

Identification of inorganic anions

Questions

- What is the goal of chemical analysis?
- What signals are used for quantitative analysis?
- What signals are used for qualitative analysis?
- Do you know any examples of qualitative analysis?

Classifications

- Precipitation
- Redox

Classification of anions by precipitation

Group No.	Anions	Reagent
I	SO_4^{2-}, SO_3^{2-}, $\text{S}_2\text{O}_3^{2-}$, CO_3^{2-}, $\text{C}_2\text{O}_4^{2-}$, PO_4^{3-}, SiO_3^{2-}, $\text{Cr}_2\text{O}_7^{2-}$, CrO_4^{2-}, F^-, $\text{B}_4\text{O}_7^{2-}$ (BO_2^-), AsO_3^{3-}, AsO_4^{3-}	BaCl_2
II	S^{2-}, Cl^-, Br^-, I^-, SCN^-, CN^-, IO_3^-, BrO_3^-	AgNO_3
III	NO_3^-, NO_2^-, CH_3COO^-, MnO_4^- and others	No

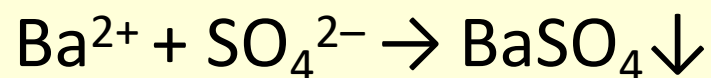
Redox classification of anions

Group No.	Cations	Group feature	Reagent
I	NO_2^- , $\text{Cr}_2\text{O}_7^{2-}$, AsO_4^{3-} , BrO_3^-	<i>Oxidants:</i> formation of iodine	$\text{KI} + \text{H}_2\text{SO}_4$
	NO_3^- , NO_2^- , $\text{Cr}_2\text{O}_7^{2-}$, MnO_4^-	<i>Oxidants:</i> formation of brown MnCl_6^{2-}	$\text{MnCl}_2 + \text{HCl (conc.)}$
II	S^{2-} , SO_3^{2-} , $\text{S}_2\text{O}_3^{2-}$, NO_2^- , $\text{C}_2\text{O}_4^{2-}$, Cl^- , Br^- , I^- , SCN^- , CN^- , AsO_3^{3-}	<i>Reducers:</i> discoloration of potassium permanganate solution with formation of Mn^{2+}	$\text{KMnO}_4 + \text{H}_2\text{SO}_4$
	S^{2-} , SO_3^{2-} , $\text{S}_2\text{O}_3^{2-}$, AsO_3^{3-}	<i>Reducers:</i> reduction of I_2 to I^- , disappearance of blue color	I_2 B $\text{KI} + \text{H}_2\text{SO}_4$ (starch)
III	SO_4^{2-} , CO_3^{2-} , PO_4^{3-} , CH_3COO^- , SiO_3^{2-} , $\text{B}_4\text{O}_7^{2-}$ (BO_2^-)	Indifferent	No

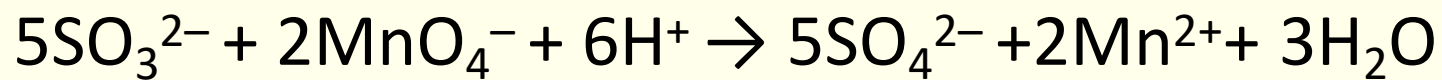
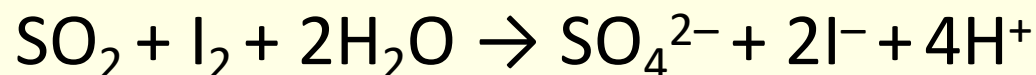
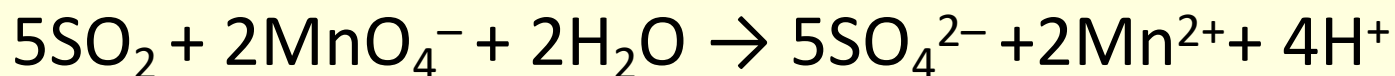
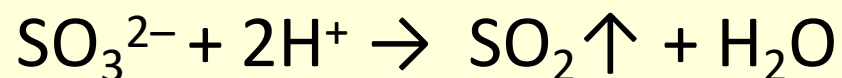
Anions of the first group

