Chemistry

Higher level

Paper 1B

Practice paper

Topic: Organic Chemistry

Chemistry

Higher level

Paper 1B

Specimen paper

1 hour

Instructions to candidates

- Answer all questions.
- Answers must be written within the answer boxes provided.
- A calculator is required for this paper.
- The maximum mark for paper 1B is [35 marks].

Section B

1. The laboratory synthesis of phenylamine from benzene involves specialized conditions and multiple steps.

(a) State the reagents required for the nitration of benzene. **[2]**

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(b) Outline the reaction conditions necessary to subsequently reduce nitrobenzene to phenylamine. **[2]**

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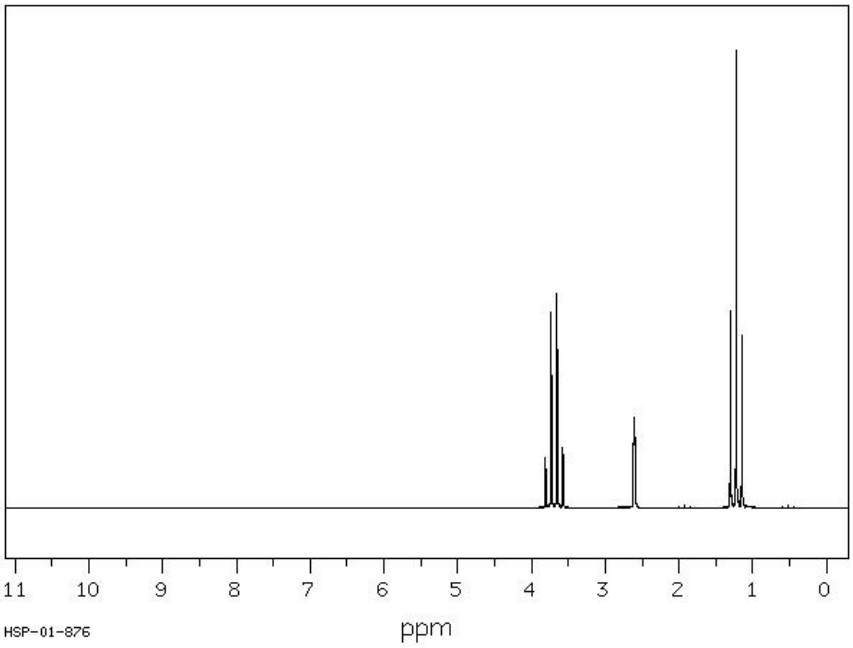
2. Compound X, with molecular formula C_2H_6O, was analyzed using ^1H NMR spectroscopy. The resulting high-resolution spectrum is shown below.



(a) Deduce the structural identity of Compound X using the multiplicity (splitting patterns) presented in the spectrum. **[3]**

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(b) Compound X's mass spectrum contains a prominent peak at m/z = 31. Identify the specific fragment ion responsible for this peak. **[1]**

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3. 2-bromobutane is a chiral molecule that can undergo nucleophilic substitution with hydroxide ions under differing conditions.

(a) Explain why the product of this reaction forms a racemic mixture if the mechanism proceeds exclusively via S_N1. **[3]**

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4. An unknown hydrocarbon has an Index of Hydrogen Deficiency (IHD) of exactly 2 and contains 4 carbon atoms.

(a) Identify two potential structures for this hydrocarbon that belong to entirely different homologous series. **[2]**