

**Max. Marks : 27 Marks**

**Time : 27 Minutes**

(a) A chemist discovered four unlabelled bottles of liquid, each of which contained a different pure organic compound. The compounds were known to be propan-1-ol, propanal, propanoic acid and 1-chloropropane.

Your answer should include the name of the organic compound, the reagent(s) used and the expected observation for each test.

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

**(8)**

- (b) A fifth bottle was discovered labelled propan-2-ol. The chemist showed, using infrared spectroscopy, that the propan-2-ol was contaminated with propanone.

The chemist separated the two compounds using column chromatography. The column contained silica gel, a polar stationary phase.

The contaminated propan-2-ol was dissolved in hexane and poured into the column. Pure hexane was added slowly to the top of the column. Samples of the eluent (the solution leaving the bottom of the column) were collected.

- Suggest the chemical process that would cause a sample of propan-2-ol to become contaminated with propanone.

- State how the infrared spectrum showed the presence of propanone.
- Suggest why propanone was present in samples of the eluent collected first (those with shorter retention times), whereas samples containing propan-2-ol were collected later.

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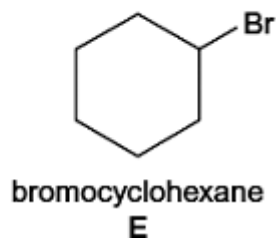
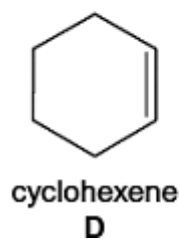
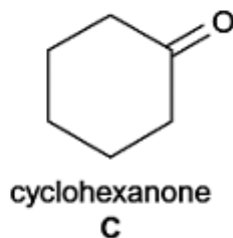
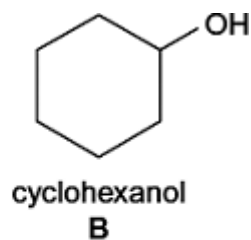
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(4)

(Total 12 marks)

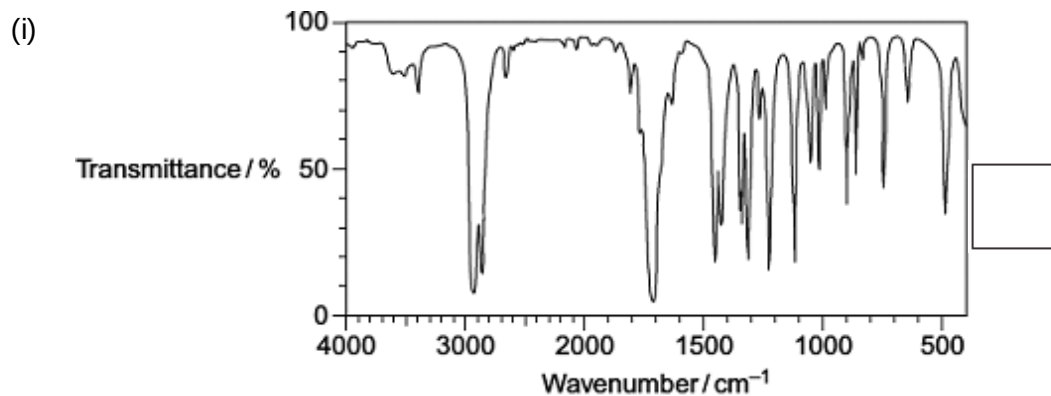
Q2.

Consider the five cyclic compounds, **A**, **B**, **C**, **D** and **E**.

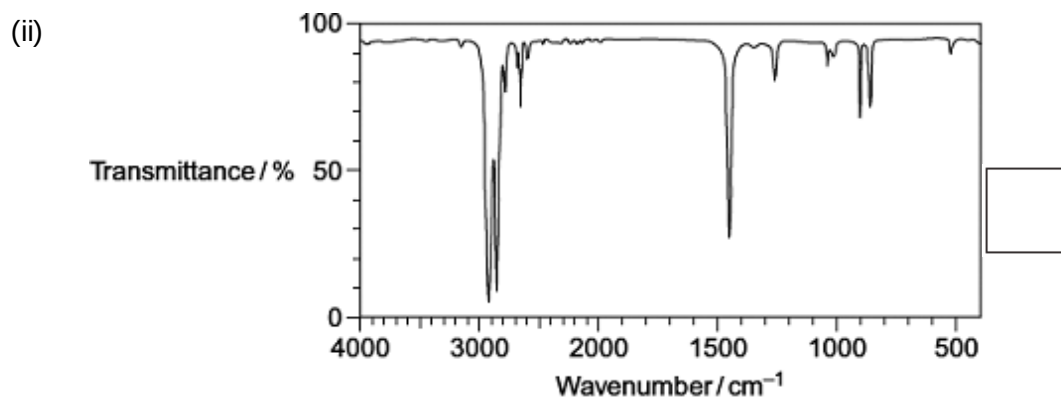


- (a) The infrared spectra of compounds **A**, **B**, **C** and **D** are shown below.

