



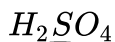
CHEMISTRY

BOOKS - NAGEEN CHEMISTRY (ENGLISH)

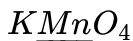
REDOX REACTIONS (OXIDATION AND REDUCTION)

Example

1. Calculate the oxidation number of the underlined element in the following molecules.

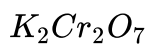
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2. Calculate the oxidation number of the underlined element in the following molecules.



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3. Calculate the oxidation number of the underlined element in the following molecules.



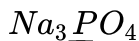
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4. Calculate the oxidation number of the underlined element in the following molecules.



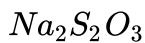
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5. Calculate the oxidation number of the underlined element in the following molecules.



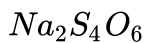
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6. Calculate the oxidation number of the underlined element in the following molecules.



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7. Calculate the oxidation number of the underlined element in the following molecules.



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8. Calculate the oxidation number of the underlined element in the following molecules.



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9. Calculate the oxidation number of the underlined element in the following ions.



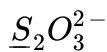
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10. Calculate the oxidation number of the underlined element in the following ions.



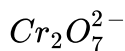
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11. Calculate the oxidation number of the underlined element in the following ions.



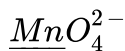
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12. Calculate the oxidation number of the underlined element in the following ions.



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13. Calculate the oxidation number of the underlined element in the following ions.



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14. Calculate the oxidation number of the underlined element in the following ions.



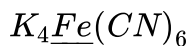
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15. Calculate the oxidation number of the underlined element in the following ions.



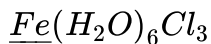
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16. Calculate the oxidation number of the underlined atom in the following species.



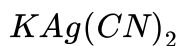
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17. Calculate the oxidation number of the underlined atom in the following species.



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18. Calculate the oxidation number of the underlined atom in the following species.



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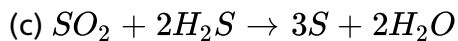
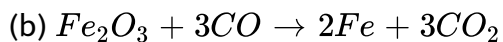
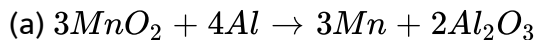
19. Calculate the oxidation number of the underlined atom in the following species.



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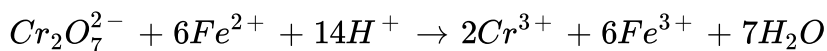
20. Name the substance oxidised and the substance reduced, and also identify the oxidising agent and reducing agents in the following

reactions :



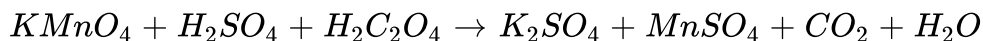
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21. Identify the substance undergoing oxidation, the substance undergoing reduction, the oxidising agent and the reducing agent in each of the following reactions.



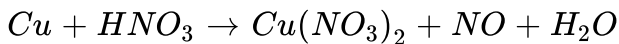
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22. Balance the following equation by oxidation number method.



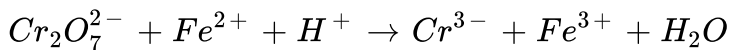
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23. Balance the following equation by oxidation number method.



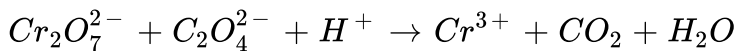
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24. Balance the following equation by oxidation number method in acidic medium.



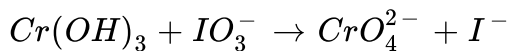
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25. Balance the following equation by ion electron method in the acidic medium.



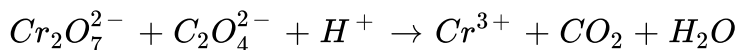
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26. Balance the following equation in basic medium.



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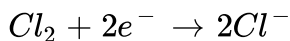
27. Balance the following equation by ion electron method in the acidic medium.



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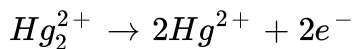
Review Exercises

1. Explain with reasons which of the following half reactions is oxidation and which is reduction?



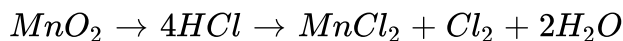
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2. Explain with reasons which of the following half reactions is oxidation and which is reduction?



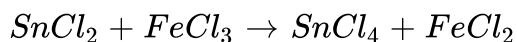
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3. Sort out the substances undergoing oxidation and reduction in the following reactions :



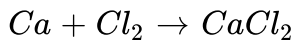
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4. Sort out the substances undergoing oxidation and reduction in the following reactions :



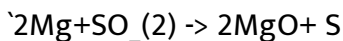
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5. Sort out the oxidising and reducing agents in the following reactions :



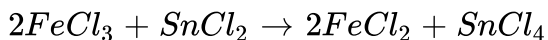
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6. Sort out the oxidising and reducing agents in the following reactions :



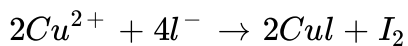
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7. Sort out the oxidising and reducing agents in the following reactions :



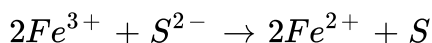
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8. On the basis of the electron transfer, explain which ion is getting oxidised and which getting reduced in the following reactions :



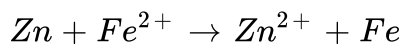
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9. On the basis of the electron transfer, explain which ion is getting oxidised and which getting reduced in the following reactions :



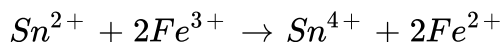
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10. Split the following redox reactions into two half reactions :



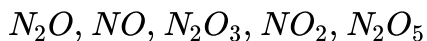
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11. Split the following redox reactions into two half reactions :



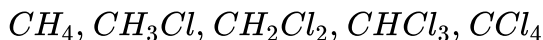
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12. Calculate the oxidation number of nitrogen in the following oxides.



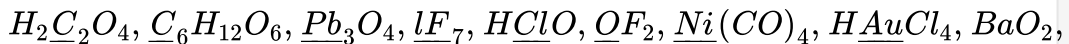
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13. Calculate the oxidation number of carbon in the following compounds.