- Form white precipitates at pH 7-9
- All precipitates (except BaSO_4) dissolve in acids
- $\text{Ba}_3(\text{PO}_4)_2$ and BaCO_3 dissolve in HAc
- BaCO_3 dissolves in boiling HAc

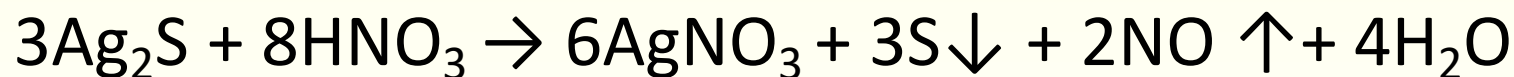
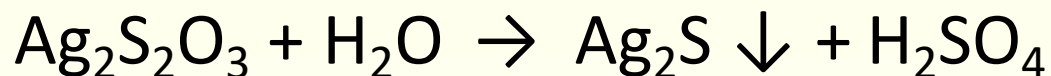
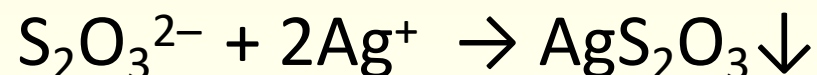
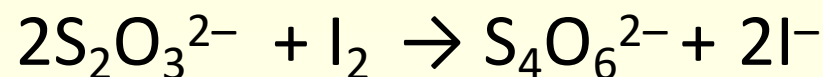
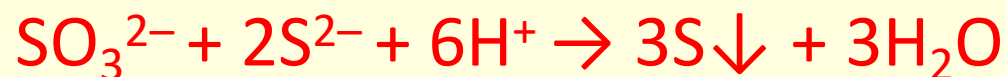
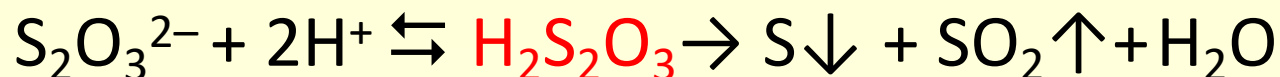
Anions of the first group (SO_4^{2-})



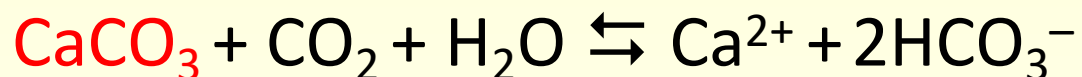
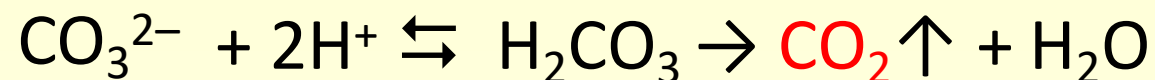
Identification of SO_3^{2-}



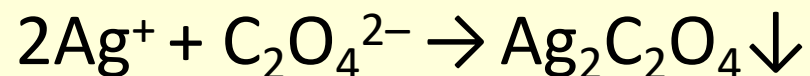
Identification of $\text{S}_2\text{O}_3^{2-}$



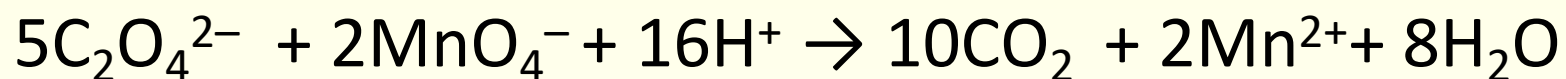
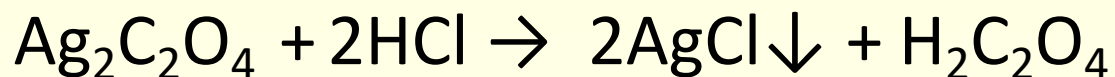
Identification of CO_3^{2-}



