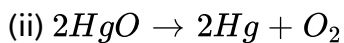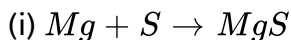# CHEMISTRY

AAKASH INSTITUTE ENGLISH

REDOX REACTIONS

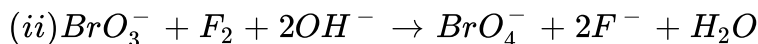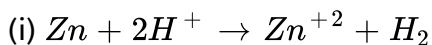**Example**

1. In the given reaction, identify the species undergoing oxidation and reduction

(i) $Mg + S \rightarrow MgS$

(ii) $2HgO \rightarrow 2Hg + O_2$

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2. Using electronic concept, identify the oxidant and reductant in the following redox reactions.

(i) $Zn + 2H^+ \rightarrow Zn^{+2} + H_2$

(ii) $BrO_3^- + F_2 + 2OH^- \rightarrow BrO_4^- + 2F^- + H_2O$

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3. Calculate the oxidation number of 'O' in H_2O molecule.

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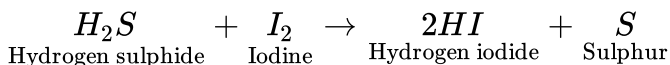**4.** Calculate the oxidatioin number of S in SO_4^{2-} ion.

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5. Oxidation number of N in $(NH_4)_2SO_4$ is

▶ Watch Video Solution

6. Calculate the oxidation number of Mn in $KMnO_4$ molecule.

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7. Select the oxidising agent and the reducing agent from the following reaction :

$$\underset{\text{Hydrogen sulphide}}{H_2S} + \underset{\text{Iodine}}{I_2} \rightarrow \underset{\text{Hydrogen iodide}}{2HI} + \underset{\text{Sulphur}}{S}$$
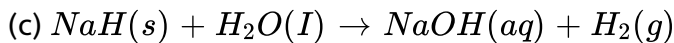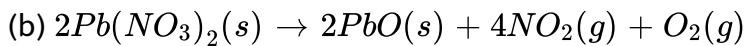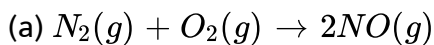
> ▶ Watch Video Solution

8. Assertion : In the reaction, $2Cu_2O_{(s)} + Cu_2S_{(s)} \rightarrow 6Cu_{(s)} + SO_{2(g)}$ copper acts as a reductant and sulphur acts as an oxidant.

Reason : The given reaction is not a redox reaction.

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9. Suggest a scheme of classification of the following redox reactions

(a) $N_2(g) + O_2(g) \rightarrow 2NO(g)$

(b) $2Pb(NO_3)_2(s) \rightarrow 2PbO(s) + 4NO_2(g) + O_2(g)$

(c) $NaH(s) + H_2O(I) \rightarrow NaOH(aq) + H_2(g)$

(d) $2NO_2(g) + 2OH^-(aq) \rightarrow NO_2^-(aq) + NO_3^-(aq) + H_2O(l)$
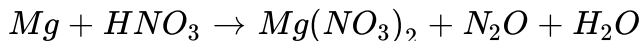
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10. How does Cu_2O act as both oxidant and reductant ?

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11. Which one of two , ClO_2^- or ClO_4^- shows disproportionation reaction and why ?
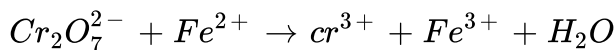
▶ Watch Video Solution
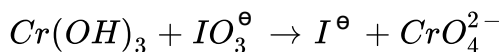
12. Balance the equation

$$Mg + HNO_3 \rightarrow Mg(NO_3)_2 + N_2O + H_2O$$

13. Balance the following equations by ion electron (half reaction) method for each of the following equations:

$$Cr_2O_7^{2-} + Fe^{2+} \rightarrow cr^{3+} + Fe^{3+} + H_2O$$

14. Balance the following by ion electron method (basic medium):

$$Cr(OH)_3 + IO_3^{\ominus} \rightarrow I^{\ominus} + CrO_4^{2-}$$

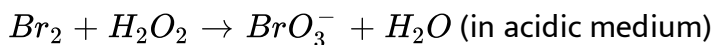**15.** Balance the net equtation for the reaction of potassium dichromate (VI), $K_2Cr_2O_7$, with sodium sulphite, Na_2SO_3, in an acid solution to give chromium (III) ion and and sulphate ion.

Strategy : Follow the seven -step proceduce , one step at a time.

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16. Balance the redox reaction by half reaction method :

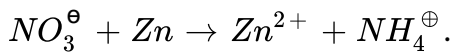$Br_2 + H_2O_2 \rightarrow BrO_3^- + H_2O$ (in acidic medium)

▶ Watch Video Solution

17. In passing chlorine gas through a concentrated solution of alkali we get chloride and chlorate ions Obtain balanced chemical equation for this reaction.
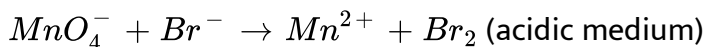
▶ Watch Video Solution

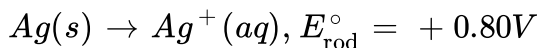**18.** Balance the following by ion electron method is basic medium.

$$NO_3^{\ominus} + Zn \rightarrow Zn^{2+} + NH_4^{\oplus}.$$

19. Balance the equation by ion electron method

$$MnO_4^- + Br^- \rightarrow Mn^{2+} + Br_2 \text{ (acidic medium)}$$

20. The half cell reactions with reduction potentials are

$$Pb(s) \rightarrow Pb^{+2}(aq), E_{red}^{\circ} = -0.13V$$

$$Ag(s) \rightarrow Ag^{+}(aq), E_{rod}^{\circ} = +0.80V$$
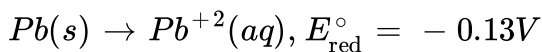
Calculate its emf.

21. Can a solution of 1 M copper sulphate be stored in a vessel made of nickel metal ? Given that $E^\circ_{Ni^{+2}/Ni} = -0.25$ volt and $E^\circ_{Cu^{+2}/Cu} = +0.34$ volt

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22. $Cr_2O_7^{-2}{}_{(aq)} + SO_3^{-2}{}_{(aq)} \rightarrow Cr^{+3}{}_{(aq)} + SO_4^{-2}{}_{(aq)}$ (Acidic medium)

▶ Watch Video Solution

23. $MnO_4^-{}_{(aq)} + Br^-{}_{(aq)} \rightarrow MnO_2{}_{(aq)} + BrO_3^-{}_{(aq)}$

▶ Watch Video Solution

24. In the given reaction, identify the species undergoing oxidation and reduction

(i) $Mg + S \rightarrow MgS$

(ii) $2HgO \rightarrow 2Hg + O_2$
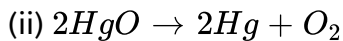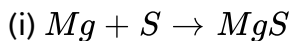
> ▶ Watch Video Solution

25. Using electronic concept, identify the oxidant and reductant in the following redox reactions.

(i) $Zn + 2H^+ \rightarrow Zn^{+2} + H_2$

(ii) $BrO_3^- + F_2 + 2OH^- \rightarrow BrO_4^- + 2F^- + H_2O$
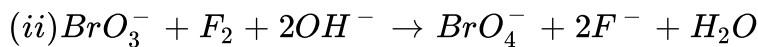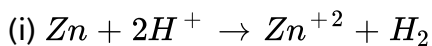
> ▶ Watch Video Solution

26. Calculate the oxidation number of 'O' in H_2O molecule.

> ▶ Watch Video Solution

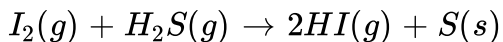27. Calculate the oxidatioin number of S in SO_4^{2-} ion.

> ▶ Watch Video Solution

28. Calculate the oxidation number of N in $(NH_4)_2SO_4$ molecule.

> ▶ **Watch Video Solution**

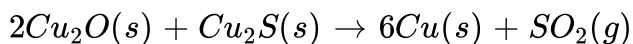**29.** Calculate the oxidation number of Mn in $KMnO_4$ molecule.

> ▶ **Watch Video Solution**

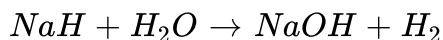**30.** Identify the species undergoing oxidation & reduction and oxidising agent & reducing agent in the reaction.

$I_2(g) + H_2S(g) \rightarrow 2HI(g) + S(s)$

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31. Justify that the reaction is a redox reaction.

$2Cu_2O(s) + Cu_2S(s) \rightarrow 6Cu(s) + SO_2(g)$

32. Classify the following redox reactions.

$N_2 + O_2 \rightarrow 2NO$

$NaH + H_2O \rightarrow NaOH + H_2$
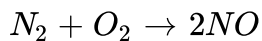
33. How does Cu_2O act as both oxidant and reductant ?

34. Which of the following species, do not show disproportionation reaction and why ?

ClO^-, ClO_2^-, ClO_3^- and ClO_4^-
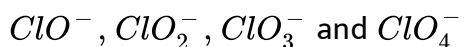
Also write reaction for each of the species that disproportionates.

35. Balance the equation

$$Mg + HNO_3 \rightarrow Mg(NO_3)_2 + N_2O + H_2O$$
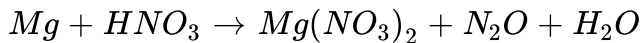
36. For the redox reaction

$$xFe^{2+} + yCr_2O_7^{2-} + zH^+ \rightarrow Fe^{3+} + Cr^{3+} + H_2O$$
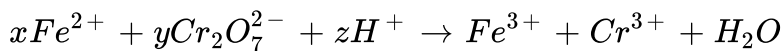
x, y and z are

37. Balance the ionic equation in alkaline medium

$$Cr(OH)_3 + IO_3^- \rightarrow I^- + CrO_4^{2-}$$
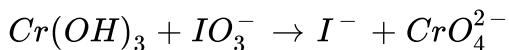
38. Balance the net equtation for the reaction of potassium dichromate (VI), $K_2Cr_2O_7$, with sodium sulphite, Na_2SO_3, in an acid solution to give chromium (III) ion and and sulphate ion.

Strategy : Follow the seven -step proceduce , one step at a time.

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39. Balance the redox reaction by half reaction method :

$Br_2 + H_2O_2 \rightarrow BrO_3^- + H_2O$ (in acidic medium)
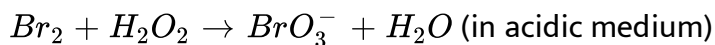
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40. In passing chlorine gas through a concentrated solution of alkali we get chloride and chlorate ions Obtain balanced chemical equation for this reaction.

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41. Balance the following by ion electron method is basic medium.

$$NO_3^\ominus + Zn \rightarrow Zn^{2+} + NH_4^\oplus.$$
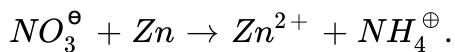
42. Balance the equation by ion electron method

$$MnO_4^- + Br^- \rightarrow Mn^{2+} + Br_2 \text{ (acidic medium)}$$
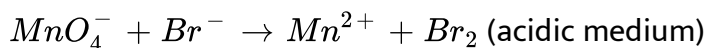
43. The half cell reactions with reduction potentials are

$$Pb(s) \rightarrow Pb^{+2}(aq), E_{red}^\circ = -0.13V$$

$$Ag(s) \rightarrow Ag^+(aq), E_{rod}^\circ = +0.80V$$
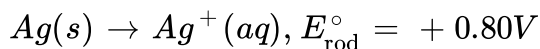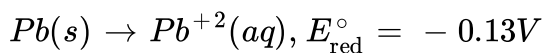
Calculate its emf.

44. Can a solution of 1 M copper sulphate be stored in a vessel made of nickel metal ? Given that $E^{\circ}_{Ni^{+2}/Ni} = -0.25$ volt and $E^{\circ}_{Cu^{+2}/Cu} = +0.34$ volt

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Try Yourself

1. Write the half reaction for the reaction

$$2Fe^{+3} + 2I^- \rightarrow 2Fe^{+2} + I_2$$
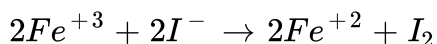
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2. identify oxidation and reduction process for the reaction

$$CH_2 = CH_2 + H_2 \rightarrow CH_3 - CH_3$$
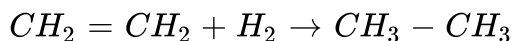
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3. Find the oxidation number of Cl in $HCl, HClO, ClO_4^{\ominus}$, and $Ca(Ocl)Cl$.

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4. What is the oxidation number of the underlined atoms in the following

:

(a) $Na_2Cr_2O_7$

(b) Na_3PO_4
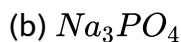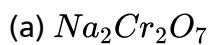
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5. Identify the oxidant and the reductant respectively in the following reaction.

$Cl_2(g) + 2Br^-(aq) \rightarrow 2Cl^-(aq) + Br_2(aq)$
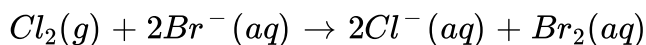
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6. Is the reaction $BaO_2 + H_2SO_4 \rightarrow BaSO_4 + H_2O_2$ a redox reaction?

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7. Write the disproportionation reaction of ClO^- to Cl^- and ClO_3^-

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8. Classify the reaction

$(i) 2NO_2 + 2OH^- \rightarrow NO_2^- + H_2O$

(ii) $2Pb(NO_3)_2 \rightarrow 2PbO + 2NO_2 + \dfrac{1}{2}O_2$
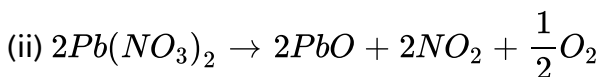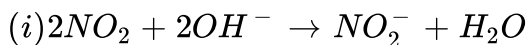
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9. In the balanced equation

$MnO_4^- + H^+ + C_2O_4^{2-} \rightarrow Mn^{2+} + CO_2 + H_2O$, the moles of CO_2
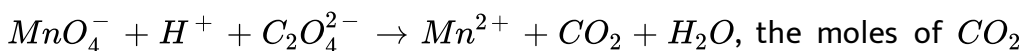
formed are :-

10. Balance the following reaction by ion electrons method (acidic medium).

$$As_2S_3 - NO_3^{\ominus} \rightarrow S + NO_2 + AsO_4^{3-}$$
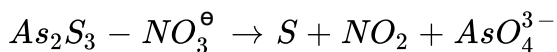
11. Balance the equation in acidic medium
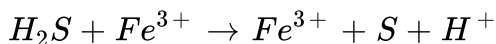
$$H_2S + Fe^{3+} \rightarrow Fe^{3+} + S + H^+$$

12. Balance the equation by Ion-electron method

$$Al + NO_3^- \rightarrow Al(OH)_4^- + NH_3 \text{ (In basic medium)}$$
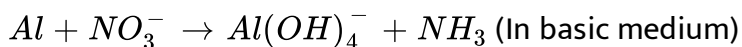
13. Why blue colour of $CuSO_4$ solution gets discharged when zinc rod is dipped in it ? Given, $E^\circ_{Cu^{+2}/Cu} = 0.34V$ and $E^\circ_{Zn^{+2}/Zn} = -0.76V$

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14. Can a solution of 1 M $ZnSO_4$ be stored in a vessel made of copper ?

