CHEMISTRY

BOOKS - SURA CHEMISTRY (TAMIL ENGLISH)

ELECTRO CHEMISTRY

Evaluation 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 :

$Mn^{2+} + 2e^- \rightarrow MnE^o = -1.18V$

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

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

A. 2.69V and spontaneous

B. -2.69V 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 in 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

$$Ag_2O(s) + H_2O(l) + 2e^- \rightarrow 2Ag(s) + 2OH^-(aq)$$

$E^o = 0.34V$. 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 5.76×10^{-3} S cm^{-1} at 298 K is

A. 2.88 S cm^2mol^{-1}

B. 11.52 S cm^2mol^{-1}

C. 0.086 S cm^2mol^{-1}

D. 28.8 S cm^2mol^{-1}

Answer: B

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5. 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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6. How many faradays of elecricity 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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7. A current strength of 3.86 A 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 40 g / mol and 1F = 96500C).

A. 4

B. 2

C. 8

D. 6

Answer: B

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8. 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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9. 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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10. Which of the following electrolytic solution has the least specific conductance

A. 2N

B. 0.002N

C. 0.02N

D. 0.2N

Answer: B

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11. While charging lead storage battery

A. $PbSO_4$ on cathode is reduced to Pb

B. $PbSO_4$ on cathode 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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12. 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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13. Zinc can be coated on iron to produce galvanized iron but the reverse is 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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14. 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 reason 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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15. In $H_2 - O_2$ fuel cell the reaction occur at cathode is

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

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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16. The equivalent conductance of $\frac{M}{36}$ solution of a weak monobasic acid is 6 mho cm^2 equivalent^{-1} and at infinite dilution is 400 mho cm^2 equivalent^{-1}. 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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17. A conductivity cell has been calibrated with a 0.01M, 1:1 electrolytic solution (specific conductance $\left(\kappa = 1.25 \times 10^{-3} \quad S \quad cm^{-1}\right)$ in the cell and the measured resistance was 800Ω at $25^\circ C$. The cell constant is,

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

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

C. $1 cm^{-1}$

D. 5.7×10^{-12}

Answer: C

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

$298K(\wedge_m^{\circ})_{AB} = 14 \times 10^{-3} S \quad m^2 mol^{-1}$.

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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19. 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 1.0 M 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. $E_2 = 0 \geq E_1$

D. $E_1 = E_2$

Answer: B

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20. 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_4^3

D. HBrO

Answer: D

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21. For the cell reaction

$2Fe^{3+}(aq) + 21^-(aq) \rightarrow 2Fe^{2+}(aq) + 1_2(aq) E^\circ_{cell} = 0.24V$ at 298 K. The standard Gibbs energy (Δ, G°) of the cell reactions is :

A. $-46.32 \text{ KJ } mol^{-1}$

B. $-23.16 \quad \mathrm{KJ} \quad mol^{-1}$

C. $46.32 \quad \mathrm{KJ} \quad mol^{-1}$

D. $23.16 \quad \mathrm{KJ} \quad mol^{-1}$

Answer: A

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22. A certain current liberated 0.504 gm of hydrogen in 2 hours. How many grams of copper can be liberated 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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23. 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 not X

C. Y will oxidize both X and Z

D. Y will reduce both X and Z

Answer: A

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24. Cell equation : $A + 2B^- \rightarrow A^{2+} + 2B, A^{2+} + 2e^- \rightarrow A \quad E^\circ = +0.34V$ and $\log_{10} K$ at 300 K for cell reactions find E° for $B^+ + e^- \rightarrow B$

A. 0.80

B. 1.26

C. -0.54

D. -10.94

Answer: A

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Evaluation Short Answer Questions

1. Define anode and cathode.

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2. Why does conductivity of a solution decrease on dilution on 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 1.5×10^{-4} S cm^{-1}.

i) molar conductivity of the solution

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

Given that

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

$\lambda^{\circ}_{\text{anion}} = 51.8$ S $cm^2 mol^{-1}$

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9. Which of 0.1 M HCl and 0.1 M KCl do you expect to have greater $\wedge^{0}_{m}$ and why?

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

i) 0.01 M KCl ii) 0.005 M KCl

iii) 0.1 M KCl iv) 0.25 M KCl

v) 0.5 M KCl

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

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13. A current of 1.608A is passed through 250 mL 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 : $E^{\circ}_{Fe^{3+}|Fe^{3+}} = 0.771$

$E^{\circ}_{Br_2|Br^-} = 1.09V$

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

Given : $E^{\circ}_{Cu^{2+}|Cu} = 0.34V$ and $E_{Fe^{2+}|Fe} = -0.44V$

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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 $E^{\circ}_{M_1^{2+}|M_1} = 2.3V$ and $E^{\circ}_{M_1^{2+}|M_2} = 0.2V$ Predict which one is better for coating the surface of iron. Given : $E^{\circ}_{Fe^{3+}|Fe} = -0.44V$

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18. Calculate the standard emf of the cell: $Cd|Cd^{2+}||Cu^{2+}|Cu$ and determine the cell reaction. The standard reduction potentials of $Cu^{2+}|Cu$ and $Cd^{2+}|Cd$u are 0.34V 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 the 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 current is used for electro deposition of Cu from Cu^{2+}, how many grams of Cu deposited?

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20. The same amont 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 deposited in the another cell? Give : molar mass of Nickel and chromium are 58.74 and 52 gm^{-1} respectively.

