CHEMISTRY

BOOKS - DISHA PUBLICATION CHEMISTRY (HINGLISH)

ELECTROCHEMISTRY

Exercise

1. When 9.65 ampere current was passed for 1.0 hour into nitrobenzene in acidic medium, the amount of p-aminophenol produced is :

A. 109.0 g

B. 98.1 g

C. 9.81 g

D. 10.9 g

Answer: C

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2. When an electric current is passed through acidified water, $112ml$ of H_2 gas at NTP is collected at the cathode is 965 seconds. The current passed in amperes is

A. 2.0

B. 0.1

C. 0.5

D. 1.0

Answer: D

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3. How long (approximate) should water be electrolysed by passing through 100 amperes current so that the oxygen released can completely

burn 27.66 g of diborane?

(Atomic weight of B = 10.8 u)

A. 6.4 hours

B. 0.8 hours

C. 3.2 hours

D. 1.6 hours

Answer: C

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4. What is the standard reducing potential (E°) for $Fe^{3+} \rightarrow Fe$?

(Given that $Fe^{2+} + 2e^{-} \rightarrow Fe,\ E_{Fe^{2+}/Fe^{\circ}} = -0.47V$

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

A. -0.057 V

B. $+0.057$ V

C. $+0.30$ V

D. -0.30 V

Answer: A

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5. Consider the following standard electrode potentials (E° in volts) in aqueous solution:

Element	M^{3+}/M	M^{+}/M
Al	-1.66	$+0.55$
TI	$+1.26$	-0.34

Based on these data, which of the following statements is correct ?

A. Tl^{+} is more stable than Al^{3+}

B. Al^{+} is more stable than Al^{3+}

C. Tl^{+} is more stable than Al^{+}

D. Tl^{3+} is more stable than Al^{3+}

Answer: C

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6. Given $E^{\circ}_{Cl_2/Cl^-} = 1.36V, E^{\circ}_{Cr^{3+}/Cr} = -0.74V$

$E^{\circ}_{Cr_2O_7^{2-}/Cr^{3+}} = 1.33V, E^{\circ}_{MnO_4^-/Mn^{2+}} = 1.51V$

Among the following, the strongest reducing agent is

A. Cr

B. Mn^{2+}

C. Cr^{3+}

D. Cl^-

Answer: A

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7. What will occur if a block of copper metal is dropped into a beaker containing a solution of $1MZnSO_4$?

A. The copper metal will dissolve with evolution of oxygen gas

B. The copper metal will dissolve with evolution of hydrogen gas

C. No reaction will occur

D. The copper metal will dissolve and zinc metal will be deposited

Answer: C

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8. Identify the correct statement

A. Corrosion of iron can be minimized by forming a contact with another metal with a higher reduction potential

B. Iron corrodes in oxygen free water

C. Corrosion of iron can be minimized by forming an impermeable barrier at its surface

D. Iron corrodes more rapidly in salt water because its electrochemical potential is higher

Answer: C

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9. Galvanization is applying a coating of:

A. Cu

B. Zn

C. Pb

D. Cr

Answer: B

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10. A variable, opposite external potential(E_{ext} is applied to the cell : $Zn\left|Zn^{2+}(1M)\right|\left|Cu^{2+}(1M)\right|Cu$, of potential 1.1 V.respectively electrons flow from :

A. anode to cathode in both cases

B. cathode to anode and anode to cathode

C. anode to cathode and cathode to anode

D. cathode to anode in both cases

Answer: C

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11. At 298 K, the standard reduction potentials are 1.51 V for $MnO_4^- \mid Mn^{2+}$, $1.36V$ for $Cl^2 \mid Cl^-$, 1.07 V for $Br_2 \mid Br^-$, and 0.54 V for $I_2 \mid I^-$. At pH=3, permanganate is expected to oxidize $\left(\frac{RT}{F} = 0.059V\right)$:

A. Cl^-, Br^- and I^-

B. Br^- and I^-

C. Cl^- and Br^-

D. I^- only

Answer: B

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12. 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. 2 g

B. 127 g

C. 0 g

D. 63.5 g

Answer: D

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13. The standard electrode potentials $\left(E^{\circ}_{M^+/M}\right)$ of four metals A, B, C and D are $-1.2V, 0.6V, 0.85V$ and $-0.76V$, respectively. The sequence

of deposition of metals on applying potential is

A. A,C,B,D

B. B, D, C, A

C. C, B,D, A

D. D,A,B,C

Answer: C

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14. A currrent of 5.0 A flows for 4.0 h through an electrlytic cell containing a molten salt of metalM. This results in deposition of 0.25 mol of the metal M at the cathode. The oxidation state of M in the molten salt is : (1 Faraday=$96485 C \mathrm{mol}^{-1}$)

A. $1+$

B. $2+$

C. $3+$

D. $4+$

Answer: C

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15. Standard electrode potential data is given below :