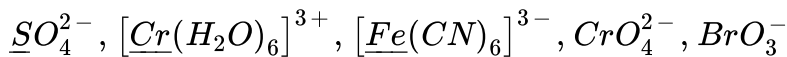
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14. Calculate the oxidation number of the underlined atom in the following molecules.



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15. Calculate the oxidation number of the underlined atom in the following ions.

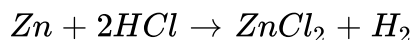


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16. Taking the example of methanol (CH_3OH), show that the oxidation number of C is not the same as its valency.

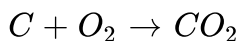
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17. Using the concept of oxidation number, identify the substances undergoing oxidation and reduction in the following reactions.



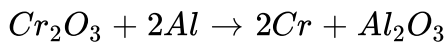
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18. Using the concept of oxidation number, identify the substances undergoing oxidation and reduction in the following reactions.



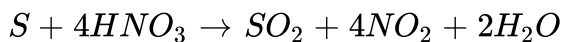
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19. Using the concept of oxidation number, identify the substances undergoing oxidation and reduction in the following reactions.



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20. Identify the oxidising and reducing agents in the following reactions.



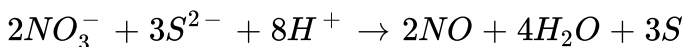
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21. Identify the oxidising and reducing agents in the following reactions.



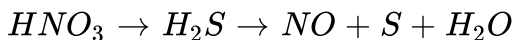
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22. Identify the oxidising and reducing agents in the following reactions.



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23. Balance the following equations by oxidation number method.



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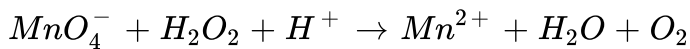
24. Balance the following equations by oxidation number method.





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25. Balance the following equations by oxidation number method.



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26. Balance the following equations by oxidation number method.



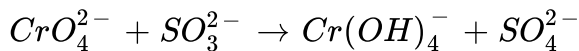
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27. Balance the following equations by oxidation number method.



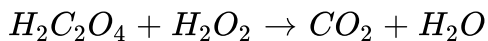
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28. Balance the following equations by oxidation number method.



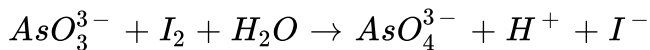
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29. Balance the following equations by ion electron method.



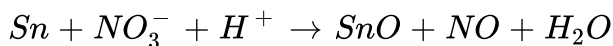
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30. Balance the following equations by ion electron method.



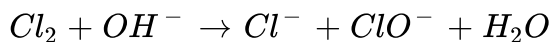
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31. Balance the following equations by ion electron method.



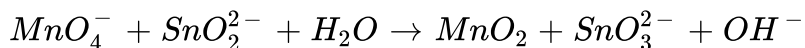
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32. Balance the following equations by ion electron method.



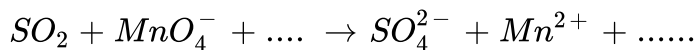
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33. Balance the following equations by ion electron method.



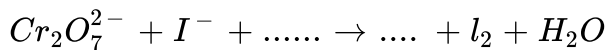
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34. Complete and balance the following equations.



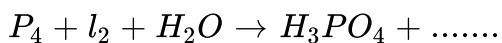
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35. Complete and balance the following equations.



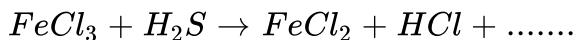
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36. Complete and balance the following equations.



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37. Complete and balance the following equations.



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Very Short Answer Type Questions

1. What do you understand by a redox reaction ? Give an example.

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2. Define oxidising and reducing agents.

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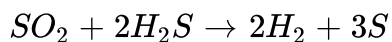
3. Define oxidation in terms of electrons.

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4. Define reduction in terms of oxidation number.

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5. Identify the substances undergoing oxidation and reduction in the following reactions.



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6. Identify the substances undergoing oxidation and reduction in the following reactions.

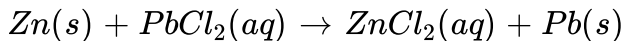


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7. Is the process of neutralisation of a strong acid by a strong base a redox process ?

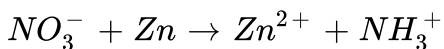
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8. Write the half equations for each of the following redox reactions.



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9. Write the half equations for each of the following redox reactions.



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10. Name the type of reaction that occurs at anode in an electrochemical cell. Give an example.

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11. What is the direction of flow of electrons in a galvanic cell?

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12. In what form does chemical energy get converted when the oxidising and reducing agents are present in the same solution?

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13. Define oxidation and reduction potentials.

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14. If $E_{Sn^{2+}/Sn}^{\circ} = -0.14V$, what would be the value of $E_{Sn/Sn^{2+}}^{\circ}$?

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15. Define standard electrode potential.

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16. The standard reduction potential for silver electrode is +0.80 V. It is connected to a standard hydrogen electrode to make a galvanic cell. State whether silver electrode will act as anode or cathode.

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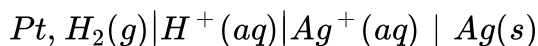
17. $E_{Li^+/Li}^\circ = -3.05V$ and $E_{Ca^{2+}/Ca}^\circ = -2.87V$, state which is a better reducing agent Li or Ca?

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18. Among Na and Mg, which is more reactive and why?

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19. Write the cell reaction for each of the following cells.



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20. Write the cell reaction for each of the following cells.



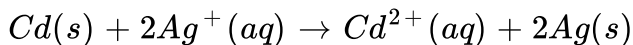
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21. In which direction the cell reaction would proceed if the E.M.F. of a galvanic cell is zero?



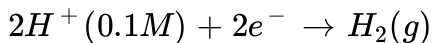
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22. Represent the cell corresponding to the following redox reaction and identify the anode and the cathode.



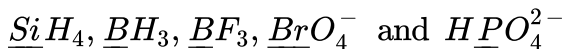
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23. Write the Nernst equation at 298 K for the electrode reaction



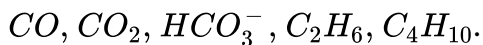
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24. Determine the oxidation number of the underlined elements in the following species.



