



Handwritten Notes
On
Redox Reactions

* Oxidation: 1. Addition of oxygen or an electro-negative element. 2. Removal of hydrogen or an electropositive element. 3. Loss of electrons or increase in oxidation number.

* Reduction: 1. Addition of hydrogen or an electro-positive element. 2. Removal of oxygen or an electronegative element. 3. Gain of electrons or decrease in oxidation number.

* Redox reactions are the reactions which involve oxidation and reduction simultaneously.

• A substance which undergoes reduction acts as an oxidising agent & the substance which undergoes oxidation acts as a reducing agent.

* Oxidation number: It is the residual charge which an atom appears to have when all the atoms surrounding it are removed.

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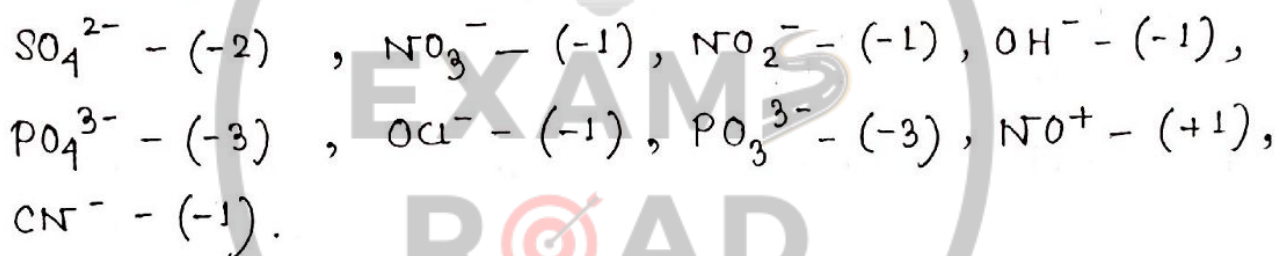
* Rules for assigning Oxidation Number:

Species	ON	Examples.
1. Elements	Zero	N_2, Cl_2, O_2
2. Monoatomic ions	Same as charge	$Na^+(I), Mg^{2+}(II).$
3. Hydrogen		
i) with non-metal	+1	H_2O, H_2S, HCl
ii) with metals	-1	LiH, CaH_2, KH
4. Oxygen	-2 (mostly)	$H_2O, CaO, NaOH$
i) in peroxides	-1	H_2O_2, BaO_2
ii) in superoxides	$-1/2$	KO_2, CsO_2
iii) in fluorides	+1 to 0	OF_2
iv) in O_2	0	

5. Alkali Metals	+1	Li, Na, K etc.
6. Alkaline earth metals	+2	Be, Mg, Ca etc.
7. Fluorine	-1 (always)	HF, OF ₂ , LiF.
8. p-, d-, f- block elements	Variable.	d-block: Fe (+2, +3), Cu (+1, +2), Mn (+7, +6, +5, +4, +3, +2 etc.) p-block: As (+3, +5), Sb (+3, +5), Sn (+2, +4) etc. f-block: Ce (+3, +4), Eu (+2, +3).