$Fe^{3+}(aq) + e^- \rightarrow Fe^{2+}(aq), E^o = +0.77V$

$Al^{3+}(aq) + 3e^- \rightarrow Al(s), E^o = -1.66V$

$Br_2(aq) + 2e^- \rightarrow 2Br^-(aq), E^o = +1.08V$

Based on the data given above, reducing power of Fe^{2+} Al and Br^- will increase in the order :

A. $Fe^{2+} < Al < Br^-$

B. $Br^- < Fe^{2+} < Al$

C. $Al < Br^- < Fe^{2+}$

D. $Al < Fe^{2+} < Br^-$

Answer: D

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16. Resistance of 0.2 M solution of an electrolyte is 50Ω . The specific conductance of the solution is $1.4Sm^{-1}$. The resistance of 0.5 M solution of the same electrolyte is :

A. 5×10^{-4}

B. 5×10^{-3}

C. 5×10^{3}

D. 5×10^{2}

Answer: A

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17. The equivalent conductance of $NaCl$ at concentration of C and at infinite dilution are λ_C and λ_∞ respectively. The correct relationship

between λ_C and λ_∞ is given as :

(where the constant B is positive)

A. $\lambda_C = \lambda_\infty + (B)C$

B. $\lambda_C = \lambda_\infty - (B)C$

C. $\lambda_C = \lambda_\infty - (B)\sqrt{C}$

D. $\lambda_C = \lambda_\infty + (B)\sqrt{C}$

Answer: C

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18. Given below are the half -cell reactions

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

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

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

A. -2.69 V, the reaction will not occur

B. -2.69 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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19. The function of a salt bridge is to:

A. maintain electrical neutrality of both half cells.

B. increase the cell potential at the positive electrode.

C. decrease the cell potential at the negative electrode.

D. eliminated the impurities present in the electrolyte.

Answer: A

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20. Standard electrode potential of SHE at 298 K is :

A. 0.05V

B. 0.10V

C. 0.50 V

D. 0.00 V

Answer: D

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21. The satandard EMF of quinhydrone is $0.699V$. The EMF of the quinhydrone electrode dipped in a solution with $pH = 10$ is

A. 0.109V

B. -0.109 V

C. 1.289 V

D. -1.289 V

Answer: A

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22. If $e^{\circ}_{Fe^{2+}/Fe} = -0.441V$. And $E^{o}_{Fe^{3+}/Fe^{2+}} = 0.771V$. The standard emf of the reaction $Fe + 2Fe^{3+} \rightarrow 3Fe^{2+}$ will be .

A. 1.653 V

B. 1.212 V

C. 0.111 V

D. 0.330 V

Answer: B

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23. In the electrolytic cell, flow of electrons is form :

A. cathode to anode in solution.

B. cathode to anode through external supply.

C. cathode to anode through internal supply

D. anode to cathode through internal supply.

Answer: D

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24. Given $E^{\circ}_{Cr^{3+}/cr} = -0.72V$, $E^{\circ}_{Fe^{2+}/Fe} = -0.42V$. The potential for the cell

$Cr\left|Cr^{3+}(0.1M)\right|\left|FE^{2+}(0.01M)\right|$ Fe is .

A. $0.26V$

B. 0.336 V

C. -0.339 V

D. $0.26V$

Answer: D

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25. Which of the following reaction is possible at anode ?

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

B. $F_2 \rightarrow 2F$

C. $(1/2)O_2 + 2H^{+} \rightarrow H_2O$

D. None of these

Answer: A

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26. Which one is not called a anode reaction from the following?

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

B. $Cu \rightarrow Cu^{++} + 2e^{-}$

C. $Hg^{+} \rightarrow Hg^{++} + e^{-}$

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

Answer: D

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27. Which of the following statements is true for an electrochemical cell of Cu-H_2?

A. H_2 is cathode and Cu is anode

B. H_2 is anode and Cu is anode

C. Reduction occurs at H_2 electrode

D. Oxidation occurs at Cu electrode

Answer: B

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28. At 298 K the standard free energy of formation of $H_2O(l)$ is $-237.20k\frac{J}{\text{mole}}$ while that of its ionisation into H^+ ions and hydroxyl ions is $80k\frac{J}{\text{mole}}$, then the emf of the following cell at 298 K will be :

[Take 1F = 96500 C]

$H_2O(g, 1^-)|H^+(1M)||OH^-(1M)|O_2)(g, 1^-)$

A. 0.40 V

B. 0.81 V

C. $1.23V$

D. 0.40 V

Answer: A

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29. If the following half cells have E° values as

