Topic :- Electro Chemistry
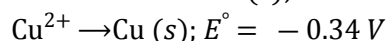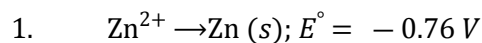
1. $Zn^{2+} \rightarrow Zn\ (s); E^\circ = -0.76\ V$
$Cu^{2+} \rightarrow Cu\ (s); E^\circ = -0.34\ V$
Which of the following is spontaneous?
   a) $Zn^{2+} + Cu \rightarrow Zn + Cu^{2+}$ b) $Cu^{2+} + Zn \rightarrow Cu + Zn^{2+}$
   c) $Zn^{2+} + Cu^{2+} \rightarrow Zn + Cu$ d)   None of the above
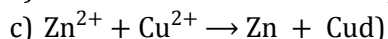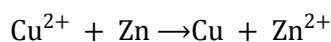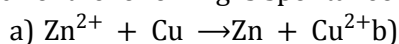
2.   Reduction potentials of $A, B, C,$ and D are 0.8 V, 0.79 V, 0.34 V and -2.37 V respectively. Which element displaces all the other three elements?
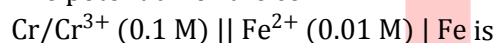   a) B b) A c) D d) C

3.   Given,
$E^\circ_{Cr^{3+}/Cr} = 0.72\ V$, $E^\circ_{Fe^{2+}/Fe} = 0.42\ V.$
The potential for the cell
Cr/Cr^{3+} (0.1 M) || Fe^{2+} (0.01 M) | Fe is
   a) 0.26 V   b) 0.399 V   c) -0.339 V   d) -0.26 V

4.   The electroplating with chromium is undertaken because :
   a) Electrolysis of chromium is easier
   b) Chromium can form alloys with other metals
   c) Chromium gives a protective and decorative coating to the base metal
   d) Of high reactivity of chromium metal

5.   Which of the following is not correct?
   a) Aqueous solution of NaCl is an electrolyte.
   b) The units of electrochemical equivalent are g-coulomb.
   c) In the Nernst equation, n represents the number of electrons transferred in the electrode reaction.
   d) Standard reduction potential of hydrogen electrode is zero volt.

6. H_2 cannot be displaced by
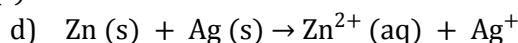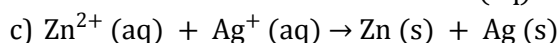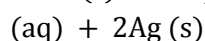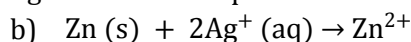   a) Li^+ b) Sr^{2+} c) Al^{3+} d) Ag^+

7.   The standard reduction potential of Zn and Ag in water at 298 K are,
$Zn^{2+} + 2e^- \rightleftharpoons Zn; E^\circ = -0.76$ V and
$Ag^+ + e^- \rightleftharpoons Ag ; \quad E^\circ = +0.80\ V.$ Which of the following reactions take place?
   a) $Zn^{2+}\ (aq) + 2Ag\ (s) \rightarrow 2Ag^+(aq) + Zn\ (s)$ b) $Zn\ (s) + 2Ag^+\ (aq) \rightarrow Zn^{2+}$
                                                  $(aq) + 2Ag\ (s)$
   c) $Zn^{2+}\ (aq) + Ag^+\ (aq) \rightarrow Zn\ (s) + Ag\ (s)$ d) $Zn\ (s) + Ag\ (s) \rightarrow Zn^{2+}\ (aq) + Ag^+$
                                                  (aq)
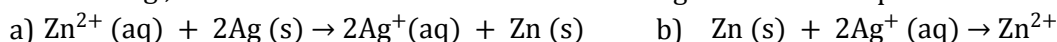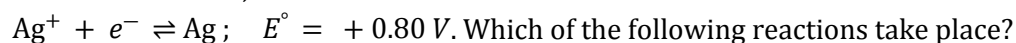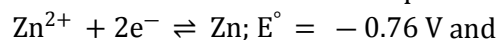
8. The amount of an ion discharged during electrolysis is not dependent of :
   a) Resistance of solution
   b) Time
   c) Current strength
   d) Electrochemical equivalent of the element

9. The conductivity of a 0.1 N KCl solution at 23^0C is 0.012 ohm^{-1} cm^{-1}.The resistance of the cell containing the solution at the same temperature was found to be 55 ohm. The cell constant will be :

   a) 0.918 cm^{-1} b) 0.66 cm^{-1} c) 1.142 cm^{-1} d) 1.12 cm^{-1}

10. Reduction potential of four elements P, Q, R, S is $-2.90, +0.34, +1.20$ and -0.76. Reactivity decreases in the order

    a) $P > Q > R > S$ b) $S > R > Q > P$ c) $P > S > Q > R$ d) $Q > S > R > P$

11. Which of the following statements are correct concerning redox properties?

I   Ametal M for which $E^{°}$ for the half reaction
     $M^{n+} + ne^- = M$, is very negative will be Agood reducing agent.