Given that

$E^\circ_{Zn^{+2}/Zn} = -0.76V$ and $E^\circ_{Cu^{+2}/Cu} = 0.34V$

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15. Write the half reaction for the reaction

$2Fe^{+3} + 2I^- \rightarrow 2Fe^{+2} + I_2$
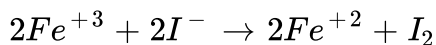
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16. identify oxidation and reduction process for the reaction

$CH_2 = CH_2 + H_2 \rightarrow CH_3 - CH_3$
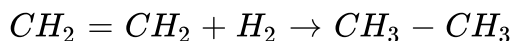
17. Determine the oxidation number of Cl in $HCl, HOCl, HClO_4$ and ClO_2.

18. What is the oxidation number of the underlined atoms in the following :

(a) $Na_2Cr_2O_7$

(b) Na_3PO_4
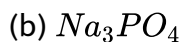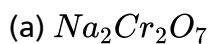
19. Identify the oxidant and the reductant respectively in the following reaction.

$Cl_2(g) + 2Br^-(aq) \rightarrow 2Cl^-(aq) + Br_2(aq)$
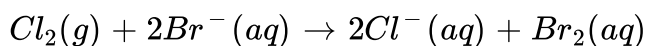
20. Is this a redox reaction ?

$$BaO_2 + H_2SO_4 \rightarrow BaSO_4 + H_2O_2$$

21. Write the disproportionation reaction of ClO^- to Cl^- and ClO_3^-

22. Classify the reaction
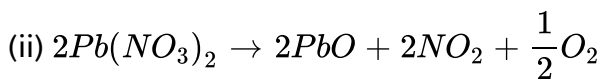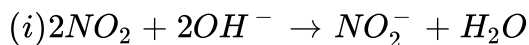
$(i) 2NO_2 + 2OH^- \rightarrow NO_2^- + H_2O$

(ii) $2Pb(NO_3)_2 \rightarrow 2PbO + 2NO_2 + \dfrac{1}{2}O_2$

23. Balance the equation by Ion-electron method

(ii) $MnO_4^- + H_2C_2O_4 \rightarrow Mn^{2+} + CO_2$ (In acidic medium)
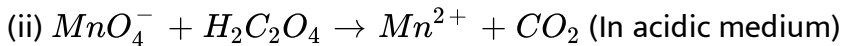
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24. Balance the equation, $As_2S_3 + NO_3^- \rightarrow AsO_4^{3-} + NO + S$ (in acidic medium).

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25. Balance the equation in acidic medium

$H_2S + Fe^{3+} \rightarrow Fe^{2+} + S + H^+$
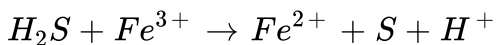
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26. Balance the equation by Ion-electron method

$Al + NO_3^- \rightarrow Al(OH)_4^- + NH_3$ (In basic medium)

27. Why blue colour of $CuSO_4$ solution gets discharged when zinc rod is dipped in it ? Given, $E^\circ_{Cu^{+2}/Cu} = 0.34V$ and $E^\circ_{Zn^{+2}/Zn} = -0.76V$

28. Can a solution of 1 M $ZnSO_4$ be stored in a vessel made of copper ? Given that

$E^\circ_{Zn^{+2}/Zn} = -0.76V$ and $E^\circ_{Cu^{+2}/Cu} = 0.34V$

Assignment Section A Objective Type Questions One Option Is Correct

1. A redox reaction is:

A. (A) Proton transfer reaction

B. (B) Neutron transfer

C. (C) Double displacement

D. (D) Electron transfer reaction

Answer: D

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2. The reaction $H_2S + H_2O_2 \rightarrow S + 2H_2O$ manifests

A. Oxidising action of H_2O_2

B. Reducing nature of H_2O_2

C. Acidic nature of H_2O_2

D. Alkaline nature of H_2O_2

Answer: A

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3. 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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4. The conversion of $K_2Cr_2O_7$ into $Cr_2(SO_4)_3$ is

    A. Oxidation

    B. Reduction

    C. Decomposition

    D. Substitution

Answer: B

---

5. In this reaction $2Na_2S_2O_3 + I_2 \rightarrow Na_2SO_4O_6 + 2NaI_2$,NaI_2acts as:

    A. Reducing agent

    B. Oxidising agent

    C. Oxidising agent as well as reducing agent

    D. None of these

Answer: B

---

6. The oxidation number of nitrogen in NH_2OH is :

    A. Zero

B. $+1$

C. -1

D. -2

Answer: C

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7. When $KMnO_4$ is reduced with oxalic acid in acidic solution, the oxidation number of Mn changes from

A. $+7$ to $+2$

B. $+7$ to $+4$

C. $+7$ to $+6$

D. $+6$ to $+2$

Answer: A

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8. In which of the following reactions the underlined substance is oxidised?

A. $3Mg + \underline{N_2} \rightarrow Mg_3N_2$

B. $2Kl + \underline{Br_2} \rightarrow 2KBr + I_2$

C. $\underline{Cu}O + H_2 \rightarrow Cu + H_2O$

D. $\underline{C}O + Cl_2 \rightarrow COCl_2$
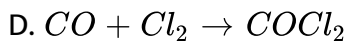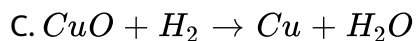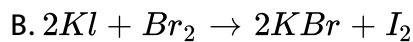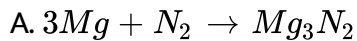
Answer: D

9. The oxidation state of phosphorus vary from

A. -1 to $+1$

B. -3 to $+3$

C. -3 to $+5$

D. -5 to $+1$

Answer: C

10. In which of the following reactions, the underlined element has decreased its oxidation number during the reaction?

A. $Fe + CuSO_4 \rightarrow Cu + \underline{Fe}SO_4$

B. $\underline{H_2} + Cl_2 \rightarrow 2\underline{H}Cl$

C. $\underline{C} + H_2O \rightarrow \underline{C}O + H_2$

D. $\underline{Mn}O_2 + 4HCl \rightarrow \underline{Mn}Cl_2 + Cl_2 + 2H_2O$
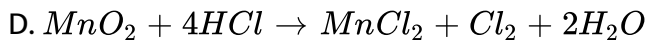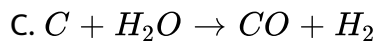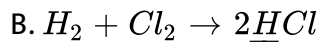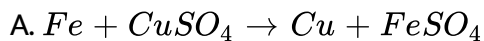
Answer: D

11. A metal ion M^{3+} loses three electrons , its oxidation number will be

A. Zero

B. $+6$

C. $+2$

D. $+4$

Answer: B

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12. In which one of the following changes there are transfer of five electrons?

A. $MnO_4^- \rightarrow Mn^{2+}$

B. $CrO_4^{2-} \rightarrow Cr^{3+}$

C. $MnO_4^- \rightarrow MnO_2$

D. $Cr_2O_7^{2-} \rightarrow 2Cr^{3+}$
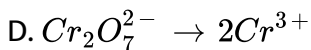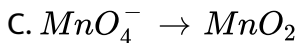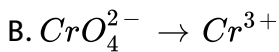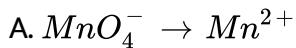
Answer: A

13. The oxidation states of the most electronegative elements in the products of the reaction between BaO_2 and H_2SO_4 are

A. 0 and -1

B. -1 and -2

C. -2 and 0

D. -2 and $+1$

Answer: B

14. The oxidation number of chlorine in HOCl is

A. -1

B. Zero

C. $+1$

D. $+2$

Answer: C

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15. In the reaction : $Cl_2 + OH^- \rightarrow Cl^- + ClO_4^- + H_2O$

A. Oxidised

B. Reduced

C. oxidising as well as reduced

D. Neither oxidised nor reduced

Answer: C

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16. The oxidation number of P in $Mg_2P_2O_7$ is

A. $+3$

B. $+2$

C. $+5$

D. -3

Answer: C

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17. For the redox recation

$$MnO_4^- + C_2O_4^{2-} + H^+ \rightarrow Mn^{2+} + CO_2 + H_2O$$
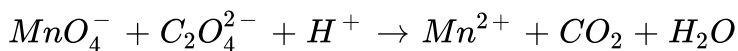
the correct coefficients of the reactants for the blalanced equation are

A.

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

B.

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

	MnO_4^-	$C_2O_4^{2-}$	H^+
C.	5	16	2
D.	MnO_4^-	$C_2O_4^{2-}$	H^+
	2	16	5
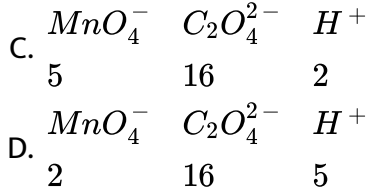
Answer: A

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18. Oxygen has an oxidation state of +2 in

A. H_2O_2

B. OF_2

C. SO_2

D. H_2O
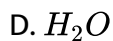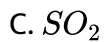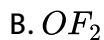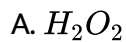
Answer: B

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19. A compound contains three elements A, B and C, if the oxidation number of $A = +2B = +5$ and $C = -2$ then possible formula of the compound is

A. ABC_2

B. $B_2(AC_3)_2$

C. $A_3(BC_4)_2$

D. $A_3(B_4C)_2$

Answer: C

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20. In which of the following pairs. the oxidation states, of sulphuric and chromium are same?

A. SO_3^{2-}, CrO_4^{2-}

B. SO_3, CrO_4^{2-}

C. SO_2, CrO_4^{2-}

D. $SO_2, Cr_2O_7^{2-}$
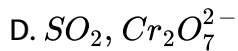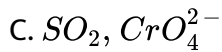
Answer: B

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21. The oxidation number of S in S_8, S_2F_2, and H_2S, respectively, are

A. 0, +1 and -2

B. $+2, +1$ and -2

C. 0,+1 and +2

D. $-2, +1$ and -2

Answer: A

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22. The oxidation number of C in HNC is

A. $+2$

B. -3

C. $+3$

D. Zero

Answer: A

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23. The oxidation number of Cl in $CaOCl_2$ is

A. -1 and $+1$

B. $+2$

C. -2

D. None of these

Answer: A

24. Which of the following molecules can act as an oxidising agent as well as a reducing agent ?

A. H_2S

B. SO_3

C. H_2O_2

D. F_2
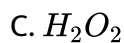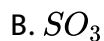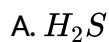
Answer: C

25. The oxidation state of iodine in ICI_3 is

A. $+1$

B. $+3$

C. $+5$

D. $+7$

Answer: B

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26. The pair of compounds having metals in their highest oxidation state

is

A. MnO_2, $FeCl_3$

B. MnO_4^-, CrO_2Cl_2

C. $CuCl$, $HgCl$

D. $FeCl_2$, $FeSO_4$

Answer: B

27. Consider a titration of potassium dichromate solution with acidified Mohr's salt solution using diphenylamine as indicator. The number of moles of Mohr's salt required per mole of dichromate is:

A. 3

B. 4

C. 5

D. 6

Answer: D

28. Number of moles of MnO_4^- required to oxidise one mole of ferrous oxalate completely in acidic medium will be

A. 7.5 moles

B. 0.2 moles

C. 0.6 moles

D. 0.4 moles

Answer: C

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29. The reaction, $P_4 + 3NaOH + 3H_2O \rightarrow 3NaH_2PO_2 + PH_3$ is an example of

A. Disproportionation reaction

B. Neutralization reaction

C. Double decomposition reaction

D. Displacement reaction

Answer: A

30. CrO_5 has structure as shown
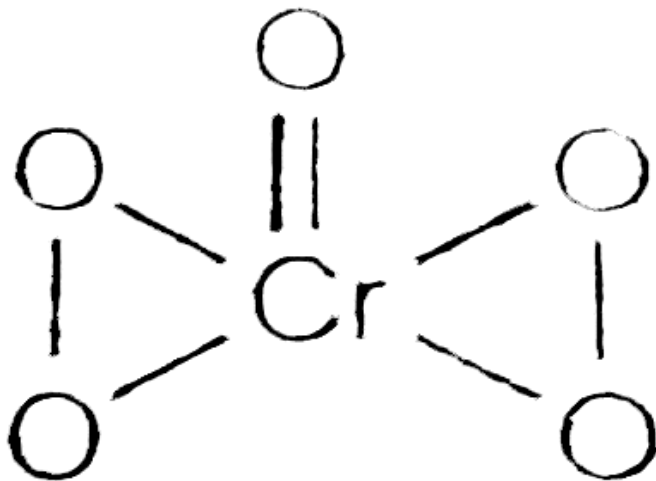
The oxidation number of chromium in the above compound is

A. $+4$

B. $+5$

C. $+6$

D. $+10$

Answer: C

31. The oxidation states of S atom in $S_4O_6O^{2-}$ from left to right respectively are

$$O^- - \overset{\overset{O}{\|}}{\underset{\underset{O}{\|}}{S}} - S - S - \overset{\overset{O}{\|}}{\underset{\underset{O}{\|}}{S}} - O^-$$
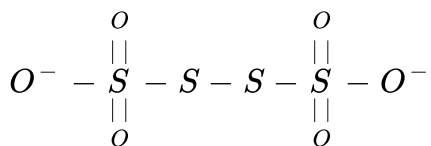
A. $+6, 0, 0, +6$

B. $+3, +1, +1, +3$

C. $+5, 0, 0, +5$

D. $+4, +1, +1, +4$

Answer: C

32. The oxidation number of phosphorus in PO_4^{3-}, P_4O_{10}, and $P_2O_7^{4-}$ is

A. $+5$

B. $+3$

C. -3

D. $+2$

Answer: A

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33. The reaction

$$5H_2O_2 + XClO_2 + 2OH^- \rightarrow XCl^- + YO_2 + 6H_2O$$
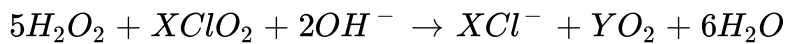
is balanced if

A. X=5,Y=2

B. X=2,Y=5

C. X=4,Y=10

D. X=5,Y=5

Answer: B

34. Nitrogen forms a variety of compounds in all oxidation states ranging

from:

    A. -3 to $+5$

    B. -3 to $+3$

    C. -3 to $+4$

    D. -3 to $+6$

Answer: A

35. $KMnO_4$ is a strong oxidising agent in acidic medium. To provide

acidic medium H_2SO_4 is used instead of HCl. This is because

    A. H_2SO_4 is a stronger acid than HCl

B. HCl is oxidised by $KMnO_4$ to Cl_2

C. H_2SO_4 is dibasic acid

D. Rate is faster in the presence of H_2SO_4

Answer: B

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36. 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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37. In this reaction: $S_2O_8^{2-} + 2I^- \rightarrow 2SO_4^{2-} + I_2$

A. Oxidation of iodide into iodine takes place

B. Reduction of iodine into iodide takes place

C. Both oxidation and reduction of iodine takes place

D. All of these

Answer: A

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38. Which of the following has the highest value of E_{red}° ?

