CHEMISTRY

BOOKS - MODERN PUBLICATION CHEMISTRY (KANNADA ENGLISH)

ELECTROCHEMISTRY

Multiple Choice Questions Level I

1. Molten NaCl conducts electricity due to the presence of :

A. free electrons

B. sodium chloride molecule

C. free ions

D. free atoms of sodium and chlorine.

Answer: C

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2. Which of the following is not a conductor of electricity ?

A. NaCl (molten)

B. Silver metal

C. NaCl (s)

D. NaCl (aq)

Answer: C

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3. The cell constant is product of resistance and

A. conductance

B. specific conductance

C. molar conductance

D. specific resistance

Answer: B

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4. The product of specific resistance and specific conductance is equal to :

A. conductance

B. resistance

C. 1

D. zero

Answer: C

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5. Which of the following can be considered as a weak electrolyte ?

A. KCl

B. HCl

C. CH_3COOH

D. K_2SO_4

Answer: C

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6. On dilution the molar conductance of an electrolyte

A. increases

B. decreases

C. remains unaffected

D. may increase or decrease

Answer: A

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7. The units for cell constant are :

A. cm^2

B. cm^{-1}

C. $\text{ohm}^{-1}\text{cm}^2$

D. cm

Answer: B

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8. Which of the following relations is correct for Kohlrausch's law ?

A. $\alpha = \frac{\Lambda}{\Lambda^\circ}$

B. $\lambda_+^\circ \times \lambda_-^\circ = \Lambda^\circ$

C. $\lambda_+^\circ = \Lambda - \lambda_-^\circ$

D. $\frac{\Lambda^{\circ}}{\lambda_{+}^{\circ}} = \lambda_{-}^{\circ}$.

Answer: C

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9. If C is the concentration in gram mol per litre, then specific conductance (k) and molar conductance (Λ) are related as

A. $\Lambda = k \times 1000 \times C$

B. $\Lambda = \frac{C \times 1000}{k}$

C. $k = \frac{\Lambda \times C}{1000}$

D. $k = \frac{1000 \times \Lambda}{C}$

Answer: C

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10. The decrease in the molar conductance of a strong electrolyte with increase in concentration is due to

A. increase in interionic forces

B. decrease in degree of ionisation

C. decrease in self-ionisation of water

D. none of these.

Answer: A

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11. The dissociation of a weak electrolyte obeys the law of mass action. It was found by :

A. Ostwald

B. Kohlrausch

C. Arrhenius

D. Berzelius.

Answer: A

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12. The units of conductivity are :

A. $\text{ohm}^{-1}\text{cm}^{-1}$

B. ohm cm^{-1}

C. ohm^{-1} cm

D. $\text{ohm}^{-1}\text{cm}^{2}\text{mol}^{-1}$

Answer: A

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13. Which of the following aqueous solutions will conduct electricity quite well ?

A. Glycerol

B. Sugar

C. Pure water

D. HCl

Answer: D

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14. The resistance of a 0.01 N solution of an electrolyte AB at 328 K is 100 ohm. The specific conductance of the solution is (cell constant $= 1cm^{-1}$) :

A. 100 ohm

B. $1 \times 10^{-2}\text{ohm}^{-1}$

C. $1.0 \times 10^{-2} \text{ohm}^{-1}\text{cm}^{-1}$

D. 1.0×10^{2} ohm cm.

Answer: C

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15. The molar conductance of a 0.1 M solution of an electrolyte was found to be $400 ohm^{-1} cm^2 \text{mol}^{-1}$. The cell constant of the cell is $0.1 cm^{-1}$. The resistance of the solution is :

A. 25 ohm

B. 2000 ohm

C. 200 ohm

D. 400 ohm

Answer: A

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16. The molar conductance of CH_3COONa, HCl and NaCl at infinite dilution are 91, 426 and 126 S $cm^2 \text{mol}^{-1}$ respectively at $25^\circ C$. The molar conductance at infinite dilution for CH_3COOH would be

A. 209 S $cm^2 \text{mol}^{-1}$

B. 391 S $cm^2 \text{mol}^{-1}$

C. 461 S $cm^2 \text{mol}^{-1}$

D. none of these.

Answer: B

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17. The molar conductance of NH_4OH at 0.01 M concentration is $11.3 ohm^{-1} cm^2 \text{mol}^{-1}$. The degree of dissociation of NH_4 OH is (molar conductance at infinite dilution $= 271.1$) :

A. 4.2%

B. $1.3\ \%$

C. $12.6\ \%$

D. $41\ \%$

Answer: A

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18. If the specific conductance and conductance of the solution are same, then its cell constant is equal to :

A. 1

B. 0

C. 1000

D. 10

Answer: A

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19. For an electrolytic solution of 0.05 mol L^{-1}, the specific conductance has been found to be $0.0110 \mathrm{S\ cm^{-1}}$. The molar conductance is :

A. 0.55 S $cm^2 \mathrm{mol}^{-1}$

B. 550 S $cm^2 \mathrm{mol}^{-1}$

C. 0.22 S $cm^2 \mathrm{mol}^{-1}$

D. 220 S $cm^2 \mathrm{mol}^{-1}$

Answer: D

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20. The resistance of 0.1 N solution of acetic acid is 250 ohm , when measured in cell of cell constant $1.15 cm^{-1}$. The equivalent conductance (in $ohm^{-1} cm^2 \mathrm{equiv}^{-1}$) of 0.1 N acetic acid is :

A. 46

B. 9.2

C. 18.4

D. 0.023

Answer: A

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21. Which of the following solutions will have the highest specific conductance ?

A. 0.01 M NaCl

B. 0.01 M CH_3COOH

C. 0.01 M NH_4Cl

D. 0.01 M K_2SO_4

Answer: D

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22. The molar ionic conductances at infinite dilution of Mg^{2+} and Cl^{-} are 106.1 and $76.3 ohm^{-1} cm^2 \text{mol}^{-1}$ respectively. The molar conductance of solution of $MgCl_2$ at infinite dilution is :

A. $29.8 \text{ohm}^{-1} \text{cm}^2 \text{mol}^{-1}$

B. $183.4 \text{ohm}^{-1} \text{cm}^2 \text{mol}^{-1}$

C. $285.7 \text{ohm}^{-1} \text{cm}^2 \text{mol}^{-1}$

D. $258.7 \text{ohm}^{-1} \text{cm}^2 \text{mol}^{-1}$

Answer: D

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23. The value of molar conductance of HCl is more than that of NaCl at a particular temperature because

A. molecular mass of HCl is less than that of Na^{+} ions

B. HCl is strongly acidic

C. HCl ionises to greater extent than NaCl

D. the velocity of H^+ ions is more than that of Na^+ ions.

Answer: D

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24. The molar conductance of a 0.01 M solution of acetic acid at 298 K is 16.5 $ohm^{-1}cm^2\text{mol}^{-1}$. Its specific conductance is :

A. $1.65\text{ohm}^{-1}\text{cm}^{-1}$

B. $1.65 \times 10^{-4}\text{ohm}^{-1}\text{cm}^{-1}$

C. $1.65 \times 10^{-2}\text{ohm}^{-1}\text{cm}^{-1}$

D. $1.65 \times 10^{-4}\text{ohm}^{-1}$ cm

Answer: B

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25. Which of the following decreases with dilution ?

A. conductance

B. specific conductance

C. equivalent conductance

D. molar conductance

Answer: B

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26. When a piece of copper wire is immersed in a solution of silver nitrate, the colour of solution becomes blue. This is due to the :

A. oxidation of silver

B. reduction of copper

C. oxidation of copper

D. reduction of silver

Answer: C

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27. In the case of Daniell cell,

$Zn|Zn^{2+}||Cu^{2+}|Cu$

Which is not true ?

