

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.

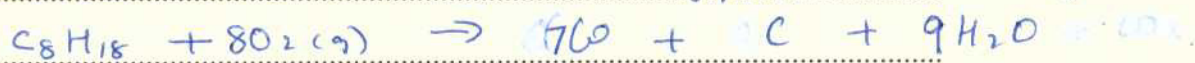
6

There is a need for monitoring the products in a chemical reaction such as combustion because the conditions at which it occurs will affect the product that will be produced in the reaction, eg, in combustion with plentiful of oxygen and high temp,

$$\frac{25}{2} O_2(g) + C_8H_{18} \rightarrow 8CO_2 + 9H_2O$$

total - complete combustion will take place.

In combustion with insufficient oxygen and low temp,



∴ incomplete combustion will occur. The product produced in this reaction, carbon monoxide, is environmentally threatening.

This is why chemical reaction must be monitored, to make sure it produce the desire product instead of products which will be harmful to the environment on release.

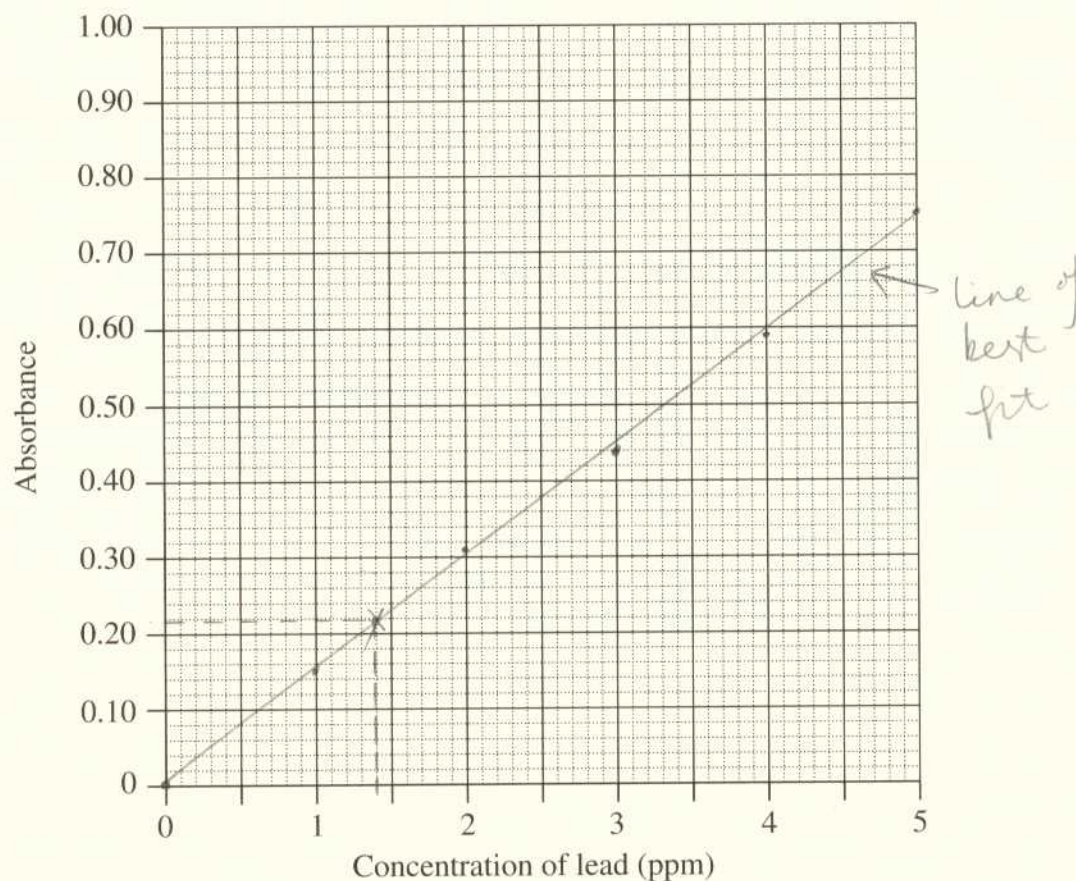
Question 26 (4 marks)

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.

Concentration of lead standard (ppm)	Absorbance
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.

..... Mail box - 0.22 absorbance \Rightarrow 1.4 ppm

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

The mail box is in front of the house outside whereas all areas are inside the front fence or in backyard. Due to the pollutants from cars that use leaded petrol driving past the soil is contaminated by the car exhaust and absorbs the lead hence it has the highest concentration. Whereas the back garden bed is in the back of house away from pollutants hence has the least concentration.

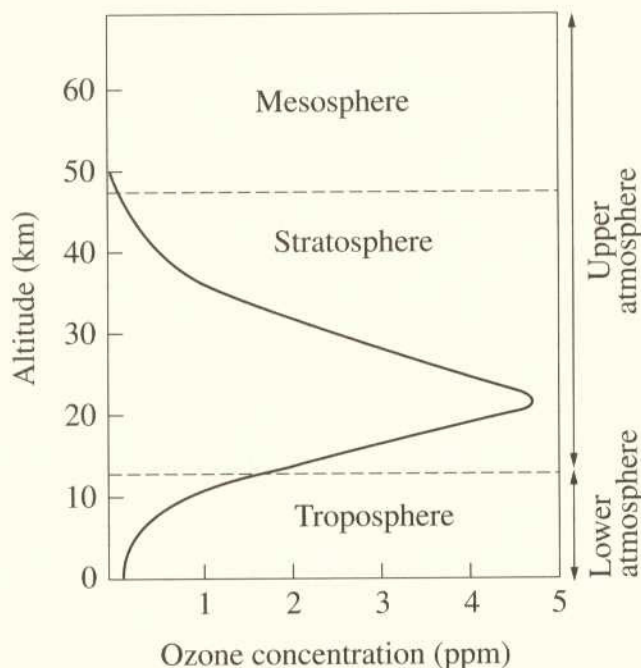
End of Question 26

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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.

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

Ozone (O_3) in the upper atmosphere is a favourable thing as it shields us from high energy UV-B rays which can lead to increased cancers, etc. ^{and ill functioning of organisms} if they are allowed through. ^{to the lower atmosphere} On the other hand O_3 in the lower atmosphere (or troposphere) can be seen as a toxic pollutant present in photochemical smog (primarily in cities). Here it exacerbates lung irritation in asthmatics, irritates eyes and may potentially damage the functioning of plants as it may oxidise (O_3 is a strong oxidant) necessary proteins, ~~that~~ whilst promoting the greenhouse effect. Thus, whilst O_3 is ~~a~~ favourable in the upper atmosphere (stratosphere - 15-50 km) it ~~is~~ poses quite an environmental hazard at lower altitudes.