A. P_4

B. Cl_2

C. I_2

D. F_2

Answer: D

---

39. Which of the following species has an atom with +6 oxidation state?

A. CrO_2Cl_2

B. $[Cr(CN)_6]^{3-}$

C. MnO_4^-

D. $[NiF_6]^{3-}$

Answer: A

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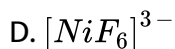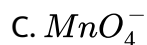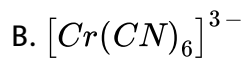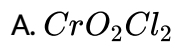
40. The oxidant which cannot act as a reducing agent is
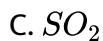
A. CO_2

B. NO_2

C. SO_2

D. ClO_2

Answer: A

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1. which of the following is a redox reaction ?

A. $CaCO_3 \rightarrow CaO + CO_2$

B. $AgNO_3 + NaCl \rightarrow AgCl + NaNO_3$

C. $NaOH + HCl \rightarrow NaCl + H_2O$

D. $KClO_3 \rightarrow KCl + \dfrac{3}{2}O_2$
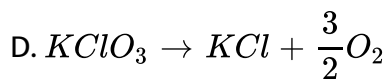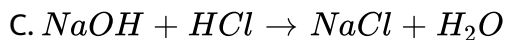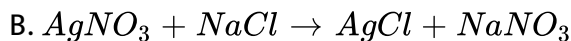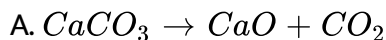
Answer: D

2. Concrete is produced form a mixture of cement, water and small stones. Small amount of gypsum, $CaSO_4.2H_2O$ is added in cement production to improve the subsequent hardening of concrete. The elevated temperature during the production of cement may lead to the formation of unwanted hemihydrate $CaSO_4\frac{1}{2}H_2O$ according to reaction.

$$CaSO_42H_2O(s) \rightarrow CaSO_4\frac{1}{2}H_2O(s) + \frac{3}{2}H_2O(g)$$
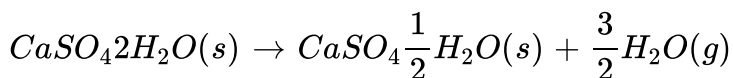
The $\Delta_f H^{\ominus}$ of $CaSO_2.2H_2O(s)$, $CaSO_4\frac{1}{2}H_2O(s)$, $H_2O(g)$ are $-2021.0kJmol^{-1}$, $-1575.0kJmol^{-1}$ and $-241.8kJmol^{-1}$, respectively. The respective values of their standard entropies are 194.0, 130.0 and $188.0JK^{-1}mol^{-1}$. The values of $R = 8.314JK^{-1}mol^{-1} = 0.0831L$ bar $mol^{-1}K^{-1}$.

Answer the following questions on the basis of above information.

Heat change occurring during conversion of $1kg$ of $CaSO_4.2H_2O(s)$ (molar mass $172gmol^{-1}$) of $CaSO_4\frac{1}{2}H_2O(s)$ is equal to

A. Oxidising agent

B. Reducing agent

C. Oxidising as well as reducing agent

D. Catalyst

Answer: A

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3. Which can act as an oxidising as well as a reducing agent ?

A. $HClO_4$

B. HNO_3

C. H_2SO_4

D. H_2O_2

Answer: D

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4. The number of electrons required to balance the following equation

are :

$$NO_3^- + 4H^+ \rightarrow 2H_2O + NO$$
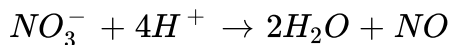
A. 5

B. 4

C. 3

D. 2

Answer: C

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5. Which of the following statement is correct about oxidation number ?

A. Oxidation number of all atoms in elementary state is zero

B. The sum of Oxidation number of all the atoms in the formula of a

compound is always zero

C. Alkali and alkaline earth metals have +1 and +2 oxidation staes respectively

D. All of these

Answer: D

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6. Which can act as a reducing agent ?

A. HNO_3

B. H_2SO_4

C. H_2S

D. $KMnO_4$

Answer: C

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7. The oxidation number of Fe in $Fe_{0.94}O$ is

A. $+2$

B. $+3$

C. $+\dfrac{200}{94}$

D. $\dfrac{8}{3}$

Answer: C

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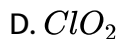
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8. In this reaction $4Al + 3O_2 \rightarrow 4Al^{3+} + 6O^{2-}$ which of the following statement is incorrect ?

A. It is a redox reaction

B. Metallic aluminium is a reducing agent

C. Metallic aluminium is oxidised to Al^{3+}

D. Metallic aluminium is reducing to Al^{3+}

Answer: D

---

9. Calculate the oxidation numbers of Cr in K_3CrO_8:

A. $+6$

B. $+5$

C. $+3$

D. $+2$

Answer: B

---

10. Peroxides are basic in nature and they form hydrogen peroxides on treatment with acid. What volume of 0.5 M H_2SO_4 solution is required to neutralise a solution containing 7.2 g of CaO_2 ?

A. 400 ml

B. 300 ml

C. 200 ml

D. 100 ml

Answer: C

11. What is the difference in oxidation state of nitrogen in between hydroxyl amine (NH_2OH) and hydrazine (N_2H_4) ?

A. $+5$

B. $+3$

C. -3

D. 1

Answer: D

12. In which one of the following changes there are transfer of five electrons?

A. $MnO_4^- \rightarrow Mn^{2+}$

B. $CrO_4^{2-} \rightarrow Cr^{3+}$

C. $MnO_4^- \rightarrow MnO_2$

D. $Cr_2O_7^{2-} \rightarrow 2Cr^{3+}$
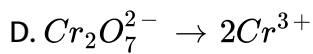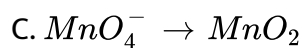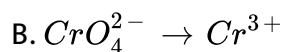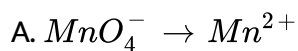
Answer: A

13. How many gm of $K_2Cr_2O_7$ is present in 1 L of its N/10 solution in acid medium ?

A. 4.9

B. 49

C. 0.49

D. 3.9

Answer: A

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14. When Cu_2S is converted into Cu^{2+} & SO_2 then equivalent weight of Cu_2S will be (M=mol. Wt. of Cu_2S)

A. M

B. $\dfrac{M}{2}$

C. $\dfrac{M}{4}$

D. $\dfrac{M}{8}$

Answer: D

15. Which of the following changes involve reduction ?

A. The conversion of ferrous sulphate to ferric sulphate

B. The conversion of H_2S to S

C. The conversion of Cl_2 to $NaCl$

D. The conversion of Zn to $ZnSO_4$

Answer: C

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16. $FeS \rightarrow Fe^{3+} + SO_3$

Eq. wt. of FeS for this change is (mol. Wt. of FeS=M)

A. $\dfrac{M}{1}$

B. $\dfrac{M}{5}$

C. $\dfrac{M}{7}$

D. $\dfrac{M}{9}$

Answer: D

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17. The reaction

$$Cl_2 + S_2O_3^{2-} + OH^- \rightarrow SO_4^{2-} + Cl^- + H_2O$$
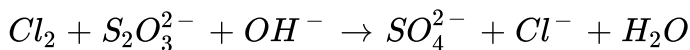
Starting with 0.15 mole Cl_2 , 0.010 mole $S_2O_3^{2-}$ and 0.30 mole OH^-

mole of Cl_2 left in solution will be

A. 0.11

B. 0.01

C. 0.04

D. 0.09

Answer: A

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18. The number of moles of $KMnO_4$ that are needed to react completely with one mole of ferrous oxalate in acidic solution is

A. $3/5$

B. $2/5$

C. $4/5$

D. $1/5$

Answer: A

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19. 200 ml of 0.01 M $KMnO_4$ oxidise 20 ml of H_2O_2 sample in acidic medium. The volume strength of H_2O_2 is

A. 2.8 volume

B. 5.6 volume

C. 0.5 volume

D. 0.25 volume

20. If equal volumes of 1 M $KMnO_4$ and 1M $K_2Cr_2O_7$ solutions are allowed to oxidise Fe(II) to Fe(III) in acidic medium, then Fe(II) oxidised will be

    A. More with $KMnO_4$

    B. More with $K_2Cr_2O_7$

    C. Equal with both oxidising agent

    D. Cannot be determined

21. 4 mole of a mixture of Mohr's salt and $Fe_2(SO_4)_3$ requires 500mL of $1MK_2Cr_2O_7$ for complete oxidation in acidic medium. The mole % of the Mohr's salt in the mixture is:

A. 40 %

B. 5 %

C. 50 %

D. 25 %

Answer: D

22. What volume of 3 molar HNO_3 is needed to oxidise $8g$ of Fe^{3+}, HNO_3 gets converted to NO ?

A. 8 ml

B. 16 ml

C. 32 ml

D. 64 ml

Answer: B

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23. The stoichiometric coefficient of S in the following reaction

$$H_2S + HNO_3 \rightarrow NO + S + H_2O$$
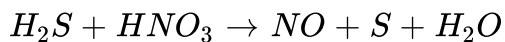
is balanced (in acidic medium):

A. 1

B. 2

C. 3

D. 4

Answer: C

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24. A volume of 12.5 mL of 0.05 M SeO_2 reacts with 25 mL of 0.1 M $CrSO_4$ which is oxidised to Cr^{3+}. To what oxidation state was the selenium converted by the reaction ?

A. 3

B. $+2$

C. 1

D. 0

Answer: D

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25. A sample of $NaHCO_3 + Na_2CO_3$ required 20 ml of HCl using phenolphthalein as indicator and 35ml more required if methyl orange is used as indicator . Then molar ratio of $NaHCO_3$ to Na_2CO_3 is

A. $\dfrac{1}{2}$

B. $\dfrac{2}{3}$

C. $\dfrac{3}{4}$

D. $\dfrac{1}{3}$

Answer: C

26. A sample of $FeSO_4$ and FeC_2O_4 is dissolved in H_2SO_4 . The complete oxidation of sample required 8/3 eq. of $KMnO_4$. After oxidation , the reaction mixture was reduced by Z. On again oxidation by $KMnO_4$ required $\dfrac{5}{3}$ eq. The mole ratio of $FeSO_4$ and FeC_2O_4 is

A. $\dfrac{3}{7}$

B. $\dfrac{7}{3}$

C. $\dfrac{5}{7}$

D. $\dfrac{7}{5}$

Answer: B

27. The equivalent mass of $MnSO_4$ is half of its molecular mass when it is converted to

A. Mn_2O_3

B. MnO

C. MnO_2

D. MnO_4^-
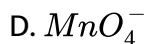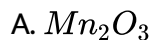
Answer: C

28. In the titration of $NaHCO_3$ with HCl, indicator cannot be used

A. Methyl orange

B. Methyl red

C. Phenolphthalein

D. All of these

Answer: C

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29. Equivalent weight of Mohr salt in the titration with $KMnO_4$ is (M-Molecular weight)

A. $\dfrac{M}{1}$

B. $\dfrac{M}{4}$

C. $\dfrac{M}{3}$

D. $\dfrac{M}{2}$

Answer: A

30. 100 ml of each HCl solution having pH=5 and NaOH having pH=8 is mixture. How much volume of $\dfrac{N}{100}$ NaOH is required to neutralise to 20 ml of this mixture ?

A. 0.009ml

B. 9 ml

C. 20 ml

D. 15 ml

Answer: A

31. The volume of 0.1M $AgNO_3$ which is required by 10 ml of 0.09 M K_2CrO_4 to precipitate all the chromate as Ag_2CrO_4 is

A. 9 ml

B. 18 ml

C. 20 ml

D. 36 ml

Answer: B

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32. One litre of a solution contains 15.12 g of HNO_3 and one litre of another solution contains 3.2 g of NaOH. In what volume ratio must these solutions be mixed to obtain a neutral solution ?

A. $\dfrac{1}{3}$

B. $\dfrac{2}{3}$

C. $\dfrac{8}{3}$

D. $\dfrac{3}{8}$

Answer: A

1. Regarding the compound CrO_5 which of the following statement is/are correct ?

    A. Oxidation number of Cr is (+6)

    B. 4-oxygen atoms are present in form of peroxide

    C. Oxidation number of Cr is +10

    D. 2-oxygen atoms are present in form of peroxide

Answer: A::B

2. Which of the following can acts as a reducing agent ?

A. H_2S

B. HNO_3

C. $FeSO_4$

D. $SnCl_2$
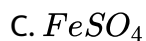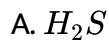
Answer: A::C::D

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3. Which of the following act both as an oxidising as well as reducing agent ?

A. HNO_3

B. H_2SO_4

C. H_2O_2

D. HNO_2
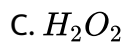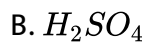
Answer: C::D

4. Which of the following statement are correct regarding this equation

$$Br_2 \rightarrow BrCO_3^- + Br^- ?$$

A. Bromine is oxidised

B. Bromine is reduced

C. It is an example of disproportionation reaction

D. Bromine is neither oxidised nor reduced

Answer: A::B::C

5. Which of the following is/are disproportionation reactions ?

A. $6NaOH + 3Cl_2 \rightarrow NaClO_3 + 5NaCl + 3H_2O$

B. $2NaOH + Cl_2 \rightarrow NaOCl + NaCl + H_2O$

C. $H_2O_2 \rightarrow H_2O + \dfrac{1}{2}O_2$

D. $2KClO_3 \rightarrow 2KCl + 3O_2$
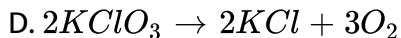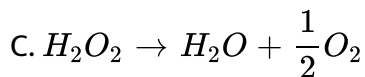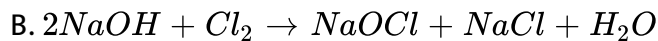
Answer: A::B::C

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6. Which of the following statements regardign H_2SO_5 is/are correct ?

A. The oxidation number of sulphur is +6

B. Two oxygen atoms are present in form of peroxide

C. Three oxygen atoms are present in form of oxide

D. The oxidation state of sulphur is +8

Answer: A::B::C

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7. Which of the following can act as an oxidising agent ?