$A^{3+} + e^- \rightarrow A^{2-}, E^\circ = y_2V$

$A^{2+} + 2e^- \rightarrow A, E^\circ = -y_1 V$

The E° of the half cell $A^{3+} + 3e \rightarrow A$ will be

A. $\frac{2y_1 - y_2}{3}$

B. $\frac{y_2 - 2y_1}{3}$

C. $2y_1 - 3y_2$

D. $y_2 - 2y_1$

Answer: B

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30. In a galvanic cell

A. decrease in free energy in a spontaneous chemical process appears as electrical energy.

B. decrease in free energy in a spontaneous physical process appears as electrical energy.

C. decrease in free energy in a spontaneous physical or chemical process appears as electrical energy.

D. a non-spontaneous physical or chemical process produces electrical energy.

Answer: B

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31. Based on the cell notation for a spontaneous reaction, at the anode:

$Ag(s)|AgCl(s)|Cl^-(aq)||Br^-(aq)|Br_2(l)|C(s)$

A. AgCl gets reduced

B. Ag gets oxidized

C. Br^- gets oxidized

D. Br_2 gets reduced

Answer: B

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32. Zn can displace :-

A. Mg from its aqueous solution.

B. Cu from its aqueous solution.

C. Na from its aqueous solution.

D. Al from its aqueous solution.

Answer: B

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33. The oxidation potential of a hydrogen electrode at $pH = 10$ and $P_{H_2} = 1$ is

A. $-0.59V$

B. 0.00 V

C. $+0.59V$

D. 0.059 V

Answer: C

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34. The E° at 25°C for the following reaction is 0.22 V. Calculate the equilibrium constant at 25°C :

$H_2(g) + 2AgCl(s) \rightarrow 2Ag(s) + 2HCl(aq)$

A. 2.8×10^7

B. 5.2×10^8

C. 5.2×10^6

D. 5.2×10^3

Answer: A

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35. A galvanic cell is composed of two hydrogen electrods, one of which is a standard one. In which of the following solutions should the other electrode be immersed to get maximum e.m.f:

A. 0.1 M HCl

B. $0.1MH_2SO_4$

C. $0.1MNH_4OH$

D. $0.01MHCOOH$

Answer: C

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36. The solution of $CuSO_4$ in which copper rod is immersed is diluted to times. The reduction electrode potential

A. increases by 30 mV

B. decreases by 30 m V

C. increases by 59 m V

D. decreases by 59 m V

Answer: B

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37. For a given reaction : $M^{(x+n)} + ne^- \rightarrow M^{c+}$, E^{c-}. (red) is known along with M^{x+n} and M^{x+} ion concentrations. Then

A. n can be evaluated.

B. x can be evaluated.

C. (x + n) can be evaluated.

D. n, x, (x + n) can be evaluated.

Answer: A

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38. In the electrochemical reaction,

$2Fe^{3+} + Zn \rightarrow Zn^{2+} + 2Fe^{2+}$,

increasing the concentration of Fe^{2+} :

A. increases cell emf

B. increases the current flow

C. decreases the cell emf

D. alters the pH of the solution

Answer: C

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39. What is the standard reducing potential (E°) for $Fe^{3+} \rightarrow Fe$?

(Given that $Fe^{2+} + 2e^{-} \rightarrow Fe,\ E_{Fe^{2+}/Fe^{\circ}} = -0.47V$

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

A. $-0.057V$

B. $+0.057V$

C. $+0.30V$

D. $-0.30V$

Answer: A

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40. What will be the emf for the given cell ?

$Pt|H_2(g, P_1)|H^+(aq)|H_2(g, P_2)|Pt$

A. $\frac{RT}{F}\frac{\log_e(P_1)}{P_2}$

B. $\frac{RT}{2F}\frac{\log_e(P_1)}{P_2}$

C. $\frac{RT}{F}\frac{\log_e(P_2)}{P_1}$

D. None of these

Answer: B

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41. $Ni|Ni^{2+}(1.0M)||Au^{3+}(1.0M)|$ Au (where E° for $Ni^{2+}/Niis-0.25$ and V and E° for Au^{3+}/Au is $(0.150V)$. What is the emf of the cell ?

A. 2.00 V

B. $1.25V$

C. $-1.25V$

D. 1.75 V

Answer: D

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42. For a cell reaction involvinig 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 $25^{\circ}C$ will be:

A. 29.5×10^{-2}

B. 10

C. 1×10^{10}

D. 2.95×10^{-10}

Answer: C

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43. Following cell has EMF 0.7995 V .

