Redox reaction { Reduction / oxidation } occur simultaneously

Oxidation / reduction occur when species:

- gains O / donates O
- donates H / gain H
- ↑ oxidation number / ↓ oxi number
- donates e^- / gain e^-

↓ species is oxidized

↓ species is reduced

LIVEWORKSHEETS

(a) Balancing Redox Reaction In Acidic Solution

1) Det oxi and red
2) Separate both eq
3) Bal the metal
4) Bal the non-metal other than H n O
5) Bal the O by adding H_2O
6) Bal the H by adding H^+ at the other sid
7) Bal the charge by adding e^- at +ve side
8) Overall eq (delete both e^- from both equa
9) Recheck

LIVEWORKSHEETS

Exercise 3(b) Balancing Redox Reaction In Acidic Solution

$$S^{2-} + I_2 \rightarrow SO_4^{2-} + I^-$$

Step 1: Determine species undergo reduction and oxidation

$$S^{2-} + I_2 \rightarrow SO_4^{2-} + I^-$$

Step 3: Separate the equations

Oxidation: $S^{2-} \rightarrow SO_4^{2-}$

Reduction: $I_2 \rightarrow I^-$

LIVEWORKSHEETS

Step 3: Balance the metal (if any)

Skip this step. There is no metal to balance

Step 4: Balance the non-metal other than H and O

Oxidation : $S^{2-} + \rightarrow SO_4^{2-}$

S: Both sides are balanced.

Reduction : $I_2 \rightarrow I^-$

LIVEWORKSHEETS

Step 5: Add H_2O to balance the O atoms

Oxidation : S^{2-} + $\rightarrow SO_4^{2-}$

Reduction : I_2 $\rightarrow 2I^-$

There is no O at both sides. **SKIP** the step

Step 6: Add H+ to balance the H atoms

Oxidation : S^{2-} + $\rightarrow SO_4^{2-}$

Reduction : I_2 $\rightarrow 2I^-$

There is no H at both sides. **SKIP** the step

LIVEWORKSHEETS

Step 7: Add electrons at (+ve) side to balance the charges

Oxidation : $S^{2-} + 4H_2O \rightarrow SO_4^{2-} + 8H^+ +$

S^{2-}: -2; $4H_2O$: 0; -2

SO_4^{2-}: -2; $8H^+$: $+8$; $+6$

Reduction : $I_2 + \rightarrow 2I^-$

I_2: 0; $2I^-$: -2

LIVEWORKSHEETS

Step 8: Overall equation by deleting e at both equations

Oxidation : $S^{2-} + 4H_2O \rightarrow SO_4^{2-} + 8H^+ + 8e^-$

Reduction : $(I_2 + 2e^- \rightarrow 2I^-)$

The whole reduction equation x 8 because there are 8e at oxidation equation

Reduction : $I_2 + e^- \rightarrow I^-$

Overall equation :

$$S^{2-} + H_2O + I_2 \rightarrow SO_4^{2-} + H^+ + I^-$$

LIVEWORKSHEETS

Step 9: Recheck the overall equation

$$S^{2-} + 4H_2O + I_2 \rightarrow SO_4^{2-} + 8H^+ + 8I^-$$

S =
H =
O =
I =

Total Charge =

S =
H =
O =
I =

T. Charge =

LIVEWORKSHEETS

If we want to balance the equation in basic medium

Step 10 : Add OH^- at both sides of overall equation

$$S^{2-} + 4H_2O + I_2 \rightarrow SO_4^{2-} + 8H^+ + 8I^-$$

$$S^{2-} + 4H_2O + I_2 \rightarrow SO_4^{2-} + 8I^- + H_2O$$

$$OH^- + S^{2-} + I_2 \rightarrow SO_4^{2-} + 8^- + H_2O$$

LIVEWORKSHEETS