

Name:

Target grade:

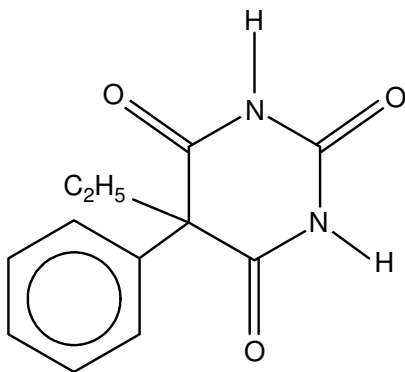
Mark: / 37

Actual grade:

Percentage:

Homework 10 - NMR

1. Phenobarbital is a medicine which is used for the treatment of epilepsy. It is able to cross the blood/brain barrier better than many other substances.



phenobarbital

- (i) Name the CONH group.

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[1]

- (ii) The proton n.m.r. spectrum of phenobarbital has shifts at 1.0 and 1.4 from protons attached to carbon atoms. Explain the origin of these shifts, relating them to part of the molecule and give the relative areas of the peaks.

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[3]

[Total 4 marks]

2. In this question, two marks are available for the quality of the use and organisation of scientific terms.

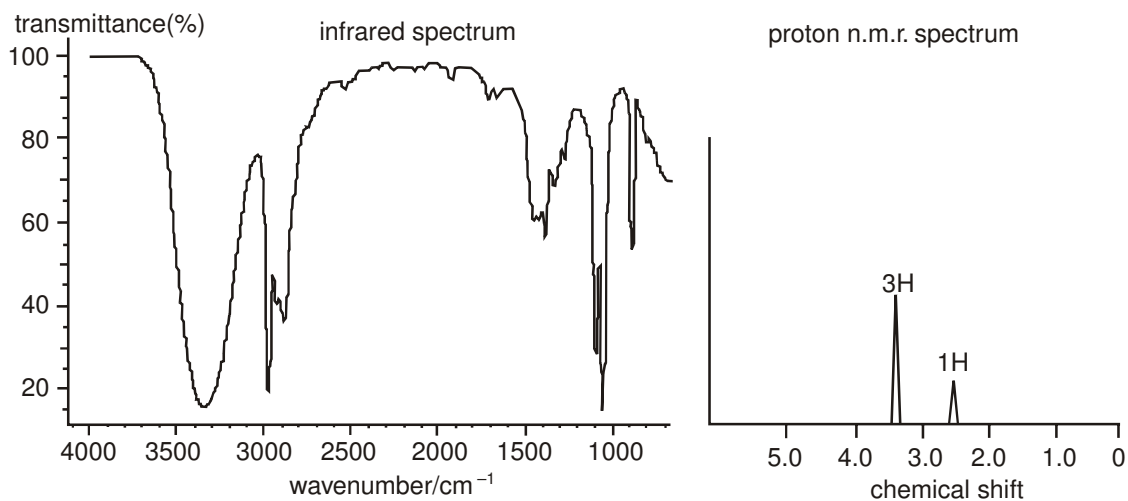
Name:

Shown below are the infrared and proton n.m.r. spectra of **compound Y** that is known to be one of:

methanol, methanal or methanoic acid.

Give **two** pieces of evidence from the **infrared** spectrum to identify the compound.

Give **two** pieces of evidence from the **n.m.r.** spectrum that confirm your identification.



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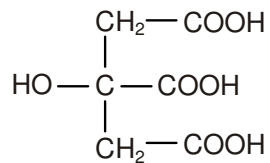
[5]

Quality of Written Communication [2]

[Total 7 marks]

Name:

3.



citric acid, C₆H₈O₇

In this question, two marks are available for the quality of use and organisation of scientific terms.

The mass spectrum, infrared spectrum and proton n.m.r. spectrum of citric acid are studied by a student. Describe and explain **one** important feature from each spectrum that would be characteristic of citric acid.

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[6]

Quality of Written Communication [2]

[Total 8 marks]

Name:

4. In this question, two marks are available for the quality of use and organisation of scientific terms.

Ethanal and **ethanoic acid** can be distinguished by their infrared spectra but their proton n.m.r. spectra are rather similar.

Describe and explain

- **two important differences** between their i.r. spectra
- **two similarities** of their n.m.r. spectra.

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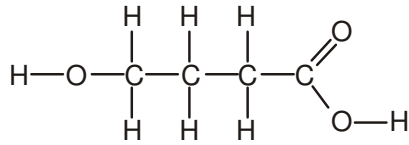
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[8]
Quality of Written Communication [2]
[Total 10 marks]

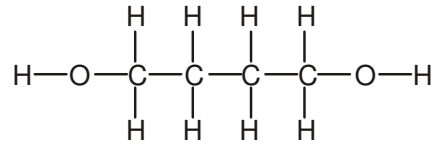
Name:

5. In this question, two marks are available for the quality of the use and organisation of scientific terms.

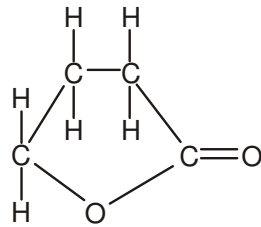
The substance GHB was originally designed for use in sleeping pills. However, other drug-related uses were found for the substance and its sale was restricted in 2003. GHB stands for gamma-hydroxybutyric acid, an old name for the structure shown below.



GHB



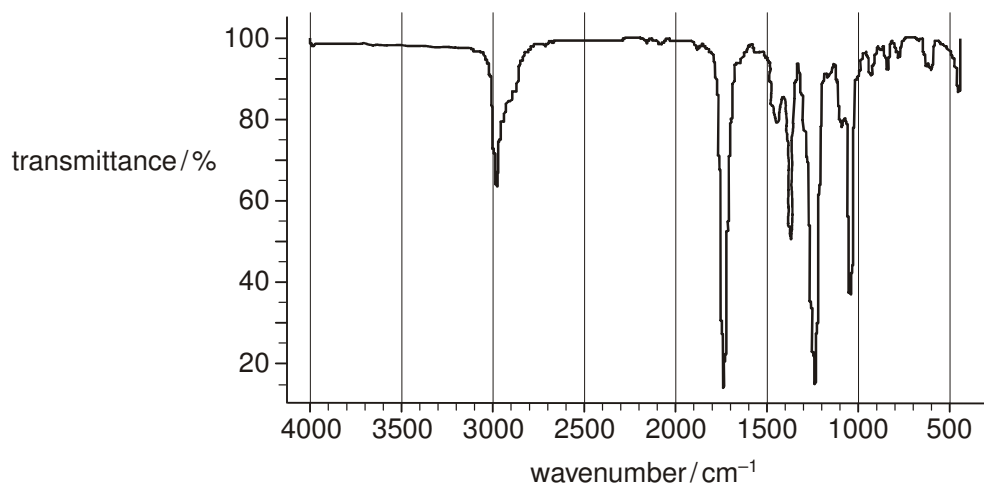
GHB alcohol



GBL

Name:

The infrared spectrum of one of the compounds described in this question is shown below.



Use the *Data Sheet* to identify the substance, giving your reasoning. Then describe the proton n.m.r. spectrum of this compound.

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Quality of Written Communication [2]

[Total 8 marks]