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25. Determine the oxidation number of C in the following:



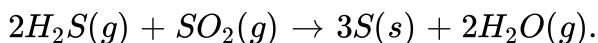
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26. Determine the oxidation number of O in the following:

OF_2 , Na_2O_2 and CH_3COOH .

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27. Determine the change in the oxidation number of S in H_2S and SO_2 in the following reaction :



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Short Answer Type Questions

1. What are the classical views regarding oxidation and reduction ? Give examples.

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2. What are the modern views regarding oxidation and reduction ?

Explain with examples.

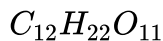
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3. Calculate the oxidation number of all the atoms in the following species.



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4. Calculate the oxidation number of all the atoms in the following species.



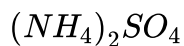
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5. Calculate the oxidation number of all the atoms in the following species.



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6. Calculate the oxidation number of all the atoms in the following species.



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7. Define oxidation, reduction, oxidising agent and reducing agent in terms of oxidation number.

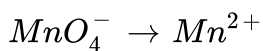
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8. Balance the following half cell reactions.



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9. Balance the following half cell reactions.

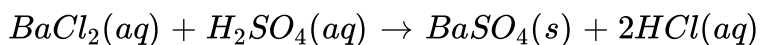


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10. Oxidation and Reduction

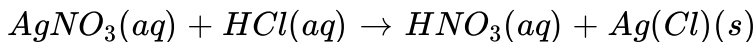
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11. Why are the following reactions not redox reactions ?



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12. Why are the following reactions not redox reactions ?



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Essay Long Answer Type Questions

1. What do you understand by oxidation number? Mention the working rules used to calculate it.

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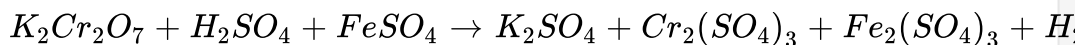
2. What is oxidation number? Mention the working rules used to calculate the oxidation number of an atom in a given species. Calculate the oxidation number of S in Na_2S , Na_2SO_3 , Na_2SO_4 , $Na_2S_2O_3$ and $Na_2S_4O_6$.

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3. How is the concept of oxidation number helpful in identifying the oxidising and reducing agents in a redox reaction. Explain with examples.

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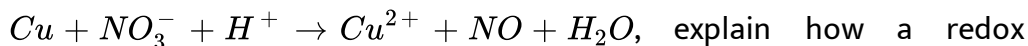
4. Taking the example of the reaction



explain how a redox reaction is balanced by oxidation number method.

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5. Taking the example of the reaction



explain how a redox reaction is balanced by ion electron method.

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6. Give a brief account of various types of redox reactions.

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7. How do redox reactions form the basis of titration?

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8. How can redox reactions be used to convert chemical energy into electrical energy?

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Objective Multiple Choice Type Questions Choose The Correct Option In The Following Questions

1. A reducing agent is a substance which can

- A. accept electrons
- B. donate electrons
- C. accept protons
- D. donate protons.

Answer: B

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2. SnCl_2 gives a precipitate with a solution of HgCl_2 . In this process, HgCl_2 is

- A. reduced
- B. oxidised
- C. converted into a complex compound containing both Sn and Hg
- D. converted into a chloro complex of Hg.

Answer: A

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3. When a copper wire is placed in a solution of $AgNO_3$, the solution acquires blue colour. This is due to

- A. oxidation of Cu
- B. reduction of Cu
- C. formation of a soluble complex
- D. oxidation of Ag.

Answer: A

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4. The oxidation number of C in CH_2O is

- A. -2
- B. $+2$

C. 0

D. +4

Answer: C

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5. Which of the following is the strongest oxidising agent ?

A. F_2

B. Cl_2

C. Br_2

D. I_2

Answer: A

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6. Phosphorus has the oxidation state of +3 in

A. ortho phosphoric acid

B. phosphorus acid

C. meta phosphoric acid

D. pyro phosphoric acid.

Answer: B



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7. Oxygen has an oxidation state of +2 in

A. H_2O_2

B. H_2O

C. OF_2

D. SO_2

Answer: C

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8. The most common oxidation state of an element is -2. The number of electrons present in its outermost shell is

A. 2

B. 4

C. 6

D. 8

Answer: C

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9. A metal ion M^{3+} after loss of three electrons in a reaction will have an oxidation number equal to

A. zero

B. +2

C. +3

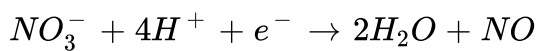
D. +6

Answer: D



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10. The number of electrons to balance the equation



A. 5

B. 4

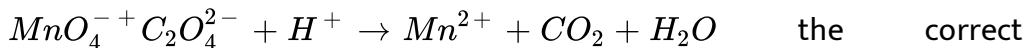
C. 3

D. 2

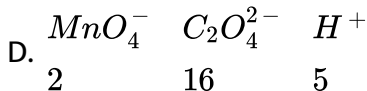
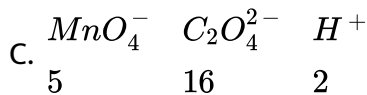
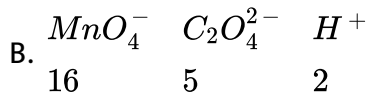
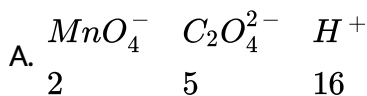
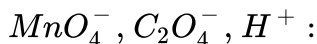
Answer: C

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11. For the redox reaction,



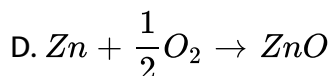
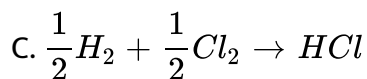
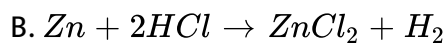
the correct coefficients of the reactants for the balanced reaction are respectively



Answer: A

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12. Which one of the following reactions is not a redox reaction ?



