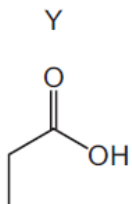


**1. Nov/2022/Paper\_11/No.38**

Which compounds can be used to make Y in a single-step reaction?



- 1 propanenitrile
- 2 ethanenitrile
- 3 propyl ethanoate
- 4 ethyl propanoate

**A** 1 and 3

**B** 1 and 4

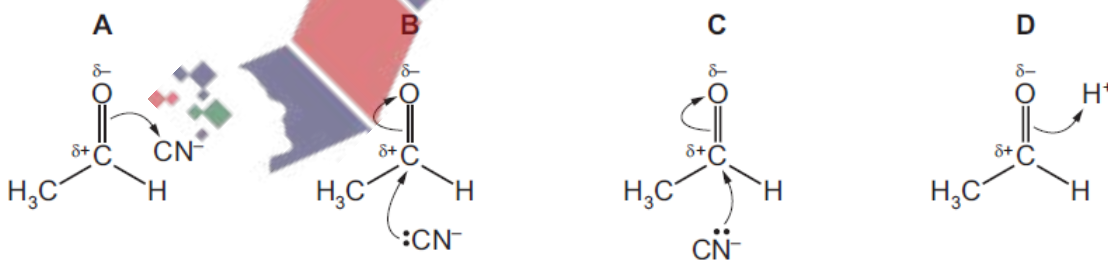
**C** 2 and 3

**D** 2 and 4

**2. Nov/2022/Paper\_11/No.34**

Ethanal reacts with hydrogen cyanide in the presence of KCN to produce a hydroxynitrile.

What is the first step in the mechanism of this reaction?



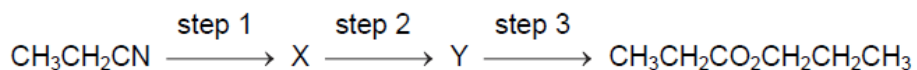
3. Nov/2022/Paper\_12/No.37

Propyl propanoate can be synthesised in three steps using propanenitrile as the only organic starting material.

In step 1, the nitrile is converted into compound X.

In step 2, compound X is converted into compound Y.

In step 3, compound Y is reacted with more of compound X to give propyl propanoate.



Which reagents are suitable for carrying out step 1 and step 2?

	step 1	step 2
<b>A</b>	HCl(aq)	conc. H <sub>2</sub> SO <sub>4</sub>
<b>B</b>	HCl(aq)	LiAlH <sub>4</sub>
<b>C</b>	NaOH(aq)	conc. H <sub>2</sub> SO <sub>4</sub>
<b>D</b>	NaOH(aq)	NaBH <sub>4</sub>

4. Nov/2022/Paper\_22/No.3(d)

(d) **C2** can be synthesised using **A1** as a single organic reactant.



Devise a multi-step synthetic route to form **C2** from **A1**.

Identify relevant reagents and conditions, and state the organic products of each step.

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[3]