CHEMISTRY

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ELECTRO CHEMISTRY

Evaluation Textbook Questions Answers Choose The Correct Answer

1. The number of electrons that have a total charge of 9650 coulombs is :

A. 6.22×10^{23}

B. 6.022×10^{24}

C. 6.022×10^{22}

D. 6.022×10^{-34}

Answer: C

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2. Consider the following half cell reactions :

$$Mn^{2+} + 2e^- \rightarrow Mn \qquad E^0 = -1.18V$$
$$Mn^{2+} \rightarrow Mn^{3+} + e^- \qquad E^0 = -1.51V$$

The E^0 for the reaction $3Mn^{2+} \rightarrow Mn + 2Mn^{3+}$, and the possiblility of the forward reaction are respectively.

A. $2.69V$ and spontaneous

B. -2.69 and non spontaneous

C. $0.33V$ and Spontaneous

D. $4.18V$ and non spontaneous

Answer: B

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3. The button cell used is watches function as follows :

$$Zn(s) + Ag_2O(s) + H_2O(l) \Leftrightarrow 2Ag(s) + Zn^{2+}(aq) + 2OH(aq)$$

the half cell potentials are

$Ag_2O(s) + H_2O(l) + 2e^- \rightarrow 2Ag(s) + 2OH^-(aq) E^0 = 0.34V.$

The cell potential will be :

A. $0.84V$

B. $1.34V$

C. $1.10V$

D. $0.42V$

Answer: C

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4. The molar conductivity of a 0.5 mol dm^{-3} solution of $AgNO_3$ with electrolytic conductivity of $5.76 \times 10^{-3} \text{ S cm}^{-1}$ at 298 K is :

A. $2.88 Scm^2 mol^{-1}$

B. $11.52 Scm^2 mol^{-1}$

C. $0.086 Scm^2 mol^{-1}$

D. $28.8 Scm^2 mol^{-1}$

Answer: B

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5. Calculate $\wedge^0_{\mathrm{HOAC}}$ using appropriate molar conductances of the electrolytes listed below at infinite dilution in water at $25^\circ C$.

Electrolyte	KCl	KNO_3	HCl	$NaOAC$	$NaCl$
$\left(Scm^2 mol^{-1}\right)$	149.9	145.0	426.2	91.0	126.5

A. 517.2

B. 552.7

C. 390.7

D. 217.5

Answer: C

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6. Faradays constant is defined as :

A. charge carried by 1 electron

B. charge carried by one mole of electrons

C. charge required to deposit one mole of substance

D. charge carried by 6.22×10^{10} electrons.

Answer: B

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7. How many Faradays of eectricity are required for the following reaction to occur $MnO_4^- \rightarrow Mn^{2+}$?

A. $5F$

B. $3F$

C. $1F$

D. $7F$

Answer: A

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8. A current strength of 3.86A was passed through molten Calcium oxide for 41 minutes and 40 seconds . The mass of Calcium in grams deposited at the cathode is (atomic mass of Ca is 40g / mol and $1F = 96500C$) :

A. 4

B. 2

C. 8

D. 6

Answer: B

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9. During electrolysis of molten sodium chloride, the time required to produce 0.1 mol of chlorine gas using a current of 3A is :

A. 55 minutes

B. 107.2 minutes

C. 220 minutes

D. 330 minutes

Answer: B

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10. The number of electrons delivered at the cathode during electrolysis by a current of 1A in 60 seconds is (charge of electron = $1.6 \times 10^{-19} C$) :

A. 6.22×10^{23}

B. 6.022×10^{20}

C. 3.75×10^{20}

D. 7.48×10^{23}

Answer: C

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11. Which of the following electrolytic solution has the least specific conductance :

A. 2N

B. 0.002 N

C. 0.02 N

D. 0.2 N

Answer: B

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12. While charging lead storage battery :

A. $PbSO_4$ on cathode is reduced to Pb

B. $PbSO_4$ on anode is oxidised to PbO_2

C. $PbSO_4$ on anode is reduced to Pb

D. $PbSO_4$ on cathode is oxidised to Pb

Answer: C

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13. Among the following cells:

(I) Leclanche cell

(II) Nickel - Cadmium cell

(III) Lead storage battery

(IV) Mercury cell

Primary cells are :

A. I and IV

B. I and III

C. III and IV

D. II and III

Answer: A

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14. Zinc can be coated on iron to produce galvanized iron but the reverse in not possible .