Answer: A

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13. Oxidation state of oxygen atom in potassium superoxide is

A. $-\frac{1}{2}$

B. -1

C. -2

D. 0

Answer: A

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14. In the reaction

$C_3H_6(g) + nO_2(g) \rightarrow CO_2(g) + H_2O(l)$. The ratio of the coefficients of CO_2 and H_2O is

A. 1 : 1

B. 1 : 3

C. 2 : 3

D. 3 : 2

Answer: C



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15. Phosphorus on reaction with NaOH produces PH_3 and NaH_2PO_2 .

This reaction is an example of

A. oxidation

B. reduction

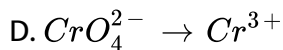
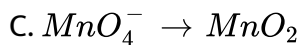
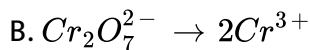
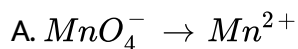
C. disproportionation

D. neutralisation

Answer: C

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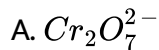
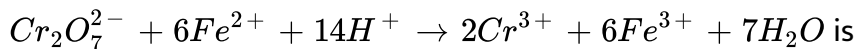
16. Which atom in the following reactions undergoes a change of oxidation state of -5 ?



Answer: A

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17. The ion acting as an oxidising agent in the reaction,



Answer: A



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18. The stock notation for Mn_2O_7 is

A. manganese (II) oxide

B. manganese (III) oxide

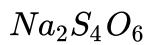
C. manganese (V) oxide

D. manganese (VII) oxide.

Answer: D

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19. Calculate the oxidation number of the underlined element in the following molecules.



A. 0

B. +5

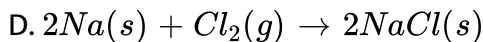
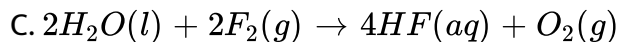
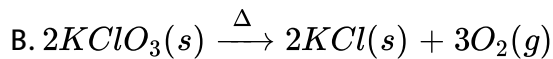
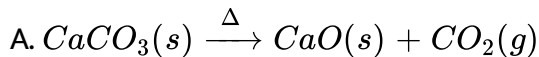
C. both 0 and +5

D. $+\frac{5}{2}$

Answer: D

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20. Which of the following is a redox decomposition reaction ?

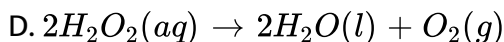
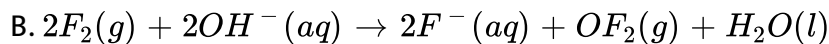
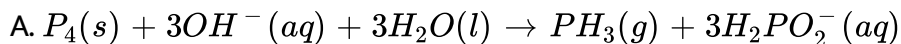


Answer: B



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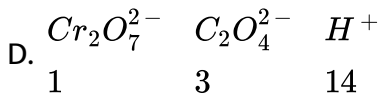
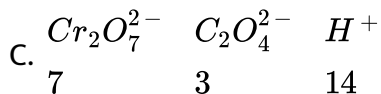
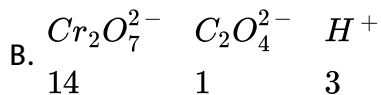
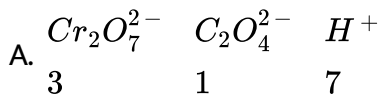
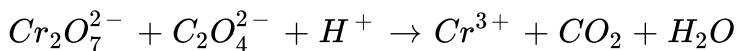
21. Which of the following is not a disproportionation reaction ?



Answer: B

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22. Balance the following equation by ion electron method in the acidic medium.



Answer: D

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23. Equivalent mass of $C_2O_4^{2-}$ ion in the reaction,



A. 11

B. 22

C. 44

D. 88

Answer: C



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24. In the titration of $FeSO_4$ against $KMnO_4$ in acidic medium, one mole of $KMnO_4$ reacts with x moles of $FeSO_4$. The value of x is

A. 10

B. 8

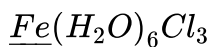
C. 5

D. 3

Answer: C

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25. Calculate the oxidation number of the underlined atom in the following species.



A. +3

B. -3

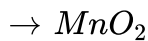
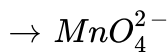
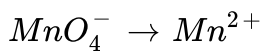
C. +2

D. -2

Answer: A

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26. MnO_4^- is a good oxidising agent in different mediums changing to



Changes in oxidation number respectively are

A. 1,3,4,5

B. 5,4,3,2

C. 5,1,3,4

D. 2,6,4,3

Answer: C



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27. Oxidation number of Cl in $CaOCl_2$ (bleaching powder) is

A. zero, since it contains Cl_2

B. -1 since it contains Cl^-

C. $+1$, since it contains ClO^-

D. $+1$ and -1 since it contains ClO^- and Cl^-

Answer: D

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28. The oxidation state of Cr in $[Cr(NH_3)_4Cl_2]^+$ is

A. 0

B. $+1$

C. $+2$

D. $+3$

Answer: D

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29. The oxidation state of chromium in the final product formed by the reaction between KI and acidified potassium dichromate solution is

A. +3

B. +2

C. +6

D. +4

Answer: A



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30. What products are expected from the disproportionation reaction of hypochlorous acid ?

A. $HClO_3$ and Cl_2O

B. $HClO_2$ and $HClO_4$

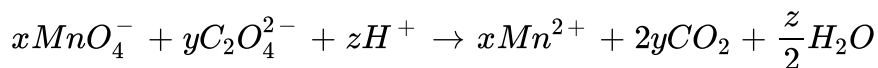
C. HCl and Cl_2O

D. HCl and $HClO_3$

Answer: D

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31. Consider the following reaction,



The values of x,y and z in the reactions are, respectively

A. 5, 2 and 16

B. 2, 5 and 8

C. 2, 5 and 16

D. 5, 2 and 8.

Answer: C

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32. Oxidation states of P in $H_4P_2O_5$, $H_4P_2O_6$, $H_4P_2O_7$ respectively are

A. +3, +5, +4

B. +5, +3, +4

C. +5, +4, +3

D. +3, +4, +5

Answer: D



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33. A mixture of potassium chlorate, oxalic acid and sulphuric acid is heated. During the reaction which element undergoes maximum change in the oxidation number?