A. Zinc acts as anode

B. Copper acts as cathode

C. Electrons move from copper to zinc

D. Zinc is negative electrode

Answer: C

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28. The metal which cannot displace hydrogen from dil H_2SO_4 is :

A. Zn

B. Al

C. Fe

D. Ag

Answer: D

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29. The oxidation potentials of Zn, Mg, Ni and Cu are 0.76, 2.37, 2.25 and -0.34 V respectively. Which of these will not be capable of liberating H_2 from 1 M HCl ?

A. Zn

B. Mg

C. Ni

D. Cu

Answer: D

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30. For the electrochemical cell :

$Zn|Zn^{2+}(1M)||H^{+}(1M)|H_2(\text{atm})$, Pt the e.m.f. of the cell has been found to be 0.76. The standard reduction potential of zinc is :

A. -0.76 V

B. 0.24 V

C. 0.76 V

D. $-0.24V$

Answer: A

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31. The e.m.f. of a cell is 1.3 V. The positive electrode has a potential of 0.5 V. The potential of negative electrode is :

A. 0.8 V

B. $-0.8V$

C. 1.8 V

D. -1.8 V

Answer: B

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32. Which of the following statement is incorrect about electrochemical cell ?

A. Electrons are released at anode

B. Chemical energy is converted into electrical energy

C. Salt bridge maintains the electrical neutrality of the solution

D. Cathode is reagarded as negative electrode.

Answer: D

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33. The standard reduction potentials of zinc and silver are - 0.76 and 0.8 V respectively. Which of the following reactions actually occurs ?

A. $Zn + 2Ag^{+} \rightarrow Zn^{2+} + 2Ag$

B. $Zn^{2+} + 2Ag \rightarrow 2Ag^{+} + Zn$

C. $Zn^{2+} + 2Ag^{+} \rightarrow Zn + 2Ag$

D. none of these.

Answer: A

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34. Which one of the following statements is not correct ?

A. Anode is negatively charged

B. Cathode is positively charged

C. Reduction takes place at the anode

D. Reduction takes place at the cathode.

Answer: C

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35. The electrode potential of oxidation half cell :

A. is independent of the concentration of the ions in the cell

B. decreases with decreased concentration of the ions in the cell

C. decreases with increased concentrations of the ions in the cell

D. none of the above

Answer: B

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36. When zinc rod is directly placed in copper sulphate solution

A. the blue colour of the solution starts intensifying.

B. the solution remains electrically neutral

C. the temperature of the solution falls.

D. the weight of zinc rod starts increasing .

Answer: B

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37. The electrode potential of some metal electrodes are :

$Cu^{2+}|Cu = 0.34V, Pb^{2+}|Pb = -0.13V$

$Ag^+|Ag = 0.80V$, $Zn^{2+}|Zn = -0.76V$.

Which of the following reactions will not occur :

A. $Zn + Cu^{2+} \rightarrow Zn^{2+} + Cu$

B. $Zn + Pb^{2+} \rightarrow Zn^{2+} + Pb$

C. $Cu + 2Ag^+ \rightarrow Cu^{2+} + 2Ag$

D. $Cu + Pb^{2+} \rightarrow Cu^{2+} + Pb$

Answer: D

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38. The standard electrode potential of four electrodes I, II, III and IV are -2.65, -1.72, -0.80 and 0.72 V respectively. The highest chemical activity will be exhibited by

A. I

B. II

C. III

D. IV

Answer: A

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39. The e.m.f. of the cell, $Cu(s)\left|Cu^{2+}(aq)\right||Ag^{+}(aq)\left|Ag(s)\right.$ is 0.46 V. The standard reduction potential of Ag^{+}/Ag is 0.80 V. The standard reduction potential of $Cu^{2+} \mid Cu$ will be

A. -0.34 V

B. 1.26 V

C. -1.26 V

D. 0.34 V

Answer: D

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40. For the cell reaction $Fe(s)\left|Fe^{2+}(0.1M)\right|\left|H^{+}(1M)\right|H_3(1\,\mathrm{atm})$, Pt $E^{\circ} = 0.44V$. The cell e.m.f. is :

A. 0.41 V

B. 0.47 V

C. 1.26 V

D. 1.20 V

Answer: B

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41. The e.m.f. of the cell, $Mg|Mg^{2+}(1M)||Pb^{2+}(1M)|Pb$ is $\left[E^{\circ}\left(Pb^{2+}|Pb\right) = -0.14V, E^{\circ}\left(Mg^{2+}|Mg\right) = -2.37V\right]$

A. -2.51 V

B. -2.23 V

C. 2.23 V

D. 2.51 V

Answer: C

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42. The standard e.m.f. of the cell

$Zn + Cu^{2+} \rightarrow Cu + Zn^{2+}$

is 1.10 V at $25^{\circ}C$. The e.m.f. of the cell when 0.1 M Cu^{2+} and 0.1 M Zn^{2+} solutions are used will be

A. 1.01 V

B. 0.110 V

C. -1.10V

D. -0.110 V

Answer: A

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43. The standard electrode potential for $Pb^{2+}|Pb$ and $Zn^{2+}|Zn$ are -0.126 V and -0.763 V respectively. The e.m.f. of the cell $Zn|Zn^{2+}(0.1M)||Pb^{2+}(0.1M)|Pb$ is :

A. 0.637 V

B. < 0.637 V

C. $>$ 0.637 V

D. 0.889 V

Answer: A

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44. The reduction potentials of Zn, Cu, Ag, H_2 and Ni are -0.76, +0.34, +0.80, 0.00 and -0.25 respectively. Which of the following reaction will provide maximum voltage ?

A. $2Zn(s) + 2Cu^{2+}(aq) \rightarrow 2Zn^{2+}(aq) + 2Cu(s)$

B. $1/2Zn(s) + Ag^+(aq) \rightarrow 1/2Zn^{2+}(aq) + Ag(s)$

C. $H_2(g) + Cu^{2+}(aq) \rightarrow 2H^+(aq) + Cu(s)$

D. $2Ni(s) + 2H^+(aq) \rightarrow Ni^{2+}(aq) + H_2(g)$

Answer: B

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45. Four colourless salt solutions are placed in separate test-tubes and a strip of copper is placed in each . Which solution finally turns blue

A. $Zn(NO_3)_2$

B. $AgNO_3$

C. $Cd(NO_3)_2$

D. $Pb(NO_3)_2$

Answer: B

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46. Out of Cu, Ag, Fe and Zn, the metal which can displace all others from their salt solution is :

A. Ag

B. Cu

C. Zn

D. Fe

Answer: C

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47. The reference electrode is made up of

A. $ZnCl_2$

B. $PbSO_4$

C. Hg_2Cl_2

D. $HgCl_2$

Answer: C

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48. For the cell reaction $Co + Ni^{2+} \Leftrightarrow Co^{2+} + Ni, E^{\circ} = 0.046V$. The e.m.f. of cell , when $\left[Co^{2+}\right] = 0.1M$ and $\left[Ni^{2+}\right] = 1M$ is :

A. 0.048 V

B. 0.056 V

C. 0.076 V

D. 0.016 V

Answer: C

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49. For the cell reaction, $Zn(s) + Mg^{2+}(0.1M) \Leftrightarrow Zn^{2+}(1M) + Mg$ the e.m.f. has been found to be 0.2312 V. The standard e.m.f. of the cell is :

A. 0.2903 V

B. -0.2312 V

C. 0.0231 V

D. 0.2670 V

Answer: D

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50. The potential of the cell for the reaction $M(s) + 2H^{+}(1M) \rightarrow H_2(1\text{atm}) + M^{2+}(0.1M)$ is 1.65 V. The standard reduction potential for MM^{2+} electrode is :

A. 1.6205 V

B. 1.6795 V

C. 1.709 V

D. 1.591 V

Answer: A

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51. E° values of $Mg^{2+}|Mg$ is $-2.37V$, of $Zn^{2+}|Zn$ is $-0.76V$ and $Fe^{2+}|Fe$ is $0.44V$. Which of the following statements is correct ?