A. H_2SO_4

B. HNO_3

C. $KMnO_4$
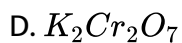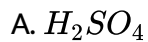
D. $K_2Cr_2O_7$

Answer: A::B::C::D

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8. The oxidation number of carbon is zero in

A. $HCHO$

B. CH_2Cl_2

C. $C_{12}H_{22}O_{11}$
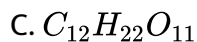
D. $CHCl_3$

Answer: A::B::C

9. 150 ml $\dfrac{M}{10} Ba(MnO_4)_2$ in acidic medium can oxidise completely

A. 150 ml 1M Fe^{2+}

B. 50 ml 1M FeC_2O_4

C. 75 ml 1M $C_2O_4^{2-}$

D. 75 ml 1M $K_2Cr_2O_7$

Answer: A::B::C

10. 20 volume H_2O_2 solution has a strength of about

A. 60.86 g/L

B. 3.58 N

C. 1.79 M

D. 3.035 %

Answer: A::B::C

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11. When 1 mole of $KMnO_4$ is reacted with FeC_2O_4 in acidic medium, then the reacted amount of FeC_2O_4 is

A. $\dfrac{5}{3}$ moles

B. 5 equivalents

C. $\dfrac{3}{5}$ moles

D. 3 equivalents

Answer: A::B

12. For the following balanced redox reaction,

$$2MnO_4^- + 4H^+ + Br_2 \Leftrightarrow 2Mn^{2+} + 2BrO_3^- + 2H_2O.$$ If the
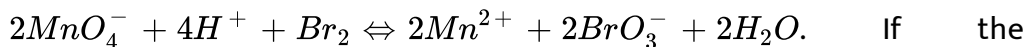
molecular weight of MnO_4^- and Br_2 are x & y respectively then

A. Equivalent weight of MnO_4^- is $\dfrac{x}{5}$

B. Equivalent weight of Br_2 is $\dfrac{y}{5}$

C. Equivalent weight of Br_2 is $\dfrac{y}{10}$

D. n-factor ratio of MnO_4^- and Br_2 is 2:1

Answer: A::C

13. Consider the reaction

$$aFeS_2 + bO_2 \rightarrow cFe_3O_3 + dSO_2$$
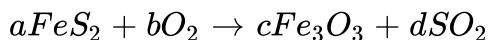
Which is correct for the above reaction

A. n-factor for FeS_2 is 11

B. The ratio of moles of a:b is 4:11

C. The ratio of moles of a:b is 11:4

D. The ratio of moles of c:d is 1:4

Answer: A::B::D

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14. When $Na_2S_2O_3$ is reacted with I_2 to form $Na_2S_4O_6$ and NaI then which statement is correct ?

A. n-factor for $Na_2S_2O_3$ is one

B. n-factor for I_2 is two

C. 2 moles of $Na_2S_2O_3$ is reacted with one mole of I_2

D. n-factor for $Na_2S_4O_6$ is one

Answer: A::B::C

15. Choose the corret statement regarding following reaction

$$HNO_2 \rightarrow HNO_3 + NO \uparrow$$

    A. It is an example of disproportionation reaction

    B. Equivalent weight of $HNO_2 = \dfrac{3M}{2}$

    C. Equivalent weight of $HNO_3 = 1M$

    D. It is an example of intramolecular redox reaction

Answer: A::B

16. 31.26 ml of 0.165 M solution of $Ca(OH)_2$ is required to just neutralise

25 ml of citric acid $H_3C_6H_5O_7$. Then correct regarding this is/are

    A. n-factor of citric acid is 3

B. Molarity of citric acid is 0.138 M

C. Molarity of citric acid is 0.029 M

D. n-factor of citric acid is 2

Answer: A::B

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17. With 4 mole of KI one mole of Cl_2 is treated to yield gas, which is then treated with hypo solution, then correct regarding this is/are

A. Equivalent weight of I_2 is $\dfrac{M}{1}$

B. To react completed with product 1 mole of hypo solution are required

C. n-factor of hypo solution is 1

D. n-factor of Cl_2 is 2

Answer: B::C::D

18. Choose the correct regarding indicator Titration Indicator NaOH vs C H 3 C O O H Phenolphthalein Titration Indicator K M n O 2 vs F e C 2 O 4 K M n O 4 Titration Indicator I 2 vs N a 2 S 2 O 3 Starch Titration Indicator K 2 C r 2 O 7 vs F e S O 4 K 3 [F e (C N) 6] as external indicat

A.
Titration	Indicator
NaOH vs CH_3COOH	Phenolphthalein

B.
Titration	Indicator
$KMnO_2$ vs FeC_2O_4	$KMnO_4$

C.
Titration	Indicator
I_2 vs $Na_2S_2O_3$	Starch

D.
Titration	Indicator
$K_2Cr_2O_7$ vs $FeSO_4$	$K_3[Fe(CN)_6]$ as external indicator

Answer: A::B::C::D

Assignment Section D Linked Comprehension Type Questions

1. Redox is a reaction in which both oxidation and reduction will take place simultaneously . It is obvious that if one substance gives electron there must be another substance to accept these electrons . In some reactions, same substance is reduced as well as oxidised, these reactions are termed as disproportionation reactions.

For calculating equivalent mass in redox reaction change in oxidtaion number is realted to n-factor which is reciprocal of molar ratio.

This reaction is an example of

$$Br_2 + OH^- \rightarrow BrO_3^- + H_2O + Br^-$$

    A. Oxidation reaction only

    B. Reduction reaction only

    C. Neutralization reaction

    D. Disproportionation reaction

Answer: D

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2. Redox is a reaction in which both oxidation and reduction will take place simultaneously . It is obvious that if one substance gives electron there must be another substance to accept these electrons . In some reactions, same substance is reduced as well as oxidised, these reactions are termed as disproportionation reactions.

For calculating equivalent mass in redox reaction change in oxidtaion number is realted to n-factor which is reciprocal of molar ratio.

When P reacts with NaOH, the products are PH_3 and NaH_2PO_2 which of the following statement is correct ?

A. P is oxidised only

B. P is reduced only

C. P is oxidised as well as reduced

D. P is neither reduced nor oxidised

Answer: C

3. Redox is a reaction in which both oxidation and reduction will take place simultaneously . It is obvious that if one substance gives electron there must be another substance to accept these electrons . In some reactions, same substance is reduced as well as oxidised, these reactions are termed as disproportionation reactions.

For calculating equivalent mass in redox reaction change in oxidtaion number is realted to n-factor which is reciprocal of molar ratio.

How many moles of $KMnO_4$ are reacted with one mole of ferrous oxalate in acidic medium ?

A. $\dfrac{2}{5}$

B. $\dfrac{1}{5}$

C. $\dfrac{3}{5}$

D. $\dfrac{5}{3}$

Answer: C

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4. Redox is a reaction in which both oxidation and reduction will take place simultaneously . It is obvious that if one substance gives electron there must be another substance to accept these electrons . In some reactions, same substance is reduced as well as oxidised, these reactions are termed as disproportionation reactions.

For calculating equivalent mass in redox reaction change in oxidtaion number is realted to n-factor which is reciprocal of molar ratio.

The equivalent weight of Cu_2S in the following reaction is

$$Cu_2S + O_2 \rightarrow Cu^{+2} + SO_3$$

A. $\dfrac{M.\,wt}{1}$

B. $\dfrac{M.\,wt}{10}$

C. $\dfrac{M.\,wt}{8}$
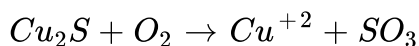
D. $\dfrac{M.\,wt}{11}$

Answer: B

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5. Redox is a reaction in which both oxidation and reduction will take place simultaneously . It is obvious that if one substance gives electron there must be another substance to accept these electrons . In some reactions, same substance is reduced as well as oxidised, these reactions are termed as disproportionation reactions.

For calculating equivalent mass in redox reaction change in oxidtaion number is realted to n-factor which is reciprocal of molar ratio.

Which of the following is an example of redox reaction ?

A. $2NO_2 \rightarrow N_2O_4$

B. $NH_4OH \rightarrow NH_4^+ + OH^-$

C. $2NO_2 + H_2O \rightarrow HNO_3 + HNO_2$

D. $N_2O_5 + H_2O \rightarrow 2HNO_3$
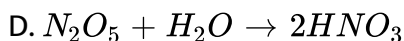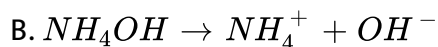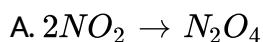
Answer: C
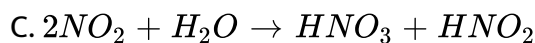
6. Redox is a reaction in which both oxidation and reduction will take place simultaneously . It is obvious that if one substance gives electron there must be another substance to accept these electrons . In some reactions, same substance is reduced as well as oxidised, these reactions are termed as disproportionation reactions.

For calculating equivalent mass in redox reaction change in oxidtaion number is realted to n-factor which is reciprocal of molar ratio.
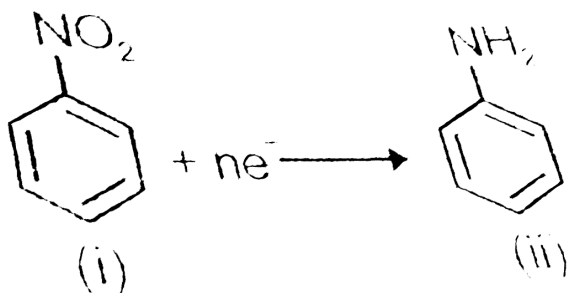
For converting one mole of nitrobenzene to aniline how many moles of electrons are transferred ?

A. 2

B. 3

C. 6

D. 8

Answer: C

7. The strength of H_2O_2 is expressed in many ways like molarity, normality, % strength and volume strengths But out of all these form of strengths, volume strength has great significance for chemical reactions. This decomposition of H_2O_2 is shown as under

$$H_2O_2(l) \rightarrow H_2O(l) + \frac{1}{2}O_2(g)$$

'x' volume strength of H_2O_2 means one volume (litre or ml) of H_2O_2 releases x volume (litre or ml) of O_2 at NTP.

1 litre H_2O_2 release x litre of O_2 at NTP

$$= \frac{x}{22.4} \text{ moles of } O_2$$

From the equation,

1 mole of O_2 produces from 2 moles of H_2O_2.

$\frac{x}{22.4}$ moles of O_2 produces from $2 \times \frac{x}{22.4}$ moles of H_2O_2

$$= \frac{x}{11.2} \text{ moles of } H_2O_2$$

So, molarity of $H_2O_2 = \frac{\frac{x}{11.2}}{1} = \frac{x}{11.2}M$

Normality = n-factor $\times$ molarity

$$= 2 \times \frac{x}{11.2} = \frac{x}{5.6} N$$

What is the percentage strength of "15 volume" H_2O_2 ?

A. 6.086 %

B. 4.55 %

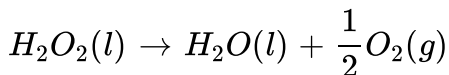C. 3.03 %

D. 1.5 %

Answer: B

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8. The strength of H_2O_2 is expressed in many ways like molarity , normality , % strength and volume strengths But out of all these form of strengths , volume strength has great significance for chemical reactions . This decomposition of H_2O_2 is shown as under

$$H_2O_2(l) \rightarrow H_2O(l) + \frac{1}{2}O_2(g)$$

'x' volume strength of H_2O_2 means one volume (litre or ml) of H_2O_2

releases x volume (litre or ml) of O_2 at NTP .

1 litre H_2O_2 release x litre of O_2 at NTP

$$= \frac{x}{22.4} \text{ moles of } O_2$$

From the equation ,

1 mole of O_2 produces from 2 moles of H_2O_2 .

$$\frac{x}{22.4} \text{ moles of } O_2 \text{ produces from } 2 \times \frac{x}{22.4} \text{ moles of } H_2O_2$$

$$= \frac{x}{11.2} \text{ moles of } H_2O_2$$

So, molarity of $H_2O_2 = \frac{\frac{x}{11.2}}{1} = \frac{x}{11.2} M$

Normality =n-factor $\times$ molarity

$$= 2 \times \frac{x}{11.2} = \frac{x}{5.6} N$$

30 g $Ba(MnO_4)_2$ sample containing inert impurity is completely reacting with 100 ml of "28 volume" strength of H_2O_2 in acidic medium then what will be the percentage purity of $Ba(MnO_4)_2$ in the sample ? (Ba=137, Mn=55, O=16)
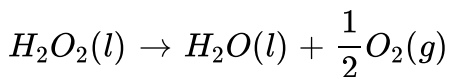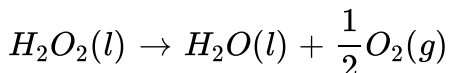
A. 10 %

B. 40 %

C. 62.5 %

D. 80 %

Answer: C

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9. The strength of H_2O_2 is expressed in many ways like molarity , normality , % strength and volume strengths But out of all these form of strengths , volume strength has great significance for chemical reactions . This decomposition of H_2O_2 is shown as under

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$$= \frac{x}{22.4} \text{ moles of } O_2$$

From the equation ,

1 mole of O_2 produces from 2 moles of H_2O_2 .

$\frac{x}{22.4}$ moles of O_2 produces from $2 \times \frac{x}{22.4}$ moles of H_2O_2

$$= \frac{x}{11.2} \text{ moles of } H_2O_2$$

So, molarity of $H_2O_2 = \frac{\frac{x}{11.2}}{1} = \frac{x}{11.2}M$

Normality =n-factor × molarity

$$= 2 \times \frac{x}{11.2} = \frac{x}{5.6} N$$

What volume of H_2O_2 solution of "11.2 volume" strength is required to liberate 2240 ml of O_2 at NTP?

A. 300 ml

B. 500 ml

C. 100 ml

D. 200 ml

Answer: D

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10. 2 g of brass containing Cu and Zn only reacts with 3M HNO_3 solution. Following are the reactions taking place

$Cu(s) + HNO_3(aq) \rightarrow Cu^{2+}(aq) + NO_2(g) + H_2O(I)$

$Zn(s) + H^+(aq) + NO_3^-(aq) \rightarrow NH_4^+ + Zn^{2+}(aq) + H_2O(l)$

The liberated $NO_2(g)$ was found to be 1.04 L at 25°C and 1 atm

$[Cu = 63.5, Zn = 65.4]$

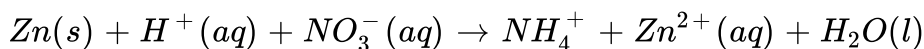The percentage by mass of Cu in brass was

A. 67 %

B. 70 %

C. 80 %

D. 90 %

Answer: A

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11. 2 g of brass containing Cu and Zn only reacts with 3M HNO_3 solution. Following are the reactions taking place

$Cu(s) + HNO_3(aq) \rightarrow Cu^{2+}(aq) + NO_2(g) + H_2O(I)$

$Zn(s) + H^+(aq) + NO_3^-(aq) \rightarrow NH_4^+ + Zn^{2+}(aq) + H_2O(l)$

The liberated $NO_2(g)$ was found to be 1.04 L at $25°C$ and 1 atm

$[Cu = 63.5, Zn = 65.4]$

The percentage by mass of Cu in brass was
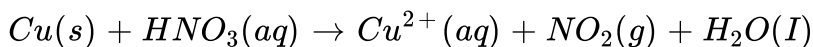
A. 9.52 ml

B. 14.5 ml
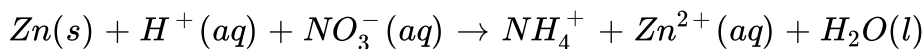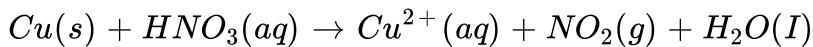
C. 16.25 ml

D. 10.5 ml

Answer: B

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12. 2 g of brass containing Cu and Zn only reacts with 3M HNO_3 solution.
Following   are   the   reactions   taking   place

$$Cu(s) + HNO_3(aq) \rightarrow Cu^{2+}(aq) + NO_2(g) + H_2O(I)$$

$$Zn(s) + H^+(aq) + NO_3^-(aq) \rightarrow NH_4^+ + Zn^{2+}(aq) + H_2O(l)$$
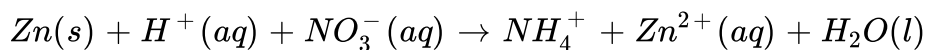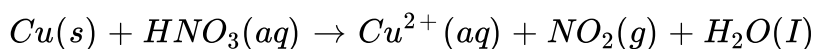
The liberated $NO_2(g)$ was found to be 1.04 L at $25°C$ and 1 atm

$[Cu = 63.5, Zn = 65.4]$

How many grams of NH_4NO_3 will be obtained in the above reaction ?