A. S

B. H

C. Cl

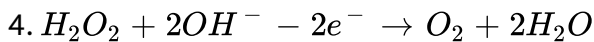
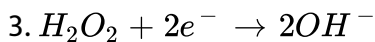
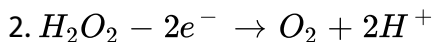
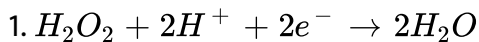
D. C

Answer: C



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34. In which of the following reactions H_2O_2 acts as a reducing agent?



A. 1,2

B. 3,4

C. 1,3

D. 2,4

Answer: D



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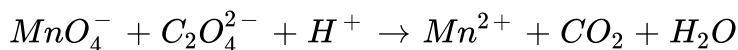
35. The correct order of N-compounds in its decreasing order of oxidation states is

- A. HNO_3 , NO , N_2 , NH_4Cl
- B. HNO_3 , NO , NH_4Cl_4 , N_2
- C. HNO_3 , NH_4Cl , NO , N_2
- D. NH_4Cl , N_2 , NO , HNO_3

Answer: A

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36. For the redox reaction



the correct coefficients of the reactants for the balanced equation are

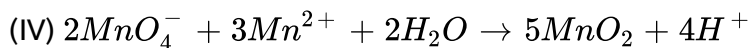
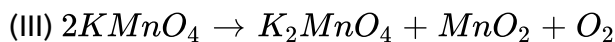
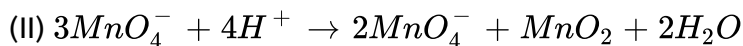
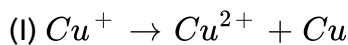
- A. MnO_4^- $C_2O_4^{2-}$ H^+
2 16 5

- B. MnO_4^- $C_2O_4^{2-}$ H^+
 2 5 16
- C. MnO_4^- $C_2O_4^{2-}$ H^+
 16 5 2
- D. MnO_4^- $C_2O_4^{2-}$ H^+
 5 16 2

Answer: B

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37. Which of the following reactions are disproportionation reactions ?



A. (a), (c) and (d)

B. (a) and (d) only

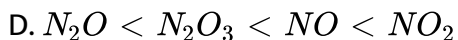
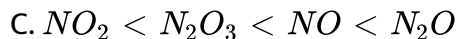
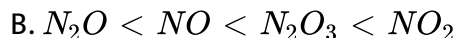
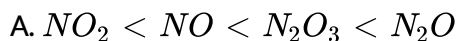
C. (a) and (b) only

D. (d) (a), (b) and (c).

Answer: C

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38. Arrange in the increasing order of oxidation state of nitrogen for following nitrogen oxides N_2O , NO_2 , NO , N_2O_3



Answer: B

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39. In order to oxidise a mixture of one mole of each of FeC_2O_4 , $Fe_2(C_2O_4)_3$, $FeSO_4$ and $Fe_2(SO_4)_3$ in acidic medium, the

number of moles of $KMnO_4$ required is :

A. 2

B. 1

C. 1.5

D. 3

Answer: A



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True Or False Type Questions State Whether The Following Statements Are True T Or False F

1. Comment on the statement : oxidation and reduction are complementary processes.



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2. An oxidising agent is a substance which electrons whereas a reducing agent is the substance which Electrons

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3. The reduction half reaction represents the gain of electrons.

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4. When a rod of copper is immersed in a solution of $ZnSO_4$ zinc gets precipitated.

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5. The oxidation state of hydrogen in CaH_2 is +1.

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6. The oxidation state of S in S_8 is zero.

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7. The oxidation state of a substance increases in oxidation and decreases in reduction.

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8. An element in its lowest oxidation state can act only as an oxidising agent.

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9. Conversion of MnO_4^- into MnO_4^{2-} is oxidation

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10. The sum of oxidation numbers of all atoms in an ion is zero.

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11. The oxidation state of hydrogen in CaH_2 is +1.

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12. The oxidation state of S in S_8 is zero.

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13. The oxidation state of a substance increases in oxidation and decreases in reduction.

 [Watch Video Solution](#)

14. An element in its lowest oxidation state can act only as an oxidising agent.

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15. Conversion of MnO_4^- into MnO_4^{2-} is oxidation

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16. The sum of oxidation numbers of all atoms in an ion is zero.

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17. The oxidation numbers of the two chlorine atoms in $CaOCl_2$ are not the same.

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1. The reaction in which electrons are transferred from one reactant to another is called a

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2. Oxidation is the process which involves of electrons and is accompanied by an in the oxidation number of the substance.

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3. An oxidising agent is a substance which electrons whereas a reducing agent is the substance which Electrons

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4. The oxidation number of oxygen in F_2O and H_2O_2 are and respectively.

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5. The oxidation number of P in KH_2PO_3 is

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6. The lowest possible oxidation state of nitrogen is

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7. The compound $Ba_2Cu_3O_7$, which shows super conductivity, has copper in oxidation state Assume that the rare earth element yttrium is in its usual +3 oxidation state.

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8. In the conversion of $Br_2 \rightarrow BrO_3^{-1}$ the oxidation state of bromine changes from to +5.

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9. Among SO_2 , H_2SO_4 and sodium thiosulphate, the sulphur has the highest oxidation state in

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10. In the reaction, $C_2O_4^{2-} + MnO_4^- + H^+ \rightarrow Mn^{2+} + CO_2$, the reducing agent is

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11. Among the halide ions, is the most powerful reducing agent.

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12. The oxidation state of cobalt in $Co_2(CO)_8$ is

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Assertion Reason Type Questions

1. Assertion :Oxidation and reduction are complementary to each other

Reason : A substance will lose electrons only when some other substance will gain them . Thus. A substance gets oxidised only when some other substance gets reduced.

A. If both Assertion and Reason are CORRECT and Reason is the CORRECT explanation of the Assertion.

B. If both Assertion and Reason are CORRECT but Reason is not the CORRECT explanation of the Assertion.

C. If Assertion is CORRECT but Reason is INCORRECT.

D. If Assertion is INCORRECT but Reason is CORRECT.

Answer: A

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2. Assertion : The oxidation number of fluorine in all its compounds is always -1

Reason : Fluorine is a highly reactive element .