It is because :

A. Zinc is lighter than iron

B. Zinc has lower melting point than iron

C. Zinc has lower negative electrode potential than iron

D. Zinc has higher negative electrode potential than iron

Answer: D

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15. Assertion : Pure iron when heated in dry air is converted with a layer of rust .

Reason : Rust has the composition Fe_3O_4

A. if both assertion and reason are true and season is the correct explanation of assertion .

B. if both assertion and reason are true but reason is not the correct explanation of assertion .

C. assertion is true but reason is false .

D. both assertion and reason are false .

Answer: D

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16. In $H_2 - O_2$ fuel cell the reaction occur at cathode is :

A. $O_2(g) + 2H_2O(1) + 4e^- \rightarrow 4OH^-(aq)$

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

C. $2H_2(g) + O_2(g) \rightarrow 2H_2O(g)$

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

Answer: A

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17. The equivalent conductance of $\frac{M}{36}$ solution of a weak monobasic acid is 6 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^{-6}

C. 1.25×10^{-4}

D. 6.25×10^{-5}

Answer: B

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18. A conductivity cell has been calibrated with a $0.01M$, $1:1$ electrolytic solution specific conductance $\left(k = 1.25 \times 10^{-3} Scm^{-1}\right)$ in the cell and the measured resistance was $800\Omega \quad \text{at} \quad 25^{\circ}C$. The cell constant is :

A. $10^{-1}cm^{-1}$

B. $10^{1}cm^{-1}$

C. $1cm^{-1}$

D. 5.7×10^{-12}

Answer: C

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19. Conductivity of a saturated solution of a sparingly solube salt AB ($1:1$ electrolyte) at 298 K is $1.85 \times 10^{-5} Sm^{-1}$.

$\left(\wedge_m^0 \right)_{AB} = 14 \times 10^{-3} Sm^2 mol^{-1}$.

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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20. In the electrochemical cell : $Zn|ZnSO_4(0.01M)||CuSO_4(1.0M)|Cu$, the emf of this Daniel cell is E_1 . When the concentration of $ZnSO_4$ is changed to $1.0M$ and that $CuSO_4$ changed to 0.01M, the emf changes to E_2. From the followings , which one is the relationship between E_1 and E_2 ?

A. $E_1 < E_2$

B. $E_1 > E_2$

C. $E_2 = 0 \uparrow E_1$

D. $E_1 = E_2$

Answer: B

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21. Consider the change in oxidation state of Bromine corresponding to different emf values as shown in the diagram below :

$BrO_4^- \xrightarrow{1.82V} BrO_3^- + \xrightarrow{1.5V} HBrO \xrightarrow{1.595V} Br_2 \xrightarrow{1.0652V} Br^-$.

Then the species undergoing disproportional is :

A. Br_2

B. BrO_4^-

C. BrO_3^-

D. $HBrO$

Answer: D

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22. For the cell reaction

$2Fe^{3+}(aq) + 2l^{-}(aq) \rightarrow 2Fe^{2+}(aq) + l_2(aq) E^0_{cell} = 0.24V$ at 298 K.

The standard Gibbs energy (Δ, G°) of the cell reactions is :

A. $-46.32KJmol^{-1}$

B. $-23.16KJmol^{-1}$

C. $46.32KJmol^{-1}$

D. $23.16KJmol^{-1}$

Answer: A

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23. A certain current liberated 0.504 gm of hydrogen in 2 hours. How many grams of copper can be liberted by the same current flowing for the same time in a copper sulphate solution :

A. 31.75

B. 15.8

C. 7.5

D. 63.5

Answer: B

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24. A gas X at 1 atm is bubble 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 oxidize X and not Z

B. Y will oxidize Z and X

C. Y will oxidize both X and Z

D. Y will reduce both X and Z

Answer: A

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25. Cell equation : $A + 2B^- \rightarrow A^{2+} + 2B, A^{2+} + 2e^- \rightarrow AE^0 = +0.3V$ and $\log_{10} K =$ at 300 K for cell reactions find E^0 for $B^{+1} + e^- \rightarrow B$.

A. 0.80

B. 1.26

C. -0.54

D. -10.94

Answer: A

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Evaluation Textbook Questions Answers Answer The Following Questions

1. Define anode and cathode .

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2. Why does conductivity of a solution increases on dilution of the solution ?