A. 0.405 g

B. 0.0428 g

C. 0.2018 g

D. 0.358 g

Answer: C

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Assignment Section E Assertion Reason Type Questions

1. STATEMENT-1 $KMnO_4 \xrightarrow{\text{acidic medium}} Mn^{2+}$, n factor of $KMnO_4$ is 5 and

STATEMENT-2 Equivalent mass of $KMnO_4$ in acidic medium is $\dfrac{M}{5}$

(M=molecular mass of $KMnO_4$)

A. Statement-1 is True, Statement-2 is True , Statement-2 is a correct

explanation for Statement-1

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a

correct explanation for Statement-1

C. Statement-1 is True, Statement-2 is False

D. Statement-1 is False , Statement-2 is True

Answer: 1

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2. STATEMENT-1 $H_2O_2 \rightarrow H_2O + \dfrac{1}{2}O_2$. This is an example of disproportionation reaction.

STATEMENT-2 H_2O_2 can act as a oxidising as well as reducing agent .

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3. The oxidation number of oxygen in OF_2 is

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4. STATEMENT-1 Oxidation state of carbon in its compound is always +4.

STATEMENT-2 : An element can show variable oxidation numbers.

5. STATEMENT-1: Equivalent mass of $KMnO_4$ in different mediums are different

STATEMENT-2 $KMnO_4$ can act as a oxidising agent .

    A. Statement -1 is True, Statement -2 is True, Statement -2 is a correct

      explanation for Statmenet -1.

    B. Statement -1 is True, Statement -2 is True, Statement-2 is NOT a

      correct explanation for Statement -1

    C. Statement -1 is True, Statement -2 is False

    D. Statement -1 is False, Statmenet -2 is True

Answer: 2

6. STATEMENT-1: In the reaction : $Cl_2 + OH^- \rightarrow Cl^- + ClO_4^-$ chlorine is oxidised only

STATEMENT-2: Oxidation and reduction cannot take place alone.

7. STATEMENT-1: The equivalent mass of of $KMnO_4$ in acidic medium is $\dfrac{M}{5}$ where M=molecular mass of $KMnO_4$

STATEMENT-2: Equivalent mass is equal to product of molecular mass and change in oxidation number.

8. STATEMENT-1: For the reaction $NaOH + H_2CO_3 \rightarrow NaHCO_3 + H_2O$ equivalent weight of H_2CO_3 is 62.

STATEMENT-2: n factor of H_2CO_3 is 1 (in above reaction) and equivalent

$$\text{mass} = \frac{\text{Molecular mass}}{\text{n factor}}$$

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Assignment Section F Matrix Match Type Questions

1. Match Column-I with Column-II

Column-I

(A) $CaOCl_2$
(Oxidation state of Cl)

(B) $S_2O_3^{2-}$
(Oxidation state of S)

(C) NH_4NO_3
(Oxidation state of N)

(D) H_2SO_5 and $H_2S_2O_8$
(Oxidation state of S)

(E) $K_2Cr_2O_7$, K_2CrO_4
(Oxidation number of Cr)

Column-II

(p) + 6, + 6

(q) + 1, –1

(r) Peroxy linkage is present

(s) –3, + 5

(t) –2. + 6

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2. Match the following

Column-I

(A) $XI_2 + YNO_3^{\Xi} \longrightarrow IO_3^- + NO_2$ (Acidic med)

(B) $XClO^- + YCrO_2 \rightarrow Cl^- + CrO_4^{--}$ (alkaline)

(C) $XN_2O_4 + YBrO_3^{\Xi} \rightarrow Br^- + NO_3$ (Acidic)

(D) $XAsO_3^{-3} + YMnO_4^- \rightarrow AsO_4^{-3} + MnO_2$ (Acid ci)

Column-II

(p) $X > Y$

(q) $X < Y$

(r) n-factor (oxidant) > n-factor (Reductant)

(s) n-factor (Reductant) > n-factor (Oxidant)

(t) Oxidant has highest O.N. among the oxidants involved in the reactions

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3. Match the following

Column-I

(A) $KMnO_4$ in acidic medium
(B) $Ba(MnO_4)_2$ in acidic medium
(C) $S_2O_3^2$ in alkaline medium
(D) $K_2Cr_2O_7$ in acidic medium

Column-II (n-factor)

(p) 10
(q) 6
(r) 5
(s) 8

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4. If 11g of oxalic acid are dissolved in 500 mL of solution (density= $1.1 gm L^{-1}$), what is the mass % of oxalic acid in solution?

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5. 0.132 g of an organic compound gave 50 ml of N_2 at STP. The weight percentage of nitrogen in the compound is close to

Assignment Section G Interger Answer Type Questions

1. 0.144 g of pure FeC_2O_4 was dissolvedin dilute H_2SO_4 and the solution was diluted to 100 ml . What volume in ml of 0.1 M $KMnO_4$ will be needed to oxidise FeC_2O_4 solution

2. 2.48 g of $Na_2S_2O_3 . xH_2O$ is dissolved per litre solution 20 ml of this solution required 10 ml 0.01 M iodine solution. What is value of x ?
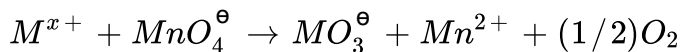
3. $1.245g$ of $CuSO_4 . xH_2O$ was dissolved in water and H_2S was passed until CuS was completely precipitated. The H_2SO_4 Produced in the filtrated required 10 ml of 1M NaOH solution . Calculate X

4. In the reaction $VO + Fe_2O_3 \rightarrow FeO + V_2O_5$, the eq.wt. of V_2O_5 is equal to its

5. For the reaction

$$M^{x+} + MnO_4^{\ominus} \rightarrow MO_3^{\ominus} + Mn^{2+} + (1/2)O_2$$

if 1mol of $MnO_4^{\ominus}$ oxidises 1.67mol of M^{x+} to $MO_3^{\ominus}$, then the value of x in the reaction is

6. A 0.1 mole of a metal is burnt in air to form oxide. The same oxide is then reduced by 0.05 M, 4 litres $S_2O_3^{2-}$ (acidic medium) to +3 oxidation state of metal. What is the oxidation state of metal in oxide ?

7. 100 ml of $Na_2S_2O_3$ solution is divided into two equal two parts A and B . A part requires 12.5 ml of 0.2 M I_2 solution (acidic medium) and part B is diluted x times and 50 ml of diluted solution requires 5 ml of 0.8 M I_2 solution in basic medium. What is value of x ?

8. For a given reductant , ratio of volumes of 0.2 M $KMnO_4$ and $1MK_2Cr_2O_7$ in acidic medium will be

1. STATEMENT-1 $KMnO_4$ acts as powerful oxidising agent in acids, alkaline and neutral medium.

STATEMENT-2: Equivalent weight of $KMnO_4$ in acidic medium in M/5 and in strongly alkaline medium in M/3.

STATEMENT-3 : $KMnO_4$ solution is used as a primary standard and acts as self indicator during its titration more Mohr salt.

    A. T F T

    B. F T T

    C. F F T

    D. F F F

Answer: A

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2. STATEMENT-1: In disproportionation reaction 50% of the substance is oxidised and remaining 50% is reduced.

STATEMENT-2: Decomposition of H_2O_2 is not a disproportionation reaction.

STATEMENT-3: Both HNO_2 & H_3PO_3 can undergo disproportionation reaction.

A. T T T

B. F F T

C. F F F

D. T F T

Answer: B

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3. STATEMENT-1: In the reaction $Zn(s) + Cu^{2+}(aq) \rightarrow Zn^{2+}(aq) + Cu(s)$. Cu^{2+} ions act as oxidising

agent and Zn atoms act as a reducing agent.

STATEMENT-2: Every redox reaction cannot be splitted into two reactions one being oxidation and the other being reductioin.

STATEMENT-3: The oxidation numbers are artifical and are useful as a book keeping device of electrons in reactions.

A. T T T

B. F F T

C. F F F

D. T F T

Answer: D

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4. STATEMENT-1: N/10, 100 ml $KMnO_4$ solution is sufficient to oxidise M/10, 50 ml FeC_2O_4 solution in acidic medium.

STATEMENT-2: The left solution of statement -1 is sufficient to react with 8.33 ml of M/10 $K_2Cr_2O_7$ solution in acidic medium.

STATEMENT-3: 1.06 g Na_2CO_3 will require 100 ml of 0.1 M HCl solution with phenolphthalein.

A. F T T

B. F T F

C. T F T

D. T T F

Answer: A

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5. STATEMENT-1: Volume required for 0.1 M solution is in order

$V_{KMnO_4} < V_{K_2Cr_2O_7} < V_{H_2O_2}$

STATEMENT-2: The number of equivalents required will be in order

$H_2O_2 > KMnO_4 > K_2Cr_2O_7$

STATEMENT-3: The n_{factor} is in order $n_{H_2O_2} < n_{KMnO_4} < n_{K_2Cr_2O_7}$

A. T T F

B. T F T

C. F F T

D. F T F

Answer: C

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1. Determine the oxidation number of the element as indicated

(i) P in NaH_2PO_4

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2. Oxidation number of Mn in K_2MnO_4 is

▶ Watch Video Solution

3. Determine the oxidation number of the element as indicated

I in KIO_3

▶ Watch Video Solution

4. What is the oxidation number of iodine in KI_3?

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5. Find the oxidation number of Fe in Fe_3O_4

▶ Watch Video Solution

6. Determine the oxidation number of the element as indicated

(vi) C in CH_3OH

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7. The oxidation number of S in $Na_2S_4O_6$ is

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8. Determine the oxidation number of the element as indicated

Cr in CrO_2Cl_2

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9. Determine the oxidation number of the element as indicated

(ix) Cr in $\left[Cr(NH_3)_6\right]Cl_3$

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10. O.N of Fe in $K_4\left[Fe(CN)_6\right]$ is

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11. The ratio of number of moles of $KMnO_4$ and $K_2Cr_2O_7$ required to oxidise 0.1mol Sn^{+4} in acidic medium :

12. Balance the chemical equation by the oxidation number method.

(ii) $P + HNO_3 \rightarrow HPO_3 + NO + H_2O$

13. Balance the chemical equation by the oxidation number method.
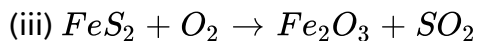
(iii) $FeS_2 + O_2 \rightarrow Fe_2O_3 + SO_2$

14. Determine the oxidation number of the element as indicated

Cr in CrO_2Cl_2

15. Balance the chemical equation by the oxidation number method.

(v) $SnO_2 + C \rightarrow Sn + CO$
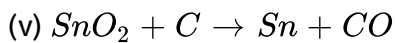
16. Balance the chemical equation by the oxidation number method.

(vi) $FeCl_3 + H_2S \rightarrow FeCl_2 + S + HCl$
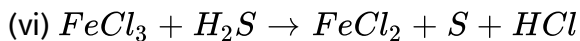
17. Balance the chemical equation by the oxidation number method.

(vii) $H_2O_2 + PbS \rightarrow PbSO_4 + H_2O$

18. Balance the following equations by oxidation number method.

$$MnO_2 + HCl \rightarrow MnCl_2 + Cl_2 + H_2O$$
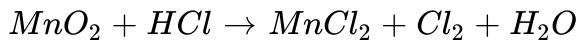
19. Balance the chemical equation by the oxidation number method.

(ix) $I_2 + HNO_3 \rightarrow HIO_3 + NO_2 + H_2O$
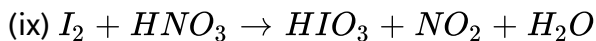
20. A solution is prepared by dissolving 60 g of sodium chloride in 400 g of water. What is the mass-by-mass percent of sodium chloride in this solution?

21. Balance the following reaction by the oxidation number method -
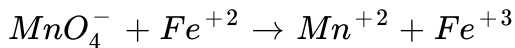
$$MnO_4^- + Fe^{+2} \rightarrow Mn^{+2} + Fe^{+3}$$

22. Balance the equation by Ion-electron method
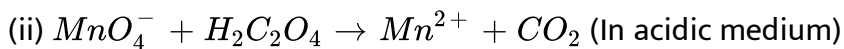
(ii) $MnO_4^- + H_2C_2O_4 \rightarrow Mn^{2+} + CO_2$ (In acidic medium)

23. Balance the equation by Ion-electron method

(iii) $Cu^{2+} + SO_2 \rightarrow SO_4^{2-} + Cu^+$ (In acidic medium)

24. Balance the equation by Ion-electron method

$N_2O_4 + BrO_3^- \rightarrow NO_3^- + Br^-$ (In acidic medium)

25. Balance the equation by Ion-electron method

(v) $Br^- + BrO_3^- \rightarrow Br_2$ (In acidic medium)
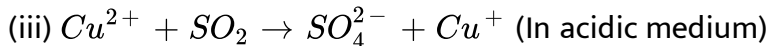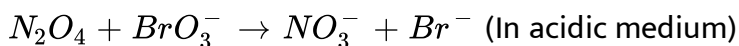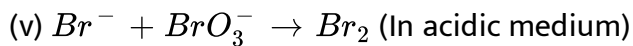
26. In acidic medium moles of $KMnO_4$ required to oxidise 1.5 moles of Cu_2S will be :-

27. Balance the equation by Ion-electron method

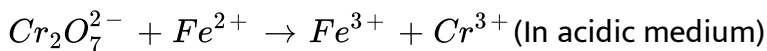(vii) $S + OH^+ \rightarrow S^{2-} + S_2O_3^{2-}$ (In basic medium)
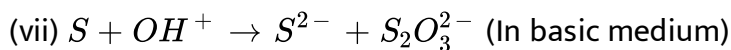
28. Balance the equation by Ion-electron method

$Al + NO_3^- \rightarrow Al(OH)_4^- + NH_3$ (In basic medium)
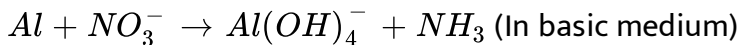
29. Balance the equation by Ion-electron method

$Cr_2O_7^{2-} + Fe^{2+} \rightarrow Fe^{3+} + Cr^{3+}$ (In acidic medium)

30. The density of a molal solution of NaOH is 1.110 g mL^{-1}. The molarity of the solution is

**31.** What is the weight of sodium bromate and molarity of solution to prepare $85.5 mL$ of $0.672N$ solution when half cell reaction are:

(ii) $2BrO_3^- + 12H^+ + 10e^- \rightarrow Br_2 + 6H_2O$
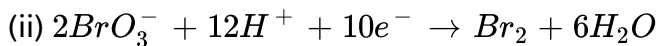
32. 12 litre of H_2 and 11.2 litre of Cl_2 are mixed and exploded. The composition by volume of mixture is:

33. What is the weight of sodium bromate and molarity of solution to prepare $85.5mL$ of $0.672N$ solution when half cell reaction are:

(i) $BrO_3^- \rightarrow 6H^+ + 6e^- \rightarrow Br^- + 3H_2O$
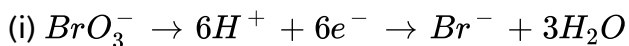
34. $5.7g$ of bleaching powder was suspended in $500mL$ of water. $25mL$ of this suspension on treatment with KI and HCl liberated iodine which

reacted with $24.35mL of N/10Na_2S_2O_3$. Calculate $\%$ of available Cl_2 in bleaching powder.

