

**ଆୟୁନୀୟ ସମୀକରଣ
ଓ ଦ୍ରବଣୀୟତା ନିୟମ**

Ionic Equations
& Solubility Rules

Video - No - 5

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- ଅନେକ ଶୁଣାୟକ ପ୍ରତିକ୍ରିୟା ତରଳ ଦ୍ରବଣରେ ହୁଏ
- ତରଳ ପ୍ରତିକ୍ରିୟା ହେଲେ, ଆୟୁନ ମାନେ ପ୍ରତିକ୍ରିୟାରେ ସ୍ଥାନ ନେଇଥାଆନ୍ତି ।

$$\text{AgNO}_3(\text{aq}) + \text{NaCl}(\text{aq}) \rightarrow \text{AgCl}(\text{s}) + \text{NaNO}_3(\text{aq})$$

T.I.E: $\text{Ag}^+ + (\text{NO}_3^-) + \text{Na}^+ + \text{Cl}^- \rightarrow \text{AgCl}(\text{s}) + \text{Na}^+ + \text{NO}_3^-$

N.I.E: $\text{Ag}^+ + \text{Cl}^- \rightarrow \text{AgCl}(\text{s})$ (ଆୟୁନୀୟ ସମୀକରଣ)

Aq. = Aqueous : ତରଳ (ଦ୍ରବଣୀୟ)
Spectator / Bystander ions (କର୍ତ୍ତବ୍ୟ ଆୟୁନ)

**ଦ୍ରବଣୀୟତା ନିୟମ
Solubility Rules**

Soluble Substances
ଦ୍ରବଣୀୟ / ଲାଭୀ ଦ୍ରବଣୀୟ ତରଳ ଆୟୁନ ମାନେ ପ୍ରକାଶିତ (। ହିଲେ ବେଳା 0.1 ଗ୍ରାମ୍ ପ୍ରତି 100 ମିଲି ଗ୍ରାମ୍) ପ୍ରକାଶିତ ଦ୍ରବଣୀୟ କଷୁ ସୁଦ୍ଧା ।

Insoluble Substances
ଅଦ୍ରବଣୀୟ : କଷୁ ଦ୍ରବଣୀୟ ତରଳ ଦ୍ରବଣୀୟ କଷୁ ମାନେ ପ୍ରକାଶିତ (। ହିଲେ ବେଳା 0.001 ଗ୍ରାମ୍ ପ୍ରତି 100 ମିଲି ଗ୍ରାମ୍) ।

ଉଦାହରଣ : NaCl : ଦ୍ରବଣୀୟ, PbI_2 : ଅଦ୍ରବଣୀୟ

- ଦ୍ରବଣୀୟ ଆୟୁନୀୟ ଲାଭୀ କେବଳ ୪ଟି ସମସ୍ତ ଅନ୍ୟେକ ଅଧିକ ତରଳ ଦ୍ରବଣୀୟ ଆୟୁନୀୟ ସୂକ୍ଷ୍ମ କରୁଥାନ୍ତି । ଶୁଣାୟକ (aq.) ହିଲେ ଦ୍ରବଣୀୟ ।

$$\text{FeSO}_4(\text{aq}) \rightarrow \text{Fe}^{2+} + (\text{SO}_4)^{2-}$$

$$\text{H}_2\text{SO}_4(\text{aq}) \rightarrow 2\text{H}^+ + (\text{SO}_4)^{2-}$$

- ଅଦ୍ରବଣୀୟ ଅନ୍ୟେକ ତରଳ ଦ୍ରବଣୀୟ ଆୟୁନୀୟ ସୂକ୍ଷ୍ମ କରୁଥାନ୍ତି । ଶୁଣାୟକ (s) ହିଲେ ଦ୍ରବଣୀୟ ।

$\text{AgCl}(\text{s}), \text{BaSO}_4(\text{s}), \text{CaCO}_3(\text{s}), \text{PbI}_2$ etc.