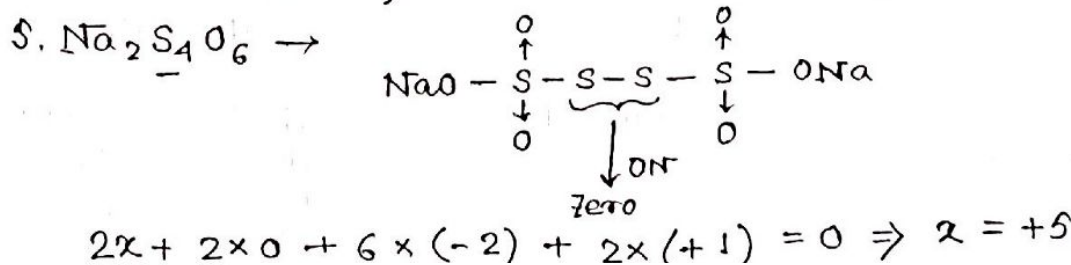
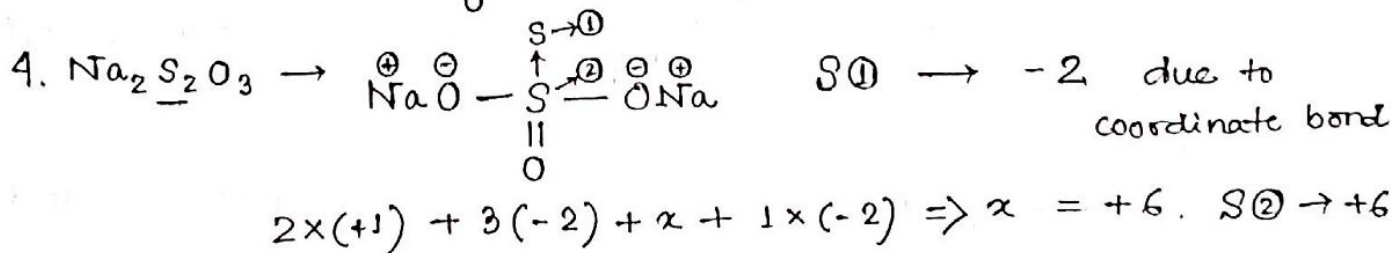
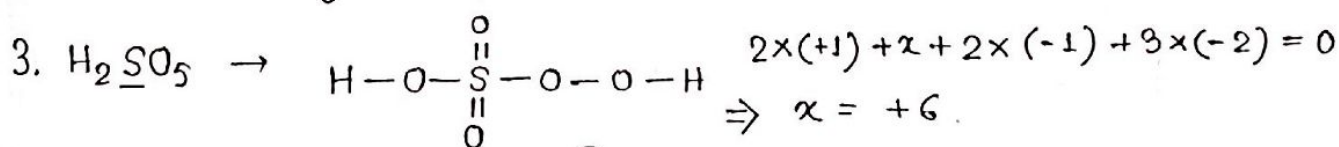
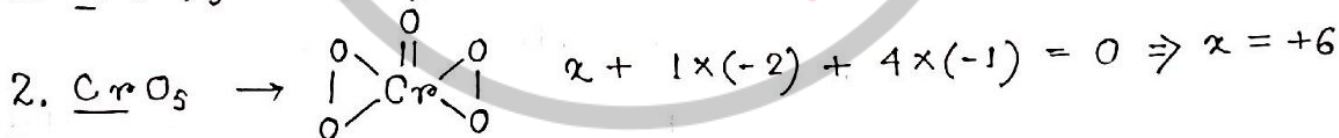
Highest ON of any element is not more than group no. of the element in periodic table.

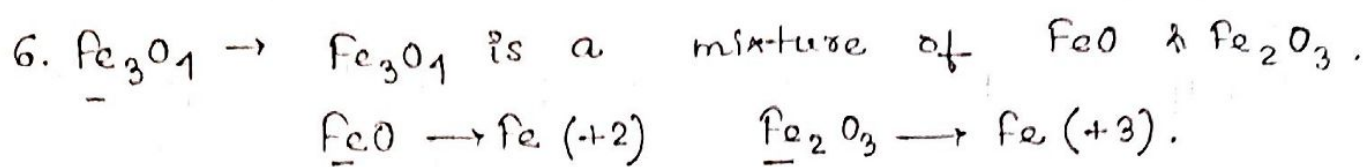
9. ON of ions.



* Some important determinations of ON :

1. $\text{Fe}(\text{CO})_5 \rightarrow (\text{CO})$ neutral. Hence, ON of Fe \rightarrow zero.





* Auto Oxidation - Reduction Reaction:



* Disproportionation reaction:



* Comproportionation reaction:



* Balancing of Redox Reactions:

1. Oxidation number method:
- Identify atoms which undergo change in ON.
 - Calculate the increase or decrease in the ON per atom & multiply it by number of atoms undergoing that change, if increase or decrease is not equal then multiply by suitable number to make them equal.
 - Add H^+ (if medium is acidic) or OH^- (if medium is basic) on the appropriate side so that the total ionic charges of reactants & products are equal.
 - Make the no. of hydrogen atoms in the expression on the two sides

equal by adding H_2O to the reactants or products & finally check the no. of oxygen atoms.

2. Half reaction method: i) Separate the equation into half-reactions.

ii) Balance the atoms other than O and H in each reaction individually. iii) For reactions occurring in acidic medium, add H_2O to balance O atoms & H^+ to balance H atoms & for basic medium, H atoms are balanced by adding H_2O to the side deficient in H atoms & equal number of OH^- ions are added to opposite side & then duplicacy is removed if any. iv) Add electrons to one side of the half-reaction to balance the charges & make the number of electrons equal in two half-reactions by multiplying one or both half-reactions by appropriate number. v) Add two half-reactions to achieve the overall reaction & cancel the electrons on both sides.

* Fluorine is the strongest oxidising agent & Lithium is the strongest reducing agent.