35. Borax in water gives the following:

$$B_4O_7^{2-} + 7H_2O \rightarrow 4H_2BO_3 + 2\overset{\ominus}{OH}$$
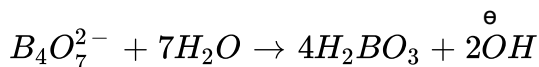
How many grams of borax $(Na_2B_4O_{7.10}H_2O)$ are required to

(a). Prepare 50 " mL of " 0.2 M solutionl.

$(Mw$ of borax $= 382)$

36. 1.0 g of $AgNO_3$ is dissolved in 50 " mL of " water It is titrated with 50 " mL of " KI solution. The AgI precipitated is filtered off. Excess of KI in the filtrate is titrated with $\dfrac{M}{10} KIO_3$ in the presence of $6MHCl$ till all $I^\ominus$ converted into ICl. It requires 50 " mL of " $\dfrac{M}{10} KIO_3$ solution. 20 " mL of "

the same solution of KI requires 30 " mL of " $\dfrac{M}{10} KIO_3$ under the same conditions. Determine the percentage of $AgNO_3$ in the sample.

37. A solution contains Na_2CO_3 and $NaHCO_3$. $10mL$ of the solution required $2.5mL$of$0.1MH_2SO_4$ for neutralisation using phenolphthalein as indicator. Methyl orange is then added when a further $2.5mL$of$0.2MH_2SO_4$was required. The amount of Na_2CO_3 and $NaHCO_3$ in 1litre of the solution is:

A. $5.3g$ and $4.2g$

B. $3.3g$ and $6.2g$

C. $4.2g$ and $5.3g$

D. $6.2g$ and $3.3g$

Answer:

38. 1.0 g of Fe_2O_3 solid of 55.2 % purity is dissolved in acid. The solution is reduced by heating with Zn dust. The resultant solution is cooled and made up to 100 mL. An aliquot of 25 " mL of " this solution requires 17 " mL of " 0.0167 M solution of an oxidant. Calculate the number of electrons taken up by oxidant in the above titration.

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1. During the oxidation of arsenite to arsenate ion in alkaline medium, the number of moles of hydroxide ions involved per mole of arsenite ion are

A. 2

B. 3

C. $2/3$

D. $3/2$

Answer: A

2. When copper is treated with a certain concentration of nitric acid, nitric oxide and nitrogen dioxide are liberated in equal volumes according to the equation

$$xCu + yHNO_3 \rightarrow Cu(NO_3)_2 + NO + NO_2 + H_2O$$

The coefficients x and y are

    A. 2 and 6

    B. 4 and 12

    C. 1 and 3

    D. 3 and 8

Answer: B

3. $IO_3^- + I^- + H^+ \rightarrow$
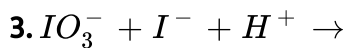
A. 5,1,6

B. 1,5,6

C. 6,1,5

D. 5,6,1

Answer: A

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4. Which one of the following compounds does not decolourise an acidified aqueous solution of $KMnO_4$

A. $FeCl_3$

B. $FeSO_4$

C. SO_2

D. H_2O_2

Answer: A

5. The number of moles of $KMnO_4$ that are needed to react completely with one mole of ferrous oxalate in acidic solution is

A. $6/5$

B. $3/5$

C. $2/5$

D. $1/3$

Answer: A

6. The oxidation number of S in S_8, S_2F_2, and H_2S, respectively, are

A. $0, +1$ and -2

B. $0, +2$ and -2

C. $+2, +1$ and -1

D. $-2, +1$ and -2

Answer: A

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7. $Cr(OH)_3 + ClO^- + 3OH^- \rightarrow ? + Cl^- 3H_2O.$ The missing ion is

A. $Cr_2O_7^{2-}$

B. Cr^{3+}

C. CrO_4^{2-}

D. Cr_2O_3

Answer: C

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8. The chromate ion present in water sample is reduced to insoluble chromium hydroxide , $Cr(OH)_3$ by dithionation, in basic solution .

$$S_2O_4^{2-} + CrO_4^{2-} + 2H_2O \rightarrow 2SO_3^{2-} + Cr(OH)_3 + OH^-$$
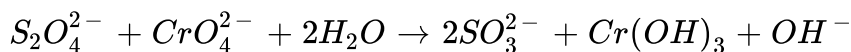
100 L of water requires 387 g of $Na_2S_2O_4$. The molarity of CrO_4^{2-} in waste water is

A. 0.0448

B. 4.448

C. 0.0148

D. 0.0224

Answer: C

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---

9. A sample which conains exactly 0.5 g of uranium in the form of U^{4+} . The total uranium is allowed to oxidized by 50 ml of $KMnO_4$. The

reaction taking place is

$$U^{4+} + KMnO_4 + H_2O \rightarrow UO_2^{2+} + Mn^{2+} + H_2O^+$$
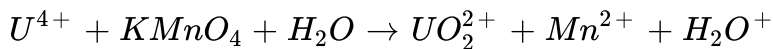
Find the concentration of $KMnO_4$ required for the above purpose

[U=238]

A. 0.0336 M

B. 0.0084 M

C. 0.0168 M

D. 0.0672 M

Answer: C

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10. A 50 ml of 20% (w/w) solution of density 1.2 g/ml is diluted until is strength becomes 6% (w/w) . Determine the mass of water added.

A. 88 g

B. 120 g

C. 140 g

D. 180g

Answer: C

---

11. $1.245g$ of $CuSO_4 . xH_2O$ was dissolved in water and H_2S was passed until CuS was completely precipitated. The H_2SO_4 Produced in the filtrated required 10 ml of 1M NaOH solution . Calculate X

A. 5

B. 6

C. 7

D. 8

Answer: C

1. Oxidation state of nitrogen in $H - N \equiv C$ is

    A. -4

    B. $+3$

    C. -3

    D. -2

Answer: C

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2. Oxidation state of oxygen in CrO_5 is

    A. -1

    B. -2

C. Both (1) & (2)

D. $-\dfrac{1}{2}$

Answer: C

3. The number of peroxide linkages in CrO_5 and H_2SO_5 respectively are

A. 1, 1

B. 2, 0

C. 2, 1

D. 1, 2

Answer: C

4. The pair of compounds in which the metals are in their highest oxidation state is

A. $FeSO_4$, CuS_2

B. CrO_2Cl_2, MnO_4^-

C. TiO_2, MnO_2

D. $[Co(CN)_6]^{3-}$, MnO_3
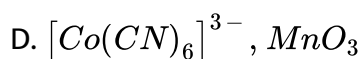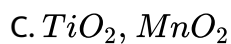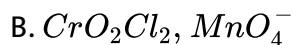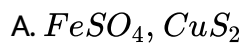
Answer: B

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5. Oxidation number of chlorine atoms in $CaOCl_2$ are

A. 0, 0

B. -1, -1

C. -1, $+1$

D. -2, $+7$
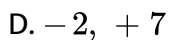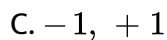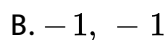
Answer: C

6. When ethane is burnt in excess of oxygen,, the oxidation number of carbon changes by

   A. $+8$

   B. $+7$

   C. $+3$

   D. $+4$

Answer: B

7. The oxidation state of oxygen in the following reaction changes,

$$K + O_2 \rightarrow KO_2$$
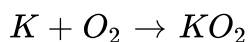
A. From $0 \rightarrow -1$

B. From $0 \rightarrow -2$

C. From $0 \rightarrow -\dfrac{1}{2}$

D. From $0 \rightarrow +1$

Answer: C

8. The number of electrons involved when 1 mole of H_2O_2 decomposes as

$H_2O_2 \rightarrow H_2O + O_2$, is

A. 1

B. 8

C. 6

D. 4
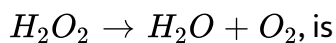
Answer: A

9. Which of the following elements never show positive oxidation number?

A. O

B. Fe

C. Ga

D. F

Answer: D

10. When SO_2 is passed into an acidified potassium dichromate solution, the oxidation numbers of sulphur and chromium in the final products respectively are :

A. $+4$ to 0

B. $+4$ to $+2$

C. $+4$ to $+6$

D. $+6$ to $+4$

Answer: C

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11. In an electrolytic cell, the flow of electrons is

A. Anode to cathode through internal circuit

B. Cathode to anode through external circuit

C. Cathode to anode through internal circuit

D. Anode to cathode through external circuit

Answer: D

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12. In SHE, the pH of the acid solution

A. 7

B. 14

C. 0

D. 4

Answer: C

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13. An electrochemical cell has two half cell reaction as,

$A^{2+} + 2e^- \dashrightarrow A, E^0 = 0.34V$
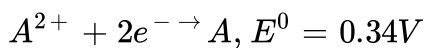
$X \rightarrow X^{2+} + 2e^-, E^0 = +2.37V.$ The cell voltage will be

A. 2.71 V

B. 2.03 V

C. $-2.71V$

D. $-2.03V$

Answer: A

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14. Which of the following is the most reactive metal?

A. K

B. Zn

C. Ni

D. Ag

Answer: A

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15. Which of the following element has maximum standard reduction potential?

A. Li

B. K

C. F

D. Cl

Answer: C

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16. Choose the correct statement for galvanic cell

A. Oxidation : cathode

B. Positive electrode : cathode

C. Flow of electron : cathode to anode

D. All are correct

Answer: B

---

17. Which of the following involves redox reaction?

A. Decomposition of $CaCO_3$

B. Rusting

C. Reaction of NaOH with HCl

D. $Zn \rightarrow Zn^{++} + 2e^-$

Answer: B

---

18. Which of the following is true about salt bridge?

A. It maintains the neutrality

B. It completes the circuit

C. It contains salt

D. All are correct

Answer: D

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19. Standard reduction potential is calculated at

A. $27°C$

B. $25°C$

C. $0°C$

D. $100°C$

Answer: B

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20. The electrochemical cell representing the given reaction

$$Ni(s) + Cu^{2+} \rightarrow Ni^{2+} + Cu(s)$$

A. $Ni(s)|Cu^{2+}||Ni^{2+}|Cu(s)$

B. $Ni(s)|Ni^{2+}||Cu^{2+}|Cu$

C. $Cu(s)|Cu^{2+}||Ni(s)|Ni^{2+}$

D. $Cu(s)|Cu^{2+}||Ni^{2+}|Ni(s)$
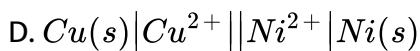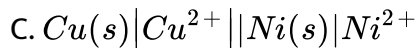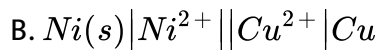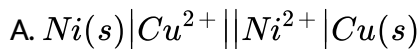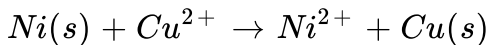
Answer: B

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Assignment Section A

1. The process in which oxidation number increase, is

A. Reduction

B. Hydrolysis

C. Oxidation

D. Decomposition

Answer: C

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2. The oxidation state of phosphorus varies from

A. -3 to $+5$

B. -1 to $+1$

C. -3 to $+3$

D. -5 to $+1$

Answer: A

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3. Oxidation number of iodine varies from -

A. -1 to $+1$

B. -1 to $+7$

C. $+3$ to $+5$

D. -1 to $+5$

Answer: B

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4. 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. Neutralization

Answer: C

---

5. Oxidation number of oxygen atom in O_3 molecule is

A. 0

B. -2

C. $+2$

D. $-1/2$

Answer: A

---

6. The oxidation number, of C in CH_4. $CH_3CI, CH_2CI_2, CHCl_3$ and CCl_4 are respectively:

A. $-4, \ -2, 0, \ +2, \ +4$

B. $+2, 4, 0, \ -2, \ -4$

C. $4, 2, 0, \ -2, 4$

D. $0, 2, \ -2, 4, 4$

Answer: A

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7. Chlorine is in $+3$ oxidation state in

A. HCl

B. $HClO_4$

C. lCl

D. ClF_3

Answer: D

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8. Given that the oxidation number of sulphur is -2, the equivalent weight of sulphur is

   A. 16

   B. 32

   C. 9

   D. 4

Answer: A

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9. In a reaction between zinc and Iodine, zinc iodide is formed. Which is being oxidised?

   A. Zinc ions

   B. Iodide ions

C. Zinc atom

D. Iodine

Answer: C

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10. In the reaction

$$3Br_2 + 6CO_3^{2-} + 3H_2O \rightarrow 5Br^{\ominus} + BrO_3^{\ominus} + 6HCO_3^{\ominus}$$
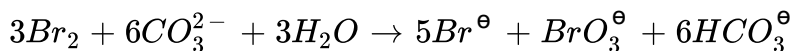
A. Bromine is oxidised and carbonate is reduced

B. Bromine is reduced and carbonate is oxidised

C. Bromine is neither reduced nor oxidised

D. Bromine is reduced as well oxidised

Answer: D

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11. In which reaction, there is change in oxidation number of N atom?