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

$\left[\text{Given}: E^\circ_{Cu^{2+}|Cu} = 0.34\right]$

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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 :

$E^\circ_{Mg^{2+}|Mg} = -237V$ and $E^\circ_{Ag^{2+}|Ag} = 0.80V$

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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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Evaluate Yourself

1. Calculate the molar conductance of 0.01M aqueous KCl solution at $25^\circ C$. The specific conductance of KCl at $25^\circ C$ is $14.114 \times 10^{-2} Sm^{-1}$.

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2. The resistance of 0.15 M solution of an electrolyte is 50Ω. The specific conductance of the solution is 2.4 Sm^{-1}. The resistance of 0.5 N solution of the same electrolyte measured using the same conductivity cell is 480Ω. Find the equivalent conductivity of 0.5 N solution of the electrolyte.

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3. The emf of the following cell at $25^{\circ}C$ is equal to 0.34 V. Calculate the reduction potential of copper electrode.

$Pt(s)\left|H_2(g, 1atm)\right| H^+(aq, 1M)\left|\left|Cu^{2+}(aq, 1M)\right|Cu(s)\right.$

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4. Using the calculated emf value of zinc and copper electrode, calculate the emf of the following cell at $25^{\circ}C$.

$Zn(s)\left|Zn^{2+}(aq, 1M)\right|\left|Cu^{2+}(aq, 1M)\right|Cu(s)$

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5. Write the overall rendox reaction which takes place in the galvanic cell,

$Pt(s)\left|Fe^{2+}(aq), Fe^{3+}(aq)\right|\left|MnO_4^-(aq), H^+(aq), Mn^{2+}(aq)\right|Pt(s)$

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6. The electrochemical cell reaction of the Daniel cell is

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

What is the change in the cell voltage on increasing the ion concentration in the anode compartment by a factor 10?

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7. A solution of a salt of metal was electrolysed for 15 minutes with a current of 0.15 amperes. The mass of the metal deposited at the cathode is 0.783 g. Calculate the equivalent mass of the metal.

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Additional Question And Answers Choose The Correct Answer

1. Which one of the following solution has highest equivalent conductance?

A. 0.1 M NaCl

B. 0.05 M NaCl

C. 0.005 M NaCl

D. 0.25 M NaCl

Answer: C

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2. Pick out the correct statement regarding resistance of an electrolytic solution

A. It is inversely proportional to the length (l)

B. It is inversely proportional to the cross sectional area (A)

C. It is directly proportional to the cross sectional area (A)

D. Resistivity is denoted by ρ (rho)

Answer: B

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3. Which among the folJowing is the strongest reducing agent?

A. F_2

B. Cl_2

C. Zn

D. Li

Answer: D

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4. Which of the statements about electrolytic conductance is not true?

A. Conductivity increases with decrease in viscosity.

B. Higher dielectric constant shows lower conductance in solution.

C. Temperature increases, conductance also increases.

D. Molar conductance increases with increase in dilution.

Answer: B

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5. A device in which spontaneous chemical reaction generates electric current.

A. Galvanic cell

B. Voltanic cell

C. Daniel cell

D. All of the above

Answer: D

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6. Kohlraush's law is applied to calculate

A. molar conductance at infinite dilution of a weak electrolyte

B. degree of dissociation of weak electrolyte

C. solubility of a sparingly soluble salt

D. all of the above

Answer: D

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7. The limiting molar conductivities of HCl, CH_3COONa and NaCl are respective 425, 190 and 150 mho cm^2mol^{-1} at $25^\circ C$. The molar conductivity of 0.1 M acetic acid is 9.2 mho cm^2mol^{-1}. The degree of dissociation of 0.1 M acetic acid is

A. 0.10

B. 0.02

C. 0.19

D. 0.03

Answer: C

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8. Using the data given below find out the strongest reducing agent

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

$E^{\circ}_{MnO_4^-}/Mn^{2+} = 1.51V, E^{\circ}_{Cr^{3+}/Cr} = -0.74V$

A. Cr

B. Cr^{3+}

C. Cl^-

D. Mn^{2+}

Answer: A

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9. Recharging of lead storage battery involves

A. anode is reduced to pb

B. cathode is reduced to pb

C. cathode is oxidised to pb

D. anode is oxidised to pbO_2

Answer: A

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10. The laws of electrolysis were enunciated first by

A. Dalton

B. Faraday

C. Kekule

D. Avogadro

Answer: B

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11. What happens during the electrolysis of molten sodium chloride?

A. Cl_2 is released at the cathode

B. Liquid sodium is obtained at the anode

C. The emf of the overall reaction is -4.07 V

D. Both (a) and (b)

Answer: C

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12. For the given cell

$Cr_{(s)}\left|Cr^{3+}_{(aq)}\right|\left|Cu^{2+}_{(aq)}\right|Cu_{(s)}$ which is correct?

A. Cr is the anode

B. Cu is the anode

C. Overall cell reaction is

$$2Cr^{3+}_{(aq)} + 3Cu_{(s)} \rightarrow 2Cr_{(s)} \rightarrow 2Cr_{(s)} + 3Cu^{2+}_{(aq)}$$

D. Both (b) and (c)

Answer: A

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13. When one coulomb of electricity is passed through an electrolytic solution, the mass deposited on the electrode is equal to

A. equivalent weight

B. molecular weight

C. electrochemical equivalent

D. one gram

Answer: C

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14. Faraday's laws of electrolysis are related to

A. atomic number of the cation

B. atomic number of the anion

C. equivalent weight of the electrolyte

D. speed of the cation

Answer: C

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15. The specific conductance of a 0.01 M solution of KCl is $0.0014\ \text{ohm}^{-1}\ \ \text{cm}^{-1}$ at $25^\circ C$. Its equivalent conductance is .....