A. Zn will reduce Fe^{2+}

B. Zn will reduce Mg^{2+}

C. Mg oxidises Fe

D. Zn oxidises Fe

Answer: A

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52. In the following half cell reactions, select the better reducing agent :

$Mg^{2+} + 2e^- \rightarrow Mg, E^\circ = -2.37V$

$Fe^{3+} + 3e^- \rightarrow Fe, E^\circ = -0.44V$

A. Mg^{2+}

B. Mg

C. Fe^{3+}

D. Fe

Answer: B

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53. The reaction:

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

has a standard reduction potential of $-0.76V$. This means that

A. Zn cannot replace hydrogen from acids

B. Zn is an oxidising agent

C. Zn is a reducing agent

D. Zn^{2+} is a reducing agent.

Answer: C

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54. When a rod of metal A is dipped in an aqueous solution of metal B (conc. of B^{2+} being 1 M) at $25^{\circ}C$, the standard electrode potentials, are $A^{2+}/A = -0.76V$ and $B^{2+}/B = 0.34V$,

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.

Answer: A

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55. The standard reduction potential values of three metallic cations X, Y and Z are 0.52, -3.03 and -1.18 V respectively. The order of reducing power of corresponding metals is

A. $Y > Z > X$

B. $X > Y > Z$

C. $Z > Y > X$

D. $Z > X > Y$

Answer: A

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56. Standard electrode potentials are :

$Fe^{2+}|Fe(E^{\circ} = -0.44V), Fe^{3+}|Fe^{2+}(E^{\circ} = 0.77V)Fe^{2+}, Fe^{3+}$

and Fe blocks are kept together, then

A. Fe^{3+} increases

B. Fe^{3+} decreases

C. Fe^{2+}/Fe^{3+} remains unchanged

D. Fe^{2+} decreased

Answer: B

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57. The elctrochemical cell stops working after sometime because

A. electrode potential of both the electrodes becomes equal

B. electrode potential of both the electrodes becomes zero

C. one of the electrode is eaten away

D. the reverse direction become more spontaneous.

Answer: A

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58. How is cell potential $\left(E^{\circ}_{\text{cell}}\right)$ related to equilibrium constant $\left(K_c\right)$ for a cell reaction ?

A. $E^{\circ}_{\text{cell}} = \frac{2.303RT}{nF}\log.\ \frac{1}{K_c}$

B. $E^{\circ}_{\text{cell}} = nRT\log R_c$

C. $E^{\circ}_{\text{cell}} - \log K_c = \frac{2.303RT}{nF}$

D. $E^{\circ}_{\text{cell}} = \frac{2.303RT}{nF}\log K_c.$

Answer: D

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59. The cell potential $\left(E^{\circ}_{\text{cell}}\right)$ is related to free energy change $\left(\Delta G^{\circ}\right)$ as :

A. $\Delta G^{\circ} = -nFE^{\circ}_{\text{cell}}$

B. $\Delta G^{\circ} = nFE^{\circ}_{\text{cell}}$

C. $\frac{\Delta G^{\circ}}{nF} = E^{\circ}_{\text{cell}}$

D. $\Delta G^{\circ} = E^{\circ}_{\text{Cell}} = nF$

Answer: A

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60. For the cell reaction

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

$E^{\circ}_{\text{cell}} = 1.10V$, ΔG° is :

A. 212.3 kJ

B. 106.05 kJ

C. -212.3 kJ

D. -424.6 kJ

Answer: C

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61. For the cell reaction

$4Br^- + O_2 + 4H^+ \rightarrow Br_2 + 2H_2O$

$E^\circ_{\text{cell}} = 0.16V$, the value of log K_c is :

A. 108

B. 10.8

C. 5.4

D. 1080

Answer: B

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62. For the cell reaction

$X(s) + 2Y^+ \rightarrow X^2 + 2Y$

k_c has been found to be 10^{12}. The E°_{Cell} is :

A. 0.708 V

B. 1.36 V

C. 0.354 V

D. 1.006 V

Answer: C

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63. Calculate the equilibrium constant for the reaction

$Cu(s) + 2Ag + (aq) \rightarrow Cu^{+2}(aq) + 2Ag(s), E^{\circ}_{\text{cell}} = 0.46V.$

A. 2.0×10^{10}

B. 4.0×10^{10}

C. 4.0×10^{15}

D. 2.4×10^{10}

Answer: C

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64. For a cell involving two electron changes, $E^{\circ}_{\text{cell}} = 0.3V$ at $25^{\circ}C$. The cell equilibrium constant of the reaction is

A. 2.95×10^{2}

B. 10

C. 1×10^{10}

D. 1×10^{-10}

Answer: C

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65. According to Faraday's second law of electroly-sis when the same quantity of electricity is passed through different electrolytes, the amounts of different substances produced at the electrodes are directly proportional to their :

A. atomic weights

B. molecular weights

C. atomic numbers

D. equivalent weights.

Answer: D

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66. The quantity of electricity needed to liberate 0.1 gram equivalent of an element at the electrode is :

A. 9650 Faraday

B. 96500 C

C. 9650 C

D. 96500 Faraday.

Answer: C

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67. Two electrolytic cells, one containing acidified ferrous sulphate and other containing acidified ferric sulphate are connected in series. The ratio of iron deposited at cathodes in the two cells will be respectively

A. $2:1$

B. $2:3$

C. $1:1$

D. $3:2$

Answer: D

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68. How many coulombs of electricity are consumed when a 100 mA current is passed through a solution of $AgNO_3$ for half an hour during an electrolysis experiment ?

A. 108

B. 18000

C. 180

D. 3000

Answer: C

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69. How many Faradays are required to liberate 8 g of hydrogen ?

A. 2

B. 4

C. 8

D. 16

Answer: C

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70. What weight of copper will be deposited by passing 2 Faradays of electricity through a cupric salt (At wt. of Cu = 63.5) ?

A. 2.0 g

B. 3.175 g

C. 63.5 g

D. 127.0 g

Answer: C

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71. How many coulombs of electricity are required for the oxidation of 1 mole of H_2O to O_2 ?

A. $9.65 \times 10^4 C$

B. $4.825 \times 10^5 C$

C. $1.93 \times 10^5 C$

D. $1.93 \times 10^4 C$

Answer: C

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72. The amount of electricity required to deposit 0.9 g of aluminium when the electrode reaction is :

$Al^{3+} + 3e^- \rightarrow Al$

(atomic mass of $Al = 27$)

A. $9.65 \times 10^3 C$

B. $1.93 \times 10^4 C$

C. $9.65 \times 10^4 C$

D. $4.34 \times 10^5 C$

Answer: A

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73. How much current is required to deposit 0.195 g of elemental Pt from a solution containing $(PtCl_6]^{2-}$ ion with a time period of 2 hrs (Atomic mass of Pt = 195) ?

A. 0.054 A

B. 0.214 A

C. 0.428 A

D. 0.027 A

Answer: A

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74. How much quantity of electricity has to be passed through 200 ml of 0.5 M $CuSO_4$ solution to completely deposit copper ?

