Level 3 Chemistry: practice paper 2026

AS 91391 Demonstrate understanding of the properties of organic compounds · Vertex Academy practice paper, not an NZQA paper

Attempt ALL the questions. Show ALL working. Write your answers on lined paper, or in the space under each question.

QUESTION ONE

(a) Propanal and propanone both have the molecular formula C_3H_6O.
Give the condensed structural formula of each, name the functional group in each, and state what type of isomers they are.

(b) Each compound is warmed with Tollens' reagent.
Describe what you would observe for each, and name the organic product of any reaction.

(c) Lactic acid, 2-hydroxypropanoic acid, $CH_3CH(OH)COOH$, forms when milk turns into yoghurt. Explain why lactic acid exists as two optical isomers (enantiomers), and how the two isomers could be told apart.

(d) Lactic acid, $CH_3CH(OH)COOH$, is heated separately with:
(i) ethanol and a few drops of concentrated sulfuric acid
(ii) acidified potassium dichromate.
Discuss both reactions: name the type of each reaction and the organic product, and explain whether each product is optically active (starting from one enantiomer of lactic acid).

QUESTION TWO

(a) 1-bromopropane, $CH_3CH_2CH_2Br$, is warmed separately with (i) aqueous potassium hydroxide and (ii) concentrated ammonia in ethanol.
Name the organic product of each reaction and the type of reaction.

(b) Propan-1-ol is heated under reflux with acidified potassium dichromate.
Name the organic product, describe the colour change and name the type of reaction. Name the product formed if, instead, the product is distilled off as soon as it forms.

(c) Methyl propanoate can be made from propanoic acid in two ways:
Route 1: heat propanoic acid with methanol and a little concentrated sulfuric acid.
Route 2: react propanoic acid with thionyl chloride, $SOCl_2$, then add methanol to the product.
Give the structure of methyl propanoate and of the intermediate in Route 2, and explain why Route 2 gives a higher yield of ester.

(d) Methyl propanoate is heated separately with (i) dilute hydrochloric acid and (ii) sodium hydroxide solution.

Discuss both reactions, naming the organic products, and explain why the reaction with sodium hydroxide goes to completion but the reaction with acid does not.

QUESTION THREE

(a) Name the type of polymer, and the linkage joining the monomers, in each of these: nylon-6,6; polyethylene terephthalate (PET) in drink bottles; keratin, the protein in wool.

(b) Two glycine molecules, H_2NCH_2COOH, join to form a dipeptide.
Give the structure of the dipeptide, name the linkage formed, and name the other product and the type of reaction.

(c) A polyester (PET) shirt is splashed with concentrated sodium hydroxide solution, and soon holes appear where the splashes landed.
Explain why, naming the type of reaction and the products.

(d) Part of a polymer chain is shown:

-NH-CH_2-CH_2-NH-CO-CH_2-CH_2-CO-NH-CH_2-CH_2-NH-CO-CH_2-CH_2-CO-

Discuss the two monomers it was made from, the type of polymerisation, and the organic products when the polymer is hydrolysed by (i) hot dilute hydrochloric acid and (ii) hot sodium hydroxide solution.

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