

## Chemistry

## Section I – Part B (continued)

Marks

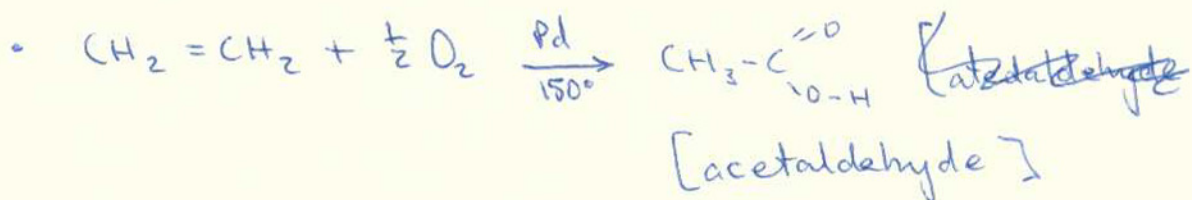
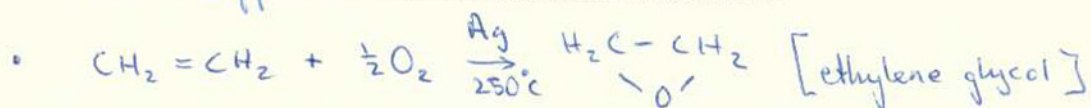
## Question 25 (6 marks)

Explain the need for monitoring the products of a chemical reaction such as combustion.

6

Reactions like the combustion of ethene must be monitored. The same ~~reactants~~ reactants can form different products under different conditions. Combustion of a substance in sufficient oxygen <sup>is</sup> results in complete combustion, resulting in carbon dioxide and water. In the example of ethene:

$$\text{C}_2\text{H}_4 + 3\text{O}_2 \rightarrow 2\text{CO}_2 + 2\text{H}_2\text{O}$$
 Without sufficient oxygen, combustion can produce products of carbon (black and sooty) or carbon monoxide (or a mixture of the two) as well as water: 
$$\text{C}_2\text{H}_4 + 2\text{O}_2 \rightarrow 2\text{CO} + 2\text{H}_2\text{O}$$
 Here, carbon monoxide, which is poisonous to living organisms, is produced. Other products can also be produced from ethene under different conditions:



∴ In all of the above reactions, the same reactants are used but different conditions & (such as temp. and catalyst) form diff. products, many of which can be toxic. So the products and the conditions must be monitored for safety, but also to maximise yield.

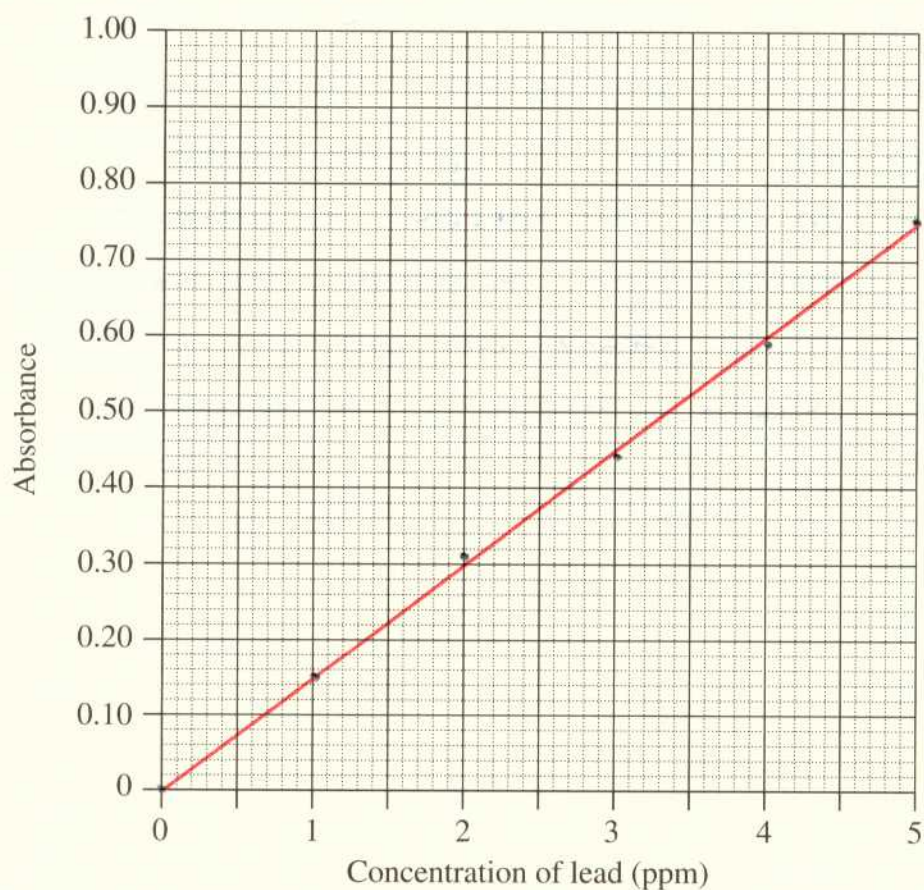
**Question 26** (4 marks)