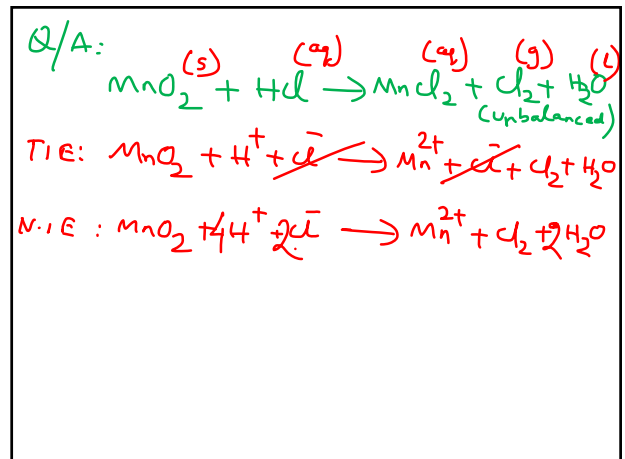
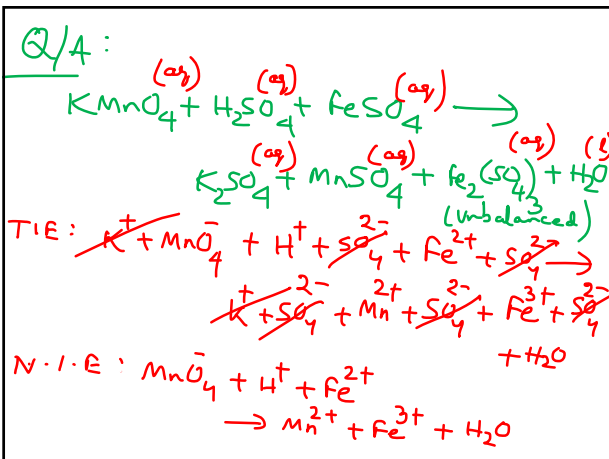
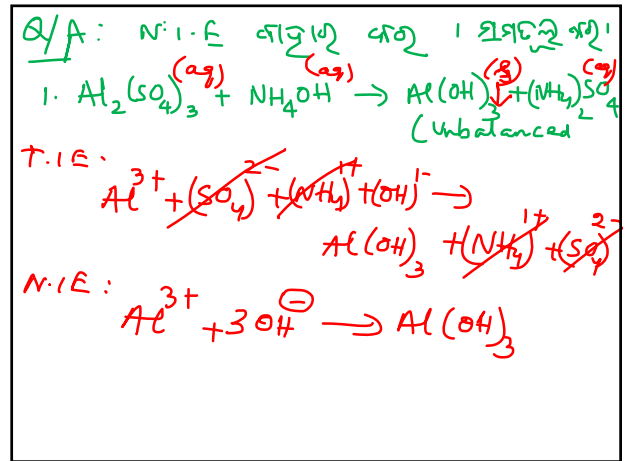
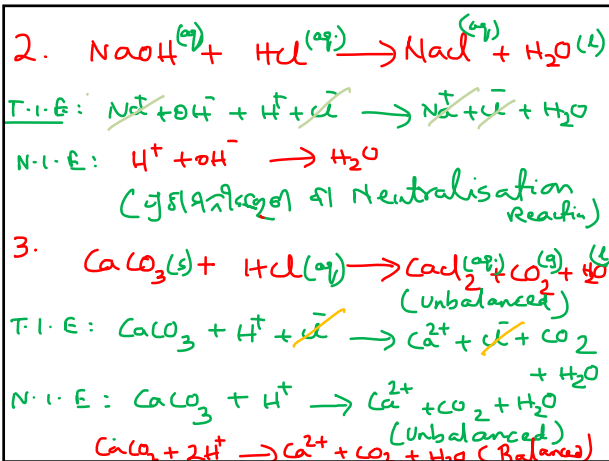
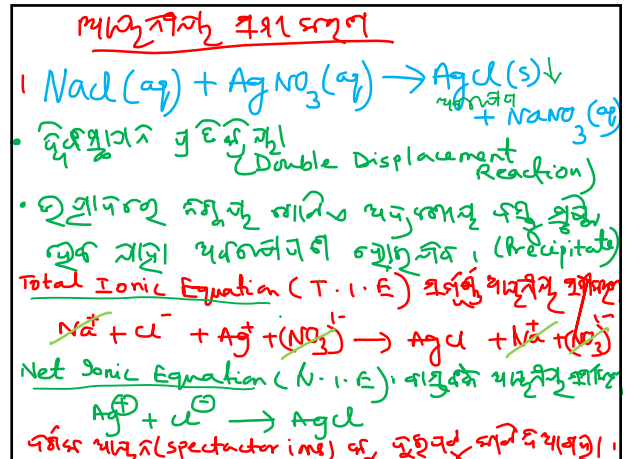
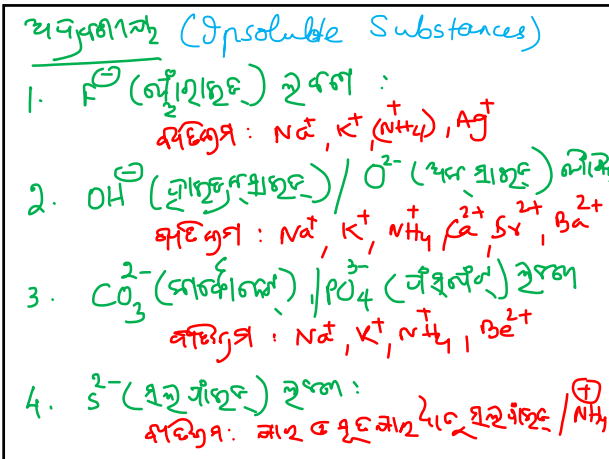
ଦ୍ରବଣୀୟ (Soluble substances)