II   The oxidizing power of the halogens decreases from chlorine to iodine.

III The reducing power of hydrogen halides increases from hydrogen chloride to hydrogen iodide.

     a) I , II and III   b) I and II   c) I only   d) II and III only

12. A cell with two electrodes, one of grey tin and the other white tin, both dipping in solution of $(NH_4)_2SnCl_6$ showed zero e.m.f. at $18°C$. What conclusion may be drawn from this?

    a) The e.m.f. developed at the electrode-solution phase boundary cancels the normal e.m.f.
    b) Grey tin being non-metallic ceases to provide a reversible electrode reaction
    c) Electrode surface develops a protective layer and the cell develops a very large internal resistance
    d) The standard Gibbs energy change of the cell becomes zero

13. Aluminium displaces hydrogen from dilute HCl whereas silver does not. The emf of Acell prepared by combining Al/ Al^{3+} and Ag / Ag^+ is 2.46 V. The reduction potential of silver electrode is +0.80 V. The reduction potential of aluminium electrode is

    a) +1.66 V   b) -3.26 V   c) 3.26 V   d) -1.66 V

14. For $I_2 +2e \rightarrow 2I^-$, standard reduction potential $= +0.54$ volt. For $2Br^- \rightarrow Br_2 +2e^-$, standard oxidation potential $= -1.09$ volt. For Fe $\rightarrow Fe^{2+} +2e^-$, stabdard oxidation potential $= +0.44$ volt. Which of the following reactions is non-spontaneous?

    a) $Br_2 +2I^- \rightarrow 2Br^- + I_2$
    b) $Fe + Br_2 \rightarrow Fe^{2+} +2Br^-$
    c) $Fe + I_2 \rightarrow Fe^{2+} +2I^-$
    d) $I_2 +2Br^- \rightarrow 2I^- + Br_2$

15. When $KMnO_4$ acts as an oxidizing agent and ultimately forms $MnO_4^{2-}, MnO_2, Mn_2O_3$ and Mn^{2+} then the number of electrons transferred in each case respectively, are

    a) 4, 3, 1, 5   b) 1, 5, 3, 7   c) 1, 3, 4, 5   d) 3, 5, 7, 1

16. For a cell reaction involving a two electron change, the standard emf of the cell is found to be 0.295 V at 25°C. The equilibrium constant of the reaction, at 25°C, will be

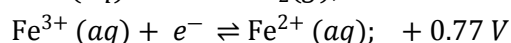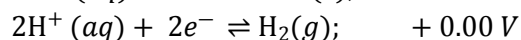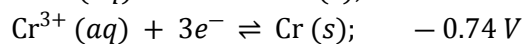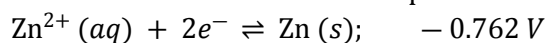   a) 10   b) 1×10^{10} c) 1×10^{-10} d) 10×10^{-2}

17. Which one of the following has the highest molar conductivity?

    a) Diaminedichloroplatinum (III)   b) Tetraaminedichlorocobalt (III) chloride

    c) Potassium hexacyanoferrate (II)   d) Hexaaquochromium (III) bromide

18. Electrode potential of Zn^{2+}/Zn is – 0.76 V and that of Cu^{2+}/Cu is + 0.34 V. The emf of the cell constructed between these two electrodes is

    a) 1.10 V   b) $-$ 1.10 V   c) 2.20 V   d) $-$ 2.20 V

19. The standard reduction potentials at 298 K for the following half-cell reactions are given

$Zn^{2+} (aq) + 2e^- \rightleftharpoons Zn (s); \quad -0.762\,V$

$Cr^{3+} (aq) + 3e^- \rightleftharpoons Cr (s); \quad -0.74\,V$

$2H^+ (aq) + 2e^- \rightleftharpoons H_2(g); \quad +0.00\,V$

$Fe^{3+} (aq) + e^- \rightleftharpoons Fe^{2+} (aq); \quad +0.77\,V$

Which one of the following is the strongest reducing agent?

    a) Zn (s)   b) Cr(s)   c) H_2 (s)   d) Fe^{2+} (aq)

20. How long (in hours) must a current of 5.0 A be maintained to electroplate 60 g of calcium from molten $CaCl_2$?

    a) 27 h   b) 8.3 h   c) 11 h   d) 16 h