A university student decided to measure the concentration of lead (Pb) in the soil around his home. He prepared five standard lead solutions of known concentration. The absorbance of these solutions was measured. These results are shown in the table.

<i>Concentration of lead standard (ppm)</i>	<i>Absorbance</i>
0	0.00
1	0.15
2	0.31
3	0.44
4	0.59
5	0.75

- (a) Draw a line graph of these data.

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**Question 26 continues on page 23**

Question 26 (continued)

- (b) The student prepared solutions from four different soil samples around his home. These solutions were also analysed using the same method. The results are shown in the table. 1

<i>Solutions made from soil samples</i>	
<i>Area sampled</i>	<i>Absorbance</i>
Front garden bed	0.19
Back garden bed	0.09
Mail box	0.22
Back fence	0.11

Determine the highest concentration of lead in the soil around the home.

At the mailbox: approximately 1.5 ppm

- (c) State an hypothesis to account for the variation in lead concentration around the student's home. 2

The highest lead concentration occur at the front of the house - closer to the road. The lead may have formed/accumulated from the long term absorption of the exhaust of cars using leaded petrols.

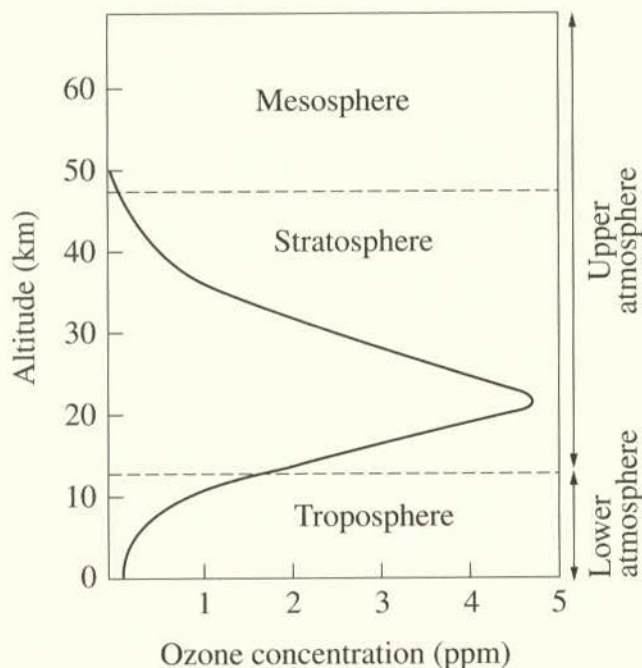
**End of Question 26**

**Please turn over**

## Question 27 (4 marks)

Oxygen exists in the atmosphere as the allotropes oxygen and ozone. The graph shows a typical change in ozone concentration with changing altitude.

4



Compare the environmental effects of the presence of ozone in the upper and lower atmosphere.

- Ozone in the upper atmosphere has a positive effect on the environment. It protects living organisms from harmful ~~the~~ short wavelength U.V. radiation (u.v.-c) which can cause skin cancers and melanomas (mutations in DNA polymers). This ozone also protects many synthetic polymers ~~from~~ (to an extent) from degradation. The ozone absorbs the U.V. light :  $O_3 + \text{u.v. light} \rightarrow O + O_2$
- On the other hand, ozone in the lower atmosphere is harmful and toxic to the environment. It can aggravate respiratory problems in humans and cause premature fatigue. It also ~~a~~ is a major constituent of photochemical smog which can have harmful effects on the environment, particularly plants as the amount of sunlight present for photosynthesis can decrease.