

1. Balancea por óxido-reducción las siguientes ecuaciones químicas, teniendo en cuenta los números de oxidación y plantea semirreacciones para cada una, indica quien se oxida y quien se reduce.

**a.  $\text{HNO}_3 + \text{H}_2\text{SO}_4 + \text{NO} + \text{H}_2\text{O}$**

**Reducción:**  
 $\text{N} = 5 \times 1 = 5$   
 $\text{O} = 3 \times 2 = 6$   
 $\text{O} = 0$

**Oxidación:**  
 $\text{N} = 4 \times 2 = 8$   
 $\text{O} = 2 \times 2 = 4$   
 $\text{O} = 0$

$3 \times \text{O} + 2 \times \text{O} = 3 \times \text{O} + 2 \times \text{O} + 4 \times \text{O}$   
 $0 = 0$

**b.  $\text{MnO}_2 + \text{HCl} \rightarrow \text{MnCl}_2 + \text{H}_2\text{O} + \text{Cl}_2$**

**Reducción:**  
 $\text{Mn} = 4 \times 1 = 4$   
 $\text{O} = 2 \times 2 = 4$   
 $\text{O} = 0$

**Oxidación:**  
 $\text{Cl} = 2 \times 2 = 4$   
 $\text{Cl} = 1 \times 2 + 1 \times 2 + 1 \times 2 = 6$

$1 \times \text{O} + 4 \times \text{O} = 1 \times \text{O} + 1 \times \text{O} + 1 \times \text{O} + 2 \times \text{O}$   
 $4 \times \text{O} + 4 \times \text{O} = 2 \times \text{O} + 2 \times \text{O} + 4 \times \text{O}$   
 $0 = 0$

**c.  $\text{MnO}_2 + \text{H}_2\text{SO}_4 + \text{NaCl} \rightarrow \text{Cl}_2 + \text{MnSO}_4 + \text{H}_2\text{O} + \text{Na}_2\text{SO}_4$**

**Reducción:**  
 $\text{Mn} = 4 \times 1 = 4$   
 $\text{O} = 2 \times 2 = 4$   
 $\text{O} = 0$

**Oxidación:**  
 $\text{Cl} = 2 \times 2 = 4$   
 $\text{Cl} = 1 \times 2 + 1 \times 2 + 1 \times 2 = 6$

$1 \times \text{O} + 4 \times \text{O} = 1 \times \text{O} + 1 \times \text{O} + 1 \times \text{O} + 2 \times \text{O}$   
 $4 \times \text{O} + 4 \times \text{O} = 2 \times \text{O} + 2 \times \text{O} + 4 \times \text{O}$   
 $0 = 0$

**d.  $\text{HNO}_3 + \text{HBr} \rightarrow \text{NO} + \text{Br}_2 + \text{H}_2\text{O}$**

**Reducción:**  
 $\text{N} = 5 \times 1 = 5$   
 $\text{O} = 3 \times 2 = 6$   
 $\text{O} = 0$

**Oxidación:**  
 $\text{Br} = 2 \times 1 = 2$   
 $\text{Br} = 2 \times 2 = 4$   
 $\text{O} = 2 \times 1 + 4 \times 1 = 6$

$2 \times \text{O} + 6 \times \text{O} = 2 \times \text{O} + 6 \times \text{O} + 4 \times \text{O}$   
 $0 = 0$

**e.  $\text{KCl} + \text{KMnO}_4 + \text{H}_2\text{SO}_4 \rightarrow \text{KHSO}_4 + \text{MnSO}_4 + \text{H}_2\text{O} + \text{Cl}_2$**

**Reducción:**  
 $\text{K} = 6 \times 1 = 6$   
 $\text{Cl} = 5 \times 1 = 5$   
 $\text{Mn} = 1 \times 1 = 1$   
 $\text{O} = 7 \times 2 = 14$   
 $\text{H} = 7 \times 2 = 14$   
 $\text{S} = 7 \times 1 = 7$

**Oxidación:**  
 $\text{K} = 6 \times 1 = 6$   
 $\text{Cl} = 5 \times 1 = 5$   
 $\text{Mn} = 1 \times 1 = 1$   
 $\text{O} = 1 \times 4 + 6 \times 4 + 4 \times 1 = 32$   
 $\text{H} = 6 \times 7 + 4 \times 2 = 50$   
 $\text{S} = 7 \times 1 + 6 \times 1 = 13$

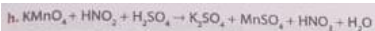
$5 \times \text{O} + 1 \times \text{O} + 2 \times \text{O} = 5 \times \text{O} + 1 \times \text{O} + 6 \times \text{O} + 4 \times \text{O}$   
 $0 = 0$