A. $2NO_2 \Leftrightarrow N_2O_4$

B. $2NO_2 + H_2O \rightarrow HNO_3 + HNO_2$

C. $NH_4OH \rightarrow NH_4^+ + OH^-$

D. $N_2O_5 + H_2O \rightarrow 2HNO_3$
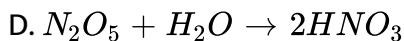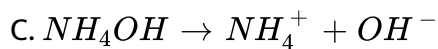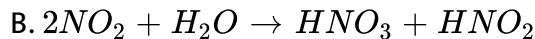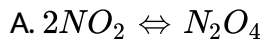
Answer: B

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12. When zinc granule is dipped into copper sulphate solution, copper is precipitated because :
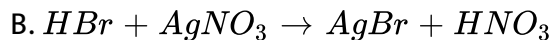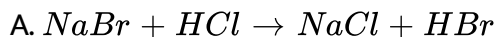
A. Oxidation of Cu^{+2}

B. Reduction of Cu^{+2}

C. Hydrolysis of $CuSO_4$

D. Ionization of $CuSO_4$

Answer: B
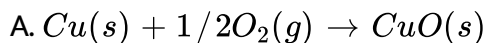
13. Which of the following reactions involve oxidation and reduction?

A. $NaBr + HCl \rightarrow NaCl + HBr$
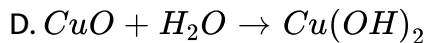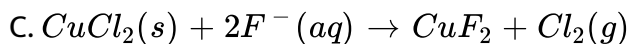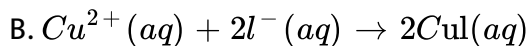
B. $HBr + AgNO_3 \rightarrow AgBr + HNO_3$

C. $H_2 + Br_2 \rightarrow 2HBr$

D. $Na_2O + H_2SO_4 \rightarrow Na_2SO_4 + H_2O$
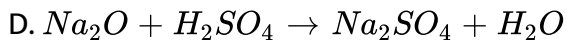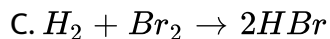
Answer: C

14. Which of the following involves the reduction of copper?

A. $Cu(s) + 1/2O_2(g) \rightarrow CuO(s)$

B. $Cu^{2+}(aq) + 2l^-(aq) \rightarrow 2Cul(aq)$

C. $CuCl_2(s) + 2F^-(aq) \rightarrow CuF_2 + Cl_2(g)$

D. $CuO + H_2O \rightarrow Cu(OH)_2$

Answer: B

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15. Which one of the following is the correct match?

A. $Cl_2 - $ only reducing agent

B. $HNO_2 - $ only oxidising agent

C. $HNO_3 - $ both oxidising and reducing agent

D. $SO_2 - $ both oxidising and reducing agent

Answer: D

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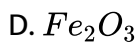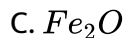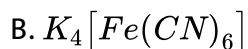**16.** The oxidation number of sulphur in $H_2S_2O_8$ is:

A. $+7$

B. $+6$

C. -6

D. $+4$

Answer: B

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17. In which of the following compounds iron has lowest oxidation number?

A. $FeSO_4 \cdot (NH_4)_2SO_4 \cdot 6H_2O$

B. $K_4[Fe(CN)_6]$

C. Fe_2O

D. Fe_2O_3

Answer: C

---

18. Phosphorus has the oxidation state of +3 in

A. Orthophosphoric acid (H_3PO_4)

B. Phosphorus acid (H_3PO_3)

C. Metaphosphoric acid (HPO_3)

D. Pyrophosphoric acid $(H_4P_2O_7)$

Answer: B

---

19. The brown ring complex compound is formulated as $[Fe(H_2O)_5NO]SO_4$. The oxidation state of Fe is

A. $+1$

B. $+2$

C. $+3$

D. $+6$

Answer: A

20. Oxidation number of Cr in CrO_5 is

A. $+10$

B. $+6$

C. $+4$

D. $+5$

Answer: B

21. In which of the following compounds , the oxidation number of iodine is fractional ?

    A. IF_7
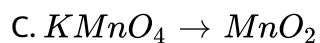
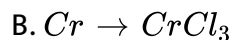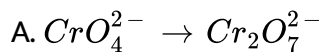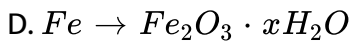   B. $I_3{}^-$

    C. IF_5

    D. IF_3

Answer: B

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22. Which reaction involves neither oxidation nor reduction?

    A. $CrO_4^{2-} \rightarrow Cr_2O_7^{2-}$

    B. $Cr \rightarrow CrCl_3$

    C. $KMnO_4 \rightarrow MnO_2$

D. $Fe \rightarrow Fe_2O_3 \cdot xH_2O$

Answer: A

23. In a chemical reaction,

$$K_2Cr_2O_7 + xH_2SO_4 + ySO_2 \rightarrow K_2SO_4 + Cr(SO_4)_3 + zH_2O, \quad , \quad \text{the}$$
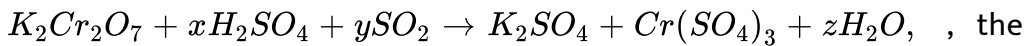
value x, y and z respectively are:

A. 1, 3, 1

B. 4, 1, 4

C. 3, 2, 3

D. 2, 1, 2

Answer: A

24. What is the oxidation state of sodium in sodium amalgam (Na/Hg)?

A. $+1$

B. 0

C. -1

D. $+2$

Answer: B

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25. Which of the following will not be oxidised by O_3 ?
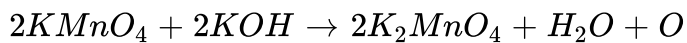
A. KI

B. $KMnO_4$

C. K_2MnO_4

D. $FeSO_4$

Answer: B

---

26. In alkaline medium , $KMnO_4$ reacts as follows

$$2KMnO_4 + 2KOH \rightarrow 2K_2MnO_4 + H_2O + O$$

Therefore, the equivalent mass of $KMnO_4$ will be

A. 31.6

B. 52.7

C. 79.0

D. 158.0

Answer: D

27. The equivalent weight of FeS_2 in the following reaction is

$$FeS_2 + O_2 \rightarrow Fe^{+3} + SO_2$$
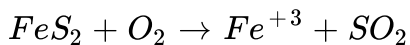
A. $\dfrac{\text{Mol. wt}}{1}$

B. $\dfrac{\text{Mol. wt}}{7}$

C. $\dfrac{\text{Mol. wt}}{11}$

D. $\dfrac{\text{Mol. wt}}{9}$

Answer: C

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28. When SO_2 is passed inoto an acidified potassium dichromate soltion, the oxidation number of sulphur and chromium in the final products respectively are:

A. $+4$ to zero

B. $+4$ to $+2$

C. $+4$ to $+6$

D. $+6$ to $+4$

Answer: C

29. How many mole of $FeSO_4$ reacted with one mole of $KMnO_4$ in acidic medium?

A. $\dfrac{2}{5}$

B. 5

C. $\dfrac{1}{2}$

D. $\dfrac{1}{5}$

Answer: B

30. A compound of Xe and F is found to have 53.3% Xe (atomic weight = 133) Oxidation number of Xe in this compound is

A. $+2$

B. 0

C. $+4$

D. $+6$

Answer: D

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31. Which of the following is not correct for electrochemical cell?

A. Convert chemical energy to electrical energy

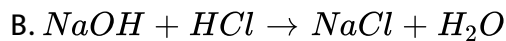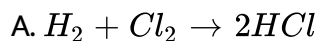B. Anode is -ve terminal

C. Cathode is -ve terminal

D. Cathode is +ve terminal

Answer: C

---

32. Which of the following is not a redox reaction?

A. $H_2 + Cl_2 \rightarrow 2HCl$

B. $NaOH + HCl \rightarrow NaCl + H_2O$

C. Photosynthesis

D. Cell respiration

Answer: B

---

33. Redox reaction have no concern with

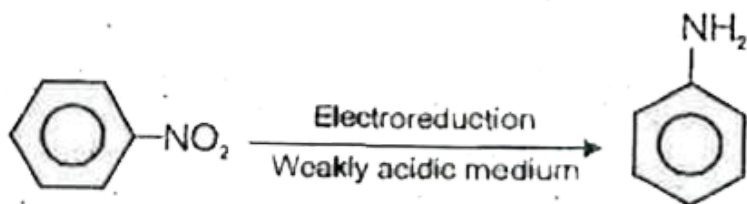A. Neutrailization of acid bases

B. Salt hydrolysis

C. Esterification

D. All of these

Answer: D

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34.

n factor of nitrobenzene in this process

A. 3

B. 6

C. 2

D. 4

Answer: B

---

35. In this process of photosynthesis, which takes place in green plants which undergoes reduction?

A. Water

B. CO_2

C. Protons

D. Photons

Answer: B

Assignment Section B

1. The ratio of number of moles of $KMnO_4$ and $K_2Cr_2O_7$ required to oxidise 0.1mol Sn^{+4} in acidic medium :
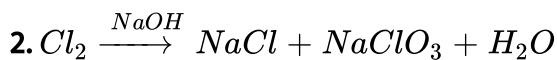
A. $6:5$

B. $5:6$

C. $1:2$

D. $2:1$

Answer: A

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2. $Cl_2 \xrightarrow{NaOH} NaCl + NaClO_3 + H_2O$

The equivalent mass of Cl_2 in the above reaction is

A. M

B. $\dfrac{M}{3}$

C. $\dfrac{M}{2}$

D. $\dfrac{3M}{5}$

Answer: D

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3. Assertion (A): A saturated solution of KCl is used in making salt bridge.
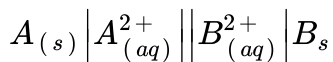
Reason (R): Ionic mobilities of $K^{\oplus}$ and Cl^{c-} are comparable.

  A. K^{+} and Cl^{-} are isoelectronic

  B. Monovalent ions are required

  C. Both the ions have almost same velocity

  D. They are having similar size

Answer: C

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4. EMF of the given cell

$$A_{(s)} \left| A^{2+}_{(aq)} \right| \left| B^{2+}_{(aq)} \right| B_s$$

Given $E^{\circ}_{A/A^{2+}} : +1.4V$ and $E^{\circ}_{B/B^{2+}} : -1.4V.$

A. 2.8 V

B. 1.8 V

C. 0 V

D. -1.8 V

Answer: A

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5. Electrode potential depends upon

A. Size of electrode

B. Surface area of electrode

C. Temperature

D. Shape of electrode

Answer: C

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6. Oxidation number of Cr atom in CrO_5 and K_3CrO_8 respectively

A. $+6, +6$

B. $+5, +6$

C. $+6, +5$

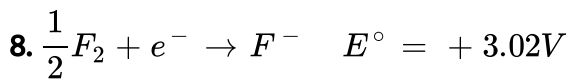D. $+5, +5$

Answer: C

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7. Number of electrons involved in the reaction when 0.1 mol NH_3 dissolved in water
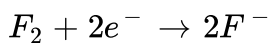
A. 2

B. 0.4

C. 0.9

D. Zero

Answer: D

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8. $\frac{1}{2}F_2 + e^- \rightarrow F^-$ $E^\circ = +3.02V$

Electrode potential for given reaction

$F_2 + 2e^- \rightarrow 2F^-$

A. 3.02 V

B. 6.04 V

C. 1.5 V

D. $- 3.02$ V

Answer: A

9. Three metals A, B and C are arranged in increasing order of standard reduction electrode potential, hence their chemical reactivity order will be

A. $A < B < C$

B. $A > B > C$

C. $B > C > A$

D. $A = B = C$

Answer: B

10. Find the incorrect statement

A. Higher reduction potential of non-metal means stronger reducing

agent

B. Lower oxidation potential of a metal means weak oxidising agent

C. Oxidation state of oxygen in O_3 is -1

D. All of these

Answer: D

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11. When an alkali metal is reacted with hydrogen then metallic hydride is

formed. In this reaction

A. Hydrogen is oxidised

B. Hydrogen is reduced

C. Hydrogen is neither oxidised nor reduced

D. Hydrogen is oxidised as well as reduced

Answer: B

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12. The oxidation number of carboxylic carbon atom in CH_3COOH is

A. -3

B. Zero

C. $+1$

D. $+3$

Answer: D

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13. How many moles of $KMnO_4$ are required to oxidise one mole of $SnCl_2$ in acidic medium?
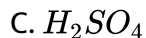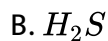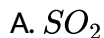
A. $\dfrac{1}{5}$

B. $\dfrac{2}{5}$

C. $\dfrac{3}{5}$

D. $\dfrac{4}{5}$

Answer: B

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14. Which compound acts as oxidising agent only?

A. SO_2

B. H_2S

C. H_2SO_4

D. HNO_2

Answer: C

---

15. The average oxidation state of chlorine in bleaching powder is

    A. -1

    B. $+1$

    C. Zero

    D. -2 as well as $+2$

Answer: C

---

16. When benzaldehyde is oxidised to give benzoic acid then the oxidation state of carbon of aldehydic group is changed from

A. $+2$ to $+3$

B. $+1$ to $+3$

C. Zero to $+2$

D. No change

Answer: B

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17. Which of the following is incorrect regarding salt bridge solution ?

A. Solution must be a strong electrolyte

B. Solution should be inert towards both electrodes

C. Size of cations and anions of salt should be much different

D. Salt bridge solution is prepared in gelatin or agar-agar to make it

semi-solid

Answer: C

18. Standard electrode potentials of redox couples A^{2+}/A, B^{2+}/B, C/C^{2+} and D^{2+}/D are 0.3 V, -0.5 V, -0.75 V and 0.9 V respectively. Which of these is best oxidising agent and reducing agent respectively?

A. D^{2+}/D and B^{2+}/B

B. B^{2+}/B and D^{2+}/D

C. D^{2+}/D and C^{2+}/C

D. C^{2+}/C and D^{2+}/D
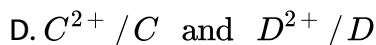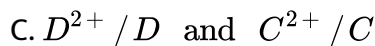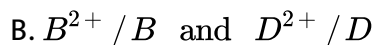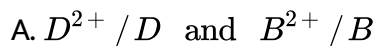
Answer: A

19. The number of moles of H_2O_2 required to completely react with 400 ml of 0.5 N $KMnO_4$ in acidic medium are

A. 0.1

B. 0.2

C. 1.0

D. 0.5

Answer: A

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20. $Cl_2(g) + X\overline{O}H \rightarrow YClO_3{}^- + ZH_2O + 10e^-$

The coefficient X, Y and Z are

A. 6, 2, 2

B. 5, 1, 3

C. 12, 2, 6

D. 12, 1, 6

Answer: C

1. Assuming complete ionisation, same moles of which of the following compounds will require the least amount of acidified $KMnO_4$ for complete oxidation?

