

Practice Question Set For A-Level
Subject : Chemistry
Paper-2 Topic: Organic analysis

Name of the Student: _____

Max. Marks : 20 Marks

Time : 20 Minutes

Q1.

This question is about fuels.

- (a) Crude oil is separated into fractions by fractional distillation.

State the meaning of the term 'fraction' in this context.

(1)

- (b) Petrol for cars contains branched and cyclic alkanes produced by catalytic cracking.

Identify the catalyst used in this process.

(1)

- (c) 3-Ethyl-4-methylhexane is a branched alkane in petrol.

Draw the skeletal formula of this alkane.

(1)

- (d) Give the equation for the complete combustion of 3-ethyl-4-methylhexane.
Use the molecular formula for 3-ethyl-4-methylhexane in your equation.

(2)

- (e) Carbon dioxide is a product from the combustion of petrol in cars. Carbon dioxide acts as a greenhouse gas when it absorbs infrared radiation.

Give **one** reason why carbon dioxide absorbs infrared radiation.

(1)

- (f) Nitrogen monoxide (NO) is formed when petrol is burned in cars.

State **one** environmental problem that NO causes.

State what is used to remove NO from the exhaust gases formed in petrol-fuelled cars.

Environmental problem _____

Removal of NO _____

(2)

- (g) Petrol sold in the UK contains 10% bioethanol. Bioethanol is ethanol made from crops by fermentation and is considered to be carbon-neutral.

State what is meant by the term 'carbon-neutral'.

(1)

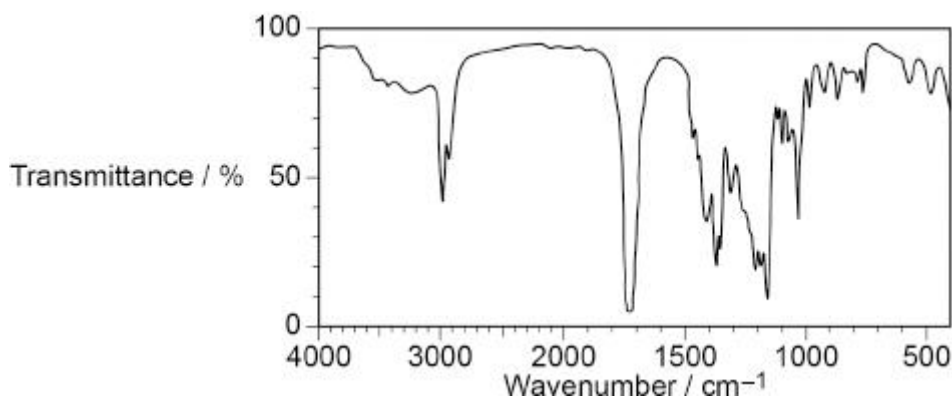
(Total 9 marks)

Q2.

This question is about compound **Z**, with molecular formula $C_7H_{12}O_3$

Figure 1 shows the infrared spectrum of **Z**.

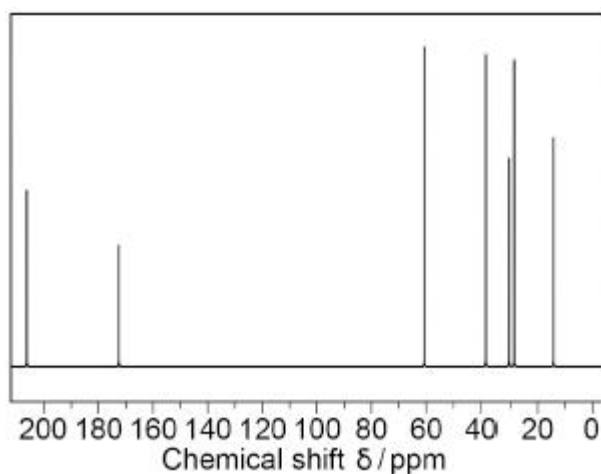
Figure 1



- (a) Identify the bond that causes the absorption at 1725 cm^{-1}

Figure 2 shows the ^{13}C NMR spectrum of **Z**.

Figure 2



(1)

- (b) How many different carbon environments are there in a molecule of **Z**?

	5	6	7	8
Tick ☒ one box	☐	☐	☐	☐

(1)

- (c) State the type of carbon environment that causes the peak at $\delta = 174\text{ ppm}$

Use **Table C** in the Data Booklet to help you answer this question.

(1)

- (d) the table below shows data from the ^1H NMR spectrum for compound **Z**.

Chemical shift δ / ppm	4.10	2.60	2.56	2.19	1.26
Integration ratio	2	2	2	3	3
Splitting pattern	quartet	triplet	triplet	singlet	triplet

Explain what can be deduced from the splitting patterns and chemical shift values for the peaks at $\delta = 4.10$ ppm and at $\delta = 1.26$ ppm

Deduce the part of the structure of **Z** that causes the peaks at $\delta = 4.10$ ppm and $\delta = 1.26$ ppm

Use **Table B** in the Data Booklet to help you answer this question.

Peak at $\delta = 4.10$ ppm _____

Peak at $\delta = 1.26$ ppm _____

Part of structure

(5)

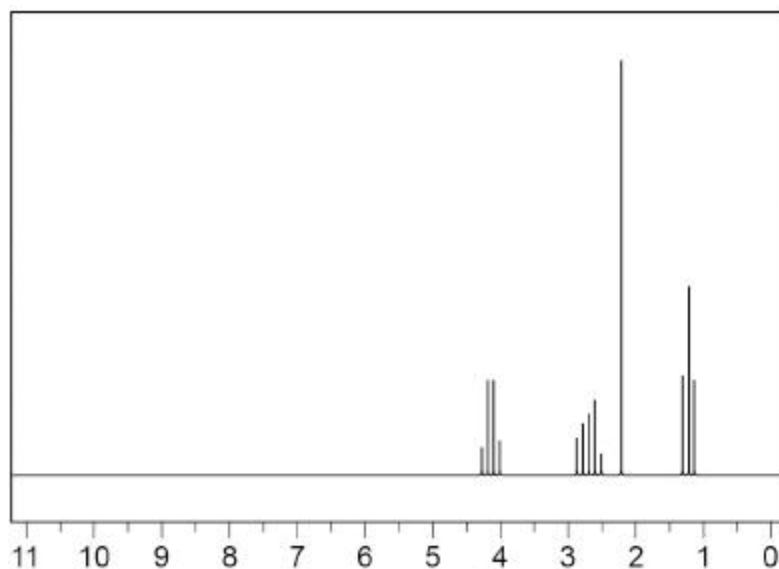
- (e) Deduce the part of the structure of **Z** that causes the peak at $\delta = 2.19$ ppm

Part of structure

(1)

Figure 3 shows the ^1H NMR spectrum of compound **Z**.

Figure 3



- (f) Suggest why it would be difficult to determine the structure of **Z** using the spectrum in **Figure 3**, without the information in the table in part (d).

(1)

- (g) Deduce the structure of **Z**.

(1)

(Total 11 marks)