Electrode potential, E_{Cell}, Nernt equation and ECS

1. The hydrogen electrode is dipped in a solution of $pH = 3$ at 25^oC. The potential of the cell would be (the value of $2.303RT/F$ is 0.059 *V*)
   (a) 0.177 *V* (b) – 0.177 *V*
   (c) 0.087 *V* (d) 0.059 *V*

2. The standard electrode potentials of Zn^{2+}/Zn and Ag^{+}/Ag are $-0.763V$ and $+0.799V$ respectively. The standard potential of the cell is
   (a) 1.56 *V* (b) 0.036 *V*
   (c) – 1.562 *V* (d) 0.799 *V*

3. The standard reduction potentials at $298K$ for the following half reactions are given against each
   $Zn^{2+}(aq.) + 2e \rightleftharpoons Zn(s)$; – 0.762
   $Cr^{3+}(aq) + 3e \rightleftharpoons Cr(s)$; – 0.740
   $2H^{+}(aq) + 2e \rightleftharpoons H_2(g)$; 0.00
   $Fe^{3+}(aq) + e \rightleftharpoons Fe^{2+}(aq)$; 0.770
   Which is the strongest reducing agent
   (a) $Zn(s)$ (b) $Cr(s)$
   (c) $H_2(g)$ (d) $Fe^{2+}(aq)$

4. When Zn piece is kept in $CuSO_4$ solution, the copper get precipitated due to standard potential of zinc is
   (a) > copper (b) < copper
   (c) > sulphate (d) < sulphate

5. Which of the following metal does not react with the solution of copper sulphate
   (a) Mg (b) Fe
   (c) Zn (d) Ag

6. A solution containing one mole per litre of each $Cu(NO_3)_2, AgNO_3, Hg_2(NO_3)_2$ and $Mg(NO_3)_2$, is being electrolysed by using inert electrodes. The values of standard electrode potentials in volts (reduction potentials) are $Ag/Ag^{+} = +0.80, 2Hg/Hg_2^{2+} = +0.79, Cu/Cu^{2+} = +0.34, Mg/Mg^{2+} = -2.37$ with increasing voltage, the sequence of deposition of metals on the cathode will be
   (a) Ag, Hg, Cu, Mg
   (b) Mg, Cu, Hg, Ag
   (c) Ag, Hg, Cu
   (d) Cu, Hg, Ag

7. The standard reduction electrode potentials of four elements are
   $A = -0.250V$ $B = -0.136V$
   $C = -0.126V$ $D = -0.402V$
   The element that displaces A from its compounds is
   (a) B
   (b) C
   (c) D
   (d) None of these

8. The standard oxidation potential of zinc and silver in water at $298K$ are

$Zn(s) \rightarrow Zn^{2+} + 2e^-; E = 0.76V$

$Ag(s) \rightarrow Ag^{2+} + 2e^-; E = -0.80V$

Which of the following reactions actually take place

(a) $Zn(s) + 2Ag^+(aq) \rightarrow Zn^{++}(aq) + 2Ag(s)$

(b) $Zn^{++}(aq) + 2Ag(s) \rightarrow 2Ag^+(aq) + Zn(s)$

(c) $Zn(s) + Ag(s) \rightarrow Zn^{++}(aq) + Ag^+(aq)$

(d) $Zn^{++}(aq) + Ag^+(aq) \rightarrow Zn(s) + Ag(s)$

9. Beryllium is placed above magnesium in the second group. Beryllium dust, therefore when added to $MgCl_2$ solution will

(a) Have no effect

(b) Precipitate Mg metal

(c) Precipitate MgO

(d) Lead to dissolution of Be metal

10. The name of equation showing relation between electrode potential (E) standard electrode potential (E^o) and concentration of ions in solution is

