

Oxidation Number Chemistry Questions with Solutions

Q1. What is the oxidation number of sulfur in sulphuric acid (H_2SO_4)?

- (a) 4
- (b) 6
- (c) 8
- (d) None of the above

Answer: (b), The oxidation number of sulphur in sulphuric acid (H_2SO_4) is 6.

Calculation:

$$1 \times 2 + x + 4 \times -2 = 0$$

$$2 + x - 8 = 0$$

$$x = 6$$

So, option (b) is correct.

Q2. What is the oxidation number of chromium in calcium dichromate (CaCr_2O_7)?

- (a) 4
- (b) 6
- (c) 8
- (d) None of the above

Answer: (b), The oxidation number of chromium in calcium dichromate (CaCr_2O_7) is 6.

Calculation:

$$2 + 2x + 7 \times (-2) = 0$$

$$2 + 2x - 14 = 0$$

$$2x = 12$$

$$x = 6$$

So, option (b) is correct.

Q3. What is the oxidation number of nitrogen in nitric acid (HNO_3)?

- (a) 3
- (b) 5
- (c) 7
- (d) None of the above

Answer: (b), The oxidation number of nitrogen in nitric acid (HNO_3) is 5.

Calculation:

$$1 + x + 3 \times (-2) = 0$$

$$1 + x - 6 = 0$$

$$x - 5 = 0$$

$$x = 5$$

So, option (b) is correct.

Q4. Which of the following statements between HClO_4 and HClO_3 is true?

- (a) The oxidation number of chlorine in HClO_4 has been decreased in HClO_3
- (b) The oxidation numbers for all atoms are the same in both molecules
- (c) The oxidation number for chlorine in HClO_4 has increased in HClO_3
- (d) The oxidation number of oxygen in HClO_4 has been decreased in HClO_3

Answer: (a), The oxidation number of chlorine in HClO_4 has been decreased in HClO_3 is true.

Explanation: To understand it better, foremost we will calculate the oxidation number of HClO_4 and HClO_3 .

The oxidation number of chlorine in HClO_4 will be:

$$1 + x + 4 \times (-2) = 0$$

$$1 + x - 8 = 0$$

$$x - 7 = 0$$

$$x = 7$$

The oxidation number of chlorine in HClO_3 will be:

$$1 + x + 3 \times (-2) = 0$$

$$1 + x - 6 = 0$$

$$x - 5 = 0$$

$$x = 5$$

Thus, we can clearly see that oxidation number in HClO_4 has been decreased in HClO_3 . So option (a) is correct.

Q5. What is the oxidation number of carbon in CH_2Cl_2 ?

- (a) 2
- (b) 4
- (c) 6
- (d) None of the above.

Answer: (d), The oxidation number of carbon in CH_2Cl_2 is zero.

Calculation:

$$x + 2 \times 1 + 2 \times (-1) = 0$$

$$x + 2 - 2 = 0$$

$$x = 0$$

The oxidation number of carbon in CH_2Cl_2 is zero.

So, option (d) is correct.

Q6. Chlorine is in +1 oxidation number in

- (a) HCl
- (b) HClO_4
- (c) ICl
- (d) Cl_2O

(e) None of the above

Answer: (d), Chlorine is in +1 oxidation number in Cl_2O .

Explanation: To understand it better, foremost we will calculate the oxidation number of HCl , HClO_4 , ICl and Cl_2O .

The oxidation number of chlorine in HCl will be:

$$1 + x = 0$$

$$x = -1$$

The oxidation number of chlorine in HClO_4 will be:

$$1 + x + 4 \times (-2) = 0$$

$$1 + x - 8 = 0$$

$$x - 7 = 0$$

$$x = 7$$

The oxidation number of chlorine in ICl will be:

$$1 + x = 0$$

$$x = -1$$

The oxidation number of chlorine in Cl_2O will be:

$$2x + (-2) = 0$$

$$2x = 2$$

$$x = 1$$

Thus, chlorine is in +1 oxidation number in Cl_2O .

So, option (d) is correct.