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3. State Kohlrausch Law. How is it useful to determine the molar conductivity of weak electrolyte at infinite dilution .

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4. Describe the electrolysis of molten NaCl using inert electrodes.

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5. State Faraday's Laws of electrolysis.

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6. Describe the construction of Daniel cell. Write the cell reaction .

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7. Why is anode in galvanic cell considered to be negative and cathode positive electrode ?

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8. The conductivity of a 0.01 M solution of a $1:1$ weak electrolyte at 298 K is $1.5 \times 10^{-4} Scm^{-1}$.

(i) molar conductivity of the solution .

(ii) degree of dissociation and the dissociation constant of the weak electrolyte.

Given that :

$\lambda^0_{\text{cation}} = 248.2 cm^2 mol^{-1}$

$\lambda^0_{\text{anion}} = 51.8 Scm^2 mol^{-1}$

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9. Which of 0.1 M HCl and 0.1 M KCl do you expect to have greater molar conductivity and why?

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10. Arrange the following solutions in the decreasing order of specific conductance.

(i)

$0.01MKCl$, $(ii)0.005MKCl$, $(iii)0.1MKCl$, $(iv)0.25MKCl$, $(v)0.5MKCl$

.

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11. Why is AC current used instead of DC in measuring the electrolytic conductance ?

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12. 0.1 M MaCl solution is placed in two different cells having cell constant 0.5 and $0.25cm^{-1}$ respectively. Which of the two will have greater value of specific conductance.

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13. A current of 1.608 A is passed through 250 mLn of 0.5 M solution of copper sulphate for 50 minutes. Calculate the strength of Cu^{2+} after electrolysis assuming volume to be constant and the current efficiency is 100% .

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14. Can Fe^{3+} oxidises bromide to bromine under standard conditions ?

Given: $E^0_{Fe^{3+}/Fe^{2+}} = 0.771$, $E^0_{Br_2/Br} = 1.09V$

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15. Is it possible to store copper sulphate in an iron vessel for a long time ?

Given : $E^0_{Cu^{2+}/Cu} = 0.34V$ and $E^0_{Fe^{3+}/Fe} = -0.44$V.

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16. Two metals M_1 and M_2 have reduction potential values of $-xV$ and $+yV$ respectively.

Which will liberate H_2 and H_2SO_4.

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17. Reduction potential of two metals M_1 and M_2 are $E^0_{M_1^{2+}/M_1} = -2.3V$ and $E^0_{M_1^{2+}/M_2} = 0.2V$.

Predict which one is better for coating the surface of iron . Given : $E^0_{Fe^{2+}/Fe} = -0.44V$.

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18. Calculate the standard emf of the cell : $Cd|Cd^{2+}||Cu^{2+}|Cu$ are 0.34 V and -0.40 volts respectively. Predict the feasibility of the cell reaction .

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19. In fuel cell H_2 and O_2 react to produce electricity. In this process, H_2 gas is oxidised at the anode and O_2 at cathode . If 44.8 litre of H_2 at $25^\circ C$ and also pressure reacts in 10 minutes, what is average current produced ? If the entire curretn is used for electro deposition of Cu from Cu^{2+} , how many grams of Cu deposited ?

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20. The same amount of electricity was passed through two separate electrolytic cells containing solutions of nickel nitrate and chromium nitrate respectively. If 2.935 g of Ni was deposited in the first cell. The amount of Cr depsoited in the another cell ? Given: molar mass of Nickel and chromium are 58.74 and $52gm^{-1}$ respectively.

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21. 0.1 M copper sulphate solution in which copper electrode is dipped at $25^\circ C$. Calculate the electrode potential of copper .

$\left[\text{Given }, E^0_{Cu^{2+}/Cu} = 0.34V\right]$.

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22. For the cell $Mg(s)\left|Mg^{2+}(aq)\right|\left|Ag^{+}(aq)\right|Ag(s)$, calculate the equilibrium constant at $25^\circ C$ and maximum work that can be obtained during operation of cell . Given : $E^0_{Mg^{2+}/Mg} = -237V$ and $E^0_{Ag^{2+}/Ag} = 0.80V$.