Pt$|H_2$ (1) atm) $|HNO_3(1M)\ ||\ |AgNO_3(1M)|Ag$ If we add enough KCl to Ag cell so that the final Cl^- is 1 M . Now the measured emf of the cell is $0.222V$. The K_{sp} of AgCl would be -

A. $1 \times 10^{-9.8}$

B. $1 \times 10^{-19.6}$

C. 2×10^{-10}

D. 2.64×10^{-14}

Answer: A

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44. An electrochemical cell is shown below $Pt, H_2(1\text{atm})|HCl(0.1M)|CH_3COOH(0.1M) \mid H_2(1\text{atm})$, The emf of the cell will not be zero, because

A. the temperature is constant.

B. e.m.f depends on molarities of acids used

C. acids used in two compartments are different .

D. pH of 0.1 M HCl and 0.1 M CH_3COOH is not same

Answer: D

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45. The emf of the cell

$Cr(s)\left|Cr^{3+}(1.0M)\right|\left|Co^{2+}(1.0M)\right|Co(s)\left[E^{o}\right.$ For $Cr^{3+}\left|Cr(s)\right. = -0.74$

A. -0.46 volt

B. -1.02 volt

C. $+0.46$ volt

D. 1.66 volt

Answer: C

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46. Define the following.

(a) stable equilibrium

(b) unstable equilibrium

(c) neutral equilibrium

A. $E^{\circ}_{\text{cell}} = 0, \Delta G^{\circ} = 0$

B. $E_{\text{cell}} = 0, \Delta G = 0$

C. Both are correct

D. None is correct

Answer: B

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47. Equivalent conductivity can be expressed in terms of specific conductance (k) and concentration (N) in gram equivalent dm^{-3} as:

A. $k \times N$

B. $\frac{k \times 1000}{N}$

C. $\frac{k \times N}{1000}$

D. $k \times N \times 1000$

Answer: B

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48. The molar conducatance of Ba^{2+} and Cl^{-} are 127 and $76 ohm^{-1} cm^{-1} mol^{-1}$ respectively at infinite dilution. The equivalent conductance of $BaCl_2$ at infinte dilution will be

A. 203

B. 279

C. 101.5

D. 139.5

Answer: B

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49. The increases in equivalent conductivity of a weak electrolyte with dilution is due to :

A. increase in degree of dissociation and decrease in ionic mobility.

B. decrease in degree of dissociation and decrease in ionic mobility.

C. increase in degree of dissociation and increase in ionic mobility.

D. decrease in degree of dissociation and increase in ionic mobility

Answer: C

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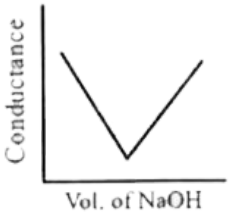
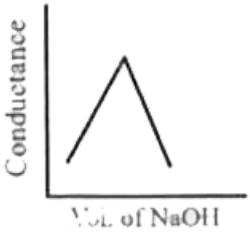
50. HNO_3(aq) is titrated with NaOH(aq) condutomatrically, graphical representation of the titration is :

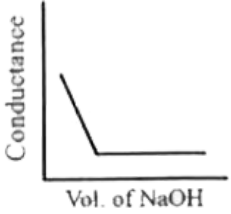
A.



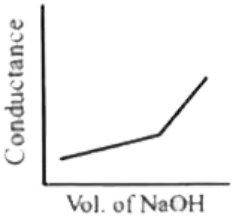
B.



C.



D.



Answer: A

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51. If X is the specific resistance of the solution and N is the normality of the solution, the equivalent conductivity of the solution is given by

A. $\frac{1000x}{N}$

B. $\frac{1000}{Nx}$

C. $\frac{1000N}{x}$

D. $\frac{Nx}{1000}$

Answer: B

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52. For an electrolyte solution of $0.05 molL^{-1}$, the conductivity has been found to be $0.0110 Scm^{-1}$. The molar conductivity is

A. $0.055 Scm^2 mol^{-1}$

B. $550 Scm^2 mol^{-1}$

C. $0.22 Scm^2 mol^{-1}$

D. $220 Scm^2 mol^{-1}$

Answer: D

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53. What is the value of $pK_b\left(CH_3COO^{c-}\right)$ if $\wedge^\circ{}_{.m} = 390 Scm^{-1} mol^{-1}$ and $\wedge_m = 7.8 Scm^2 mol^{-1}$ for $0.04M$ of

CH_3COOH at $25^\circ C$?

A. 9.3

B. 9.2

C. 4.7

D. 4.8

Answer: B

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54. An increase in equivalent conductance of a strong electrolyte with dilution is mainly due to:

A. increase in ionic mobility of ions.

B. 100% ionisation of electrolyte at normal dilution.

C. increase in both i.e. number of ions and ionic mobility of ions.

D. increase in number of ions.

Answer: A

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55. The correct order of equivalent conductance at infinite dilution of $LiCl$, $NaCl$ and KCl is:

A. $LiCl > NaCl > KCl$

B. $KCl > NaCl > LiCl$

C. $NaCl > KCl > LiCl$

D. $LiCl > KCl > NaCl$

Answer: B

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56. If 0.01 M solution of an electrolyte has a resistance of 40 ohms in a cell having a cell constant of 0.4 cm^{-1} then its molar conductance in