1. ସମସ୍ତ ଅନ୍ୟେକ ଅଧିକ : $\text{HCl}, \text{H}_2\text{SO}_4, \text{HNO}_3, \text{H}_3\text{PO}_4, \text{HBr}$ etc
Inorganic acid (ALL)
2. ସମସ୍ତ $\text{Na}^+ / \text{K}^+ / \text{NH}_4^+$ ଦ୍ରବଣୀୟ (ଲୋକାଳ)
3. ସମସ୍ତ $(\text{NO}_3)^-$ ଗ୍ରାହଣୀୟ ଦ୍ରବଣୀୟ (ALL)
4. ସମସ୍ତ $\text{Cl}^-, \text{Br}^-, \text{I}^-$ ଦ୍ରବଣୀୟ
କଠିନୀୟ: $\text{Ag}^+, \text{Hg}^+(\text{Hg}_2^{2+}), \text{Pb}^{2+}$
5. ସମସ୍ତ $(\text{SO}_4)^{2-}$ ଗ୍ରାହଣୀୟ ଦ୍ରବଣୀୟ
କଠିନୀୟ: $\text{Sr}^{2+}, \text{Ba}^{2+}, \text{Pb}^{2+}, \text{Ca}^{2+}, \text{Ag}^+, \text{Hg}_2^{2+}$

6. ସମସ୍ତ $(\text{ClO})^+$ (କ୍ଲୋରାଟ୍) ଓ $(\text{ClO}_4)^-$ ପ୍ରକାଶିତ
7. ସମସ୍ତ ଚାର୍ଜିତ (କ୍ୟାଟାୟନ) ଦ୍ରବଣୀୟ (ALL)

ଅନ୍ୟ ସମସ୍ତ ତରଳ ଅଦ୍ରବଣୀୟ

(s) : solid (ଅଦ୍ରବଣୀୟ କଠିନ)
(l) : liquid (ତରଳ), ex. H_2O
(g) : gas (ଗ୍ୟାସୀୟ), ex. $\text{N}_2, \text{H}_2, \text{NH}_3, \text{CO}_2$ etc
(aq.) : aqueous (ତରଳ) ଦ୍ରବଣୀୟ
ex. $\text{NaCl}, \text{AgNO}_3, \text{H}_2\text{SO}_4$
କଠିନୀୟ (aq.) ହିଲେ ଦ୍ରବଣୀୟ ଦ୍ରବଣୀୟ ଦ୍ରବଣୀୟ ଦ୍ରବଣୀୟ । etc



ଆଲ୍‌ଜିବ୍ରା ମିଥାନ୍ତ୍ର ପ୍ରଣାଳୀ
Balancing Ionic Equations

$$\text{MnO}_2 + \text{H}^+ + \text{Cl}^- \rightarrow \text{Mn}^{2+} + \text{Cl}_2 + \text{H}_2\text{O}$$

Hit & Trial method:

$$\text{MnO}_2 + 4\text{H}^+ + 2\text{Cl}^- \rightarrow \text{Mn}^{2+} + \text{Cl}_2 + 2\text{H}_2\text{O}$$

Q/A $\text{Al}(\text{OH})_3 + 3\text{H}^+ \rightarrow \text{Al}^{3+} + 3\text{H}_2\text{O}$

Algebraic method

$$x\text{MnO}_4^- + y\text{H}^+ + z\text{Fe}^{2+} \rightarrow p\text{Mn}^{2+} + q\text{Fe}^{3+} + r\text{H}_2\text{O}$$

Mn: $x = p = 1$ (say)
 H: $y = 2r \Rightarrow y = 8$
 Fe: $z = q = 5$
 O: $4x = r \Rightarrow r = 4$
 Charge: $-x + y + 2z = 2p + 3q$
 $\Rightarrow -1 + 8 + 2z = 2 + 3q \Rightarrow 7 + 2z = 2 + 3q$
 $\Rightarrow -1 + 8 + 2z = 2 + 3q \Rightarrow 7 + 2z = 2 + 3q$
 $\Rightarrow 9 = 5$
 $\text{MnO}_4^- + 8\text{H}^+ + 5\text{Fe}^{2+} \rightarrow \text{Mn}^{2+} + 5\text{Fe}^{3+} + 4\text{H}_2\text{O}$