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23. 8.2×10^{12} litres of water is available in a lake. A power reactor using the electrolysis of water in the lake produces electricity at the rate of $2 \times 10^6 Cs^{-1}$ at an appropriate voltage. How many years would it like to completely electrolyse the water in the lake. Assume that there is no loss of water except due to electrolysis.

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24. Derive an expression for Nernst equation.

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25. Write a note on sacrificial protection .

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26. Explain the function of $H_2 - O_2$ fuel cell.

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27. Ionic conductance at infinite dilution of Al^{3+} and SO_4^{2-} are 189 and 160 mho cm^2 equiv^{-1}. Calculate the equivalent and molar conductance of the electrolyte $Al_2(SO_4)_3$ at infinite dilution.

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Other Important Questions Answers I Choose The Correct Answer

1. In the electrolytic cell, flow of electrons is from :

A. cathode to annode in solution

B. cathode to anode through external supply

C. cathode to anode through internal supply

D. anode to cathode through internal supply

Answer: b

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2. Which of the statements about solutions of electrolytes in not correct ?

A. conductivity of solution depends upon size of ions.

B. conductivity depends upon viscosity of solution .

C. conductivity does not depend upon solvation of ions present in solution.

D. conductivity of solution increases with temperature.

Answer: c

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3. A dilute solution of Na_2SO_4 is electrolysed using platinum electrodes.

A. O_2 and H_2

B. SO_2, Na

C. O_2, Na

D. $S_2O_8^{2-}, H_2$

Answer: a

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4. The quantity of charge required to obtain one mole of aluminium from Al_2O_3 is :

A. $1F$

B. $6F$

C. $3F$

D. $2F$

Answer: c

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5. Electrolysis of dilute aqueous solution of NaCl solution was carried out by passing 10 milliampere curent. The time required to liberate 0.01 mole of H_2 gas at the cathode is (1 Faraday = $96500Cmol^{-1}$):

A. 9.65×10^4 sec

B. 19.3×10^4 sec

C. 28.95×10^4 sec

D. 36.6×10^4 sec

Answer: b

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6. 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. At mass of $Al = 27 \ \ \mathrm{g\ mol^{-1}}$):

A. 8.1×10^4 g

B. 2.4×10^5 g

C. 1.3×10^4 g

D. 9.0×10^3 g

Answer: a

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7. What current is to be passed for 0.02 A for deposition of a certain weight of metal which is equal to electrochemical equivalent?

A. $4A$

B. $100A$

C. $200A$

D. $2A$

Answer: a

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8. A certain current liberates 0.504 g of hydrogen in 2 hours. How many grams of oxygen can be liberated by the same currect in the same time ?

A. 2.0 g

B. 0.4 g

C. 4.0 g

D. 8.0 g

Answer: c

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

A. $6250 Sm^2 mol^{-1}$

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

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

D. $62.5 Sm^2 mol^{-1}$

Answer: b

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

A. increase in number of ions

B. increase in ionic mobility

C. 100% dissociation of electrolyte at normal dilution

D. increase in both i.e., number of ion and ionic mobility of ion.

Answer: b

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11. In the electrolysis of which solution, OH^- ions are discharged in preference to Cl^- ions?

A. dilute NaCl

B. very dilute NaCl

C. fused NaCl

D. solid NaCl

Answer: b

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12. The charge in coulombs on 1 g ion of N^{-3} is :

A. $28.9 \times 10^5 C$

B. $2.89 \times 10^5 C$

C. $2980 C$

D. $28900 C$

Answer: b

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13. A solution of copper sulphate is electrolysed for 10 minutes with a current of 1.5amperes. The mass of copper deposited at cathode is : (atomic mass of $Cu = 63.5gmol^{-1}$)

A. 29.6g

B. 0.296g

C. 2.96 g

D. 1.564 g

Answer: b

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14. The limiting molar conductance of HCl, CH_3COONa and NaCl are respectively 425, 90 and 125 mho cm^2mol^{-1} at $25^\circ C$. The molar conductivity of $0.1MCH_3COOH$ solution is $7.8mhocm^2mol^{-1}$ at the same temperature.

The degree of dissociation of 0.1 M acetic acid at this temperature is :

A. 0.1

B. 0.02

C. 0.15

D. 0.03

Answer: b

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15. Degree of dissociation of pure water is 1.9×10^{-9} . Molar conductances of H^+ and OH^- ions at infinite dilution are 200 S $cm^2 mol^{-1}$ and $350 Scm^2 mol^{-1}$ respectively.