A. $14 \quad ohm^{-1}cm^2eq^{-1}$

B. $140 \quad ohm^{-1}cm^2eq^{-1}$

C. $1.4 \quad ohm^{-1}cm^2eq^{-1}$

D. $0.40 \quad ohm^{-1}cm^2eq^{-1}$

Answer: B

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16. When sodium acetate is added to acetic acid, the degree of ionisation of acetic acid

A. increases

B. decreases

C. does not change

D. becomes zero

Answer: B

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17. The equivalent conductivity of CH_3COOH at $25^\circ C$ is 80 $ohm^{-1}cm^2eq^{-1}$ and at infinite dilution 400 $ohm^{-1}cm^2eq^{-1}$. The degree of dissociation of CH_3COOH is

A. 1

B. 0.2

C. 0.1

D. 0.3

Answer: B

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18. NH_4OH is a weak base because

A. it has low vapour pressure

B. it is only partially ionised

C. it is completely ionised

D. it has low density

Answer: B

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19. $\lambda_c = \mu_c$ for,

A. NaCl

B. H_2SO_4

C. Na_2SO_4

D. $Al_2(SO_4)_3$

Answer: A

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20. An example for 1:1 electrolyte is

A. H_2SO_4

B. Na_2SO_4

C. NaCl

D. $Al_2(SO_4)_3$

Answer: C

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21. The important use of Kohlrausch's law is deducing the

A. λ_∞ value of weak electrolyte.

B. λ_∞ value of strong electrolyte.

C. λ_C value of weak electrolyte.

D. λ_C value of weak electrolyte.

Answer: A

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22. According to Faradays's first law m = ZIt, where Z is

A. reaction quotient

B. effective nuclear charge

C. atomic number

D. electrochemical equivalent

Answer: D

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23. Ohm's law is mathematically expressed as

A. $I = \frac{V}{R}$

B. $I = \frac{R}{V}$

C. $V = \frac{I}{R}$

D. $R = \frac{I}{V}$

Answer: A

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24. 1 mho is equal to

A. 1 siemen

B. 1 second

C. 1 ohm

D. none of the above

Answer: A

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25. Which among the following has same equivalent and molar conductance

A. H_2SO_4

B. CH_3COOH

C. $NaCl$

D. Na_2SO_4

Answer: C

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26. When λ_c decreases linearly with increase in $\sqrt{C}$, then it is

A. an insulator

B. a semiconductor

C. a weak electrolyte

D. a strong electrolyte

Answer: D

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27. Debye, Huckel and Onsager equation for strong electrolytes is $\lambda_c = \lambda_\infty (A + B\lambda_\infty)\sqrt{C}$. The slope value is

A. λ_∞

B. $(A + B\lambda_\infty)$

C. A

D. $\sqrt{C}$

Answer: B

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28. Ionic conductance at infinite dilution of Al^{3+} and SO_4^{2-} are 1890 $ohm^{-1}cm^2gm$ equiv^{-1} and 1600$ohm^{-1}cm^2gm$ equiv^{-1} respectively.

The equivalent conductance is

A. 143 mho $cm^2 gm \quad \text{equiv}^{-1}$

B. 858mho $cm^2 gm \quad equir^{-1}$

C. 153 mho $cm^2 gm \quad \text{equiv}^{-1}$

D. 341mho $cm^2 gm \quad equir^{-1}$

Answer: A

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29. If 0.2 ampere can deposit 0.1978 g of copper in 50 minutes, how much of copper will be deposited by 600 coulombs?

A. 19.78 g

B. 1.978 g

C. 0.1978 g

D. 197.8 g

Answer: C

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30. The potential of a single electrode is a half cell is called the

A. Reduction potential

B. Half-wave potential

C. Single electrode potential

D. Cell potential

Answer: C

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31. The relationship between free energy change and emf of a cell is

A. $\Delta G = -nFE$

B. $\Delta H = -nFE$

C. $\Delta E = -nFG$

D. $\Delta F = -nFG$

Answer: A

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32. The feasibility of a redox reaction can be predicted with the help of

A. Electronegativity

B. Electrochemical series

C. Electron affinity

D. Equivalent conductance

Answer: B

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33. The metals near the bottom of the electro chemicals series are

A. strong reducing agents

B. strong oxidising agents

C. weak reducing agents

D. weak oxidising agents

Answer: A

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34. The emf of a cell with 1 M solutions of reactants and products in solution at $25^{\circ} C$ is called

A. Half cell potential

B. standard emf

C. Single electrode potential

D. Redox potential

Answer: B

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35. The relationship between equilibrium constant and standard emf of a cell is

A. $E^\circ = 0.0591$ log K

B. $0.0591E^\circ = \log K$

C. $nE^\circ = 0.0951 \log K$

D. $nE^\circ = 0.0591 \log K$

Answer: D

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36. Calculate the standard emf of the cell, provided the standard reduction potentials of cathode and anode are -0.763 V and 0.80 V.

A. -1.563 V

B. 0.037V

C. $-0.610V$

D. None of these

Answer: A

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37. How will you predict whether a reaction is not feasible?

