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Deptt of Chemistry

30.4.20

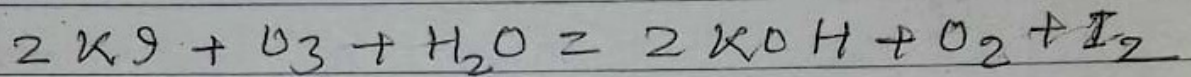
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For Deg I Chemistry Hons (Course material)  
Paper - I

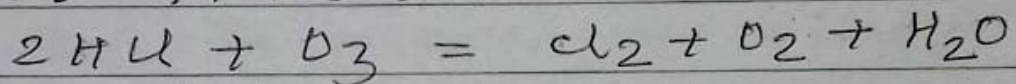
Ozone gas (Remaining Portion)

(1) It is used as powerful oxidising agent:

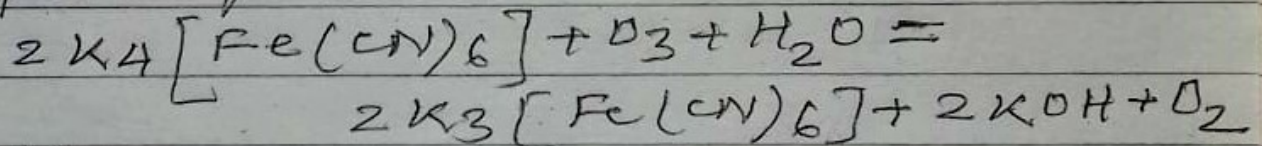
(a) Ozone liberates iodine from neutral KI solution,



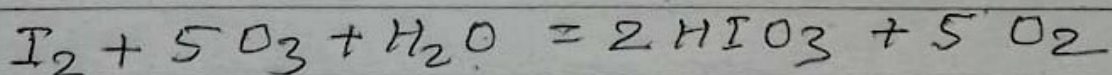
(b) It oxidises HCl to  $Cl_2$



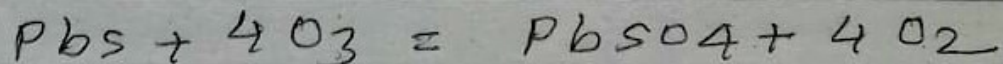
(c) It oxidises Potassiumferrocyanide to give Potassium ferricyanide



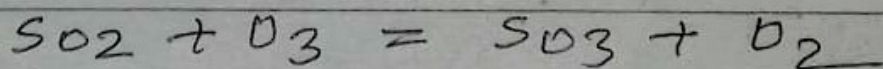
(d) It oxidises moist iodine to iodic acid,



(e) It oxidises PbS to  $PbSO_4$



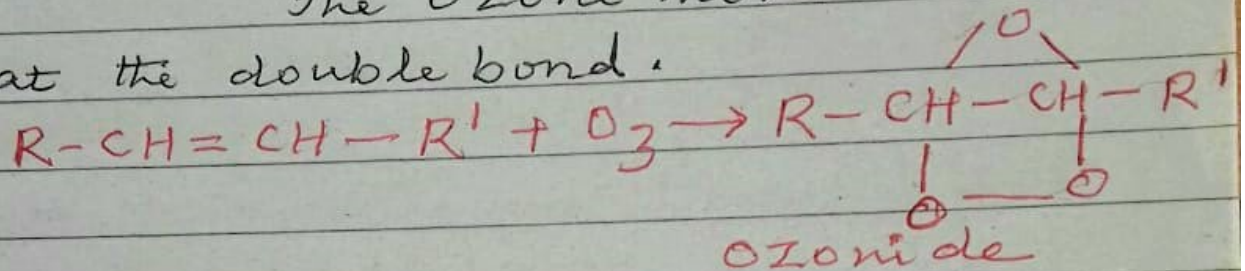
(f) It also oxidises  $SO_2$  to  $SO_3$



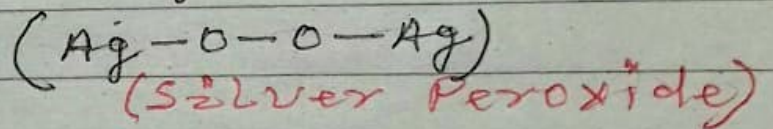
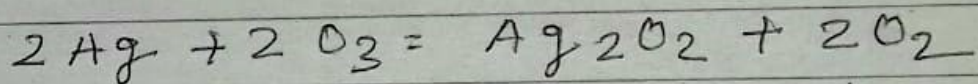
Ans

(2) It forms ozonides with unsaturated organic compounds like ethylene, ~~ethylene~~ etc.