Write the correct letter, **A**, **B**, **C** or **D**, in the box next to each spectrum. You may find it helpful to refer to **Table 1** on the Data Sheet.

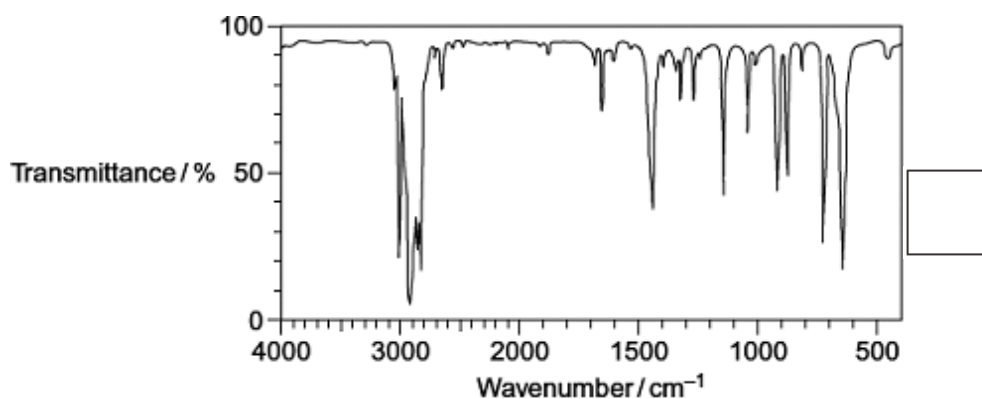


(1)



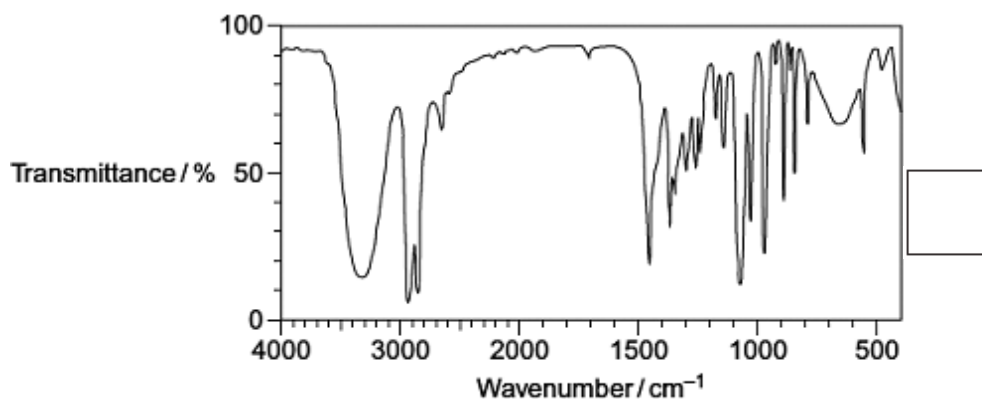
(1)

(iii)



(1)

(iv)



(1)

- (b) A simple chemical test can be used to distinguish between cyclohexane (**A**) and cyclohexene (**D**).  
Give a reagent for this test and state what you would observe with each compound.

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(3)

- (c) Cyclohexanol (**B**) can be converted into cyclohexanone (**C**).

Give a reagent or combination of reagents that can be used for this reaction and state the type of reaction.

State the class of alcohols to which cyclohexanol belongs.

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(3)

- (d) Cyclohexane (**A**) can be converted into bromocyclohexane (**E**) by a reaction that is similar to the reaction of methane either with chlorine or with bromine.

Name and outline a mechanism for the reaction of methane ( $\text{CH}_4$ ) with bromine to form bromomethane ( $\text{CH}_3\text{Br}$ ). Give **one** condition for this reaction to occur.

Write an equation for each step in your mechanism.

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(5)

(Total 15 marks)