A. $E^{\circ}_{\text{cell}} = -ve$

B. $E^{\circ}_{\text{cell}} = +ve$

C. $E^{\circ}_{\text{cell}} = 0$

D. both (a) and (c)

Answer: A

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38. The condition to obtain standard emf is

A. 1M solution of reactants and products

B. $25^{\circ} C$

C. both (a) and (b)

D. neither (a) and (b)

Answer: C

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39. What is/are the factor(s) that govern the single electrode potential of a half cell?

A. concentration of ions in solution

B. tendency to form ions

C. temperature

D. all of these

Answer: D

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40. How many half cells are present in an electrochemical cell?

A. 3

B. 4

C. 2

D. 6

Answer: C

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41. Calculate the equilibrium constant for the reaction between silver nitrate and metallic zinc.

A. 6.19×10^{52}

B. 619×10^{52}

C. 0.619×10^{25}

D. 6.19×10^{25}

Answer: A

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42. In which of the following processes, electrical energy is converted to chemical energy?

A. Purification of metals

B. Generation of gases

C. Electroplating

D. All of the above

Answer: D

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43. The electrode where there is loss of electron is called

A. cathode

B. anode

C. salt bridge

D. both (a) and (b)

Answer: B

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44. In an electrochemical cell, the wrong statement is

A. electrons move from cathode to anode.

B. anode is negative charged

C. cathode is positive charged

D. chemical energy is converted to electrical energy.

Answer: A

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45. The overall reaction that takes place in an electrochemical cell is

A. oxidation

B. reduction

C. decomposition

D. redox reaction

Answer: D

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46. Which of the following statement is wrong with regard to galvanic cell?

A. Reduction takes place at cathode

B. Reduction takes place at anode

C. Oxidation takes place at anode

D. Cathode is positively charged

Answer: B

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47. In the cell representation (+) represents

A. salt bridge

B. phase boundary

C. cathode

D. anode

Answer: B

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48. The standard conditions for determination of standard emf of the cell are

A. 1M solution of the reactant

B. temperature of $25^{\circ} C$

C. both (a) and (b)

D. none of these

Answer: C

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49. The emf generated by an electrochemical cell is given by the symbol

A. E

B. M

C. F

D. S

Answer: A

View Text Solution

50. The maximum work that can be derived from a chemical reaction is

A. $W_{\max} = \Delta H$

B. $W_{\max} = \Delta G$

C. $W_{\max} = \Delta E$

D. $W_{\max} = \Delta S$

Answer: B

View Text Solution

Additional Question And Answers Fill In The Blanks

1. Unit of resistivity is _____.

A. ohm metre

B. siemen

C. sm^{-1}

D. mho

Answer: A

View Text Solution

2. The quantity of charge required to obtain 1 mole of aluminium from Al_2O_3 is _____.

A. 2F

B. 3F

C. 6F

D. 12F

Answer: B

View Text Solution

3. The reciprocal of specific resistance is called _____.

A. conductance

B. specific conductance

C. conductivity

D. both (b) and (c)

Answer: D

View Text Solution

4. The cell constant of a conductivity cell is _____.

A. $l \times a$

B. $\frac{a}{l}$

C. $\frac{l}{a}$

D. $\frac{l^2}{a}$

Answer: C

View Text Solution

5. $Zn_{(s)} / Zn^{2+}_{(aq)} || Cu^{2+}_{(aq)} / Cu_{(s)}$

In the above cell diagram, the single vertical line represents _____.

A. salt bridge

B. Cathode

C. Anode

D. Phase boundary

Answer: D

View Text Solution

6. The electrical energy produced by a cell equals _____.

A. $E_{\text{cathode}} - E_{\text{anode}}$

B. $\dfrac{\text{Charge of electrons}}{E_{\text{cell}}}$

C. $\text{Charge of electrons} \times E_{\text{cell}}$

D. $\dfrac{E_{\text{cell}}}{\text{Charge of electrons}}$

Answer: C

View Text Solution

7. 1F equals to _____.

A. 96500 moles

B. 96500 C

C. $1.6 \times 10^{-19} C$

D. 1.6×10^{-19} moles

Answer: B

View Text Solution

8. Leclanche cell is _____.

A. primary battery

B. secondary battery

C. rechargeable

D. Both (b) and (c)

Answer: A

View Text Solution

9. The S.I unit of cell potential is _____.

A. ohm

B. volt

C. ampere

D. mho

Answer: B

View Text Solution

10. The cathode in Leclanche cell is _____.

A. Zinc container

B. Spongy lead

C. Graphite rod in contact with MnO_2

D. HgO mixed with graphite

Answer: C

View Text Solution

11. Standard electrode potential of Sn^{4+}/Sn^{2+} couple is +0.15 V and that of Cr^{3+}/Cr is 0.85 V. When connected, the cell potential will be

A. 1.10 V

B. 1.00 V

C. 0.70 V

D. 0.30 V

Answer: B

View Text Solution

12. The reaction that takes place in the cathode half cell in a Galvanic cell is _____.

A. oxidation

B. reduction

C. redox

D. hydrolysis

Answer: B

View Text Solution

13. The cell voltage depends on _____.

A. nature of the electrodes

B. concentration of the electrolytes

C. temperature

D. all of the above

Answer: D

View Text Solution

14. When two half cells of Daniel cell is connected, a spontaneous _____ reaction takes place resulting in the flow of electrons from anode to cathode

A. reduction

B. oxidation

C. redox

D. hydration

Answer: C

View Text Solution

15. The basis of kohlraush's law is _____.

A. molar conductance at infinite dilution of a weak electrolyte

B. limitating molar conductance

C. specific conductance

D. limiting specific conductance

Answer: B

View Text Solution

16. When a zinc metal strip is placed in a copper sulphate solution the blue colour of the solution fades and copper is deposited on the zinc strip as red - brown crust. The oxidation half cell reaction of the above process is represented as _____.

