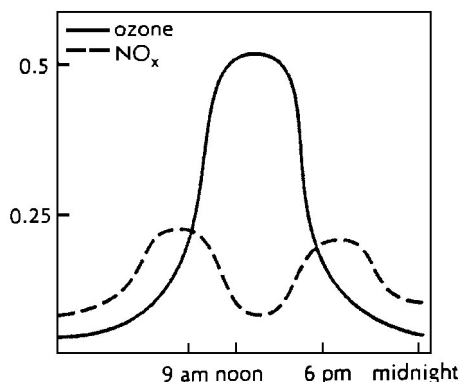


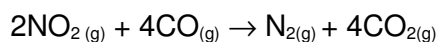
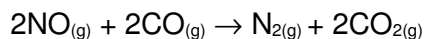
**Elemental & Environmental Chemistry****Assignment 4**

- Calculate the pH of the following solutions:
  - 0.05 mol.L<sup>-1</sup> hydrochloric acid /1
  - 0.20 mol.L<sup>-1</sup> HNO<sub>3(aq)</sub> /1
  - 0.04 mol.L<sup>-1</sup> sodium hydroxide /2
  - A solution with an H<sup>+</sup> concentration of 5.4 x 10<sup>-5</sup> mol.L<sup>-1</sup> /1
  - A solution with an OH<sup>-</sup> concentration of 3.7 x 10<sup>-7</sup> mol.L<sup>-1</sup>. /2
- Write equations to show why rain is naturally acidic. /3
- In some areas where industrial pollution is a problem, some streams have a natural ability to neutralise the affect of acid rain. This occurs where streams run over limestone rock (calcium carbonate).
  - Describe, with the aid of equations, the formation of acid rain. /3
  - Explain, using an equation, how limestone can neutralise this acidity. /2
- In some cities of the world acid rain has caused damage to metal structures, particularly iron and aluminium. Explain, with the aid of equations, the effect of acid rain on these two metals. /3
- Another effect of acid rain is the mobilisation of toxic cations. Describe, using an equation, how this occurs. /2
- The graph shows the concentration of ozone (O<sub>3</sub>) and nitrogen oxides (NO<sub>x</sub>) in the air during the course of a sunny day in a large, car dependent city such as Adelaide.



- State the source of the NO<sub>x</sub>. /1
- Suggest a reason for there being two peaks in NO<sub>x</sub> concentration. /1
- Describe, using equations, how ozone is formed from the NO<sub>x</sub>. /3
- State why the concentration of ozone peaks in the middle of the day. /1
- State why tropospheric ozone is classified as a secondary pollutant. /1

7. Platinum is the active component in catalytic converters. It brings about the removal of pollutants by speeding up reactions involving exhaust gases. Two such reactions are:



- (a) Explain, using equations, how nitric oxide and nitrogen dioxide come to be present in the exhaust gases of car engines. /3
- (b) The reactions in the catalytic converter reduce the level of ozone from the troposphere. Explain how the two reactions represented by the equations can bring this about. /2
8. Describe the use of aluminium ions in the removal of suspended matter from water. /2
9. Calcium hypochlorite is added to swimming pools to keep the water sterile and prevent health problems. When the calcium hypochlorite has been added, the pH of the water must be checked, and adjusted. The ideal pH of pool water is 7.5.
- (a) Name the chemical species that brings about the disinfectant action. /1
- (b) Explain the effect of adding calcium hypochlorite on the pH of the pool water. /2
- (c) Suggest a chemical that could be added to the water if the pH becomes too high. /1
- (d) Calculate the hydrogen ion concentration of pool water at ideal pH. /2
10. Explain, using the concept of chemical equilibrium, why it is common to add a base to water that is treated with chlorine gas. /3