DPP –3 [Application of Electrochemical series]

Chapter: Electrochemistry

Even on bad days, do minimum 30 focused minutes. Consistency is built by not breaking the chain.' *"You are allowed to study less. You are not allowed to study zero.*
Even on bad days, do minimum 30 focused minutes. Consistency is built by not breaking the chain.'

TYPE–1 : Oxidizing & Reducing Agents

1. **The E° values for M^{3+}/M^{2+} couple for Cr, Mn, Fe and Co are -0.41, $+1.57$, $+0.77$ and $+1.97$ respectively. For which one of these metals, the change in oxidation state from $+2$ to $+3$ is easiest**
   (1) Cr (2) Mn
   (3) Fe (4) Co
2. **The standard electrode potential value of the elements A, B and C are 0.68, -2.50 and 0.50 V respectively. The order of their reducing power is :**
   (1) A > B > C (2) A > C > B
   (3) C > B > A (4) B > C > A
3. **The standard reduction potential value of three metallic cations X, Y and Z are 0.52, -3.303 and -1.18 V respectively. The order of reducing power of the corresponding metals is**
   (1) Y > Z > X
   (2) X > Y > Z
   (3) Z > Y > X
   (4) Z > X > Y
4. **The standard electrode potential (E) values of Al^{3+}/Al, Ag^{+}/Ag, K^{+}/K and Cr^{3+}/Cr are -1.66 V, 0.80 V, -2.93 V and -0.74 V, respectively. The correct decreasing order of reducing power of the metal is**

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   (1) Al > K > Ag > Cr (2) Ag > Cr > Al > K
   (3) K > Al > Cr > Ag (4) K > Al > Ag > Cr
5. **Standard reduction electrode potential of three metals A, B and C are respectively $+0.5$ V, -3.0 V and -1.2 V. The reducing power of these metals are :**
   (1) C > B > A (2) A > C > B
   (3) B > C > A (4) A > B > C
6. **The standard reduction potentials at 25 °C for the following half reactions are given against each :**
   Zn^{2+} (aq) + $2e^{-} \rightleftharpoons$ Zn(s), -0.762 V
   Cr^{3+} (aq) + $3e^{-} \rightleftharpoons$ Cr(s), -0.740 V

$2H^+ + 2e^- \rightleftharpoons H_2(g)$, 0.00 V
$Fe^{3+} + 2e^- \rightleftharpoons Fe^{2+}$, 0.77 V
Which is the strongest reducing agent ?
(1) Zn (2) Cr
(3) $H_2(g)$ (4) Fe^{2+} (aq)

7. **The standard reduction potential at 25 °C of Li^+ / Li, Ba^{2+} / Ba, Na^+ / Na and Mg^{2+} / Mg are −3.05 V, −2.73 V, −2.71 V and −2.37 V respectively. Which one of the following is the strongest oxidising agent ?**
(1) Na^+ (2) Li^+
(3) Ba^{2+} (4) Mg^{2+}

8. **On the basis of the following E° values, the strongest oxidizing agent is :–**
$[Fe(CN)_6]^{4-} \rightarrow [Fe(CN)_6]^{3-} + e^-$; $E^\circ = -0.35$ V
$Fe^{2+} \rightarrow Fe^{3+} + e^-$; $E^\circ = -0.77$ V
(1) Fe^{3+} (2) $[Fe(CN)_6]^{3-}$
(3) $[Fe(CN)_6]^{4-}$ (4) Fe^{2+}

9. **Standard electrode potential of some half cell reactions are given below:**
(i) $Sn^{4+} + 2e^- \rightarrow Sn^{2+}$, $E^\circ = +0.15\,V$
(ii) $2Hg^{2+} + 2e^- \rightarrow Hg_2^{2+}$, $E^\circ = +0.92\,V$
(iii) $PbO_2 + 4H^+ + 2e^- \rightarrow Pb^{2+} + 2H_2O$, $E^\circ = +1.45\,V$
Which of the following statement is correct according to electrode potential?
(a) Pb^{2+} is more powerful reducing agent than Sn^{2+}
(b) Sn^{4+} is more powerful oxidising agent than Pb^{4+}
(c) Sn^{2+} is more powerful reducing agent than Hg_2^{2+}
(d) Hg_2^{2+} is more powerful oxidising agent than Pb^{4+}