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

B. $Cu_{(s)} \rightarrow Cu^{2+} + 2e^-$

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

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

Answer: C

View Text Solution

17. The empirical relationship between molar conductance and concentration of the electrolyte C is _____.

A. $\wedge_m = \wedge^\circ_m - k\sqrt{C}$

B. $\wedge_m = \wedge^\circ_m + k\sqrt{C}$

C. $\wedge_m = \wedge^\circ_m - \sqrt{kC}$

D. $\wedge_m = \wedge^\circ_m + \sqrt{kC}$

Answer: A

View Text Solution

18. Metals at the top of the electrochemical series are _____.

A. strong hydrating agents

B. strong dehydrating agents

C. strong reducing agents

D. strong oxidising agents

Answer: D

View Text Solution

19. Low molar conductivity at high concentration is due to _____.

A. High attractive force between oppositively charged ions

B. Viscous drag due to greater solvation

C. both (a) and (b)

D. Neither (a) nor (b)

Answer: C

View Text Solution

20. $\wedge^{\circ}_{NH_4OH}$ is _____.

A. $\wedge^{\circ}_{NH_4OH} = \wedge^{\circ}_{NH_4Cl} + \wedge^{\circ}_{NaOH} - \wedge^{\circ}_{NaCl}$

B. $\wedge^{\circ}_{NH_4OH} = \wedge^{\circ}_{NH_4Cl} - \wedge^{\circ}_{NaOH} - \wedge^{\circ}_{NaCl}$

C. $\wedge^{\circ}_{NH_4OH} = \wedge^{\circ}_{NH_4OH} + \wedge^{\circ}_{NaCl} - \wedge^{\circ}_{NaCl}$

D. $\wedge^{\circ}_{NH_4OH} = \wedge^{\circ}_{NH_4Cl} + \wedge^{\circ}_{NaCl} - \wedge^{\circ}_{NaOH}$

Answer: A

View Text Solution

21. Degree of dissociation of pure water is 2.8×10^{-9}, Molar ionic conductance of H^+ and OH^- ions at infinite dilution are 300 and 350 S cm^2 respectively. The molar conductance of water is _____.

A. $1.5 \times 10^{-6} S \quad cm^2 mol^{-1}$

B. $2.8 \times 10^{-7} S \quad cm^2 mol^{-1}$

C. $1.82 \times 10^{-6} S \quad cm^2 mol^{-1}$

D. $3.8 \times 10^{-6} S \quad cm^2 mol^{-1}$

Answer: C

View Text Solution

22. Debye constants A and B depend on _____.

A. nature of the solvent

B. temperature

C. concentration of the solvent

D. both (a) and (b)

Answer: D

View Text Solution

23. The electrolyte used in mercury button cell is _____.

A. KOH and ZnO

B. NH_4Cl and $ZnCl_2$ in water

C. $38\ \%\ H_2SO_4$

D. Li salt in organic solvent

Answer: A

View Text Solution

24. The battery used in pacemakers is _____.

A. Lead storage battery

B. Daniel cell

C. Leclanche cell

D. Mercury button battery

Answer: D

View Text Solution

25. Rust is a mixture of _____.

A. $Fe_2O_3 + Fe(OH)_3$

B. $Fe + H_2O + O_2$

C. $FeO + Fe(OH)_3$

D. $Fe + Fe(OH)_3$

Answer: A

View Text Solution

26. The metal to be protected from corrosion is treated with conc HNO_3. The process is called _____.

A. galvanzing

B. passivation

C. cathodic protection

D. formation of alloys

Answer: B

View Text Solution

27. The process in which chemical change occurs on passing electricity is termed as _____.

A. neutralisation

B. hydrolysis

C. electrolysis

D. ionisation

Answer: C

View Text Solution

28. _____ is the reciprocal of resistance.

A. specific conductance

B. molar conductance

C. specific resistance

D. conductance

Answer: D

View Text Solution

29. In Daniel cell, the charges developed by Zn/Zn^{2+} and Cu/Cu^{2+} are _____

A. positive, positive

B. negative, negative

C. positive, negative

D. negative, positive

Answer: D

View Text Solution

30. Oxidation takes place at _____ and reduction takes place at _____.

A. anode, cathode

B. cathode, anode

C. anode

D. cathode

Answer: A

View Text Solution

31. The inert electrode is _____.

A. Cu

B. Pt

C. Zn

D. None of these

Answer: B

View Text Solution

32. The electrochemical process is carried out in a device called _____

A. cell

B. cathode

C. anode

D. electrode

Answer: A

View Text Solution

33. The cell in which electrical energy is used to bring about chemical change is known as _____

A. electrolytic cell

B. galvanic cell

C. voltaic cell

D. dynamo

Answer: A

View Text Solution

34. The cell potential E_{cell} is _____

A. $E^{\circ}_{\text{cell}} = E^{\circ}_{\text{cathode}} - E^{\circ}_{\text{anode}}$

B. $E^{\circ}_{\text{cell}} = E^{\circ}_{\text{anode}} - E^{\circ}_{\text{cathode}}$

C. $E^{\circ}_{\text{cell}} = E^{\circ}_{\text{cell}} - 0.0591$ log K

D. $E_{\text{cell}} - \frac{0.0591}{n}$log K

Answer: D

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35. The emf of the cell is meausred in _____