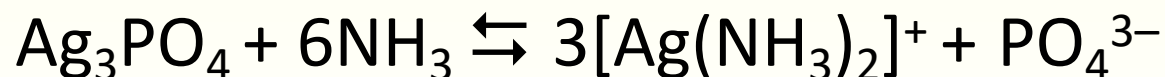
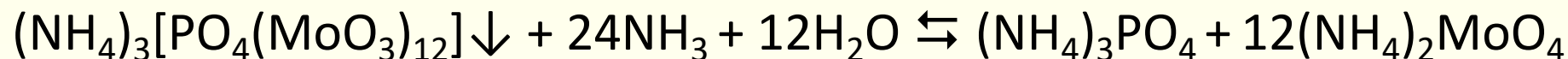
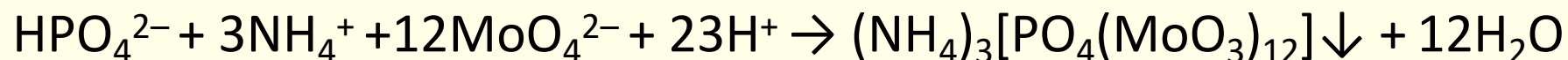
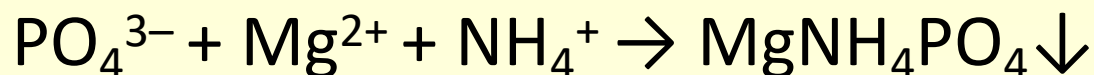
Identification of $\text{C}_2\text{O}_4^{2-}$



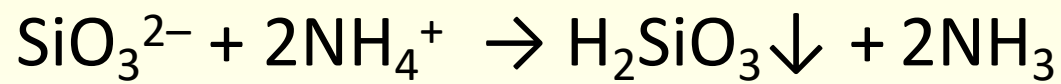
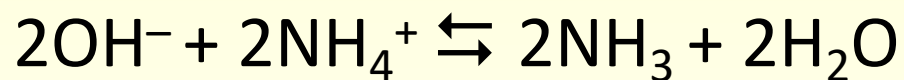
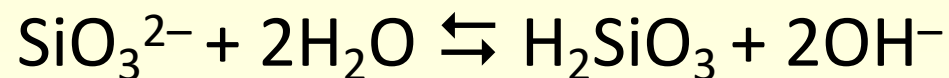
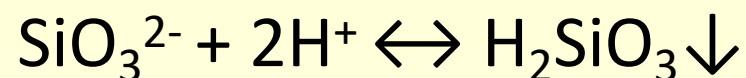
$\text{Ag}_2\text{C}_2\text{O}_4$ is soluble in HNO_3 and 25% NH_3



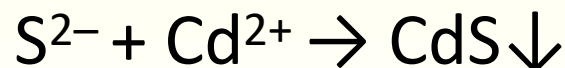
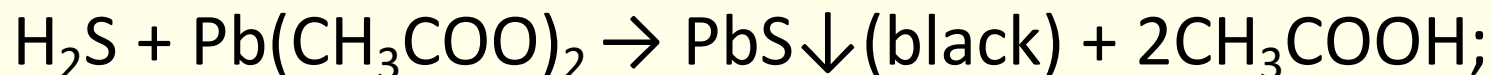
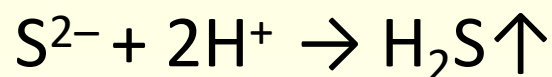
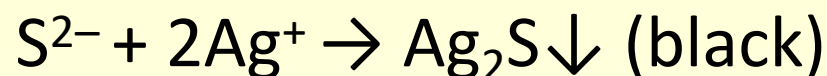
Identification of PO_4^{3-}