A. FeC_2O_4

B. $Fe(NO_2)_2$

C. $FeSO_4$

D. $FeSO_3$
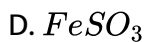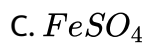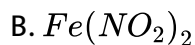
Answer: C

2. Which of the following processes does not involve oxidation of iron?

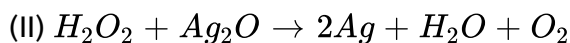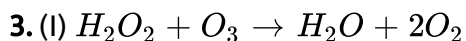A. Liberation of H_2 from steam by ironn at high temperature

B. Rusting of iron sheets

C. Decolourization of blue $CuSO_4$ solution by iron

D. Formation of $Fe(CO)_5$ from Fe

Answer: D

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3. (I) $H_2O_2 + O_3 \rightarrow H_2O + 2O_2$

(II) $H_2O_2 + Ag_2O \rightarrow 2Ag + H_2O + O_2$

Role of hydrogen peroxide in the above reactions is respectively

A. Oxidizing in (a) and reducing in (b)

B. Reducing in (a) and oxidizing in (b)

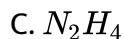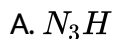C. Reducing in (a) and (b)

D. Oxidizing in (a) and (b)

Answer: C

---

4. In which of the following compounds, oxygen exhibits highest oxidation state?

    A. N_3H

    B. NH_2OH

    C. N_2H_4

    D. NH_3

Answer: A

---

5. A solution contains Fe^{2+}, Fe^{3+} and T^- ions. This solution was treated with iodine at $35°C. E°$ for Fe^{3+}, Fe^{2+} is $0.77V$ and $E°$ for

$I_2/2I^-$ = 0.536 V. The favourable redox reaction is:

A. I^- will be oxidised to I_2

B. Fe^{2+} will be oxidised to Fe^{3+}

C. I_2 will be reduced to I^-

D. There will be no redox reaction

Answer: A

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6. 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

7. Oxidation number of P in PO_4^{3-} , of S in SO_4^{2-} and that of $Cr_2O_7^{2-}$ are respectively

    A. $+3, \ +6$ and $\ +5$

    B. $+5, \ +3$ and $\ +6$

    C. $-3, \ +6$ and $\ +6$

    D. $+5, \ +6$ and $\ +6$

Answer: D

8. The number of moles of $KMnO_4$ that will be needed to react with one mole of sulphite ion in acidic solution is:

    A. 1

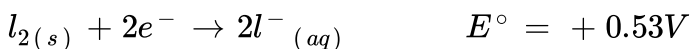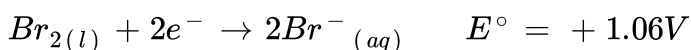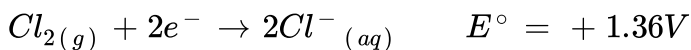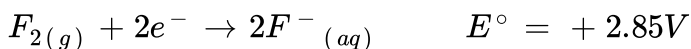B. $\dfrac{3}{5}$

C. $\dfrac{4}{5}$

D. $\dfrac{2}{5}$

Answer: D

9. Standard reduction potentials of the half reactions are given below

$F_{2(g)} + 2e^- \rightarrow 2F^-_{(aq)}$ $\qquad E^\circ = +2.85V$

$Cl_{2(g)} + 2e^- \rightarrow 2Cl^-_{(aq)}$ $\qquad E^\circ = +1.36V$

$Br_{2(l)} + 2e^- \rightarrow 2Br^-_{(aq)}$ $\qquad E^\circ = +1.06V$

$I_{2(s)} + 2e^- \rightarrow 2I^-_{(aq)}$ $\qquad E^\circ = +0.53V$

The strongest oxidising and reducing agents respectively are

A. F_2 and I_2

B. Br_2 and Cl^-

C. Cl_2 and Br^-

D. Cl_2 and I_2
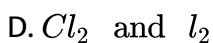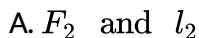
10. Standard electrode potential for Sn^{4+}/Sn^{2+} couple is $0.15V$ and that for the Cr^{3+}/Cr couple is $-0.74V$. These two couples in their standard state are connected to make a cell. The cell potential will be $+0.89V, +0.18V, +1.83V, +1.199$ V`

A. $+1.83V$

B. $+1.19V$

C. $+0.89V$

D. $+0.18V$

11. Standard electrode potential of three metal X, Y and Z are $-1.2V, +0.5V$ and $-3.0V$ respectively. The reducing power of these metals will be:
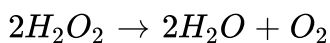
A. $X > Y > Z$

B. $Y > Z > X$

C. $Y > X > Z$

D. $Z > X > Y$

Answer: D

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12. In the reaction

$$2H_2O_2 \rightarrow 2H_2O + O_2$$

A. Oxygen is oxidised only
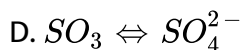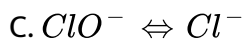
B. Oxygen is reduced only
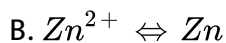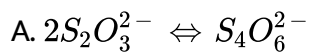
C. Oxygen is neither oxidised nor reduced

D. Oxygen is both oxidised and reduced
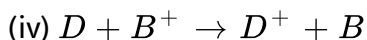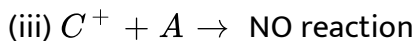
Answer: D

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13. Which change requires an oxidising agent?

A. $2S_2O_3^{2-} \Leftrightarrow S_4O_6^{2-}$

B. $Zn^{2+} \Leftrightarrow Zn$

C. $ClO^- \Leftrightarrow Cl^-$

D. $SO_3 \Leftrightarrow SO_4^{2-}$

Answer: A

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14. Given the following reaction involving A,B,C and D

(i) $C + B^+ \rightarrow C^+ + B$

(ii) $A^- + D \rightarrow$ NO reaction

(iii) $C^+ + A \rightarrow$ NO reaction

(iv) $D + B^+ \rightarrow D^+ + B$
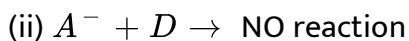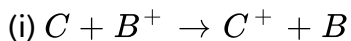
the correct arrangement of A,B,C,D in the order of their decreasing ability as reducing agent

   A. $D > B > C > A$

   B. $A > C > D > B$

   C. $C > A > B > D$

   D. $C > A > D > B$
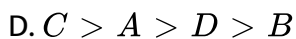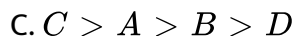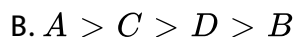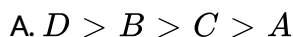
Answer: D

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15. Which element undergoes disproportionation in water ?

A. Cl_2

B. F_2

C. K

D. Cs

Answer: A

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16. Standard reduction potential at $25°C$ of $Li^+/Li, Ba^+/Ba, Na^+/Na$ and $Mg^{2+}/Mg are - 3.05, - 2.90, - 2.71$ respectively. Which one of the following is the strongest oxidising agent ?

A. Ba^{2+}

B. Mg^{2+}

C. Na^+

D. Li^+

Answer: B

---

17. Which species is acting as a reducing agent in the following reaction ?

$$14H^+ + Cr_2O_7^{2-} + 3Ni \rightarrow 2Cr^{3+} + 7H_2O + 3Ni^{2+}$$
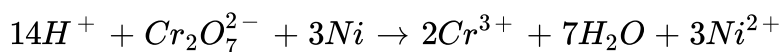
A. H^+

B. $Cr_2O_7{}^{2-}$

C. H_2O

D. Ni

Answer: D

---

18. The oxidant which cannot act as a reducing agent is

A. CO_2

B. ClO_2

C. NO_2

D. SO_2

Answer: A

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19. Oxidation state of Fe in Fe_3O_4 is

A. $\dfrac{5}{4}$

B. $\dfrac{4}{5}$

C. $\dfrac{3}{2}$

D. $\dfrac{8}{3}$

Answer: D

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20. Oxidation numbers of A, B, C are +2, +5 and -2 respectively. Possible formula of compound is

A. $A_2(BC_2)_2$

B. $A_3(BC_4)_2$

C. $A_2(BC_3)_2$

D. $A_3(B_2C_2)$
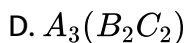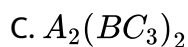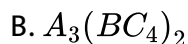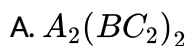
Answer: B

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21. The oxidation states of sulphur in the anions SO_3^{2-}, $S_2O_4^{2-}$, and $S_2O_6^{2-}$ follow the order

A. $S_2O_4{}^{2-} < SO_3{}^{2-} < S_2O_6{}^{2-}$

B. $SO_3{}^{2-} < S_2O_4{}^{2-} < S_2O_6{}^{2-}$

C. $S_2O_4{}^{2-} < S_2O_6{}^{2-} < SO_3{}^{2-}$

D. $S_2O_6{}^{2-} > S_2O_4{}^{2-} < SO_3{}^{2-}$
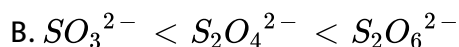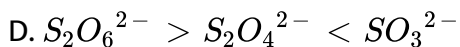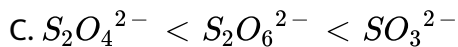
Answer: A

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22. Reduction potential for the following half-cell reaction are

$Zn \rightarrow Zn^{2+} + 2e^-, E^\circ_{Zn^{2+} / Zn} = -0.76V$

$Fe \rightarrow Fe^{2+} + 2e^-, E^\circ_{Fe^{2+} / Fe} = -0.44V$
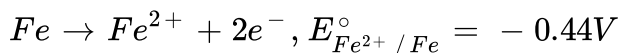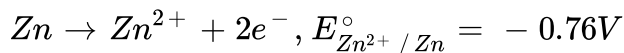
The emf for the cell reaction

$Fe^{2+} + Zn \rightarrow Zn^{2+} + Fe$
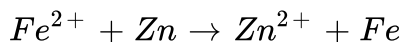
will be

A. $-0.32V$

B. $+1.20V$

C. $-1.20V$

D. $+0.32V$

Answer: D

---

23. In acidic medium, H_2O_2 changes $Ce_2O_7^{2-}$ to CrO_5 which has two $(-O-O-)$ bonds. Oxidation state of Cr in CrO_5 is

A. $+5$

B. $+3$

C. $+6$

D. -10

Answer: C

Assignment Section D

1. A : Fluorine acts as a stronger oxidising agent than chlorine.

R : Standard reduction potential of fluorine is higher than Cl_2

    A. If both Assertion & Reason are true and the reason is the correct

       explanation of the assertion, then mark (1).

    B. If both Assertion & Reason are true but the reason is not the

       correct explanation of the assertion, then mark (2).

    C. If Assertion is true statement but Reason is false, then mark (3).

    D. If both Assertion and Reason are false statements, then mark (4).

Answer: A

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2. A : Oxidation number of carbon in HCN is +4.

R : Oxidation state and valency is same for carbon.

A. If both Assertion & Reason are true and the reason is the correct

   explanation of the assertion, then mark (1).

B. If both Assertion & Reason are true but the reason is not the

   correct explanation of the assertion, then mark (2).

C. If Assertion is true statement but Reason is false, then mark (3).

D. If both Assertion and Reason are false statements, then mark (4).

Answer: D

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3. A : Equivalent weight of $KMnO_4$ in acidic medium is $\dfrac{M}{5}$.

R : In acidic medium 1 mol of MnO_4^- gains 5 electron.

A. If both Assertion & Reason are true and the reason is the correct

   explanation of the assertion, then mark (1).

B. If both Assertion & Reason are true but the reason is not the
correct explanation of the assertion, then mark (2).

C. If Assertion is true statement but Reason is false, then mark (3).

D. If both Assertion and Reason are false statements, then mark (4).

Answer: A

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4. A : Electrons flow in external circuit of galvanoic cell while ions flow in
internal circuit.

R : Direction of current flow is reverse that of electron flow.

A. If both Assertion & Reason are true and the reason is the correct
explanation of the assertion, then mark (1).

B. If both Assertion & Reason are true but the reason is not the
correct explanation of the assertion, then mark (2).

C. If Assertion is true statement but Reason is false, then mark (3).

D. If both Assertion and Reason are false statements, then mark (4).

Answer: B

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5. A : Sn^{2+} and Fe^{3+} can't remain together in a solution.

R : Sn^{2+} and Fe^{3+} will react mutually to form Sn^{4+} and Fe^{2+}.

A. If both Assertion & Reason are true and the reason is the correct explanation of the assertion, then mark (1).

B. If both Assertion & Reason are true but the reason is not the correct explanation of the assertion, then mark (2).

C. If Assertion is true statement but Reason is false, then mark (3).

D. If both Assertion and Reason are false statements, then mark (4).

Answer: A

6. A : The oxidation number of S is +6 in H_2SO_4.

R : H_2SO_4 has one peroxide linkage.

A. If both Assertion & Reason are true and the reason is the correct

explanation of the assertion, then mark (1).

B. If both Assertion & Reason are true but the reason is not the

correct explanation of the assertion, then mark (2).

C. If Assertion is true statement but Reason is false, then mark (3).

D. If both Assertion and Reason are false statements, then mark (4).

Answer: C

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7. Assertion : HNO_2 can act both as a reducing agent and an oxidising

agent.

Reason : In HNO_2, oxidation state of nitrogen is +3 which can change from -3 to +5.

A. If both Assertion & Reason are true and the reason is the correct explanation of the assertion, then mark (1).

B. If both Assertion & Reason are true but the reason is not the correct explanation of the assertion, then mark (2).

C. If Assertion is true statement but Reason is false, then mark (3).

D. If both Assertion and Reason are false statements, then mark (4).

Answer: D

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8. A : In alkaline medium, $KMnO_4$ acts as powerful oxidising agent.

R : $KMnO_4$ reduces to give Mn^{2+} in alkaline medium.

A. If both Assertion & Reason are true and the reason is the correct

explanation of the assertion, then mark (1).

B. If both Assertion & Reason are true but the reason is not the

correct explanation of the assertion, then mark (2).

C. If Assertion is true statement but Reason is false, then mark (3).

D. If both Assertion and Reason are false statements, then mark (4).

Answer: C

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9. A : When Cu_2S is converted into Cu^{++} & SO_2, then equivalent

weight of Cu_2S will be M/8 (M = Mol. wt. of Cu_2S)

R : Cu^+ is converted Cu^{++}, during this one electrons is lost.

A. If both Assertion & Reason are true and the reason is the correct

explanation of the assertion, then mark (1).

B. If both Assertion & Reason are true but the reason is not the

correct explanation of the assertion, then mark (2).

C. If Assertion is true statement but Reason is false, then mark (3).

D. If both Assertion and Reason are false statements, then mark (4).

Answer: B

10. A : I_2 is a mild oxidising agent.

R : I_2 can be used for titrating sodium thiosulphate.

A. If both Assertion & Reason are true and the reason is the correct

explanation of the assertion, then mark (1).

B. If both Assertion & Reason are true but the reason is not the

correct explanation of the assertion, then mark (2).

C. If Assertion is true statement but Reason is false, then mark (3).

D. If both Assertion and Reason are false statements, then mark (4).

Answer: B

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