A. $9.65 \times 10^4 C$

B. 1.93×10^4

C. 3.86×10^5C

D. $2.895 \times 10^5 C$

Answer: B

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75. During the electrolysis of fused NaCl, the anodic reaction is

A. oxidation of sodium ions

B. reduction of sodium ions

C. oxidation of chloride ions

D. reduction of chloride ions.

Answer: C

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76. The mass of copper deposited when a solution of $CuSO_4$ is electrolysed for 10 min with a current of 1.5 ampere is

A. 9.328 g

B. 2.938 g

C. 0.2938 g

D. 0.3928 g

Answer: C

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77. In the electrolysis of acidulated water, it is desired to obtain 1.12 cc of hydrogen per second uner S.T.P. condition. The current to be passed is

A. 9.65 A

B. 19.3 A

C. 0.965 A

D. 1.93 A

Answer: A

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78. In $H_2 - O_2$ fuel cell, the reaction occurring at cathode is :

A. $H^+ + OH^- \rightarrow H_2O(l)$

B. $H^+ + e^- \rightarrow 1/2H_2$

C. $O_2 + 2H_2O + 4e^- \rightarrow 4OH^-$

D. $2H_2 + O_2 \rightarrow 2H_2O(l)$

Answer: C

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79. An example of a simple fuel cell is :

A. Lead storage battery

B. Daniell cell

C. Leclanche cell

D. $H_2 - O_2$ cell

Answer: B

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80. Rust is a mixture of

A. FeO and $Fe(OH)_3$

B. FeO and $Fe(OH)_2$

C. Fe_2O_3 and $Fe(OH)_3$

D. Fe_3O_4 and $Fe(OH)_3$

Answer: D

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81. In lead storage battery, at cathode

A. PbO_2 is reduced

B. lead is oxidised

C. $PbSO_4$ is ionized

D. Lead ions combine with Cl^- ions.

Answer: D

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82. Rusting of iron is a

A. oxidised

B. reduced

C. sublimed

D. decomposed

Answer: C

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83. Galvanisation of iron means coating iron with

A. C

B. Cu

C. Zn

D. Ni

Answer: B

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84. In the Leclanche dry cell, anode is :

A. Graphite rod

B. Carbon

C. Zinc container

D. $MnO_2 + C$

Answer: D

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85. In which of the following will be corrosion of iron be most rapid ?

A. in pure water

B. in air and moisture

C. in air and saline water

D. in pure oxygen

Answer: A

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86. A depolarizer used in dry cell is :

A. Ammonium chloride

B. Sodium carbonate

C. Manganese dioxide

D. Lead sulphate.

Answer: C

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87. When a lead storage battery is charged, it acts as

A. a fuel cell

B. an electrolytic cell

C. a galvanic cell

D. a concentration cell

Answer: B

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88. The efficiency of a fuel cell is given by :

A. $\frac{\Delta G}{\Delta S}$

B. $\frac{\Delta G}{\Delta H}$

C. $\frac{\Delta S}{\Delta G}$

D. $\frac{\Delta H}{\Delta G}$

Answer: B

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89. Which of the following statement is not correct ?

A. e.m.f. of a cell is an intensive property.

B. The presence of CO_2 in water increases rusting of iron.

C. When current is drawn from lead storage battery, the concentration of sulphuric acid decreases.

D. It is not possible to store copper sulphate in an iron vessel.

Answer: D

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90. The technique of protecting a metal from corrosion by connecting it to a second metal (which is more easily oxidised) is called.

A. cathodic protection

B. anodic protection

C. galvanisation

D. annealing.

Answer: A

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Multiple Choice Questions Level Ii

1. Iodine and bromine are added to a solution containing I^- and Br^- ions. What reaction would occur if the concentration of each species was 1 M ? $\left[E^\circ\left(I_2, I^-\right) = 0.54V, E^\circ\left(Br_2, Br^+\right) = 1.08V\right]$

A. $Br^- + I_2 \rightarrow 2Br_2 + 2I^-$

B. $I_2 + Br_2 \rightarrow 2I^- + 2Br^+$

C. $Br_2 + 2I^- \rightarrow 2Br^- + I_2$

D. $2Br^- + 2I^- \rightarrow I_2 + Br_2.$

Answer: C

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2. 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 electrode potential in volts (reduction potentials) are $Ag^+|Ag = +0.80, Hg_2^{2+}|Hg = 0.79.$

$Cu^{2+}|Cu = 0.34$ and $Mg^{2+}|Mg = -2.37$ V.

With increasing voltage, the sequence of deposition of metal on the cathode will be

A. Ag, Hg, Cu, Mg

B. Mg, Cu, Hg, Ag

C. Ag, Hg, Cu

D. Cu, Hg, Ag

Answer: C

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3. Copper sulphate cannot be stored in a container made of zinc because

A. $CuSO_4$ is a good oxidising agent

B. Zn will pass into the solution as Zn^{2+} and copper be precipitated

C. Zinc is not a good metal for storing

D. Zinc is a non-conductor and current will not pass.

Answer: B

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4. In a simple electrochemical cell, the half cell reduction reaction with their standard electrode potentials are :

$Pb(s) - 2e^- \rightarrow Pb^{2+}(aq), E^\circ = -0.30V$

$Ag(s) - e^- \rightarrow Ag^+(aq), E^\circ = +0.80V$

Which of the following reaction takes place ?

A. $Pb^{2+}(aq) + 2Ag(s) \rightarrow 2Ag^+(aq) + Pb(s)$

B. $Pb^{2+}(aq) + Ag(s) \rightarrow Ag^+(aq) + Pb(s)$

C. $Ag^+(aq) + Pb(s) \rightarrow Ag(s) + Pb^{2+}(aq)$

D. $2Ag^+(aq) + Pb(s) \rightarrow 2Ag(s) + Pb^{2+}(aq).$

Answer: D

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5. The reference electrode is made up of

A. $CuSO_4$

B. $HgCl_2$

C. Hg_2Cl_2

D. Pt

Answer: C

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6. The electrode potential of some half cell reactions are :

$Cl_2 + 2e^- \rightarrow 2Cl^-(aq), E^\circ = +1.36V$

$O_2 + 2H^+(aq) + 2e^- \rightarrow H_2O_2(aq), E^\circ = +0.65V$

$F_2 + 2e^- \rightarrow 2F^-(aq), E^\circ = +2.87V$

$H_2O + 2e^- \rightarrow H_2(g) + 2OH^-(aq), E^\circ = -0.83V$

The strongest oxidising agent is :

A. Cl_2

B. O_2

C. F_2

D. H_2O

Answer: C

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7. For the cell reaction

$Zn(s) + Cu^{2+}(0.1M) \rightarrow zn^{2+}(0.01M) + Cu(s),$

If E° is the strandard e.m.f. of the cell, then

A. $E = E^\circ$

B. $E > E^\circ$

C. $E < E^\circ$

D. $E = 0$

Answer: B

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8. The e.m.f. of the cell

$Zn|Zn^{2+}(0.1M)||Pb^{2+}(0.1M)|Pb$ is (standard electrode potentials for $Pb^{2+}|Pb$and $Zn^{2+}|Zn$ electrode are - 0.126 V and - 0.763 V respectively.)

A. 0.608 V

B. 0.637 V

C. 0.667 V

D. -0.608 V

Answer: B

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9. The e.m.f. of the cell at $25^\circ C$

$Cu|Cu^{2+}(0.01M)||Ag^{+}(0.1M)|Ag$

is $\left[E^\circ\left(Cu^{2+}|Cu\right) = 0.34V, E^\circ\left(Ag^{+}|Ag\right) = 0.80V\right]$

A. 0.46 V

B. 1.14 V

C. 0.43 V

D. 1.11 V

Answer: A

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10. The e.m.f. of the cell

$Cr|Cr^{3+} + (1M)||Cd^{2+} = -0.47V, E^{\circ}Cd|Cd^{2+} = -0.40V)$

A. 0.34

B. 1.14 V

C. -1.14 V

D. 0.66 V

Answer: A

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11. The reaction occurring at cathode in Nelson's cell is :

A. $\frac{1}{2}Cl_2(g) + e^- \rightarrow Cl^-(aq)$

B. $Pb^{2+}(aq) + 2e^- \rightarrow Pb(s)$

C. $H_2O(l) + e^- \rightarrow OH^-(aq) + 1/2H_2(g)$

D. $Cl^-(aq) \rightarrow \frac{1}{2}Cl_2(g) + e^-$

Answer: C

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12. A solution of sodium sulphate in water is electrolyzed using inert electrodes.

