2001 HIGHER SCHOOL CERTIFICATE EXAMINATION

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**

Under ~~different~~ different conditions, chemical reactions can produce different products. Some of these products are often very poisonous to humans and the environment. For example, combustion in an internal combustion engine. In high levels of oxygen: $C_8H_{18(g)} + \frac{25}{2}O_{2(g)} \rightarrow 8CO_{2(g)} + 9H_2O_{(g)}$. In low levels: $C_8H_{18(g)} + \frac{17}{2}O_{2(g)} \rightarrow 8CO_{(g)} + 9H_2O_{(g)}$ or even $C_8H_{18(g)} + \frac{11}{2}O_{2(g)} \rightarrow 6C_{(s)} + 2CO_{(g)} + 9H_2O_{(g)}$. The products in the latter 2 reactions are very toxic. In addition, sometimes, sulphur and nitrogen can be combusted in these engines forming very poisonous gases of sulphur dioxide and nitrogen oxides which can also form acid rain. Because of the harmful products that can be produced, the reactions need careful monitoring.

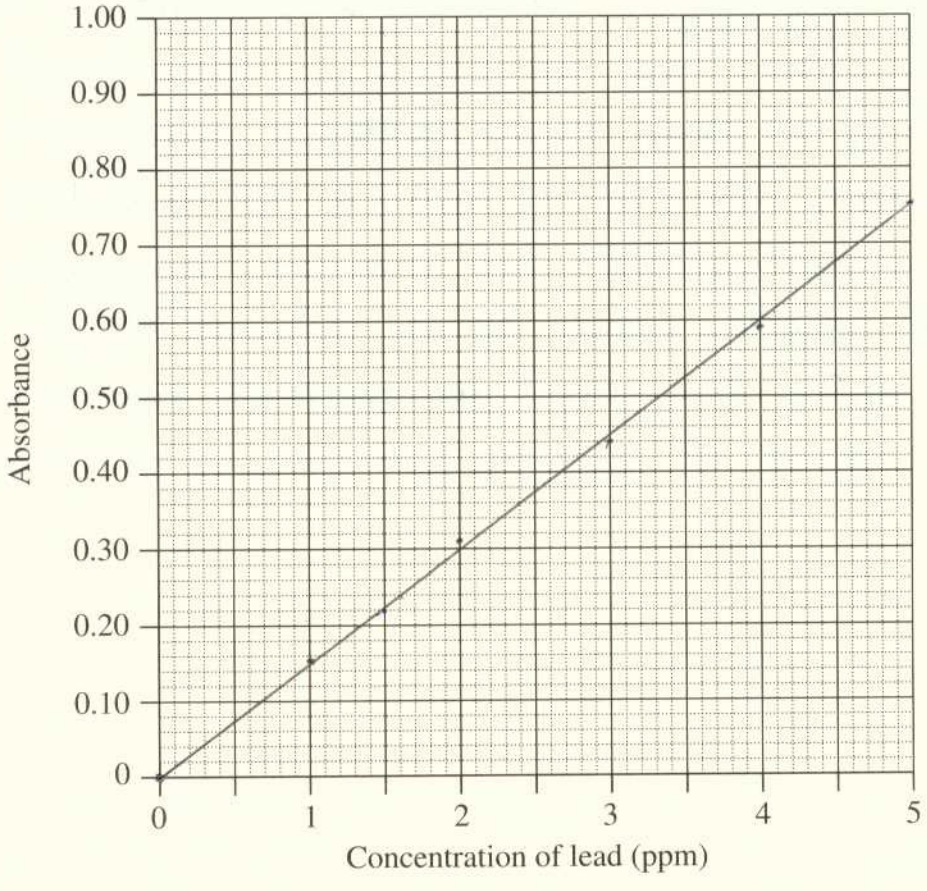
Marks

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. **1**



Question 26 continues on page 23

Marks

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**

Solutions made from soil samples	
Area sampled	*Absorbance*
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.

Approx 1.5 p.p.m.

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

The front garden and mail box soils are exposed to more to Car exhausts which contain lead that accounts for their higher concentration. The back garden and fence have a low concentration due to less exposure to exhaust gases. The back fence soil has a higher concentration than the garden, maybe the fence contains a lead part which is slightly dissolving in the soil.

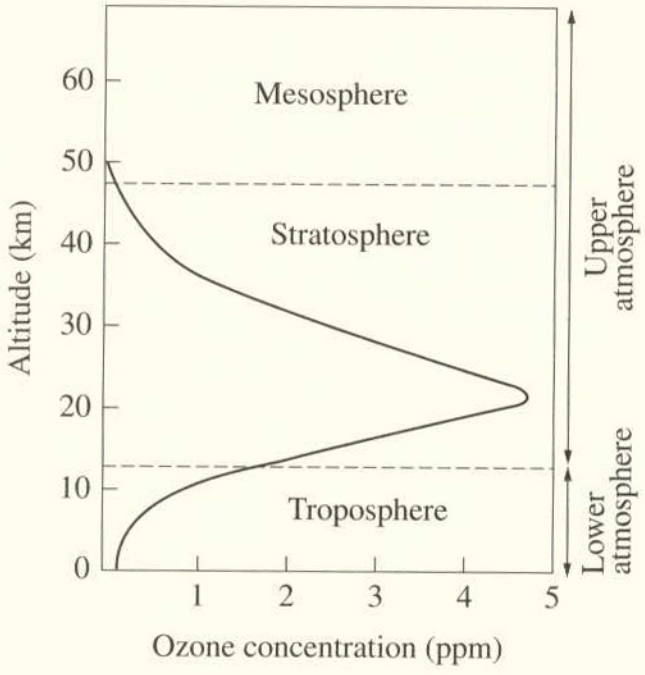
End of Question 26

Please turn over

Marks

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.

Presence of ozone in the troposphere is poisonous and harmful to humans and animals. It causes breathing difficulty and ~~irritating~~ irritation in the respiratory system. ~~The~~ In contrast, the presence of ozone in the stratosphere is very useful as it acts as a radiation shield to absorb the harmful shortwavelength radiations, eg. UV-B and UV-C. These UV radiation can cause alot of damage if it reaches Earth surface. Some of UV-B does reach earth, they cause cancer and sunburns. ~~but~~ But none of UV-C reaches Earth, if it does it is able to break down the polymers and complex molecules in our body to cause them to malfunction.