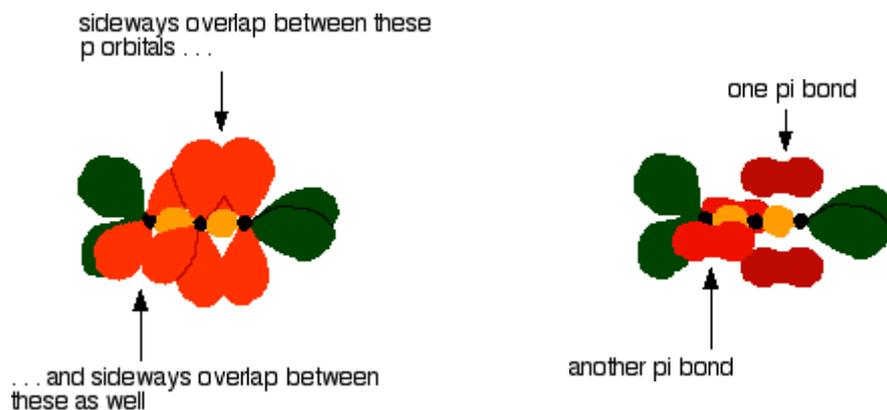


Chemguide – questions

GROUP 4: OXIDES

1. a) Carbon dioxide is structurally different from the other dioxides of Group 4 elements. What simple bit of evidence suggests that that must be the case?
- b) If you work through the way the bonding happens in carbon dioxide, you will end up with the following two diagrams, taken from the Chemguide page:



- (i) In simple terms, what sort of bonds does this show exist between the carbon and oxygen atoms?
- (ii) Why can't something similar happen between silicon (and the rest of Group 4) and oxygen atoms?
- c) What type of structure does silicon dioxide have? Draw a diagram to show one form of SiO_2 .
2. This question contains some detailed acid-base chemistry of the Group 4 oxides. Check your syllabus to find out exactly what you need to know, and just concentrate on those questions.
- a) Carbon monoxide is usually thought of as a neutral oxide, but does have one reaction where it reacts with a base, and therefore it has some acidic behaviour. Name the base that it will react with, give the conditions for the reaction and write the equation.
- b) Carbon dioxide is an acidic oxide. Write equations for reactions that show this:
- (i) in its reaction with water;
- (ii) in its reactions with sodium hydroxide solution (you will need two equations – one where the sodium hydroxide is in excess, and one where the carbon dioxide is in excess. Say which is which.)

Chemguide – questions

c) Silicon dioxide is an acidic oxide.

(i) Write the equation for the reaction between silicon dioxide and hot concentrated sodium hydroxide solution. Name the product.

(ii) Write the equation for a reaction involving silicon dioxide as an acidic oxide occurring in the blast furnace.

d) Tin(II) oxide and tin(IV) oxide are both amphoteric. What does *amphoteric* mean?

e) (i) Write an equation for the reaction of tin(II) oxide with hydrochloric acid (you can ignore the formation of any complex ions containing tin in the negative ion).

(ii) Write an equation for the reaction of tin(II) oxide with sodium hydroxide solution.

f) (i) Write the equation(s) for the reaction of tin(IV) oxide with concentrated hydrochloric acid.

(ii) Write an equation for the reaction of tin(IV) oxide with hot concentrated sodium hydroxide solution.

g) Why doesn't lead(II) oxide appear to react with dilute hydrochloric acid?