The products at the cathode and anode are respectively

A. H_2SO_2

B. O_2, H_2

C. O_2, Na

D. O_2, SO_2

Answer: A

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13. Standard reduction potentials of some electrodes are :

$Cd|Cd^{2+} = -0.40V, Ni|Ni^{2+} = -0.25V$

$Cu|Cu^{2+} = +0.34V, Ag|Ag^{+} = +0.80V$

The copper sulphate can be stored in a container made of

A. Ni

B. Cd

C. Ag

D. None of these.

Answer: C

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14. When a lead storage battery is charged, it acts as

A. lead dioxide dissolves

B. sulphuric acid is regenerated

C. the lead electrode becomes coated with $PbSO_4$

D. the amount of H_2SO_4 decreases.

Answer: B

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15. Which of the following batteries is reachargeable ?

A. Dry cell

B. Mercury cell

C. Nickel-cadmium cell

D. $H_2 - O_2$ cell

Answer: C

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16. The unit of electrochemical equivalents is :

A. gram/ampere

B. gram/coulomb

C. gram ampere

D. coulomb/gram

Answer: A

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17. The best conductor electricity is a solution of

A. acetic acid

B. boric acid

C. sulphuric acid

D. phosphoric acid.

Answer: C

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18. The cathode reaction in electrolysis of dilute sulphuric and with platinum electrodes is :

A. Oxidation

B. Reduction

C. Neutralisation

D. Both oxidation and reduction.

Answer: A

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19. The e.m.f. of a cell reaction is positive when the free energy of the cell reaction is :

A. positive

B. negative

C. zero

D. between 0 and 1

Answer: B

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20. Which one of the following will increase the volatage of the cell ?

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

A. increase in size of the silver rod

B. increase in the concentration of Sn^{2+} ions

C. increase in the concentration of Ag^+ ions

D. none of the above.

Answer: C

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21. Which of the following plots represents correctly the variation of equivalent conductance with dilution for a strong electrolyte ?

A. 

B. 

C. 

D. 

Answer: D

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22. The standard electrode potential values of the elements A, B and C are 0.68, -2.50 and -0.50 V respectively. The order of their reducing power is :

A. $A > B > C$

B. $A > C > B$

C. $C > B > A$

D. $B > C > A$

Answer: D

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23. The standard reduction potential of Ag, Cu and Zn are 0.80 V, 0.34 V and - 0.76 V respectively . Which one of the following can be stored ?

A. $CuSO_4$ in zinc vessel

B. $AgNO_3$ in copper vessel

C. $Cu(NO_3)_2$ in silver vessel

D. $AgNO_3$ in zinc vessel

Answer: C

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24. The main function of salt bridge is :

A. to allow the ions to go from one solution to another

B. to keep e.m.f. of the cell positive

C. to maintain electrical neutrality of the solution in the half cells

D. to provide link between two half cells

Answer: C

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25. Which of the following solutions will have highest equivalent conductance ?

A. 0.01 M NaCl

B. 0.050 M NaCl

C. 0.005 M NaCl

D. 0.02 M NaCl

Answer: C

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26. If a salt bridge is removed between the two half cells in an experiment, the voltage

A. does not change

B. increases rapidly

C. decreases slowly

D. falls to zero

Answer: D

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27. Which of the substances Na, Hg, S, Pt and graphite can be used as electrodes in electrolytic cells having aqueous solution ?

A. Na and S

B. Na and Hg only

C. Pt, Hg and graphite

D. Na, Pt and graphite

Answer: C

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28. The solution of copper sulphate in which copper rod is dipped is diluted to 10 times. The reduction potential of copper

A. decreases by about 60 mV.

B. decreases by about 30 mV

C. decreases by 30 V

D. increases by about 30 mV

Answer: B

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29. What will happen if a copper spoon is used to stir a solution of aluminium nitrate ?

A. The spoon will get coated with aluminium

B. The solution will turn blue

C. An alloy of copper aluminium will be formed

D. There will be no reaction.

Answer: D

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30. The coulombs of electricity required for reduction of 1 mol of MnO_4^- to Mn^{2+} are :

A. 96500 C

B. $1.93 \times 10^5 C$

C. $4.83 \times 10^5 C$

D. $9.65 \times 10^6 C$

Answer: C

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31. The molar conductances of AB and AC electrolytes are 120 and 160 $ohm^{-1}cm^2\text{mol}^{-1}$ respectively. If ionic molar conductance of C is $120 ohm^{-1}cm^2\text{mol}^{-1}$, then ionic molar conductance of B is

A. $400\text{ohm}^{-1}\text{cm}^2\text{mol}^{-1}$

B. $40\text{ohm}^{-1}\text{cm}^2\text{mol}^{-1}$

C. $80 \text{ohm}^{-1}\text{cm}^2\text{mol}^{-1}$

D. $160 \text{ohm}^{-1}\text{cm}^2\text{mol}^{-1}$

Answer: C

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32. The two platinum electrodes fitted in a conductance cell are 1.5 cm apart while the cross sectional area of each electrode is 0.75 cm^2. The cell constant is :

A. 1.125

B. 0.5

C. 2.0

D. 0.2

Answer: C

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33. The charge required for the reduction of 1 mol of $Cr_2O_7^{2-}$ to Cr^{3+} is :

A. 96500 C

B. $1.93 \times 10^5 C$

C. $5.79 \times 10^5 C$

D. $2.895 \times 10^5 C$

Answer: C

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34. The e.m.f. of the following cell containing two hydrogen electrodes is :

Pt, $1/2H_2(g)|H^+\left(10^{-8}M\right).||M^+(0.001M)|1/2H_2(g), Pt$

A. 0.295 V

B. 0.0295 V

C. 0.0590 V

D. zero

Answer: A

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35. The following half reaction occur in a galvanic cell

$Fe^{2+} \rightarrow Fe^{3+} + e^{-}\ E^{\circ} = 0.77V$

$MnO_4^{-} + 8H^{+} + 5e^{-} \rightarrow Mn^{2+} + 4H_2O,$

$E^{\circ} = 1.49V$

The e.m.f. of the cell is :

A. 3.60 V

B. 0.72 V

C. 2.26 V

D. not feasible cell

Answer: B

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36. A quantity of electricity equal to 3 Faraday is required to electroplate a given metal. If a current of 5 amp is used in the electrolytic cell, how long will it take to electroplate the metal ?

