

TDC Part I
Paper I, Group B
Inorganic Chemistry



Department of Chemistry

L.S COLLEGE MUZAFFARPUR

B. R. A. BIHAR UNIVERSITY

Dr. Priyanka

TOPIC:- Oxides(Group 16)

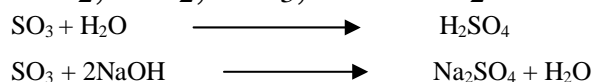
Oxides

Oxygen reacts with practically all elements in the periodic table, except lighter noble gases, to form oxides. Oxides may be classified as:

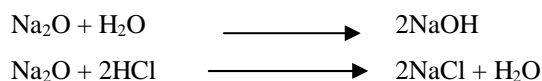
- i) Normal oxides - Here oxygen shows oxidation state of -2 . They may be ionic or covalent eg. CaO , CO_2 ,
- ii) Peroxides - These contain O-O linkage eg. H_2O_2 , Na_2O_2
- iii) Suboxides - They involve bonds between atoms of the element, in addition to bonds between element and oxygen e.g. C_3O_2 ($\text{O}=\text{C}=\text{C}=\text{C}=\text{O}$)
- iv) Superoxides - They contain O^- ion and are formed by some alkali metals eg. KO_2

Oxides may also be classified as acidic, basic, neutral or amphoteric depending on their reaction with water.

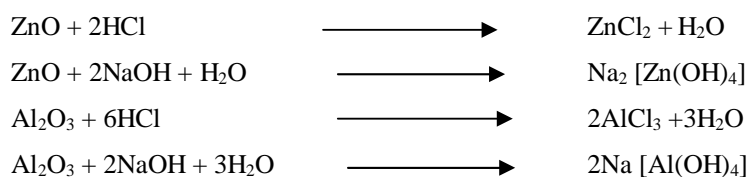
Acidic oxides (oxides of non-metals) dissolve in water giving acidic solution and react with bases forming salt and water eg CO_2 , SO_2 , SO_3 , and NO_2 etc.



Basic oxides (oxides of metals) may dissolve in water to give alkaline solutions. They all dissolve in acids to give salt and water eg. Na_2O , MgO etc.



Amphoteric oxides dissolve in both acids and bases eg. Al_2O_3 , ZnO etc.



Neutral oxides have neither acidic nor basic properties eg. CO , N_2O .

The elements of Group 16 form several oxides, which are listed in table 20, whilst the structures of some important ones are shown in Fig. 26

Table 20: Oxides of Group 16 Elements

| Element | MO ₂ | MO ₃ | Other Oxides |
|---------|------------------|------------------|---------------------------------|
| S | SO ₂ | SO ₃ | S _n O (n=2, 6 to 10) |
| Se | SeO ₂ | SeO ₃ | |
| Te | TeO ₂ | TeO ₃ | Te O |
| Po | PoO ₂ | | Po O |

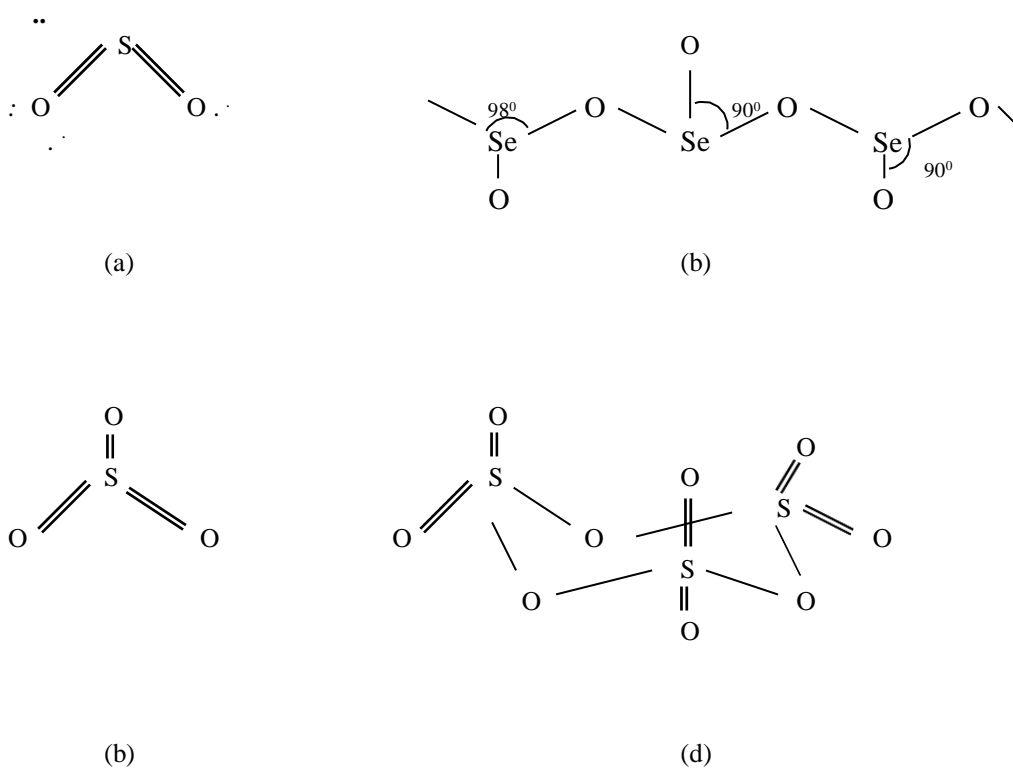
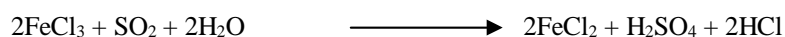
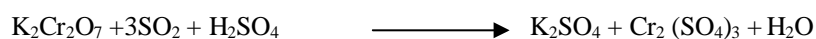


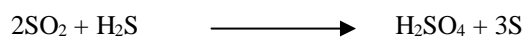
Fig 26: The Structures of (a) SO₂ (gaseous) (b) SeO₂ (solid)
(c) SO₃ (gaseous) (d) Trimer of SO₃ (solid)

The dioxides and trioxides of S and Se have been well characterized. Sulphur dioxide and selenium dioxide are acidic in nature whereas tellurium dioxide is amphoteric. This illustrates increase in basic character on descending a group. SO_2 contains sulphur in +4 oxidation state and may act as both reducing and oxidizing agent depending on the other reactant. The following reactions illustrate this.

a) As reducing agent:



b) As oxidizing agent:



The most important trioxide is SO_3 , which is used in the manufacture of H_2SO_4 . It is an acidic oxide and a powerful oxidizing agent and can oxidize HBr to Br_2 and P to P_4O_{10} .