A. ohm

B. amperes

C. volts

D. coulomb

Answer: C

View Text Solution

36. The electrode where there is gain of electrons is called _____

A. cathode

B. anode

C. electrode

D. both (b) and (c)

Answer: A

View Text Solution

37. An example of secondary cell is _____

A. Daniel cell

B. galvanic cell

C. lead acid accumulator

D. dynamo

Answer: C

View Text Solution

38. The zinc - copper cell has emf of _____

A. 1 V

B. 2.1 V

C. 1.1 V

D. $-1.1V$

Answer: C

View Text Solution

39. When the emf of the cell is determined under standard conditions, it is called as _____

A. single electrode emf

B. standard emf

C. individual emf

D. half cell emf

Answer: B

View Text Solution

40. For gases, the standard emf depends on _____.

A. 1 atm pressure

B. 1 M solution

C. temperature of $25^{\circ} C$

D. both (a) and (c)

Answer: D

View Text Solution

41. The emf of the unknown half cell is _____

A. $E_{\text{measured}} = E_R - E_I$

B. $E_{\text{measured}} = E_L - E_R$

C. $E_{\text{measured}} = -nFE$

D. $E_{\text{measured}} = E^0 - \frac{RT}{F}\log$

Answer: A

View Text Solution

42. SHE is _____.

A. Standard Helium Electrode

B. Standard Hydrogen Electrode

C. Standard Mercury Electrode

D. none of these

Answer: B

View Text Solution

43. The gas that bubbles over the platinum electrode in SHE is _____.

A. hydrogen

B. helium

C. neon

D. oxygen

Answer: A

View Text Solution

44. The feasibility of a redox reaction can be predicted with the help of _____.

A. Reduction potential

B. oxidation potential

C. electrochemical series

D. standard emf

Answer: C

View Text Solution

Additional Question And Answers Assertion Reason

1. Assertion : Molar conductance increases with increase in dilution.

Reason : For a strong electrolyte, interionic forces of attraction increase with dilution

A. (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true but (R) does not explain (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: C

View Text Solution

2. Assertion : For measurement of specific resistance of a metallic wire, AC current is used.

Reason : This is to prevent electrolysis

A. (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true but (R) does not explain (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: A

View Text Solution

3. Assertion : Increase in temperature, decreases conductance

Reason : This is due to the increase in the attractive forces between the oppositely charged ions

A. (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true but (R) does not explain (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: D

View Text Solution

4. Assertion : The electrolysis of aqueous NaCl gives hydrogen at the cathode and chlorine at the anode

Reason : Chlorine has higher oxidation potential than water

A. (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true but (R) does not explain (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: C

View Text Solution

5. Assertion : For a strong electrolyte, higher the concentration, lower the molar conductivity

Reason : The plot of $\wedge_m V_s \sqrt{C}$ is not linear one for a weak electrolyte

A. (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true but (R) does not explain (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: B

View Text Solution

6. Assertion : Copper sulphate can be kept in a zinc vessel

Reason : The position of copper is higher than zinc in the electro chemical series

A. (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true but (R) does not explain (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: D

View Text Solution

7. Assertion : Galvanisation of iron protects it from rust

Reason : Zinc had lower reduction potential than iron

A. (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true but (R) does not explain (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: A

View Text Solution

8. Assertion : Standard hydrogen electrode (SHE) is assigned an emf of zero arbitarily

Reason : SHE can act as cathode only

A. (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true but (R) does not explain (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: C

View Text Solution

9. Assertion : In Daniel cell, oxidation takes place at the zinc electrode

Reason : To maintain electrical neutrality in the anode and cathode compartment, a salt bridge is used

A. (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true but (R) does not explain (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: B

View Text Solution

10. Assertion : Formation of rust requires both oxygen and water.

Reason : The oxidising tendency of iron can be reduced by formation of its alloy with anodic metals

A. (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true but (R) does not explain (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: B

View Text Solution

11. Assertion : The relationship between ΔG and emf of cell is $\Delta G = -FE$

Reason : In the Nernst equation, 'n' denotes number of protons.

A. (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true but (R) does not explain (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: C

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Additional Question And Answers Very Short Answer

1. Give the mathematical expression of ohm's law.

View Text Solution

2. Define resistance. Give its mathematical expression.

View Text Solution

3. Define resistivity.

View Text Solution

4. Two electrodes having cross sectional area of A and are separated by a distance l. What is the ratio of length by area called?

View Text Solution

5. Define conductance. Give its unit.

View Text Solution

6. Define specific conductance.

View Text Solution

7. Give a mathematical expression that relates cell constant, specific conductance and specific resistance.

View Text Solution

8. Derive the unit of specific conductance.

View Text Solution

9. For a uni - univalent electrolyte, write the Debye - Huckel Onsagar equation.

View Text Solution

10. Give the empirical relationship between molar conductance and concentration of the electrolyte.

View Text Solution

11. Account for the following : For a strong electrolyte molar conductivity decreases as concentration increases.

View Text Solution

12. Molar conductivity increases with dilution. Is the above statement true? Justify your answer

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13. On dilution of 0.1 M of Na_2SO_4, what will happen to its

(a) Conductance (C)

(b) Conductivity κ

(c) Molar conductance $\wedge_m$

(d) Equivalent conductance $\wedge$

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14. Give the expression that relates molar conductivity and degree of dissociation.