A. If both Assertion and Reason are CORRECT and Reason is the CORRECT explanation of the Assertion.

B. If both Assertion and Reason are CORRECT but Reason is not the CORRECT explanation of the Assertion.

C. If Assertion is CORRECT but Reason is INCORRECT.

D. If Assertion is INCORRECT but Reason is CORRECT.

Answer: B



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3. Assertion : In the reaction $H_2S + HNO_3 \rightarrow NO + S + H_2O$, HNO_3 acts as an oxidising agent.

Reason : HNO_3 gets oxidised to NO.

- A. If both Assertion and Reason are CORRECT and Reason is the CORRECT explanation of the Assertion.
- B. If both Assertion and Reason are CORRECT but Reason is not the CORRECT explanation of the Assertion.
- C. If Assertion is CORRECT but Reason is INCORRECT.
- D. If Assertion is INCORRECT but Reason is CORRECT.

Answer: C



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4. Assertion : Copper is unable to displace H_2 from dil. H_2SO_4

Reason : The standard electrode potential for Cu^{2+} / Cu system is greater than that of $H^+ / \frac{1}{2}H_2$ system.

- A. If both Assertion and Reason are CORRECT and Reason is the CORRECT explanation of the Assertion.
- B. If both Assertion and Reason are CORRECT but Reason is not the CORRECT explanation of the Assertion.
- C. If Assertion is CORRECT but Reason is INCORRECT.
- D. If Assertion is INCORRECT but Reason is CORRECT.

Answer: A



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5. Assertion : Silver can displace copper from $CuSO_4$ solution.

Reason : Silver is placed below copper in the electrochemical series.

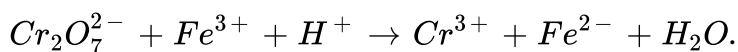
- A. If both Assertion and Reason are CORRECT and Reason is the CORRECT explanation of the Assertion.
- B. If both Assertion and Reason are CORRECT but Reason is not the CORRECT explanation of the Assertion.
- C. If Assertion is CORRECT but Reason is INCORRECT.
- D. If Assertion is INCORRECT but Reason is CORRECT.

Answer: D

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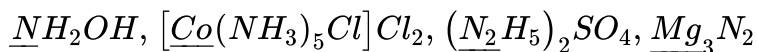
Numerical Problems

1. Why is it not possible to balance the following equation ?



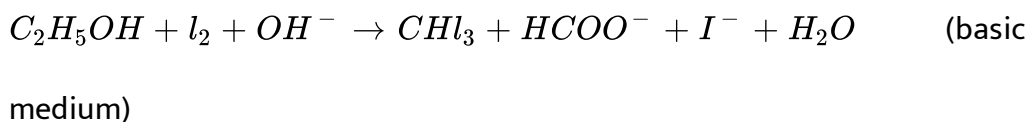
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2. Calculate the oxidation number of the underlined atoms in the following species.



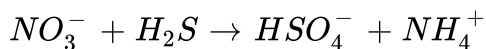
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3. Balance the following equations.



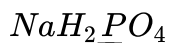
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4. Balance the following equations.



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1. Assign oxidation number to the underlined elements in each of the following species :



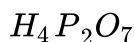
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2. Assign oxidation number to the underlined elements in each of the following species :



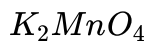
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3. Assign oxidation number to the underlined elements in each of the following species :



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4. Assign oxidation number to the underlined elements in each of the following species :



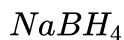
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5. Assign oxidation number to the underlined elements in each of the following species :



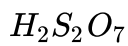
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6. Assign oxidation number to the underlined elements in each of the following species :



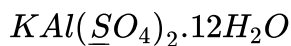
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7. Assign oxidation number to the underlined elements in each of the following species :



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8. Assign oxidation number to the underlined elements in each of the following species :



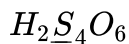
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9. What are the oxidation number of the underlined elements in each of the following and how do you rationalise your results?



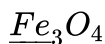
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10. What are the oxidation number of the underlined elements in each of the following and how do you rationalise your results?



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11. What are the oxidation number of the underlined elements in each of the following and how do you rationalise your results?



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12. What are the oxidation number of the underlined elements in each of the following and how do you rationalise your results?



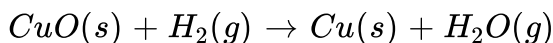
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13. What are the oxidation number of the underlined elements in each of the following and how do you rationalise your results?



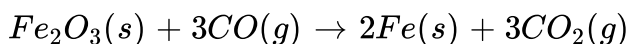
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14. Justify that the following reactions are redox reactions :



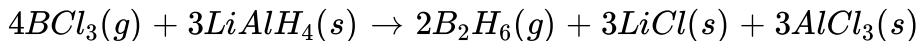
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15. Justify that the following reactions are redox reactions :



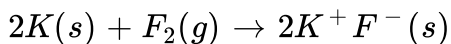
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16. Justify that the following reactions are redox reactions :



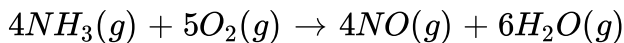
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17. Justify that the following reactions are redox reactions :



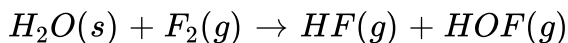
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18. Justify that the following reactions are redox reactions :



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19. Fluorine reacts with ice and results in the change:



Justify that this reaction is a redox reaction .

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20. Calculate the oxidation number of Sulphur in H_2SO_5 . Suggest structure of this compounds. Count for the fallacy.

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21. Calculate the oxidation number of Chromium in CrO_5 . Suggest structure of this compound. Count for the fallacy.

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22. Calculate the oxidation number of nitrogen in NO_3^- . Suggest structure of this compound. Count for the fallacy.