**f.  $\text{Zn} + \text{NaNO}_3 + \text{NaOH} \rightarrow \text{Na}_2\text{ZnO}_2 + \text{NH}_3 + \text{H}_2\text{O}$**

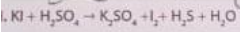
**Reducción:**  
 $\text{Zn} = 4 \times 1 = 4$   
 $\text{Na} = 1 \times 1 + 7 \times 1 = 8$   
 $\text{N} = 1 \times 1 = 1$   
 $\text{O} = 7 \times 2 + 7 \times 1 = 21$   
 $\text{H} = 7 \times 1 = 7$

**Oxidación:**  
 $\text{Zn} = 4 \times 1 = 4$   
 $\text{Na} = 4 \times 2 = 8$   
 $\text{N} = 1 \times 1 = 1$   
 $\text{O} = 4 \times 2 + 2 \times 1 = 10$   
 $\text{H} = 1 \times 3 + 2 \times 2 = 7$

$4 \times \text{Zn} + 10 \times \text{O} + 7 \times \text{H} = 4 \times \text{Zn} + 8 \times \text{O} + 1 \times \text{N} + 7 \times \text{H}$   
 $0 = 0$

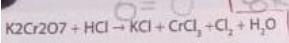


Izquierda Derecha  
 $\text{H} = 20 \quad \text{H} = 5 \times 1 + 3 \times 2 = 11$   
 $\text{N} = 5 \times 1 + 3 \times 2 = 11 \quad \text{N} = 5 \times 1 = 5$   
 $\text{O} = 5 \times 1 = 5 \quad \text{O} = 5 \times 3 + 2 \times 4 \times 1 \times 4 + 3 \times 1 = 30$   
 $\text{K} = 5 \times 2 + 2 \times 4 + 3 \times 4 = 30 \quad \text{K} = 1 \times 2 = 2$   
 $\text{Mn} = 2 \times 1 = 2 \quad \text{Mn} = 2 \times 1 = 2$   
 $\text{Mn} = 2 \times 1 = 2 \quad \text{S} = 2 + 1 + 1 = 3$   
 $\text{S} = 3 \times 1 = 3 \quad \text{O} \neq 0 \quad 5 \times 0 + 2 \times 0 + 3 \times 0 = 5 \times 0 + 2 \times 0 + 2 \times 0 + 3 \times 0$



Izquierda Derecha  
 $\text{K} = 8 \times 1 = 8 \quad \text{K} = 4 \times 2 = 8$   
 $\text{I} = 8 \times 1 = 8 \quad \text{I} = 4 \times 2 = 8$   
 $\text{H} = 5 \times 2 = 10 \quad \text{H} = 7 \times 2 + 4 \times 2 = 10$   
 $\text{S} = 5 \times 1 = 5 \quad \text{S} = 7 \times 1 + 4 \times 1 = 5$   
 $\text{O} = 5 \times 4 = 20 \quad \text{O} = 4 \times 4 + 4 \times 1 = 20$

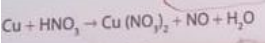
$8 \times 0 + 5 \times 0 = 4 \times 0 + 1 \times 0 + 4 \times 0 + 4 \times 0$   
 $0 = 0 \quad 8 \text{KI} + 5 \text{H}_2\text{SO}_4 \rightarrow 4 \text{K}_2\text{SO}_4 + 4 \text{I}_2 + 4 \text{H}_2\text{O}$



Izquierda Derecha  
 $\text{K} = 1 \times 2 = 2 \quad \text{K} = 2 \times 1 = 2$   
 $\text{Cr} = 1 \times 2 = 2 \quad \text{Cr} = 2 \times 1 = 2$   
 $\text{O} = 1 \times 7 = 7 \quad \text{O} = 7 \times 1 = 7$   
 $\text{H} = 14 \times 1 = 14 \quad \text{H} = 7 \times 2 = 14$   
 $\text{Cl} = 14 \times 1 = 14 \quad \text{Cl} = 3 \times 2 + 2 \times 3 + 2 \times 1 = 14$

$1 \times 0 + 14 \times 0 = 3 \times 0 + 2 \times 0 + 7 \times 0$   
 $0 = 0$

$\text{K}_2\text{Cr}_2\text{O}_7 + 14 \text{HCl} \rightarrow 2 \text{KCl} + 2 \text{CrCl}_3 + 7 \text{Cl}_2 + 7 \text{H}_2\text{O}$



Izquierda Derecha  
 $\text{Cu} = 3 \times 1 = 3 \quad \text{Cu} = 3 \times 1 = 3$   
 $\text{H} = 8 \times 1 = 8 \quad \text{H} = 4 \times 2 = 8$   
 $\text{N} = 8 \times 1 = 8 \quad \text{N} = 3 \times 2 + 2 \times 1 = 8$   
 $\text{O} = 8 \times 3 = 24 \quad \text{O} = 3 \times 6 + 2 \times 1 + 4 \times 1 = 24$

$3 \times 0 + 8 \times 0 = 3 \times 0 + 2 \times 0 + 4 \times 0$   
 $0 = 0$

$3 \text{Cu} + 8 \text{HNO}_3 \rightarrow 3 \text{Cu}(\text{NO}_3)_2 + 2 \text{NO} + 4 \text{H}_2\text{O}$