The ozone molecule combines at the double bond.

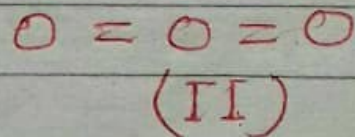
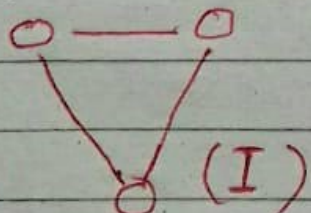


(3) Ozone forms a layer of black oxide on the surface of silver



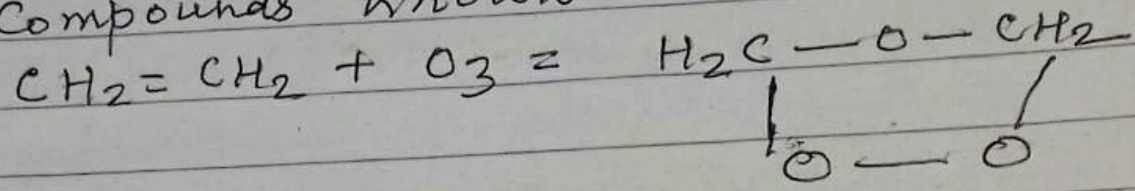
Structure of Ozone :-

The molecular formula of ozone is  $O_3$ . The structure of ozone may be expressed in two ways -



The formula (I) is supported by the fact that ozone can react with carbon compounds containing

double bond such as ethylene giving compounds known as ozonides.

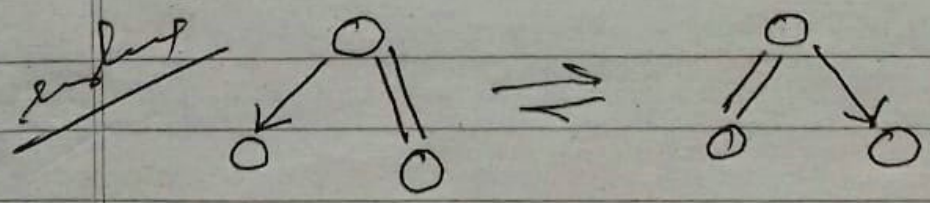


Ethylene  
Ozonide

But the structure (I) shows that all the oxygen atoms to be identical this is not the case because one of the oxygen atoms of ozone can be split off easily.

In the structure (II) the middle oxygen atom is tetravalent and other two are bivalent. Now in Oxonium ion compound oxygen is found to be tetravalent hence the structure (II) is a probable structure.

At present it is assumed to be a resonance hybrid between these two structures



Special features: -

Ozone,  $O_3$  is an allotropic form of oxygen ( $O_2$ ) can be considered as a derivative of  $O(IV)$

The oxygen is transformed into ozone to a small extent. A higher concentration of ozone in the oxygen can be obtained by passing the gas through several ozonisers in series.

Ozone is a very toxic blue gas with a pungent irritating odour. Ozone is thermodynamically unstable with respect to oxygen since its decomposition into oxygen results in the liberation of heat ( $\Delta H = -ve$ ) and an increase in the entropy ( $\Delta S = +ve$ ) since a triatomic molecule is broken down into the diatomic oxygen. These two forces reinforce each other, resulting in a large negative free energy change ( $\Delta G = \Delta H - T\Delta S$ ) Hence a highly concentrated ozone is dangerously explosive.

Uses: - Ozone is used to purify drinking water. It protects from ultra-violet of sun and absorbs earth's infra-red light