2) $x\text{Zn} + y\text{H}^+ + z\text{NO}_3^- \rightarrow p\text{Zn}^{2+} + r\text{N}_2\text{O} + t\text{H}_2\text{O}$ (Z=1)

Zn: $x = p = 2$
 N: $z = 2r = 1 \Rightarrow r = \frac{1}{2}$
 H: $y = 2t \Rightarrow y = 2 \times \frac{5}{2} = 5$
 O: $3z = q + r \Rightarrow 3 = \frac{1}{2} + r \Rightarrow r = \frac{5}{2}$
 Charge: $+y - z = 2p \Rightarrow 5 - 1 = 2p \Rightarrow p = 2$

$$2[2\text{Zn} + 5\text{H}^+ + 1\text{NO}_3^- \rightarrow 2\text{Zn}^{2+} + \frac{1}{2}\text{N}_2\text{O} + \frac{5}{2}\text{H}_2\text{O}]$$

$$4\text{Zn} + 10\text{H}^+ + 2\text{NO}_3^- \rightarrow 4\text{Zn}^{2+} + \text{N}_2\text{O} + 5\text{H}_2\text{O}$$

ପ୍ରଶ୍ନାବଳୀ N.I-E ଉଦାହରଣ କରାଯାଇଥିବା ପ୍ରଶ୍ନରୁ କର
 (ଆଲ୍‌ଜିବ୍ରା ମିଥାନ୍ତ୍ର ପ୍ରଣାଳୀ) (Heat: ପ୍ରଥମ ପଦ୍ୟ ଉପରେ ଉପ
 ନିର୍ଭର କରୁଥିବା ମିଥାନ୍ତ୍ର ପ୍ରଣାଳୀ)

- 1) $\text{NaOH} + \text{Al}(\text{OH})_3 \rightarrow \text{NaAlO}_2 + \text{H}_2\text{O}$
- 2) $\text{ZnS} + \text{HCl} \rightarrow \text{ZnCl}_2 + \text{H}_2\text{S}$
- 3) $\text{BaCl}_2 + \text{Na}_2\text{SO}_4 \rightarrow \text{BaSO}_4 + \text{NaCl}$
- 4) $\text{Zn} + \text{NaOH} \rightarrow \text{Na}_2\text{ZnO}_2 + \text{H}_2$
- 5) $\text{Cr}(\text{OH})_3 + \text{H}_2\text{O}_2 + \text{NaOH} \rightarrow \text{Na}_2\text{CrO}_4 + \text{H}_2\text{O}$
- 6) $\text{HNO}_3 + \text{Ba}(\text{OH})_2 \rightarrow \text{Ba}(\text{NO}_3)_2 + \text{H}_2\text{O}$
- 7) $\text{Fe} + \text{HNO}_3 \rightarrow \text{Fe}(\text{NO}_3)_2 + \text{NH}_4\text{NO}_3 + \text{H}_2\text{O}$
- 8) $\text{K}_2\text{Cr}_2\text{O}_7 + \text{H}_2\text{SO}_4 + \text{H}_2\text{O}_2 \rightarrow \text{K}_2\text{SO}_4 + \text{Cr}_2(\text{SO}_4)_3 + \text{O}_2 + \text{H}_2\text{O}$

(9) $\text{Zn}(\text{s}) + \text{HNO}_3(\text{aq}) \rightarrow \text{Zn}(\text{NO}_3)_2(\text{aq}) + \text{N}_2\text{O}(\text{g}) + \text{H}_2\text{O}(\text{l})$

(10) $\text{Cu}(\text{OH})_2(\text{s}) + \text{H}_2\text{SO}_4(\text{aq}) \rightarrow \text{CuSO}_4(\text{aq}) + \text{H}_2\text{O}(\text{l})$

ପଞ୍ଚମ ଶ୍ରେଣୀର ପ୍ରଶ୍ନ :

- ପଞ୍ଚମ ଶ୍ରେଣୀର ପଦ୍ୟ
 Atoms & Molecules
 ପାଞ୍ଚମ ଶ୍ରେଣୀର ପଦ୍ୟ ଓ ଆଣବିକ ସମ୍ବନ୍ଧ
 Atomic mass & Molecular mass