$ohm^{-1}cm^2mol^{-1}$ will be

A. 10^2

B. 10^4

C. 10

D. 10^3

Answer: D

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57. The resistance of 0.01 N solution of an electrolyte was found to be 220 ohm at 298 K using a conductivity cell with a cell constant of $0.88cm^{-1}$. The value of equivalent conductance of solution is

A. 400 mho cm^2geq^{-1}

B. 295 mho cm^2geq^{-1}

C. 419 mho cm^2geq^{-1}

D. 425 mho cm^2geq^{-1}

Answer: A

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58. 0.05 M NaOH solution offered a resistance of $3.1 \cdot 6\Omega$ in a conductivity cell at 298 K. If the cell constant of the cell si $0 \cdot 367cm^{-1}$, calculate the molar conductivity of NaOH solution.

A. $234Scm^2mol^{-1}$

B. $23.2Scm^2mol^{-1}$

C. $4645Scm^2mol^{-1}$

D. $5464Scm^2mol^{-1}$

Answer: B

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59. The specific conductance of a $0.1NKCl$ solution at $23^\circ C$ is $0.012ohm^{-1}cm^{-1}$. The resistance of cell containing the solution at the same tempreature was found to be $55ohm$. The cell constant will be

A. $0.0616cm^{-1}$

B. $0.66cm^{-1}$

C. $6.60cm^{-1}$

D. $660cm^{-1}$

Answer: B

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60. Which of the following is an electrolyte ?

A. CH_3OH

B. $CH_3 - O - CH_3$

C. $C_6H_{12}O_6$

D. CH_3COONa

Answer: D

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61. The electric charge required for electrode deposition of one gram-equivalent of a substance is :

A. one ampere per second.

B. 96500 coulombs per second.

C. one ampere for one hour.

D. charge on one mole of electrons.

Answer: D

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62. How many minutes will it take to plate out 5.2g of cr from a $Cr_2(SO_4)_3$ solution using a current of 9.65 A ? (Atomic mass:Cr=52.0)

A. 200

B. 50

C. 100

D. 103

Answer: B

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63. Calculate the current (in mA) required to deposite 0.195g of platinum metal in 5.0 hours from a solution of $\left[PtCl_6^{2-}\right.$:(Atomic mass:Pt=195)

A. 310

B. 31

C. 21.44

D. 5.36

Answer: C

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64. By virtue of Faraday's second law of electrolysis, the electrochemical equivalent of the two metals liberated at the electrodes has the same ratio as that of their

A. atomic masses

B. molecular masses

C. equivalent masses

D. any of three

Answer: C

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65. In electrolysis of very dilute of $NaOH$ using platinum electrodes

A. H_2 is evolved at cathode and O_2 at anode

B. NH_3 is produced at anode

C. Cl_2 is obtained at cathode

D. O_2 is produced at cathode and H_2 at anode

Answer: A

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66. Indicate the reactions which take place at cathode and anode in fuel cell.

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

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

C. $Mn^{2+}(aq) + 2e^- \rightarrow Mn(s)$

D. $Mn(s) \rightarrow Mn^{+}(aq)) + e^- + 1.5\,V$

Answer: B

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67. A hydrogen gas electrode is made by dipping platinum wire in a solution of HCl or $pH = 10$ and by passing bydrogen gas around the platinum wire at one atm pressure . The oxidation potential of electrode would be ?

A. 0.59 V

B. 0.118 V

C. 1.18 V

D. 0.059 V

Answer: A

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68. A metal X displaces nickel from nickel sulphate solution but does not displace manganese from manganese sulphate solution. What is the correct order of their reducing powers ?

A. $Mn > Ni > M$

B. $Ni > Mn > M$

C. $Mn > M > Ni$

D. $M > Ni > Mn$

Answer: C

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69. A solution of sodium sulphate in qater is electrolysed using inert electrodes, The products at the cathode and anode are respectively.

A. H_2, O_2

B. O_2, H_2

C. O_2, Na

D. O_2, SO_2

Answer: A

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70. If 0.5 amp current is passed through acidified silver nitrate solution for 10 minutes. The mass of silver deposited on cathode, is (eq. wt. of silver nitrate = 108).

A. 2.3523 g

B. 3.3575 g

C. 5.3578 g

D. 6.3575 g

Answer: B

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71. Find the charge in coulombs required to convert 0.2 mole VO_3^{2-} into VO_4^{3-}

A. 1.93×10^4

B. 9.65×10^4

C. 1.93×10^5

D. 9.65×10^5

Answer: A

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72. The amount of electricity that can deposit 108g of silver from silver nitrate solution is

A. 1 F

B. $2A$

C. $1C$

D. $1A$

Answer: A

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73. Three faradays of electricity was passed through an aqueous solution of iron (II) bromide. The mass of iron metal (at mass 56) deposited at the cathode is:

A. 56

B. 84

C. 112

D. 168

Answer: B

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74. Which of the following statement is false for fuel cell?