Q7. When $\text{K}_2\text{Cr}_2\text{O}_7$ is converted to K_2CrO_4 , the change in the oxidation number of chromium is

(a) 0

(b) 2

(c) 4

(d) None of the above

Answer: (a), When $\text{K}_2\text{Cr}_2\text{O}_7$ is converted to K_2CrO_4 , the change in the oxidation number of chromium is zero.

Explanation: To understand it better, foremost we will calculate the oxidation of $\text{K}_2\text{Cr}_2\text{O}_7$ and K_2CrO_4 .

The oxidation number of chromium in $\text{K}_2\text{Cr}_2\text{O}_7$ is:

$$2 \times 1 + 2x + 7 \times (-2) = 0$$

$$2 + 2x - 14 = 0$$

$$2x - 12 = 0$$

$$2x = 12$$

$$x = 6$$

The oxidation number of chromium in K_2CrO_4 is:

$$2 \times 1 + x + 4 \times (-2) = 0$$

$$2 + x - 8 = 0$$

$$x - 6 = 0$$

$$x = 6$$

Thus, the oxidation number of chromium does not change when $K_2Cr_2O_7$ is converted to K_2CrO_4 .

So, option (a) is correct.

Q8. What is the oxidation number of chlorine in HOCl?

- (a) 1
- (b) 3
- (c) 5
- (d) None of the above

Answer: (a), The oxidation number of chlorine in HOCl is 1.

Calculation:

The oxidation number of chlorine in HOCl will be:

$$1 + (-2) + x = 0$$

$$-1 + x = 0$$

$$x = 1$$

The oxidation number of chlorine in HOCl is one.

So, option (a) is correct.

Q9. Oxidation number of oxygen in O_2 molecule is

- (a) 0
- (b) 1
- (c) 2
- (d) None of the above

Answer: (a), Oxidation number of oxygen in O_2 molecule is zero.

Q10. The process in which oxidation number increases is known as

- (a) Oxidation
- (b) Reduction
- (c) Catalysis
- (d) None of the above

Answer: (a), The process in which oxidation number increases is known as oxidation.

Q11. Which element in the given compounds has the highest oxidation number?

- (a) Sulphur in SO_3
- (b) Carbon in CO_2
- (c) Aluminum in $AlCl_3$
- (d) Sulphur in CaS

Answer: (a) Sulphur in SO_3 will have the highest oxidation number.

Explanation: To understand it better, foremost we will calculate the oxidation number of SO_3 , CO_2 , AlCl_3 and CaS .

The oxidation number of sulphur in SO_3 is

$$x + 3 \times (-2) = 0$$

$$x - 6 = 0$$

$$x = 6$$

The oxidation number of carbon in CO_2 is

$$x + 2 \times (-2) = 0$$

$$x - 4 = 0$$

$$x = 4$$

The oxidation number of aluminum in AlCl_3 is

$$x + 3 \times (-1) = 0$$

$$x - 3 = 0$$

$$x = 3$$

The oxidation number of sulphur in CaS is

$$2 + x = 0$$

$$x = -2$$

Thus, the oxidation number of sulphur in SO_3 is highest.

So, option (a) is correct.

Q12. Name an element that always shows a negative oxidation number.

Answer: Fluorine always shows a negative (-1) oxidation number.

Q13. What is the oxidation state?

Answer: The oxidation state is the number of electrons that a specific atom can gain, lose or share with another atom. It explains the degree of oxidation of an atom in a molecule.

Q14. What is the oxidation number?

Answer: The oxidation number is the charge that a central metal atom will have even after all the ligands have been removed from that atom.

Q15. What are the rules for finding oxidation numbers?

Answer: The oxidation number is the charge that a central metal atom will have even after all the ligands have been removed from that atom.

Rules for finding the oxidation number:

Rule 1: An atom has a **zero** oxidation number in its elemental form.

Example: The oxidation number of chlorine in the Cl_2 molecule is zero.

Rule 2: The oxidation number of an ion is equivalent to its charge.

Example: The charge of chlorine ion is -1, so the oxidation number of chlorine ion will be -1.