A. 6.70 hr

B. 13.40 hr

C. 26.80 hr

D. 16.08 hr

Answer: B

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37. If E° for the reaction,

$Zn + 2Ag^{+}(1M) \Leftrightarrow Zn^{2+}(1M) + 2Ag$ is

1.56V, then e.m.f. for the cell reaction :

$1/2Zn + Ag^+(1M) \Leftrightarrow 1/2Zn^{2+}(1M) + Ag$ is :

A. 0.78 V

B. 3.12 V

C. 1.56 V

D. $\sqrt{1.56V}$

Answer: C

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38. In salt bridge, generally KCl is used because

A. K^+ and Cl^- ions are isoelectronic

B. K^+ and Cl^- ions have the same transport number

C. KCl is present in the calomel electrode

D. KCl is a strong electrolyte.

Answer: B

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39. 0.1 Faraday of current was passed through the electrolytic cell placed in series containing solutions of Ag^+, Ni^{2+} and Cr^{3+} respectively. The amount of Ag, Ni and Cr deposited will be (at. Mass, $Ag = 108, Ni = 59, Cr = 52$)

A. $\begin{matrix} \text{Ag} & \text{Ni} & \text{Cr} \\ 10.8g & 2.95g & 1.73g \end{matrix}$

B. $\begin{matrix} \text{Ag} & \text{Ni} & \text{Cr} \\ 10.8g & 5.90g & 5.20g \end{matrix}$

C. $\begin{matrix} \text{Ag} & \text{Ni} & \text{Cr} \\ 32.4g & 11.80g & 5.20g \end{matrix}$

D. $\begin{matrix} \text{Ag} & \text{Ni} & \text{Cr} \\ 10.8g & 11.80g & 16.6g \end{matrix}$

Answer: A

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40. The potential of hydrogen electrode having $pH = 10$ is :

A. 0.59 V

B. zero volt

C. -0.59 V

D. -0.059 V

Answer: C

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41. Two platinum electrodes were immersed in a solution of cupric sulphate and electric current passed through the solution. After some time it was found that the colour of copper sulphate disappeared with evolution of gas at the electrode. The colourless solution contains

A. platinum sulphate

B. copper hydroxide

C. sulphuric acid

D. cuprous sulphate

Answer: C

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42. The oxidation potential of hydrogen electrode $H_2|H_3O^+(aq)$ will be greater than zero if

A. concentration of H_3O^+ ions is 1 M

B. concentration of H_3O^+ ions is 2 M

C. partial pressure of H_2 gas is 2 atm

D. E (oxidation) can never be +ve .

Answer: C

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43. Consider the cell at $25^{\circ}C$

$Tl|Tl^{+}(0.001M)||Cu^{2+}(0.10)M)|Cu$

for which e.m.f. is 0.84 V. The e.m.f. of this cell could be increased by

A. increasing $\left[Tl^{+}\right]$

B. increasing $\left[Cu^{2+}\right]$

C. decreasing $\left[Cu^{2+}\right]$

D. e.m.f. remains constant.

Answer: B

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44. A galvanic cell is set up from a zinc bar weighting 100 g and 1.0 L of 1.0 M $CuSO_4$ solution. How long would the cell run assuming it delivers a steady current of 1.0 amp ?

A. 24.6 hr

B. 26.8 hr

C. 53.6 hr

D. 16.8 hr

Answer: C

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45. The molar conductance at infinite dilution of aluminium sulphate is $858 \text{ohm}^{-1}\text{cm}^2\text{mol}^{-1}$. Given the molar ionic conductance of sulphate ions as $160 \text{ohm}^{-1}\text{cm}^2\text{mol}^{-1}$, the molar ionic conductance of Al^{3+} ion is :

A. $378 \text{ohm}^{-1}\text{cm}^2\text{mol}^{-1}$

B. $189 \text{ohm}^{-1}\text{cm}^2\text{mol}^{-1}$

C. $698 \text{ohm}^{-1}\text{cm}^2\text{mol}^{-1}$

D. $349 \text{ohm}^{-1}\text{cm}^2\text{mol}^{-1}$

Answer: B

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46. The equilibrium constant of a weak electrolyte at concentration 'C' can be expressed as ($\Lambda_m =$ molar conductance at infinite dilution) :

A. $K = \dfrac{C\Lambda_m^2}{\Lambda_m^\circ - \Lambda_m}$

B. $K = \dfrac{C\Lambda_m^{\circ 2}}{\Lambda_m(\Lambda_m^\circ - \Lambda_m)}$

C. $K = \dfrac{C\Lambda_m^2}{\Lambda_m^\circ(\Lambda_m^\circ + \Lambda_m)}$

D. $K = \dfrac{C\Lambda_m^2}{\Lambda_m^\circ(\Lambda_m^\circ - \Lambda_m)}$

Answer: D

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47. When a solution of weak electrolyte is heated the conductance of the solution

A. decreases because thermal agitation of solvent molecules offer resistance to the movement of ions.

B. increases because the electrodes conduct better

C. decreases because the dissociation of the electrolyte is suppressed

D. increases because the electrolyte is dissociated more.

Answer: D

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48. The standard reduction potentials for $Cu^{2+}/Cu, Zn^{2+}/Zn, Li^{+}/Li, Ag^{+}/Ag$ and H^{+}/H_2 are $0.34V, -0.762V, -3.05V, +0.80V$ and 0.00 V respectively . Choose the strongest reducting agent among the following

A. Zn

B. H_2

C. Ag

D. Li

Answer: D

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49. Al_2O_3 is reduced by electrolysis at low potentials and high currents. If 4.0×10^4 amperes of current is passed through molten Al_2O_3 for 6 hours, what mass of aluminium is produced ? (Assume 100% current efficiency, atomic mass of $Al = 27$ g/mol)

A. $8.1 \times 10^4 g$

B. $2.4 \times 10^5 g$

C. $1.3 \times 10^4 g$

D. $9.0 \times 10^3 g$

Answer: A

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50. The equivalent conductance of M/32 solution of a work monobasic acid is 8 mho cm^2 and at infinite dilution is 400 mho cm^2. The dissociation constant of this acid is

A. 1.25×10^{-6}

B. 6.25×10^{-4}

C. 1.25×10^{-4}

D. 1.25×10^{-5}

Answer: D

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51. Electrode potential for Mg electrode varies according to the equation $E_{Mg^{2+}|Mg} = E^{\Theta}_{Mg^{2+}|Mg} - (0.059)(2)\log. \frac{1}{Mg^{2+}}$. The graph of $E_{Mg^{2+}|Mg}$ vs log $\left[Mg^{2+}\right]$ is

A. 

B. 

C. 

D. 

Answer: B

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52. An electrochemical cell can behave like an electrolytic cell when

A. $E_{\text{cell}} = 0$

B. $E_{\text{cell}} > E_{\text{ext}}$

C. $E_{\text{ext}} > E_{\text{cell}}$

D. $E_{\text{cell}} = E_{\text{ext}}$

Answer: C

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53. Using the data given below,

$E^{\ominus}_{Cr_2O_7^{2-}/Cr^{3+}} = 1.33V \quad E^{\ominus}_{Cl_2/Cl^-} = 1.36V$

$E^{\ominus}_{MnO_4^-/Mn^{2+}} = 1.51V \quad E^{\ominus}_{Cr^{3+}/Cl} = 0.74V$

the order of reducing power is

A. $Cr^{3+} < Cl^- < Mn^{2+} < Cr$

B. $Mn^{2+} < Cl^- < Cr^{3+} < Cr$

C. $Cr^{3+} < Cl^- < Cr_2O_7^{2-} < MnO_4^-$

D. $Mn^{2+} < Cr^{3+} < Cl^- < Cr$

Answer: B

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54. The cell constant of a conductivity cell

A. changes with change of electrolyte.

B. changes with change of concentration of electrolyte.

C. changes with temperature of electrolyte.

D. remains constant for a cell.

Answer: D

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55. In the electrolysis of aqueous sodium chloride solution, which of the half cell reactions will occur at anode?

