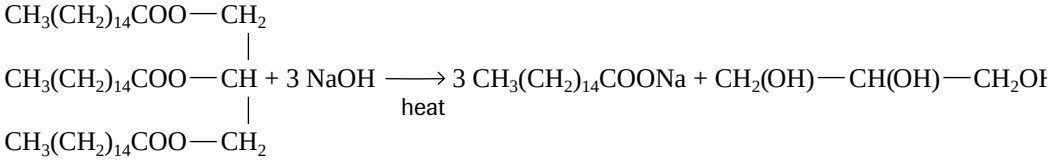
Analysis

(a) In saponification, an ester bond is broken and a carboxylic acid (salt) and an alcohol are recovered. In esterification, a carboxylic acid and an alcohol react to form an ester bond.

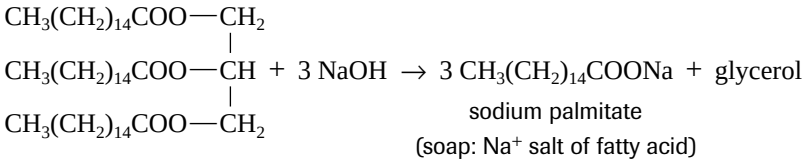
(b) If difference exists, it may be explained by differences in saturation of fats and oils and intermolecular forces in saturated and unsaturated hydrocarbon components of fatty acids.

(c) Soap molecules have a polar end (the ion end) and a nonpolar end (the hydrocarbon end).



palmitin (triglyceride) | sodium palmitate (soap: Na^+ salt of fatty acid) | glycerol

(d) (Sample answer)



sodium palmitate (soap: Na^+ salt of fatty acid)

(e) Filtrate may contain NaCl, NaOH, vinegar, and glycerol.

CHAPTER 2 SUMMARY

Make a Summary

(Page 144)

Polymer	Monomer(s)	Example	Structure	Properties
synthetic polyesters	ester			
synthetic polyamides	amide			
proteins	amino acids			
nucleic acids	sugar, base phosphate			
carbohydrates	monosaccharides			