A. They are more efficient

B. They are free from pollution

C. They run till reactants are active

D. Fuel burned with O_2

Answer: D

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75. Zn acts as sacrifical or cathodic protect iont to prevent rusting of iron because

A. $E^{\circ}_{OP} of Zn < E^{\circ}_{OP}$ of Fe

B. $E^{\circ}_{OP} of Zn > E^{\circ}_{OP}$ of Fe

C. $E^{\circ}_{OP} of Zn = E^{\circ}_{OP}$ of Fe

D. Zn is cheaper than iron

Answer: B

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76. Identify the correct statement

A. Corrosion of iron can be minimized by forming a contact with another metal with a higher reduction potential

B. Iron corrodes in oxygen free water

C. Corrosion of iron can be minimized by forming an impermeable barrier at its surface

D. Iron corrodes more rapidly in salt water because its electrochemical potential is higher .

Answer: C

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77. Serveral blocks of magnesium are fixed to the bottom of a ship to

A. make the ship lighter

B. prevent action of water and salt

C. prevent puncturing by under-sea rocks.

D. keep away the sharks.

Answer: B

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78. During the recharging of lead acid storage cell the reaction at anode is

A. $Pb^{2+} + SO_4^{2-} \rightarrow PbSO_4$

B. $PbSO_4 + 2H_2O \rightarrow PbO_2 + SO_4^{2-} + 4H^+ + 2e^-$

C. $Pb \rightarrow Pb^{2+} + 2e^-$

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

Answer: B

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79. Select the correct cell reaction of the cell $Ag(s) \mid Ag^+(aq)||cu^{2+}(aq)|cu(s)$:

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

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

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

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

Answer: C

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80. When an aqueous solution of $CuSO_4$ is sstirred with a silver spoon then :

A. Cu^+ will be formed

B. Ag^+ will be formed

C. Cu^{2+} will be deposited

D. None of these

Answer: D

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81. The following facts are availabel :

$2A^{c-} + B_2 \rightarrow 2B^- + A_2,$

$2C^{c-} + B_2 \rightarrow Noreaction,$

$2D^{c-} + A_2 \rightarrow 2A^{c-} + D_2$

Which of the following statement is correct ?

A. $E^{\circ}_{C^-|C_2} > E^{\circ}_{B^-|B_2} > E^{\circ}_{A^-|A_2} > E^{\circ}_{D^-|D_2}$

B. $E^{\circ}_{C^-|C_2} < E^{\circ}_{B^-|B_2} < E^{\circ}_{A^-|A_2} < E^{\circ}_{D|D_2}$

C. $E^{\circ}_{C^-|C_2} < E^{\circ}_{B^-|B_2} > E^{\circ}_{A^-|A_2} > E^{\circ}_{D^-|D_2}$

D. $E^{\circ}_{C^-|C_2} > E^{\circ}_{B^-|B_2} < E^{\circ}_{A^-|A_2} < E^{\circ}_{D^-|D_2}$

Answer: B

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82. If an iron rod is dipped into a solution of $CuSO_4$, the blue colour of the solution gradually fades away . Why ?

A. blue colour of the solution turns green.

B. brown layer is deposited on iron rod .

C. no change occurs in the colour of the solution .

D. blue colour of the solution vanishes.

Answer: A

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

A. Y will oxidize X and not Z

B. Y will oxidize Z and not X

C. Y will oxidize both X and Z

D. Y will reduce both X and Z

Answer: A

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84. The E° for the following cell is +0.34 V. In(s)|In $(OH)_3(aq)||Sb_2^-(AQ)|Sb(s)$.

Using $E^{\circ} = -1.0V$ for the In $(OH)_3|$ In, couple, calculate E° for the $Sb_2^-|$Sb half-reaction:

A. -1.34

B. $+0.66$

C. $+0.82$

D. -0.66

Answer: D

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85. From the fllowing half-cell reactions and their standard potentials ,what is the smallest possible standard e.m.f for spontaneous reactions?

$PO_4^{3-}(aq) + 2H_2O(l) + 2e^- \rightarrow HPO_3^{2-} + 3OH^-(aq), E^{\circ} = -1.05V$

$PbO_2(s) + H_2O(l) + 2e^- \rightarrow PbO(s) + 2OH^-(aq), E^{\circ} = +0.28V$

A. $+0.00V$

B. $+0.74V$

C. $+0.56V$

D. $+0.28V$

Answer: D

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86. The nature of curve of E°_{cell} vs. log K_c is :

A. straight line

B. parabola

C. hyperbola

D. elliptical curve

Answer: A

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87. The equillibrium constant for thefollowing general reaction is 10^{30}. Calculate E° for the cell at 298 K.