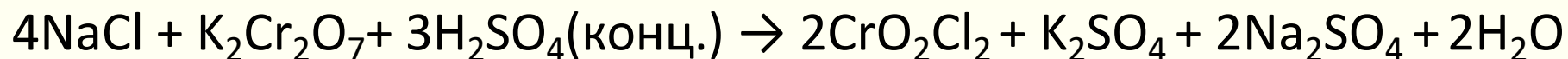
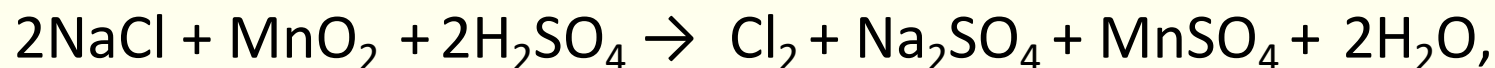
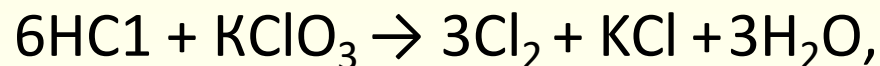
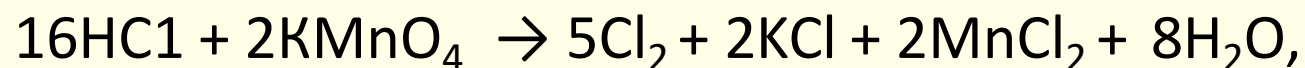
Identification of SiO_3^{2-}



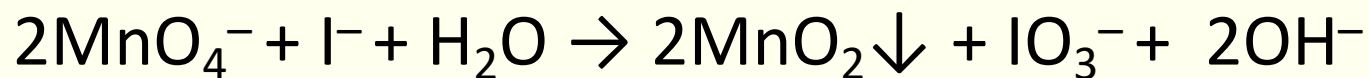
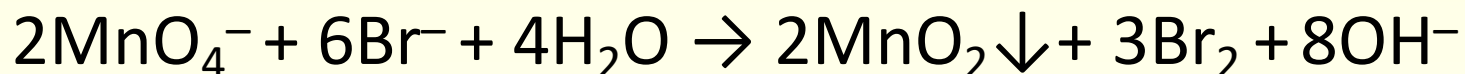
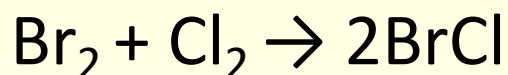
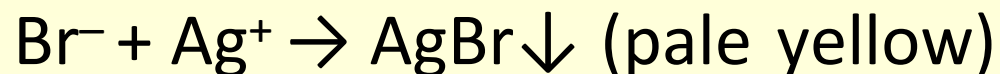
Anions of the second group (S^{2-})



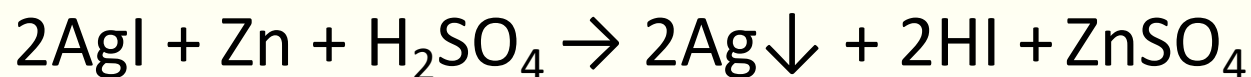
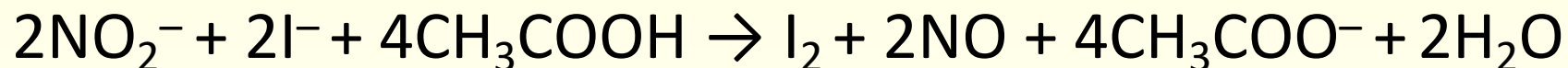
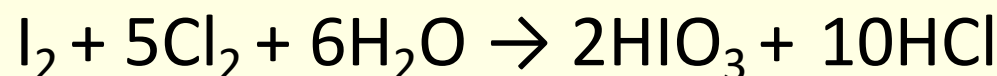
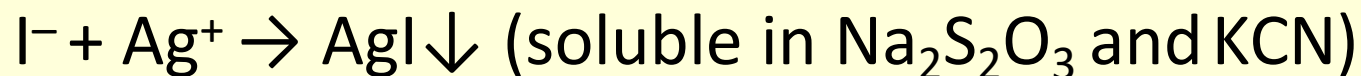
Identification of Cl⁻



Identification of Br⁻



Identification of I⁻



Identification of SCN⁻