10. **Which of the following can oxidise fluoride ions?**
(1) O_3
(2) Cl_2
(3) Br_2
(4) No chemical substance

TYPE–2 : Displacement Reactions & Activity Series

11. **Four alkali metals A, B, C & D have standard electrode potentials −3.05, −1.66, −0.40 and 0.80 V respectively. Which metal will be the most reactive**
(1) A (2) B
(3) C (4) D

12. **The standard electrode potential of Zn, Ag and Cu are −0.76 V, 0.80 V and 0.34 V respectively, then :**
(1) Ag can oxidise Zn and Cu
(2) Ag can reduce Zn^{2+} and Cu^{2+}
(3) Zn can reduce Ag^+ and Cu^{2+}
(4) Cu can oxidise Zn and Ag

13. **E° values of Mg^{2+}/Mg, Zn^{2+}/Zn and Fe^{2+}/Fe are −2.37 V, −0.76 V and −0.44 V respectively. Which of the following statements is correct**

(1) Zn will reduce Fe^{2+} (2) Zn will reduce Mg^{2+}

(3) Mg oxidises Fe (4) Zn oxidises Fe

14. **A standard reduction electrode potentials of four elements are**

A = −0.250 V , B = −0.140 V

C = −0.126 V , D = −0.402 V

The element that displaces A from its compounds aqueous solution is :–

(1) B

(2) C

(3) D

(4) None of the above

15. **Using the standard electrode potential values given below, decide which of the statements, I, II, III and IV are correct. Choose the right answer from (1), (2), (3) and (4).**

$Fe^{2+} + 2e^- \rightleftharpoons Fe$; $E^\circ = -0.44$ V

$Cu^{2+} + 2e^- \rightleftharpoons Cu$; $E^\circ = +0.34$ V

$Ag^+ + e^- \rightleftharpoons Ag$; $E^\circ = +0.80$ V

I. Copper can displace iron from $FeSO_4$ solution.

II. Iron can displace copper from $CuSO_4$ solution.

III. Silver can displace copper from $CuSO_4$ solution.

IV. Iron can displace silver from $AgNO_3$ solution.

(1) I and II (2) II and III

(3) II and IV (4) I and IV

16. **A gas X at 1 atm is bubbled through a solution containing a mixture of 1 M Y^- and 1 M Z^- at 25 °C. If the reduction potential of Z > Y > X then :**

(1) Y will oxidise X and not Z

(2) Y will oxidise Z and not X

(3) Y will oxidise both X and Z

(4) Y will reduce both X and Z

17. **If the standard reduction potential E for four divalent elements X, Y, Z & W are −1.46 V, −0.15V, +0.15 V and −1.24 V respectively then**

(1) X will replace Z^{2+} from aqueous solution

(2) Y will replace Z^{2+} from aqueous solution

(3) W will replace Z^{2+} from aqueous solution

(4) All statements are correct

18. **Red hot carbon will remove oxygen from the oxide XO and YO but not from ZO. Y will remove oxygen from XO. Use this evidence to deduce the order of activity of the three metals X, Y and Z putting the most active first.**

(1) XYZ (2) ZYX

(3) YXZ (4) ZXY

19. **The following facts are available :–**

$2X^- + Y_2 \rightarrow 2Y^- + X_2$

$2W^- + Y_2 \rightarrow$ no reaction

$2Z^- + X_2 \rightarrow 2X^- + Z_2$

Which of the following statements is correct :–

(1) $E^\circ_{W^-/W_2} > E^\circ_{Y^-/Y_2} > E^\circ_{X^-/X_2} > E^\circ_{Z^-/Z_2}$
(2) $E^\circ_{W^-/W_2} < E^\circ_{Y^-/Y_2} < E^\circ_{X^-/X_2} < E^\circ_{Z^-/Z_2}$
(3) $E^\circ_{W^-/W_2} < E^\circ_{Y^-/Y_2} > E^\circ_{X^-/X_2} > E^\circ_{Z^-/Z_2}$
(4) $E^\circ_{W^-/W_2} > E^\circ_{Y^-/Y_2} < E^\circ_{X^-/X_2} < E^\circ_{Z^-/Z_2}$