View Text Solution

15. Express Kohlraush's law for molar conductance of a uni - univalent electrolyte NaCl.

View Text Solution

16. Apply Kohlraush's law and determine the limiting molar conductivity of

$BaCl_2$

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17. Apply Kohlraush's law and determine the limiting molar conductivity of

$Al_2(SO_4)_3$

View Text Solution

18. What is meant by limiting molar conductivity?

View Text Solution

19. What is a electro chemical cell?

View Text Solution

20. What type of cell is a Daniel cell?

View Text Solution

21. Explain the function of a salt bridge in an electrochemical cell.

View Text Solution

22. What are the factors on which cell potential depends?

View Text Solution

23. Give the uses of mercury button cell.

View Text Solution

24. Why is the electrode potential of a single electrode cannot be determined?

View Text Solution

25. What is the value of Faraday constant? Define it.

View Text Solution

26. Define electrolysis.

View Text Solution

27. Define electrochemical equivalent.

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28. How much amount of a substance is deposited by 1 coulomb? What is it called?

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29. What are the two types of batteries?

View Text Solution

30. What are primary cells?

View Text Solution

31. What is the anode, cathode and electrolyte of a mercury button cell?

View Text Solution

32. What are secondary cells?

View Text Solution

33. What is the principle used in secondary batteries to regenerate the original reactants?

View Text Solution

34. Write the anode, cathode and electrolyte of lead storage battery.

View Text Solution

35. What is the emf developed by a single lead storage battery?

View Text Solution

36. On what does the emf of a lead storage battery depend?

View Text Solution

37. Give examples of primary cells.

View Text Solution

38. Give an example of secondary cell.

View Text Solution

39. Name the anode, cathode and electrolyte used in lithium - ion Battery.

View Text Solution

40. Write the oxidation, reduction and overall redox reaction taking place in the Lithium ion battery.

View Text Solution

41. What is known as intercalation?

View Text Solution

42. What is a fuel cell?

View Text Solution

43. Write a note on galvanising.

View Text Solution

44. Explain how iron is protected from corrosion by coating with magnesium.

View Text Solution

45. What is meant by corrosion ?

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46. What is passivation?

View Text Solution

47. What is standard reduction potential E° ?

View Text Solution

48. What is an electrochemical series?

View Text Solution

49. Higher the standard reduction potential lesser is corrosion. Give reason.

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50. Define electrochemical equivalent.

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51. How are specific and equivalent conductances related?

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52. Write the cell reaction for the half cell $Cl^-_{(aq)} / AgCl_{(s)} Ag$.

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53. The standard reduction potentials of Fe^{3+}/Fe and Fe^{2+}/Fe electrode system are -0.035 V and -0.44 V respectively. Predict which of the two oxidations is easy. Fe^{3+}/Fe and Fe^{2+}/Fe.

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54. What is single electrode potential?

View Text Solution

55. Define standard emf of a cell.

Watch Video Solution

56. Write the Nernst equation.

Watch Video Solution

Additional Question And Answers Short Answer

1. Answer the following question with regard to specific resistance.

How is specific resistance represented?

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2. Answer the following question with regard to specific resistance.

What does specific resistance depend on?

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3. Answer the following question with regard to specific resistance.

What is the reciprocal of specific resistance? How is it denoted.

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4. Answer the following question with regard to specific resistance.

What is the unit of resistivity?

View Text Solution

5. Define molar conductance.

View Text Solution

6. Define equivalent conductance.

View Text Solution

7. 0.1 M solution of two electrolytes P and Q have specific conductance 4×10^{-4} S cm^{-1} and 6×10^{-6} S cm^{-1} respectively. Which among the following will have greater resistance to the flow of current? Give reason.

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8. What is the oxidation and reduction half cell in a Daniel cell?

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9. From the below graph, Explain the variation of molar conductance of a weak electrolyte with decrease in concentration.

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10. How are electro chemical cells classified? Explain.

View Text Solution

11. Give the oxidation and reduction half cell reaction taking place in the Daniel cell.

View Text Solution

12. Write the cell representation of the galvanic cell in which the following reaction take place

$$Zn_{(s)} + CuSO_4 \rightarrow ZnSO_4 + Cu_{(s)}$$

For the above cell. Identify the anode and cathode half cell.

View Text Solution

13. Explain the IUPAC convention of representing a Galvanic cell.

View Text Solution

14. Explain the relationship between free energy of the cell and its emf.

View Text Solution

15. Leclanche cell is a non-rechargeable cell. Answer the questions below with respect to Leclanche cell.

(i) Anode

(ii) Cathode

(iii) Electrolyte

(iv) Oxidation half cell reaction

(v) Reduction half cell reaction

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16. Why does the emf of Leclanche cell decrease?

View Text Solution

17. Write the reactions taking place in anode and cathode of a mercury button cell. Give the over all redox reaction of the cell with the emf

generation.

View Text Solution

18. Explain the reactions taking place in the anode and cathode of a lead storage battery.

View Text Solution

19. Explain the process of recharging of lead storage battery.

View Text Solution

20. Corrosion of aluminum takes place at a much slower rate than iron. Give reason.

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21. Define Faraday.

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22. (a) (i) State Ohm's law.