A. $3.8 \times 10^{-7} Scm^2 mol^{-1}$

B. $5.7 \times 10^{-7} Scm^2 mol^{-1}$

C. $9.5 \times 10^{-7} Scm^2 mol^{-1}$

D. $1.045 \times 10^{-6} Scm^2 mol^{-1}$

Answer: b

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16. When measured against a standard calomel electrode, an electrode is found to have a standard reduction potential of calomel electrode is 0.244 V, the standard reduction potential of the same electrode against standard hydrogen electrode will be :

A. -0.144 V

B. $+0.100$ V

C. -0.344 V

D. -0.100 V

Answer: b

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17. On the basis of the following E^0 values, the strongest oxidising agnet is :

$\left[Fe(CN)_4\right]^{4-} \rightarrow \left[Fe(CN)_6\right]^{3-} + e, E^0 = -0.35V$

$Fe^{2+} \rightarrow Fe^{3+} + e \quad E^0 = -0.77V$

A. $\left[Fe(CN)_6\right]^{4-}$

B. Fe^{2+}

C. Fe^{3+}

D. $\left[Fe(CN)_6\right]^{3-}$

Answer: c

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18. Standard electrode potentials for Sn^{4+}/Sn^{2+} couple is $+0.15V$ and that for Cr^{3+}/Cr couple is $-0.74V$. These two couples in their standard states are connected to make a cell. The cell potential will be :

A. $+1.83V$

B. $+1.19V$

C. $+0.89V$

D. $+0.18V$

Answer: c

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19. $Cr_2O_7^{2-} + I^- \rightarrow I_2 + Cr^{3+}$,

Given $E^0_{\text{cell}} = 0.79V$, $E^0_{Cr_2O_7^{2-}/Cr^{3+}} = 1.33V$, $E^0_{I_2/I^-} = ?$

A. $0.54V$

B. $-0.54V$

C. $+0.18V$

D. $-0.18V$

Answer: a

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20. Given the standard electrode potentials

$K^+/K = -2.93V$, $Ag^+/Ag = 0.80V$,

$Mg_2^{2+}/Hg = 0.79$, $Mg^{2+}/Mg = -2.37V$,

$Cr^{2+}/Cr = -0.74V$.

Arrange these metals in their increasing order of reducing power .

A. $Ag < Hg < Cr < Mg < K$

B. $K < Mg < Cr < Hg < Ag$

C. $Hg < Cr < Mg < K < Ag$

D. $Mg < Cr < Hg < Ag < K$

Answer: a

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

A. $pH_2 = 1 \text{ atm and } [H^+] = 1.0M$

B. $pH_2 = 2 \text{ atm and } [H^+] = 1.0M$

C. $pH_2 = 2 \text{ atm and } [H^+] = 2.0M$

D. $pH_2 = 1 \text{ atm and } [H^+] = 2.0M$

Answer: b

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22. $2Hg \rightarrow Hg^{2+}, E^0 = 0.855V$

$Hg \rightarrow Hg^{2+}, E^0 = 0.799V$

Equibrium constant for the reaction

$Hg + Hg^{2+} \Leftrightarrow Hg_2^{2+} \text{ at } 27^\circ C$ is :

A. 89

B. 82.3

C. 79

D. none of these

Answer: c

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23. Standard free energies of formation of (in $KJmol^{-1}$) at 298 K are $-237.3, -394.2$ and -8.2 for $H_2O(l), CO_2(g)$ and pentane (g) respectively . The value of E^0_{cell} for the pentane - oxygen fuel cell is :

A. $1.968V$

B. $2.0968V$

C. $1.0968V$

D. $0.968V$

Answer: c

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Other Important Questions Answers Ii Answer The Following Questions

1. Define the following terms :

Resistivity .

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2. Define the following terms :

conductivity.

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3. Define the following terms :

cell constant .

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4. Define the following terms :

specific conductance .

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5. Define the following terms :

molar conductivity .

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6. Define the following terms :

equivalent conductance.

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7. Give the relationship between resistance and specific resistance of an electrolytic conductor.

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8. Mention the units of (i) resistance, (ii) specific resistance, (iii) conductance, (iv) specific conductance, (v) molar conductance and (vi) equivalent conductance.