A. $Na^+(aq) + e^- \rightarrow Na(s), E^{\ominus}_{\text{cell}}\text{Cell} = -2.71V$

B. $2H_2(O)(l) \rightarrow O_2(g) + 4H^+(aq) + 4e^-, E^{\ominus}_{\text{cell}} = 1.23V$

C. $H^+(aq) + e^- \rightarrow \frac{1}{2}H_2(g), E^{\ominus}_{\text{cell}} = 0.00V$

D. $Cl^-(aq) \rightarrow \frac{1}{2}Cl_2(g) + e^-, E^{\ominus}_{\text{cell}} = 1.36V$

Answer: B

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56. In the diagram given below, the value of x is

A. 0.35 V

B. 0.65 V

C. 0.325 V

D. -0.65 V

Answer: C

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57. The e.m.f. of the cell :

$Cu(s)|Cu^{2+}(1M)||Ag^{+}(1M)|Ag$

is 0.46 V. The standard reduction reduction potential of Ag^{+}/Ag is 0.80 V. The standard reduction potential of Cu^{2+}/Cu is

A. -0.34V

B. 1.26 V

C. -1.26 V

D. 0.34 V

Answer: D

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58. A gas X at a 1 atm is bubbled through a solution containing a mixture of $1MY^-$ and $1MZ^-$ at $25^\circ C$. If the reduction potential of $Z > Y > X$, then

A. Y will oxidise X and not Z

B. Y will oxidise Z and not X

C. Y will oxidise both X and Z

D. Y will reduce both X and Z

Answer: A

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59. Standard electrode potentials are :

$Fe^{2+}|Fe(E^\circ = -0.44V), Fe^{3+}|Fe^{2+}(E^\circ = 0.77V)Fe^{2+}, Fe^{3+}$

and Fe blocks are kept together, then

A. Fe^{3+} increases

B. Fe^{3+} decreases

C. Fe^{2+}/Fe^{3+} remains unchanged

D. Fe^{2+} decreased

Answer: B

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60. Same amount of electric current is passed through solutions of $AgNO_3$ and HCl. If 1.08g of silver is obtained in the first case, the amount of hydrogen liberated at S.T.P. in the second case is

A. $112cm^3$

B. $22400cm^3$

C. $224cm^3$

D. $1.008g$

Answer: A

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61. The hydrogen electrode is dipped in a solution of pH=3 at 25° C. What is the potential of the electrode?

A. 0.177 g

B. 0.087 g

C. -0.177 V

D. 0.059 V

Answer: C

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62. The conductivity of 0.001M acetic acid is $4 \times 10^{-8} S/cm$. Calculate the dissociation constant of acetic acid, if molar conductivity at infinite dilution for acetic acid is 390 Scm^2/mol.

A. 81.78×10^{-4}

B. 81.78×10^{-5}

C. 18.78×10^{-6}

D. 18.78×10^{-5}

Answer: C

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63. An alloy of Pb-Ag weighing 1.08 g was dissolved in dilute HNO_3 and the volume made to 100 mL. A silver electrode was dipped in the solution and the e.m.f. of the cell set up

$Pt(s), H_2(g)|H^+(1M)||Ag^+(aq)|Ag(s)$

was 0.62 V. If $E^\circ_{\text{cell}} = 0.80V$, what is the percentage of Ag in the alloy ? (At $25^\circ C$, $2.303RT/F = 0.06$)

A. 25

B. 2.50

C. 10

D. 1

Answer: D

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64. The equilibrium constant of the following redox reaction at 298 K is 1×10^8.

$2Fe^{3+}(aq) + 2I^-(aq) \Leftrightarrow 2Fe^{2+}(aq) + I_2(s)$

If the standard reduction potential of iodine becoming iodide is $+0.54V$, what is the standard reduction potential of Fe^{3+}/Fe^{2+} ?

A. $+1.006V$

B. $-1.006V$

C. $+0.77V$

D. $-0.77V$

Answer: C

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65. Standard free energies of formation (in kJ/mol) at 298 K are $-237.2, -394.4$ and -8.2 for $H_2O(l), CO_2(g)$ and pentane (g), respectively . The value of E°_{cell} for the pentane-oxygen fuel cell is :

A. 2.0968 V

B. 1.0968 V

C. 0.0968 V

D. 1.968 V

Answer: B

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66. From the following data at $25^\circ C$

$Cr^{3+}(aq.) + 3e^- \rightarrow Cr^{2+}(aq.),$

$E^\circ = -0.424V$

$Cr^{2+}(aq.) + 2e^- \rightarrow Cr(s), \quad E^\circ = -0.900V$

Find E° at $25^\circ C$ for the reaction :

$Cr^{3+} + 3e^- \rightarrow Cr(s)$

A. $-0.741V$

B. $-1.324\,V$

C. $-0.476\,V$

D. $+0.741V$

Answer: A

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Multiple Choice Questions Level Iii Questions From Aieee Jee Examinations

1. Given $E^{\circ}_{Fe^{3+}/Fe} = -0.36V$, $E^{\circ}_{Fe^{2+}/Fe} = -0.439V$. The value of standard electrode potential for the change , $Fe^{3+} + e^{-} \rightarrow Fe^{2+}$ will be

A. -0.072 V

B. 0.385 V

C. 0.770 V

D. -0.270 V

Answer: C

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2. The Gibbs energy for the decomposition of Al_2O_3 at $500^{\circ}C$ is as follows :

$\frac{2}{3}Al_2O_3 \rightarrow \frac{4}{3}Al + O_2, \Delta_r G = +966\text{kJ mol}^{-1}$

The potential difference needed for electrolytic reduction of Al_2O_3 at $500^\circ C$ is at least :

A. 2.5 V

B. 5.0 V

C. 4.5 V

D. 3.0 V

Answer: A

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3. The reduction potential of hydrogen half-cell will be negative if :

A. $p(H_2) = 2\text{atm and}\left[H^+\right] = 1.0M$

B. $p(H_2) = 2\text{atm and}\left[H^+\right] = 2.0M$

C. $p(H_2) = 1\text{atm and}\left[H^+\right] = 2.0M$

D. $p(H_2) = 1\text{atm}$ and $\left[H^+\right] = 1.0M$

Answer: A

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4. Resistance of 0.2 M solution of an electrolyte is 50Ω. The specific conductance of the solution is $1.3Sm^{-1}$. If resistance of the 0.4 M solution of the same electrolyte is 260Ω, its molar conductivity is :

A. $6.25 \times 10^{-4} Sm^2 \text{mol}^{-1}$

B. $625 \times 10^{-4} Sm^2 \text{mol}^{-1}$

C. $62.5 Sm^2 \text{mol}^{-1}$

D. $6250 Sm^2 \text{mol}^{-1}$

Answer: A

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5. The standard reduction potential for $Zn^{2+}/Zn, Ni^{2+}/Ni,$ and Fe^{2+}/Fe are $-0.76, -0.23$ and $-0.44V$ respectively. The reaction $X + Y^{2+} \rightarrow X^{2+} + Y$ will be spontaneous when :

A. $X = Zn, Y = Ni$

B. $X = Ni, Y = Fe$

C. $X = Ni, Y = Zn$

D. $X = Fe, Y = Zn$

Answer: A

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6. Given $E^{\circ}_{Cr^{3+}/Cr} = -0.74V, E^{\circ}_{MnO_4^-/Mn^{2+}} = 1.51V$ $E^{\circ}_{Cr_2O_7^{2-}/Cr^{3+}} = 1.33V, E^{\circ}_{Cl/C/l^-} = 1.36V$ Based on the data given above , strongest oxidising agent will be :

A. Cl^-

B. Cr^{3+}

C. Mb^{2+}

D. MnO_4^-

Answer: D

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7. Resistance of 0.2 M solution of an electrolyte is 50Ω. The specific conductance of the solution is $1.4Sm^{-1}$. If resistance of the 0.5 M solution of the same electrolyte is 280Ω. The molar conductivity of 0.5 M solution of the electrolyte in $Sm^2\text{mol}^{-1}$ is