$2X_2(s) + 3Y^{2+}(aq) \rightarrow 2X_2^{3+}(aq) + 3Y(s)$

A. $+0.105$ V

B. $+0.2955$ V

C. $0.0985V$

D. $-0.2955V$

Answer: B

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88. The E° at 25°C for the following reaction is 0.55 V. Calculate the ΔG° in kJ/mol :

$4BiO^{+}(aq) + 3N_2H_5^{+} \rightarrow 4Bi(s) + 3N_2(g) + 4H_2O(l) + 7H^{+}$

A. -637

B. -424

C. -106

D. -318.5

Answer: A

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89. Consider the following equation for an electrochemical cell reaction. Which of the following changes in condition will increase the cell voltage ?

$H_2(g) + PbCl_2(s) \rightarrow Pb(s) + 2HCl(aq)$

(I) addition of concentrated $HClO_4$ in the cell solution

(II) Increase the pressure of $H_2(g)$ (III) increase the amount of Pb

A. III

B. I and II

C. II and III

D. II

Answer: D

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90. The temperature coefficient of a cell whose operation is based on the reaction

$Pb(s) + HgCl_2(aq) \rightarrow PbCl_2(aq) + Hg(l)$ is :

$\left(\frac{dE}{dT}\right)_P = 1.5 \times 10^{-4} VK^{-1}$ at 298 K

The change in entropy (in J/k mol) during the operation is :

A. 8627

B. 57.9

C. 28.95

D. 14.475

Answer: C

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91. A fuel cell develops an electrical potential from the combustion of butane at 1 bar and 298 K

$C_4H_{10}(g) + 6.5O_2(g) \rightarrow 4CO_2(g) + 5H_2O(l),\ \triangle_r G^\circ = -2746kJ/mol$

what is E° of a cell?

A. $4.74V$

B. $0.547V$

C. $4.37V$

D. $1.09V$

Answer: D

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92. Given the following cell at $25^{\circ}C$

$$\text{Pt}\left|\begin{matrix}\text{H}_2\\(1\text{ atm})\end{matrix}\right|\left|\begin{matrix}\text{CH}_3\text{COOH}\\(10^{-3}\text{ M})\end{matrix}\right|\left|\begin{matrix}\text{NaOH}\\(10^{-3}\text{M})\end{matrix}\right|\left|\begin{matrix}\text{H}_2\\(1\text{ atm})\end{matrix}\right|\text{Pt.}$$

. What will be the potential of the cell ? Given pK_a of $CH_3COOH = 4.74$

A. -0.42 V

B. $0.42V$

C. $-0.19V$

D. $0.19V$

Answer: A

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93. The combustion of butane in O_2 at 1 bar and $298K$ shows a decrease in free energy equal to $2.95 \times 10^3 kJmol^{-1}$ in a fuel cell. K and E^{c-} of the fuel cell are

A. $9.55 \times 10^{482}, 1.096V$

B. $9.55, 1.096V$

C. $1.023 \times 10^{966}, 2.85V$

D. $5.5 \times 10^{484}, 0.55V$

Answer: A

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94. The emf of the cell,

$Zn|Zn^{2+}(0.01M)||Fe^{2+}(0.001M)|Fe$ at 298 K is 0.2905 V then the value of equilibrium constant for the cell reaction is :

A. $\frac{0.32}{e^{0.0295}}$

B. $\frac{0.32}{10^{0.0295}}$

C. $\frac{0.26}{10^{0.0295}}$

D. $\frac{0.32}{10^{0.0591}}$

Answer: B

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95. The specific conductance of a saturated solution of silver bromide is $kScm^{-1}$. The limiting ionic conductivity of Ag^{+} and Br^{-} ions are x and y respectively. The solubility of silver4 vromide in gL^{-1} is : (molar mass of AgBr=188)

A. $\frac{k \times 1000}{x - y}$

B. $\frac{k}{x + y} \times 188$

C. $\frac{k \times 1000 \times 188}{x + y}$

D. $\frac{x + y}{k} \times \frac{1000}{188}$

Answer: C

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96. Given the ionic conductance of $\underset{\underset{COO^{c-}}{|}}{COO^{c-}}$, $K^{\oplus}$, and $Na^{\oplus}$ are $74, 50,$ and $73 cm^2 ohm^{-1} eq^{-1}$, respectviley. The equivalent conductance at infinite dilution of the salt $\underset{\underset{COOK}{|}}{COONa}$ is

A. $197 cm^2 ohm^{-1} eq^{-1}$

B. $172 cm^2 ohm^{-1} eq^{-1}$

C. $135.5 cm^2 ohm^{-1} eq^{-1}$

D. $160.5 cm^2 ohm^{-1} eq^{-1}$

Answer: C

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97. During conductometric titration of 0. 1 MHCl with 1.0 M KOH, which is the correct observation ?