20. **Each of the three metals x, y and z were put in turn into aqueous solution of the other two. x + salt of y (or z) → y (or z) + salt of x**
Which one of the following observation is incorrect?
(1) y + salt of x → no action observed
(2) y + salt of z → z + salt of y
(3) z + salt of x → x + salt of z
(4) z + salt of y → no action observed

21. **The following facts are available**
$2A^- + B_2 \longrightarrow 2B^- + A_2$
$2C^- + B_2 \longrightarrow$ No reaction
$2D^- + A_2 \longrightarrow 2A^- + D_2$
Which of the following statement is correct?
(1) $E^\circ_{C^-/C_2} > E^\circ_{B^-/B_2} > E^\circ_{A^-/A_2} > E^\circ_{D^-/D_2}$
(2) $E^\circ_{C^-/C_2} < E^\circ_{B^-/B_2} < E^\circ_{A^-/A_2} < E^\circ_{D^-/D_2}$
(3) $E^\circ_{C^-/C_2} > E^\circ_{B^-/B_2} < E^\circ_{A^-/A_2} < E^\circ_{D^-/D_2}$
(4) Can't predict

22. **The following four colourless salt solutions are placed in separate test tubes and a strip of Cu is placed in each solution which finally turns blue :–**
(1) $Zn(NO_3)_2$ (2) $Mg(NO_3)_2$
(3) KNO_3 (4) $AgNO_3$

23. **Which of the following displacement does not occur**
(1) $Zn + 2H^+ \rightarrow Zn^{2+} + H_2\uparrow$
(2) $Fe + 2Ag^+ \rightarrow Fe^{2+} + Ag\downarrow$
(3) $Cu + Fe^{2+} \rightarrow Cu^{2+} + Fe\downarrow$
(4) $Zn + Pb^{2+} \rightarrow Zn^{2+} + Pb\downarrow$

24. **If a spoon of copper metal is placed in a solution of ferrous sulphate :**
(1) Cu will precipitate out
(2) Iron will precipitate
(3) Cu and Fe will precipitate
(4) No reaction will take place

25. **Reactivity of metals increases as electropositivity increases, what will happen if a copper spoon is used to stir a solution of aluminium nitrate?**
(1) The spoon will get coated with aluminium
(2) An alloy of aluminium and coper is formed
(3) The solution becomes blue
(4) There is no reaction.

26. **Adding powdered Pb and Fe to a solution containing 1.0 M in each of Pb^{+2} and Fe^{+2} ions, would result into the formation of :–**
(1) More of Fe and Pb^{2+} ions
(2) More of Fe^{+2} and Pb^{2+} ions

(3) More of Pb and Fe^{+2} ions

(4) More of Fe and Pb

27. **Zn rod is placed in 100 mL of 1M $CuSO_4$ solution so that molarity of Cu^{2+} changes to 0.7 M. The molarity of SO_4^{2-} at this stage will be**

(1) 0.8 M (2) 1 M

(3) 0.7 M (4) 1.8 M

28. **Zn can not displace following ions from their aqueous solution :**

(1) Ag^+ (2) Cu^{2+}

(3) Fe^{2+} (4) Na^+

29. **The decreasing order of standard electrode potential is**

[NCERT Pg. 71]

(1) Li, Al, Zn, Ba

(2) Ba, Al, Zn, Li

(3) Zn, Al, Ba, Li

(4) Zn, Ba, Al, Li

30. **Which one will liberate Br_2 from KBr ?**

(1) HI (2) I_2

(3) Cl_2 (4) SO_2