A. 5×10^{-4}

B. 5×10^{-3}

C. 5×10^3

D. 5×10^2

Answer: A

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8. The equivalent conductance of NaCl at concentration C and at infinite dilution are $Lamba_c$ and Λ_∞ respectively . The correct relationship between Λ_c and Λ_∞ is given as (where the constant B is positive)

A. $\Lambda_c = \Lambda_\infty + BC$

B. $\Lambda_c = \Lambda_\infty - BC$

C. $\Lambda_c = \Lambda_\infty - B\sqrt{c}$

D. $\Lambda_c = \Lambda_\infty + B\sqrt{c}$

Answer: C

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9. Given below are the half cell reactions :

$Mb^{2+} + 2e^- \rightarrow Mn, E^\circ = -1.18V$

$2\left(Mn^{3+} + e^- \rightarrow Mn^{2+}\right), E^\circ = +1.51V$

The E° for $3Mn^{2+} \rightarrow Mn + 2Mn^{3+}$ will be

A. -2.69 V , the reaction will not occur

B. -2.96 V , the reaction will occur

C. -0.33 V , the reaction will not occur

D. -0.33 V, the reaction will occur.

Answer: A

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10. Two Faraday of electricity is passed through a solution of $CuSO_4$. The mass of copper deposited at the cathode is : (at. mass of Cu $= 63.5$ amu)

A. 0 g

B. 63.5 g

C. 2 g

D. 127 g

Answer: B

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Recent Examination Questions

1. In the electrolysis of acidulated water, it is desired to obtain 1.12 cc of hydrogen per second uner S.T.P. condition. The current to be passed is

A. 9.65 A

B. 19.3 A

C. 0.965 A

D. 1.93 A

Answer: A

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2. The one which decreases with dilution is

A. Conductance

B. Specific conductance

C. Equivalent conductance

D. Molar conductance

Answer: B

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3. The standard electrode potentials E° for the half cell reactions are as :

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

$Fe \rightarrow Fe^{2+} + 2e^-, E^\circ = 041V$

The EMF of the cell reaction $Fe^{2+} + Zn \rightarrow Zn^{2+} + Fe$ is :

A. $-1.20V$

B. $+1.20$ V

C. $+0.32V$

D. $-0.32V$

Answer: D

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4. $9.65C$ of electric current is passed through fused anhydrous magnesium chloride. The magnesium metal thus, obtained is completely converted into a Grignard reagent. The number of moles of the Grignard reagent obtained is

A. 5×10^{-4}

B. 1×10^{-4}

C. 5×10^{-5}

D. 1×10^{-5}

Answer: C

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5. The standard emf of galvanic cell involving 3 moles of electrons in its redos reaction is 0.59V. The equilibrium constant for the reaction of the cell is

A. 10^{25}

B. 10^{20}

C. 10^{15}

D. 10^{30}

Answer: D

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6. E_1, E_2 and E_3 are the emf values of the three galvanic cells respectively

(i) $Zn|Zn^{2+}(1M)||Cu^{2+}(0.1)M|Cu$

(ii) $Zn|Zn^{2+}(1M)||Cu^{2+}(1M)|Cu$

(iii) $Zn|Zn^{2+}(0.1M)||Cu^{2+}(1M)|Cu$

Which one of the following is true ?

A. $E_2 > E_3 > E_1$

B. $E_3 > E_2 > E_1$

C. $E_1 > E_2 > E_3$

D. $E_1 > E_3 > E_2$

Answer: B

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7. The approximate time duration in hours to electroplate 30 g of calcium from molten calcium chloride using a current of 5 amp is

[At., mass of Ca = 40]

A. 8

B. 80

C. 10

D. 16

Answer: A

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8. Which one of the following has a potential more than zero ?

A. pt, $\frac{1}{2}H_2$ (1 atm) I HCl (1 M)

B. pt, $\frac{1}{2}H_2$ (1 atm) I HCl (2 M)

C. pt, $\frac{1}{2}H_2$ (1 atm) I HCl (0.1 M)

D. pt, $\frac{1}{2}H_2$ (1 atm) I HCl (0.5 M)

Answer: B

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9. The emf of a galvanic cell constituted with the electrodes $Zn^{2+}|Zn(-0.76V)$ and $Fe^{2+}|Fe(-0.41V)$ is :

A. -0.35 V

B. $+1.17$ V

C. $+0.35$ V

D. -1.17 V

Answer: C

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10. Conductivity of a saturated solution of a sparingly soluble salt AB at 298 K is $1.85 \times 10^{-5} Sm^{-1}$. Solubility product of the salt AB at 298 K is

Given $\wedge_m^0 (AB) = 140 \times 10^{-4} Sm^2 \ \ \text{mol}^{-1}$

A. 5.7×10^{-12}

B. 1.32×10^{-12}

C. 7.5×10^{-12}

D. 1.74×10^{-12}

Answer: D

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11. For $Cr_2O_7^{2-} + 14H^+ + 6e^- \rightarrow 2Cr^{+3} + 7H_2O, E^\circ = 1.33V$ $\text{At}\left[Cr_2O_7^{2-}\right]$ = millimoles , $\left[Cr^{+3}\right] = 15$ millimole , E is 1.067V. The pH of the solution is nearly equal to

A. 2

B. 3

C. 4

D. 5

Answer: A

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12. In $H_2 - O_2$ fuel cell the reaction occurring at cathode is

A. $H^+ + e^- \rightarrow \frac{1}{2}H_2$

B. $2H_{2(g)} + O_{2(g)} \rightarrow 2H_2O_{(l)}$

C. $H^+_{(aq)} + OH^-_{(aq)} \rightarrow H_2O(l)$

D. $O_{2(g)} + 2H_2O_{(l)} + 4e^- \rightarrow 4OH^-_{(aq)}$

Answer: D

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13. How many coulombs of electricity are required for the oxidation of one mol of water to dioxygen ?

A. $1.93 \times 10^3 C$

B. $9.65 \times 10^4 C$

C. $19.3 \times 10^5 C$

D. $1.93 \times 10^4 C$

Answer: A

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14. The standard electrode potential for Daniel cell is 1.1 volt. What is the standard Gibbs energy for the reaction ?

A. 212.3 kJ mol^{-1}

B. -212.3kJ mol^{-1}

C. 106.15kJ mol^{-1}

D. $-106.15\text{kJ mol}^{-1}$

Answer: B

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15. The cathode reaction in the dry cell will be :

A. $Zn(s) \rightarrow Zn^{2+} + 2e^-$

B. $MnO_2 + NH_4^+ - e^- \rightarrow MnO(OH) + NH_3$

C. $Zn(Hg) + 2OH^- \rightarrow ZnO(s) + H_2O + 2e^-$

D. $MnO(OH) + NH_3 \rightarrow MnO_2 + NH_4^+ + 2e^-$.

Answer: B

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16. Λ_m° for $NH_4Cl, NaOH$ and NaCl are 130, 248 and $126.5 \text{ohm}^{-1} cm^2 \text{mol}^{-1}$ respectively. The Λ_m° of NH_4OH will be,

A. 251.5

B. 244.5

C. 130

D. 504.5

Answer: A

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17. Strongest reducing agent among the following is :

(i) $Na^{+} + e^{-} \rightarrow N\alpha_{(s)} - 2.71E^{\Theta}/v$

(ii) $Al^{3+} + 3e^{-} \rightarrow Al_{(s)} - 1.66E^{\Theta}/v$

(iii) $F_{2(g)} + 2e^{-} \rightarrow 2F^{-} + 2.87E^{\Theta}/v$

(iv) $2H_2O + 2e^{-} \rightarrow F_{2(g)} + 2OH^{-}_{(g)} - 0.83E^{\Delta}/V$

A. (iv)

B. (iii)

C. (ii)

D. (i)

Answer: D

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