(a) Kohlrausch's equation

(b) Nernst's equation

(c) Ohm's equation

(d) Faraday's equation

11. The correct representation of Nernst's equation is

(a) $E_{M^{n+}/M} = E^o{}_{M^{n+}/M} + \frac{0.0591}{n} log(M^{n+})$

(b) $E_{M^{n+}/M} = E^o{}_{M^{n+}/M} - \frac{0.0591}{n} log(M^{n+})$

(c) $E_{M^{n+}/M} = E^o{}_{M^{n+}/M} + \frac{n}{0.0591} log(M^{n+})$

(d) None of the above

12. Standard electrode potential of NHE at 298 K is

(a) 0.05 V (b) 0.1 V

(c) 0.00 V (d) 0.11 V

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

(a) Cu^{2+} ions

(b) Cu^+ ions

(c) Soluble complex of copper with $AgNO_3$

(d) Cu^- ion by the reduction of Cu

14. Consider the reaction $M^{n+}_{(aq)} + ne^- \rightarrow M_{(s)}$. The standard reduction potential values of the elements M_1, M_2 and M_3 are $-0.34V, -3.05V$ and $-1.66V$ respectively. The order of their reducing power will be

(a) $M_1 > M_2 > M_3$

(b) $M_3 > M_2 > M_1$

(c) $M_1 > M_3 > M_2$

(d) $M_2 > M_3 > M_1$

15. $E^0 = \frac{RT}{nF} \ln K_{eq}$. This is called

(a) Gibb's equation
(b) Gibb's–Helmholtz equation
(c) Nernst's equation
(d) Vander Waal's equation

16. Four alkali metals A, B, C and D are having respectively standard electrode potential as –3.05,–1.66,–0.40 and 0.80. Which one will be the most reactive
(a) A (b) B
(c) C (d) D

17. Which one of the following metals cannot evolve H_2 from acids or H_2O or from its compounds
(a) Hg (b) Al
(c) Pb (d) Fe

18. Which one of the following reaction is not possible
(a) $Fe + H_2SO_4 \rightarrow FeSO_4 + H_2$
(b) $Cu + 2AgNO_3 \rightarrow Cu(NO_3)_2 + 2Ag$
(c) $2KBr + I_2 \rightarrow 2KI + Br_2$
(d) $CuO + H_2 \rightarrow Cu + H_2O$

19. When a rod of metal A is dipped in an aqueous solution of metal B (concentration of B^{2+} ion being 1M) at 25^oC , the standard electrode potentials are A^{2+}/A =–0.76 volts, B^{2+}/B = + 0.34 volts
(a) A will gradually dissolve
(b) B will deposit on A
(c) No reaction will occur
(d) Water will decompose into H_2 and O_2

20. The reaction $Zn^{2+} + 2e^- \rightarrow Zn$ has a standard potential of $-0.76V$. This means
(a) Zn can't replace hydrogen from acids
(b) Zn is a reducing agent
(c) Zn is a oxidising agent
(d) Zn^{2+} is a reducing agent

21. $2H^+(aq) + 2e^- \rightarrow H_2(g)$. The standard electrode potential for the above reaction is (in volts)
(a) 0
(b) + 1
(c) – 1
(d) None of these

22. K, Ca and Li metals may be arranged in the decreasing order of their standard electrode potentials as
(a) K, Ca, Li (b) Ca, K, Li
(c) Li, Ca, K (d) Ca, Li, K

23. The correct order of chemical reactivity with water according to electrochemical series
(a) $K > Mg > Zn > Cu$
(b) $Mg > Zn > Cu > K$
(c) $K > Zn > Mg > Cu$

(d) $Cu > Zn > Mg > K$

24. EMF of cell
$Ni|Ni^{2+}(1.0M)||Au^{3+}(1.0M)|Au$
(Where E^o for $Ni^{2+}|Ni$ is $-0.25V$; E^o for $Au^{+3}|Au$ is $1.50V$) is
(a) + 1.25 V (b) $-1.75V$
(c) + 1.75 V (d) + 4.0 V

25. Oxidation and reduction take place in a cell, then its electromotive force will be
(a) Positive (b) Negative
(c) Zero (d) Stable