CO-ORDINATE COVALENT BOND

You have learnt two types of bonds ionic bond and covalent bond. But when we try to draw the structure of O₃ molecule we find these two bonds are not capable to define the bonding involved in O₃ molecule.

The coordinate covalent bond is like covalent bond but the only difference is in the way of sharing of electrons. You have seen that in covalent bond both bonded atoms share single electron, this shared pair of electrons makes a bond and both atoms get the equal share of it.

The co-ordinate covalent bond is a kind of partnership where the whole investment is done by one atom while other partner invests nothing but gets the equal share of the company.
In the previous post we have studied NH₃ and BF₃ molecules. In NH₃ molecule N has a lone pair of electron and in BF₃ molecule B has an incomplete octet. So they choose such type of joint-venture where NH₃ invests its lone pair of electrons with BF₃. In this way NH₃ helps BF₃ to achieve octet. Now the bonded pair of electron is equally shared between N and B.

Once the co-ordinate covalent bond is formed it is identical to the normal covalent bond. Let’s try to solve the mystery of O₃ molecule. We have studied O₂ molecule, it has a double bond and two lone pair of electrons. It gives one of the lone pair to the third O atom. Thus, O₃ is formed by a double bond a co-ordinate covalent bond.
If you apply LCAO treatment for O₃ molecule you will find its bond order is 1.5 which shows that each O-O bond is formed by 1 sigma and half pi bond. The pi bond is delocalised over all three O atoms. So the structure of O₃ is best explained by resonating hybrid.
This type of co-ordinate covalent bond is mostly formed by d block elements. We will study about such molecules, when we study “Co-ordination chemistry”.

Source: http://chemistrynotmystery.blogspot.in/2014/09/co-ordinate-covalent-bond.html