Rule 3: The oxidation number of alkali metals is **+1**, and alkaline earth metal is **+2**.

Example: The oxidation number of sodium is +1, while the oxidation number of calcium is +2.

Rule 4: Hydrogen has two probable oxidation numbers, i.e. **+1 and -1**.

Example: The oxidation number of hydrogen in NaH is -1, while the oxidation number in HCl is +1.

Rule 5: Oxygen has three probable oxidation numbers: **+2, -2 and -1**.

Example: The oxidation number of oxygen in H₂O is -2, while the oxidation number in OF₂ is +2. In contrast, the oxidation number of oxygen is -1 in H₂O₂.

Rule 6: The oxidation number of fluorine in any compound is **-1**.

Example: The oxidation number of fluorine in HF is -1.

Rule 7: The oxidation number of halogen is typically equal to **-1** except when bonded with oxygen or fluorine atom.

Example: The oxidation number of chlorine in HCl is -1, while the oxidation number of chlorine in HClO₄ is +7.

Rule 8: The sum of the oxidation numbers of neutral compounds equals **zero**.

Example: The oxidation number of chlorine is -1 in HCl, while the oxidation number of hydrogen is +1, and their sum is equal to zero.

Practise Questions on Oxidation Number

Q1. Fluorine always shows a -1 oxidation number. Why?

Answer: Fluorine always shows a -1 oxidation number as it is the most electronegative element. It has seven valence electrons and gains one valence electron to complete its octet. This gives a -1 oxidation number to fluorine.

Q2. Differentiate between oxidation state and oxidation number.

Answer:

S. No.	Oxidation State	Oxidation Number
1.	The oxidation state is the number of electrons that a specific atom can gain, lose or share with another atom.	The oxidation number is the charge that a central metal atom will have even after all the ligands have been removed from that atom.
2.	It can be applied to coordinate complex.	It can apply to coordinate complex and molecules.
3.	It does not tell us about the charge on the central atom.	It tells us about the charge on the central atom.

Q3. What is the oxidation number of chlorine in the perchlorate ion?

- (a) 5
- (b) 7
- (c) 9
- (d) None of the above

Answer: (b), The oxidation number of chlorine in the perchlorate ion is 7.

Explanation: The formula of perchlorate ion is ClO_4^- .

The oxidation number of chlorine in perchlorate ion is:

$$x + 4 \times (-2) = -1$$

$$x - 8 = -1$$

$$x = 8 - 1$$

$$x = 7$$

So, option (b) is correct.

Q4. What is the oxidation number of carbon in carbon suboxide (C_3O_2)?

- (a) 4 / 3
- (b) 2 / 3
- (c) 1 / 3
- (d) None of the above

Answer: (a), The oxidation number of carbon in carbon suboxide (C_3O_2) is 4 / 3.

Calculation: The oxidation number of carbon in carbon suboxide (C_3O_2) will be:

$$3x + 2 \times (-2) = 0$$

$$3x - 4 = 0$$

$$3x = 4$$

$$x = 4 / 3$$

Thus, the oxidation number of carbon in carbon suboxide (C_3O_2) will be 4 / 3.

So, option (a) is correct.

Q5. When Chlorine gas reacts with hot and concentrated sodium hydroxide solution, the oxidation number of chlorine changes from

- (a) Zero to -1 and Zero to +3
- (b) Zero to +1 and Zero to -3
- (c) Zero to +1 and Zero to -5
- (d) Zero to -1 and Zero to +5

Answer: (d), When Chlorine gas reacts with hot and concentrated sodium hydroxide solution, the oxidation number of chlorine changes from Zero to -1 and Zero to +5.

Explanation: The reaction of chlorine gas with hot and concentrated sodium hydroxide solution is $3\text{Cl}_2 + 6\text{NaOH} \rightarrow \text{NaClO}_3 + 5\text{NaCl} + 3\text{H}_2\text{O}$

The oxidation number of chlorine is 0 in Cl_2 , -1 in NaCl and +5 in NaClO_3 .

So the oxidation number of chlorine changes from Zero to -1 and Zero to +5.
So, option (d) is correct.

