



Answer the questions below then check your answers

1: What is the oxidation state of hydrogen in most compounds?

2: In the compound KClO_4 , what is the oxidation state of chlorine?

3: What is the oxidation state of sulfur in H_2SO_4 ?

4: What is the oxidation state of oxygen in peroxides like H_2O_2 ?

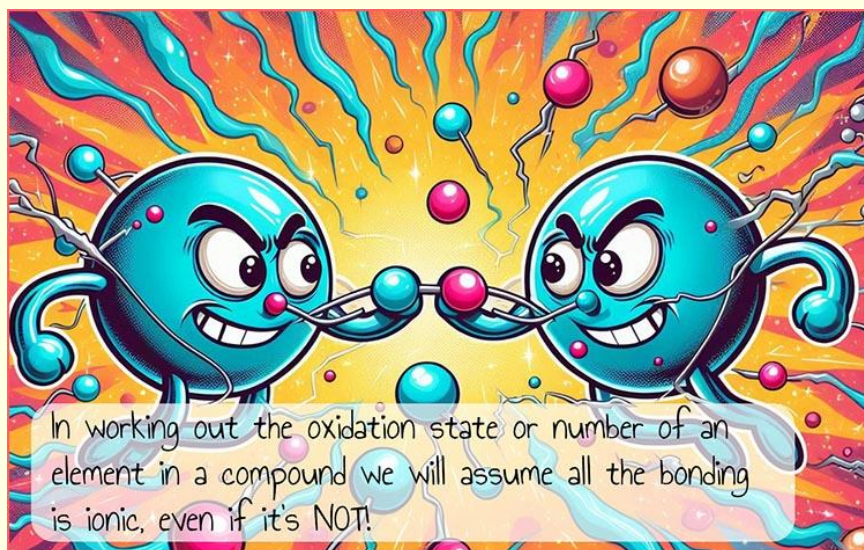
5: In Fe_2O_3 , what is the oxidation state of iron?

6: What is the oxidation state of carbon in methane CH_4 ?

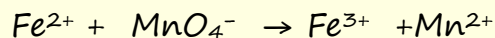
7: Define oxidation state and provide an example.

8: Calculate the oxidation state of phosphorus in PO_4^{3-}

9: Determine the oxidation state of chromium in $\text{K}_2\text{Cr}_2\text{O}_7$



10: In the reaction shown below:



a. Explain the changes in oxidation states and identify the oxidising and reducing agents.

11: Assign oxidation states to all elements in NH_4NO_3

12: Explain with examples how the oxidation state of a transition metal can change as it goes through a series of chemical reactions.

13: What is the oxidation state of chlorine in Cl_2 ?

A) 0 B) -1 C) +1 D) +5

14: In which of the following species is the oxidation state of nitrogen +4?

A) NH_3 B) N_2O C) NO_2 D) NO_3^-

15: Fill in the Gaps to complete the sentences below:

a: In the compound H_2S , the oxidation state of sulfur is _____.

b: The oxidation state of carbon in CO_2 is _____.

c: The species that gets oxidised in a redox reaction _____ electrons.

Answers

1: What is the oxidation state of hydrogen in most compounds?

Answer: +1

2: In the compound $KClO_4$, what is the oxidation state of chlorine?

Answer: +7

3: What is the oxidation state of sulfur in H_2SO_4 ?

Answer: +6

4: What is the oxidation state of oxygen in peroxides like H_2O_2 ?

Answer: -1

5: In Fe_2O_3 , what is the oxidation state of iron?

Answer: +3

6: What is the oxidation state of carbon in methane CH_4 ?

Answer: -4

7: Define oxidation state and provide an example.

Answer: The oxidation state (or oxidation number) is the charge that an atom would have if all bonds were ionic and electrons were transferred completely. For example, in $NaCl$, sodium has an oxidation state of +1 and chlorine has an oxidation state of -1.

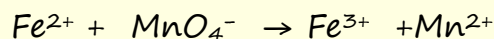
8: Calculate the oxidation state of phosphorus in PO_4^{3-}

Answer: The oxidation state of phosphorus in PO_4^{3-} is +5.

9: Determine the oxidation state of chromium in $K_2Cr_2O_7$

Answer: The oxidation state of chromium in $K_2Cr_2O_7$ is +6.

10: In the reaction shown below:



a. Explain the changes in oxidation states and identify the oxidising and reducing agents.

Answer:

The oxidation state of Fe increases from +2 to +3, so Fe is oxidised.

The oxidation state of Mn decreases from +7 in MnO_4^- to +2 in Mn^{2+} , so Mn is reduced.

The oxidising agent is MnO_4^- because it causes the oxidation of Fe.

The reducing agent is Fe^{2+} because it reduces MnO_4^- .

11: Assign oxidation states to all elements in NH_4NO_3

Answer:

Nitrogen in NH_4^+ is -3. Each hydrogen atom is +1 and the NH_4^+ has a charge of +1, so the nitrogen must be -3.

Nitrogen in NO_3^- (N in NO_3^- has an oxidation number of +5).

Hydrogen: +1

Oxygen: -2, so three oxygens will be = -6, NO_3^- has a charge of -1, so the nitrogen must be +5.

So the oxidation states are:

N in NH_4^+ : -3

N in NO_3^- : +5

H: +1

O: -2

12: Explain with examples how the oxidation state of a transition metal can change as it goes through a series of chemical reactions.

Answer:

Transition metals can exhibit multiple oxidation states due to the availability of d-electrons for bonding. For example:

Iron (Fe): In Fe_2O_3 (iron(III) oxide), Fe has an oxidation state of +3. If iron(III) oxide is reduced with carbon monoxide, it can form FeO (iron(II) oxide), where Fe has an oxidation state of +2.

Manganese (Mn): In the reaction where the MnO_4^- (permanganate ion) is reduced to Mn^{2+} , manganese goes from an oxidation state of +7 in MnO_4^- to +2 in Mn^{2+} .

These changes demonstrate how transition metals can participate in redox reactions, often serving as catalysts due to their ability to easily change oxidation states.

13: What is the oxidation state of chlorine in Cl_2 ?

- A) 0 B) -1 C) +1 D) +5

Answer: A) 0, oxidation states of elements are 0.

14: In which of the following species is the oxidation state of nitrogen +4?

- A) NH_3 B) N_2O C) NO_2 D) NO_3^-

Answer: C) NO_2

15: Fill in the Gaps to complete the sentences below:

a: In the compound H_2S , the oxidation state of sulfur is _____.

Answer: -2

b: The oxidation state of carbon in CO_2 is _____.

Answer: +4

c: The species that gets oxidised in a redox reaction _____ electrons.

Answer: loses