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9. Give the relationship between molar conductance and specific conductance of an electrolyte.

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10. Give the relationship between equivalent conductance and specific conductance of an electrolyte.

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11. Mention the factors which influence the electrolytic conductance.

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12. Explain how does the molar conductance of the electrolytes vary with concentration of the electrolyte.

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13. How much charge is required for the following reactions ?

1 mole of $Al^{3+} \quad \text{to} \quad Al$

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14. How much charge is required for the following reactions ?

1 mole of $Cu^{2+} \quad \text{to} \quad Cu$

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15. How much charge is required for the following reactions ?

1 mole of MnO_4^- to Mn^{2+}

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16. A solution of $CuSO_4$ is electrolysed for 10 minutes with a currect of 1.5 amperes. What mass of copper deposited at the cathode ?

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17. How many hours does it take to reduce 3 mole of Fe^{3+} to Fe^{2+} .

With 2 ampere of current ?

($F = 96500$ coulomb)

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18. In an electrolysis experiment, a current was passed for 5 hours through two cells connected in series. The first cell contains a solution of gold salt and the second cell contains copper sulphate solution .

If the oxidation number of gold is $+3$, find the amount of copper deposited on the cathode in the second cell. Also calculate the magnitude of the current in amperes.

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19. Specific conductance of a decinormal solution of KCl is $0.00112 ohm^{-1} cm^{-1}$. The resistance of a cell containing the solution was found to be 56 ohm. What is the value of cell constant ?

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20. 1.0 N solution of salt surrounding two platinum electrodes 2.1 cm apart and 4.2 sq. cm in area was found to offer a resistance of 50 ohm. Calculate the equivalent conductivity of the solution .

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21. The specific conductivity of 0.02 M KCl solution at $25^{\circ}C$ is $2.768 \times 10^{-3} ohm^{-1} cm^{-1}$ The resistance of this solution at $25^{\circ}C$ when measured with a particular cell was 250.2 ohm. The resistacne of $0.01 MCuSO_4$ solution at $25^{\circ}C$ measured with the same cell was 8331 ohm. Calculate the molar conductivity of the copper sulphate solution .

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22. At 291 K, the molar conductivities at infinite dilution of NH_4Cl, NH_4OH and $NaCl$ are $129.8, 217$ and $108.9 Scm^2$ respectively. If the molar conductivity of a centinormal solution of NH_4OH is $9.33 Scm^2$, what is the percentage dissociation of NH_4OH at this dilution . Also calculate the dissociation constant of NH_4OH.

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23. The conductivity of a saturated solution of AgCl at 288 K is found to be $1.382 \times 10^{-6} Scm^{-1}$. Find its solubility . Given ionic conductances of Ag^{+} and Cl^{-} ion at infinite dilution are $61.9 Scm^{2} mol^{-1}$ and $76.3 cm^{2} mol^{-1}$ respectively.

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24. Define

electrode potential .

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25. Define

emf of a cell .

View Text Solution

26. Explain the terms

oxidation potential .

View Text Solution

27. Explain the terms

reduction potential of an electrode.

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28. What is reference electrode ? Mention its use .

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29. Mention the characteristics of electrode chemical series.

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30. Given the standard reduction potentials

$E^0_{K^+/K} = -2.93V, E^0_{Ag^+/Ag} = +0.80V,$

$E^0_{Hg^{2+}/Hg} = +0.79V, E^0_{Mg^{2+}/Mg} = -2.73V,$

$E^0_{Cr^{3+}/Cr} = -0.74\,\text{V},$

Arrange these metals in their increasing order of reducing character.

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31. Write down the electrode reactions and the net cell reaction for the following cells. Which electrode would be the positive terminal in each cell .

$Zn\left|Zn^{2+}\right| \mid Br^-, Br_2, Pt$

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32. Write down the electrode reactions and the net cell reaction for the following cells. Which electrode would be the positive terminal in each

cell .

$Cr|Cr^{3+}||I^-, I_2|Pt$

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33. Write down the electrode reactions and the net cell reaction for the following cells. Which electrode would be the positive terminal in each cell .

$Pt|H_2, H^+||Cu^{2+}|Cu$

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34. Write down the electrode reactions and the net cell reaction for the following cells. Which electrode would be the positive terminal in each cell .