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23. Write formulas for the following compounds :

Mercury (II) chloride

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24. Write formulas for the following compounds :

Nickel (II) sulphate

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25. Write formulas for the following compounds :

Tin (IV) oxide

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26. Write formulas for the following compounds :

Thallium (I) sulphate



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27. Write formulas for the following compounds :

Iron (III) sulphate

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28. Write formulas for the following compounds :

Chromium (III) oxide

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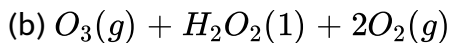
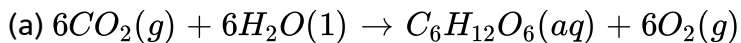
29. Suggest a list of the substances where carbon can exhibit oxidation states from -4 to $+4$ and nitrogen from -3 to $+5$.

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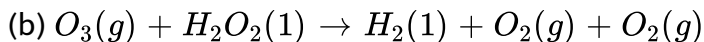
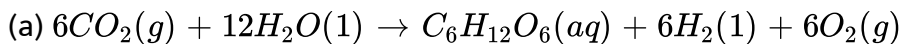
30. While sulphur dioxide and hydrogen peroxide can act as oxidising as well as reducing agents in their reactions, ozone and nitric acid act only as oxidants. Why ?

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31. Consider the reactions :



Why it is more appropriate to write these reactions as :



Also suggest a technique to investigate the path of the above (a) and (b) redox reactions .

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32. The compound AgF_2 is unstable compound. However, if formed, the compound acts as a very strong oxidising agent. Why ?

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33. Whenever a reaction between an oxidising agent and a reducing agent is carried out, a compound of lower oxidation state is formed if the reducing agent is in excess and a compound of higher oxidation state is formed if the oxidising agent is in excess. Justify this statement giving three illustrations.

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34. How do you account for the following observations ?

Though alkaline potassium permanganate and acidic potassium permanganate both are used as oxidants, yet in the manufacture of benzoic acid from toluene we use alcoholic potassium permanganate as an oxidant. Why? Write a balanced redox equation for the reaction.



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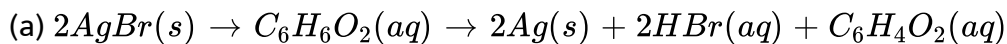
35. How do you account for the following observations ?

When concentrated sulphuric acid is added to an inorganic mixture containing chloride, we get colourless pungent smelling gas HCl, but if the mixture contains bromide then we get red vapour of bromine. Why?

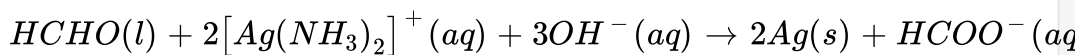


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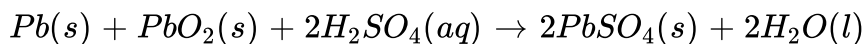
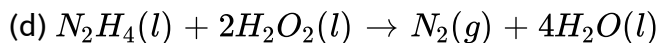
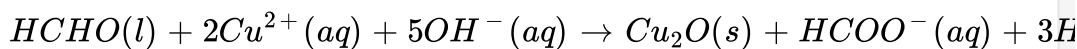
36. Identify the substance oxidised and reduced, oxidising agent and reducing agent for each of the following reactions



(b)



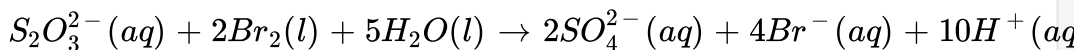
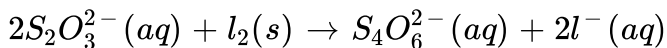
(c)





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37. Consider the reactions :



Why does the same reductant, thiosulphate react differently with iodine and bromine?



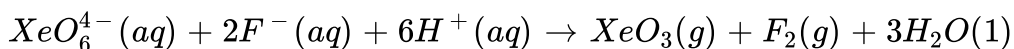
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38. Justify giving reactions that among halogens, fluorine is the best oxidant and among hydrohalic compounds, hydroiodic acid is the best reductant.



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39. Why does the following reaction occur ?

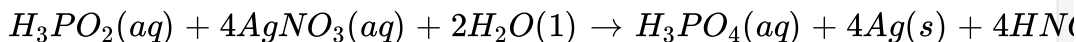


What conclusion about the compound Na_4XeO_6 (of which XeO_6^{4-} is a part) can be drawn from the reaction.

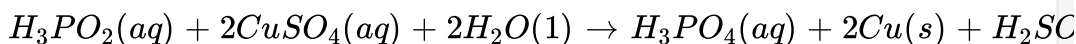
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40. Consider the reactions :

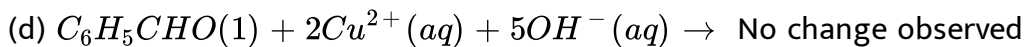
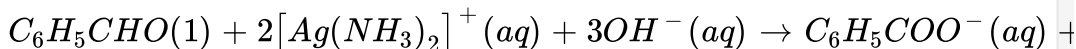
(a)



(b)



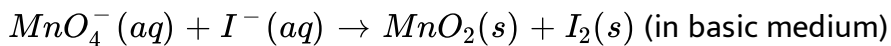
(c)



What inference do you draw about the behaviour of Ag^+ and Cu^{2+} from these reactions ?

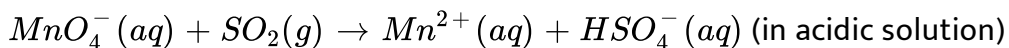
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41. Balance the following redox reactions by ion-electron method.



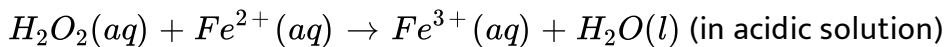
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42. Balance the following redox reactions by ion-electron method.



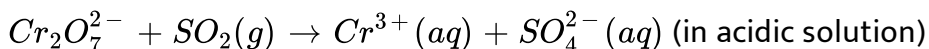
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43. Balance the following redox reactions by ion-electron method.



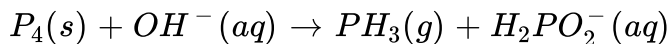
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44. Balance the following redox reactions by ion-electron method.



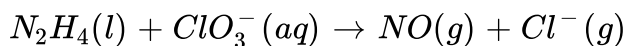
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45. Balance the following equations in basic medium by ion electron method and oxidation number method and identify the oxidising agent and the reducing agent.