A. Resistance of the solution decreases upto equivalence point and them increases

B. Resistance increases upto equivalence point and then decreases.

C. Conductance increases upto equivalence point and then decreases.

D. Conductance decreases upto equivalence point and then becomes almost constant.

Answer: B

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98. What is the amount of chlorine evoled when 2 amperes of current is passed for 30 minumtes in an aqueous solution of $NaCI$?

A. 66 g

B. 1.32 g

C. 33 g

D. 99 g

Answer: B

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99. The specific conductance of a $0.1NKCl$ solution at $23^\circ C$ is $0.012ohm^{-1}cm^{-1}$. The resistance of cell containing the solution at the same tempreature was found to be $55ohm$. The cell constant will be

A. $0.142cm^{-1}$

B. $0.66cm^{-1}$

C. $0.918cm^{-1}$

D. $1.12cm^{-1}$

Answer: B

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100. $\lambda_{ClCH_2COONa} = 224 \text{ohm}^{-1} cm^2 \text{ gm eq}^{-1}$,

$\lambda_{NaCl} = 38.2 \text{ohm}^{-1} \text{cm}^2 gmeq^{-1}$.

$\lambda_{HCl} = 203 \text{ohm}^{-1} cm^2 \text{gm eq}^{-1}$.

What is the value of λ_{ClCH_2COOH} ?

A. $288.5 ohm^{-1} cm^2 geq^{-1}$

B. $289.\ 5 ohm^{-1} cm^2 geq^{-1}$

C. $388.8 ohm^{-1} cm^2 geq^{-1}$

D. $59.5 ohm^{-1} cm^2 geq^{-1}$

Answer: C

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101.

Electrolyte:	KCl	KNO_3	HCl	NaOAc	NaCl
Λ^{∞} ($S\ cm^2\ mol^{-1}$):	149.9	145	426.2	91	126.5

Calculate Λ^{∞}_{HOAc} using appropriate molar conductances of the electrolytes listed above at infinite dilution in H_2O at $25^{\circ} C$

A. 217.5

B. 390.7

C. 552.7

D. 517.2

Answer: B

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102. An aqueous solution containing $1M$ each of $Au^{3+}, Cu^{2+}, Ag^{+}, Li^{+}$ is being electrolysed by using inert electrodes. The value of standard potentials are :

$E^{\circ}_{Ag^{+}/Ag} = 0.80V, E^{\circ}_{Cu^{+}/Cu} = 0.34V$ and

$E^{\circ}_{Au^{+3}/Au} = 1.50, E^{\circ}_{Li^{+}/Li} = -3.03V$

will increasing voltage, the sequence of deposition of metals on the cathode will be :

A. Li , Cu , Ag , Au

B. Cu , Ag , Au

C. Au , Ag , Cu

D. Au , Ag , Cu , Li

Answer: C

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103. A 100.0mL dilute solution of Ag^{+} is electrolysed for 15.0 minutes with a current of 1.25mA and the silver is removed completely. What was the initial$[Ag^{=}]$?

A. 2.32×10^{-1}

B. 2.32×10^{-4}

C. 2.32×10^{-3}

D. 1.16×10^{-4}

Answer: D

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104. A 1 M solution of H_2SO_4 is electrolysed. Select correct statement in respect of products obtain at anode and cathode respectively:

Given : $2SO_4^{2-} \rightarrow S_2O_8^{2-} + 2e^-, E^\circ = -1.23V$

$H_2O(l) \rightarrow 2H^+(aq) + 1/2O_2(g) + 2e^-, E^\circ = -1.23V$

A. concentration of H_2SO_4 remain constant , H_2, O_2

B. concentration of H_2SO_4 increases , O_2, H_2

C. concentration of H_2SO_4 decreases , O_2, H_2

D. concentration of H_2SO_4 remains constant , $S_2O_8^{2-}$, H_2

Answer: B

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105. The value of standard hydrogen electrode potential is taken as zero, because -

A. there is no potential difference between the electrode and the solution .

B. hydrogen ions acquire electrons from a platinum electrode

C. it has been measured accurately.

D. it has been defined that way.

Answer: D

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106. Faraday's Law of Electrolysis

A. temperature is increased

B. inert electrode are used

C. a mixture of electrolytes is used

D. none of these cases

Answer: D

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107. Sodium is made by the electrolysis of a molten mixture of about $40\ \%$ NaCl and $60\ \%$ CaCl_(2)` because

A. $CaCl_2$ helps in conduction of electricity

B. this mixture has a lower melting point that NaCl

C. Ca^{2+} can displace Na from NaCl

D. Ca^{2+} can reduce NaCl to Na

Answer: B

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108. A lead storage battery containing 5.0 L of 1N H_2SO_4 solution is operated for 9.65×10^5 s with a steady current of 100 mA. Assuming volume of the solution remaining constant, normality of H_2SO_4 will

A. remain unchanged

B. increases by 0.20

C. increase by unity

D. decreases by 0.40

Answer: D

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