$Cd|Cd^{2+}||Cl^-, AgCl|Ag$

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35. The standard EMF of the cell :

$Ni\left|N_1^{2+}\right|\left|Cu^{2+}\right|Cu$ is $0.59V$. The standard reduction potential of copper electrode is $0.34V$. Calculate the standard reduction potential of nickel electrode.

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36. A cell is set up between copper and silver electrodes as $Cu\left|Cu^{2+}\right| \mid Ag^{+}\left|Ag.\right.$

Given : $E^0_{Cu^{2+}/Cu} = 0.34V$, $E^0_{Ag^{+}/Ag} = 0.80V$.

Calculate the emf of the cell .

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37. Two half cells are $Al^{3+} \mid Al$ and $Mg^{2+}\left|Mg.\right.$ The reduction potentials of these half cells are -1.66 and $-2.36V$. Construct the galvanic cell, write the cell reaction and calculate the emf of the cell.

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38. A cell is prepared by dipping a copper rod in$1MCuSO_4$ solution and a nickel rod in 1M $NiSO_4$ solution. The standard reduction potentials of copper and nickel electrodes are $0.34V \quad \text{and} \quad -0.25V$ respectively. How will you represent the cell ?

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39. A cell is prepared by dipping a copper rod in $1MCuSO_4$ solution and a nickel rod in 1M $NiSO_4$ solution. The standard reduction potentials of copper and nickel electrodes are $0.34V \quad \text{and} \quad -0.25V$ respectively. What will be the cell reaction ?

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40. A cell is prepared by dipping a copper rod in$1MCuSO_4$ solution and a nickel rod in 1M $NiSO_4$ solution. The standard reduction potentials of

copper and nickel electrodes are $0.34V$ and $-0.25V$ respectively.

What will be the standard emf of the cell ?

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41. A cell is prepared by dipping a copper rod in $1MCuSO_4$ solution and a nickel rod in 1M $NiSO_4$ solution. The standard reduction potentials of copper and nickel electrodes are $0.34V$ and $-0.25V$ respectively.

Which electrode will be positive ?

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42. Predict whether zinc and silver react with 1 M H_2SO_4 to give hydrogen gas or not. Given the standard reduction potentials of zinc and silver electrodes are -0.76 and 0.80V respectively.

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43. Can a nickel spatula be used to stir a solution of copper sulphate . Support your anser with a reason.

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44. Can a solution of 1 M copper sulphate be stored in a vesel made of nickel.

Given: $E^0_{Ni^{2+}/Ni} = -0.25V$,

$E^0_{Cu^{2+}/Cu} = -0.34V$

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45. Give the relationship between the electrode potential and the concentration of the electrode.

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46. For a general reactions

$aA + bB \overset{\neq}{\longrightarrow} xX + yY$. Write the Nernst equation .

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47. Calculate the electrode potential of copper electrode, when a copper wire is dipped in $0.1MCuSO_4$ solution $E^0_{Cu^{2+}/Cu} = 0.34$.

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48. The following reaction takes place in a galvanic cell .

$Mg(s) + 2Ag^{-1}(0.00001M) \rightarrow Mg^{2+}(0.130M) + 2Ag(s)$

Calculate the emf of the cell.

Given $E^0_{Mg^{2+}/Mg} = -2.37V$ and $E^0_{Ag^{+}/Ag} = 0.80V$.

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49. Give the relationship between the free energy charge of the cell reaction and emf of the cell.

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50. Give the relationship between the free energy charge for the cell reaction and equilibrium constant.

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51. Calculate the standard free energy change and maximum work obainable by a galvanic cell, where the cell reaction

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

Given : $E^0_{Zn^{2+}/Zn} = -0.76V,$

$E^0_{Cu^{2+}/Cu} = 0.34V, F = 96500C$

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52. Also calculate the equilibrium constant for the reaction .

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53. Describe the nature of anode, cathode, the cell reaction , and salient features of Leclanche cell .

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54. Describe the nature of anode, cathode the cell reaction and salient features of mercury button cell .

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55. Explain the functioning of lead storage batteries.

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56. Explain the chemical reaction involved in the process of charging and recharging in lead storage battery .

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57. Discuss the nature of the anode, cathode and the cell reaction of Lithium ion battery . How does it act as a secondary cell ?

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58. Mention the various methods of protecting metals from corrosion.

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