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46. Balance the following equations in basic medium by ion electron method and oxidation number method and identify the oxidising agent and the reducing agent.

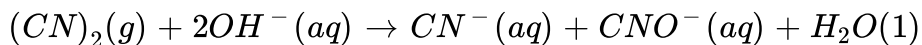


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47. If the elemental composition of butyric acid is found to be 54.4% C, 9.13% H, and 36.5% O, determine the empirical formula.

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48. What sorts of informations you can draw from the following reaction ?



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49. Mn^{3+} ions are unstable in solution and undergo disproportionation to give Mn^{2+} , MnO_2 and H^+ ions. What will be the balanced equation for the reaction ?



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50. Consider the elements :

Cs ,Ne , I and F

(a) Identify the element that exhibits only negative oxidation state.

(b) Identify the element that exhibits only positive oxidation state.

(c) Identify the element that exhibits both positive and negative oxidation states.

(d) Identify the element which exhibits neither the negative nor does the positive oxidation state.

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51. Consider the elements :

Cs ,Ne , I and F

(a) Identify the element that exhibits only negative oxidation state.

(b) Identify the element that exhibits only positive oxidation state.

(c) Identify the element that exhibits both positive and negative oxidation states.

(d) Identify the element which exhibits neither the negative nor does the positive oxidation state.

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52. Consider the elements :

Cs ,Ne , I and F

(a) Identify the element that exhibits only negative oxidation state.

(b) Identify the element that exhibits only positive oxidation state.

(c) Identify the element that exhibits both positive and negative oxidation states.

(d) Identify the element which exhibits neither the negative nor does the positive oxidation state.



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53. Consider the elements :

Cs ,Ne , I and F

(a) Identify the element that exhibits only negative oxidation state.

(b) Identify the element that exhibits only positive oxidation state.

(c) Identify the element that exhibits both positive and negative oxidation states.

(d) Identify the element which exhibits neither the negative nor does the positive oxidation state.

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54. Chlorine is used to purify drinking water. Excess of chlorine is harmful. The excess of chlorine is removed by treating with sulphur dioxide. Present a balanced equation for this redox change taking place in water.

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55. Refer to the periodic table given in your book and now answer the following questions:

(a) Select the possible non metals that can show disproportionation reaction.

(b) Select three metals that can show disproportionation reaction.

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56. Refer to the periodic table given in your book and now answer the following questions:

(a) Select the possible non metals that can show disproportionation reaction.

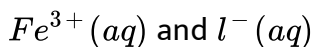
(b) Select three metals that can show disproportionation reaction.

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57. In Ostwald's process for the manufacture of nitric acid, the first step involves the oxidation of ammonia gas by oxygen gas to give nitric oxide gas and steam. What is the maximum weight of nitric oxide that can be obtained starting only with 10.00 g. of ammonia and 20.00 g of oxygen ?

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58. Using the standard electrode potentials given, predict if the reaction between the following is feasible:



$\text{Fe}^{3+}/\text{Fe}^{2+} : +0.77 \text{ V}$

$\text{I}^-/\text{I}_2 : -0.54 \text{ V}$

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59. Using the standard electrode potentials given in the Table 8.2, predict if the reaction between the following is feasible:

$\text{Ag}^+ (aq)$ and $\text{Cu} (s)$

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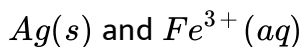
60. Using the standard electrode potential, find out the pair between which redox reaction is not feasible.

E^θ values: $\text{Fe}^{3+} / \text{Fe}^{2+} = 0.77$, $\text{I}_2 / \text{I}^- = +0.54$,

$\text{Cu}^{2+} / \text{Cu} = +0.34$, $\text{Ag}^+ / \text{Ag} = +0.80\text{V}$

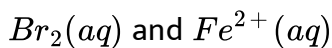
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61. Using the standard electrode potentials given in the Table 8.2, predict if the reaction between the following is feasible:



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62. Using the standard electrode potentials , predict if the reaction between the following is feasible:



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63. Predict the products of electrolysis in each of the following

- (i) an aqueous solution of $AgNO_3$ with silver electrodes.
- (ii). An aqueous solution of $AgNO_3$ with platinum electrodes.
- (iii). A dilute solution of H_2SO_4 with platinum electrodes.
- (iv). An aqueous solution of $CuCl_2$ with platinum electrodes.

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64. Predict the products of electrolysis in each of the following

- (i) an aqueous solution of $AgNO_3$ with silver electrodes.
- (ii). An aqueous solution of $AgNO_3$ with platinum electrodes.
- (iii). A dilute solution of H_2SO_4 with platinum electrodes.
- (iv). An aqueous solution of $CuCl_2$ with platinum electrodes.



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65. Predict the products of electrolysis in each of the following

- (i) an aqueous solution of $AgNO_3$ with silver electrodes.
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- (iii). A dilute solution of H_2SO_4 with platinum electrodes.
- (iv). An aqueous solution of $CuCl_2$ with platinum electrodes.



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(i) an aqueous solution of $AgNO_3$ with silver electrodes.

(ii). An aqueous solution of $AgNO_3$ with platinum electrodes.

(iii). A dilute solution of H_2SO_4 with platinum electrodes.

(iv). An aqueous solution of $CuCl_2$ with platinum electrodes.

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67. Arrange the following metals in the order in which they displace each other from the solution of their salts.

Al, Cu, Fe, Mg and Zn

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68. Given the standard electrode potentials ,

$$K^+ / K = - 2.93V, Ag^+ / Ag = 0.80V, Hg^{2+} / Hg = 0.79V$$

$$Mg^{2+} / Mg = - 2.37V. Cr^{3+} / Cr = - 0.74V$$

arrange these metals in their increasing order of the reducing power .



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69. Depict the galvanic cell in which the reaction

$Zn(s) + 2Ag^+(aq) \rightarrow Zn^{2+}(aq) + 2Ag(s)$ takes place. Further show:

- (i) which of the electrode is negatively charged?
- (ii). The carriers of the current in the cell.
- (iii). Individual reaction at each electrode.



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