(ii) With the help of a circuit diagram derive the formula for the resultant resistance of three resistances connected in parallel.

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23. Write the electrochemical cell for the overall cell reaction

$Zn_{(s)} + 2AgNO_3 \rightarrow 2Ag_{(s)} + Zn(NO_3)_2$.

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24. The standard reduction potential of $Fe^{3+}, Fe^{2+}/Pt$ is $+0.771V$. This half cell is connected with another half cell such that e.m.f. of the cell

is 0.771V. What is the other half cell ?

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25. How to predict the feasibility of a cell reaction ?

Watch Video Solution

26. Write the overall redox reaction for the zinc-copper cell. Show the oxidation and reduction half reaction.

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27. What is salt bridge? How is it represented in a cell diagram?

View Text Solution

28. Show that SHE can act both as a anode as well as cathode.

View Text Solution

29. Explain why Zn on reaction with dil. H_2SO_4 liberated hydrogen, whereas copper cannot?

View Text Solution

30. Derive the relation between EMF and free energy.

View Text Solution

31. What are the types of changes in the cathode and anode in electrolytic and electrochemical cells.

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32. Draw a neat diagram of Leclanche cell and mark the parts.

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Additional Question And Answers Long Answer

1. How will you determine the conductivity of an electrolytic solution using a wheatstone bridge?

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2. Derive a relationship between dissociation constant K_a and molar conductivity $\wedge_m$.

View Text Solution

3. Expalin SHE as a reference electrode.

View Text Solution

4. How will you calculate solubility product of AgCl which is a sparingly soluble salt?

View Text Solution

5. Write the electrochemical mechanism of corrosion.

View Text Solution

6. Write an account on cell terminology.

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Problems For Practice

1. What is the electrochemical equivalent of a substance when 150 gm of it is deposited by 10 ampere of current passed for 1 sec?

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2. The electrochemical equivalent of an electrolyte is 2.35 gm $amp^{-1}\sec^{-1}$. Calculate the amount of the substance deposited when 5 ampere is passed for 10 sec.

Watch Video Solution

3. To 1 M solution of $AgNO_3$, 0.75 F quantity of current is passed. What is the concentration of the electrolyte, $AgNO_3$ remaining in the solution?

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4. 0.5 F of electric current was passed through 5 molar solution of $AgNO_3, CuSO_4$ and $AlCl_3$ connected in series. Find out the concentration of each of the electrolyte after the electrolysis.

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5. To one molar solution of a trivalent metal salt, electrolysis was carried out and 0.667 M was the concentration remaining after electrolysis. Calculate the quantity of electricity passed.

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6. A conductance cell has platinum electrodes, each with 5 cm^2 area and separated by 0.5 cm distance. What is the cell constant?

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7. Specific conductance of 1 M KNO_3 solution is observed to be 5.55×10^{-3} mho cm^{-1}. What is the equivalent conductance of KNO_3 when one litre of the solution is used?

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8. The equivalent conductances at infinite dilution of HCl, CH_3COONa and $NaCl$ are 426.16, 91.0 and 126.45 $ohm^{-1}cm^2$ gm equivalent^{-1} respectively. Calculate the equivalent conductance (λ_∞) of acetic acid.

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9. The standard reduction potential for the reaction $Sn^{4+} + 2e^- \rightarrow Sn^{2+}$ is + 0.15V. Calculate the free energy change of the reaction.

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10. Write the Nernst equation for the half cell $Zn^{2+}{}_{(aq)} / Zn_{(s)}$.

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11. The emf of the cell $Cd/CdCl_2, \quad 25H_2O \quad /AgCl_{(s)}Ag$ is 0.675 V. Calculate of the cell reaction.

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12. The standard free energy change of the reaction $M^+{}_{(aq)} + e^- \rightarrow M_{(s)}$ is -23.125 kJ. Calculate the standard emf of the half cell.

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13. The emf of the half cell $Cu^{2+}{}_{(aq)}/Cu_{(s)}$ containing 0.01 M Cu^{2+} solution is +0.301 V. Calculate the standard emf of the half cell.

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14. If $E_1 = 0.5V$ corresponds to $Cr^{3+} + 3e^- \rightarrow Cr_{(s)}$ and $E_2 = 0.41V$ corresponds to $Cr^{3+} + e^- \rightarrow Cr^{2+}$ reactions, calculate the emf (E_3) of the reaction $Cr^{2+} + 2e^- \rightarrow Cr_{(s)}$.

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15. Calculate the standard emf of the cell having the standard free energy change of the cell reaction is -64.84 kJ for 2 electrons transfer.

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16. Calculate the emf of the cell $Zn / ZnO_2, OH^-{}_{aq}, -HgO / Hg$ given that E° values of OH^-, ZnO and $OH^-, HgO / Hg$ half cells are -1.216 V and 0.098 V respectively.

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17. The equilibrium constant of cell reaction: $Ag_{(s)} + Fe^{3+} \Leftrightarrow Fe^{2+} + Ag^{+}$ is 0.335 at $25^{\circ}C$. Calculate the standard emf of the cell $Ag/Ag^{+}, Fe^{3+}, Fe^{2+}/Pt$. Calculate E° of the half cell $Fe^{3+}, Fe^{2+}/Pt$ is 0.7791 V Calculate E° of $Fe^{3+}, Fe^{2+}/Pt$ half cell.

Watch Video Solution

18. Calculate the emf of the cell having the cell reaction $2Ag^{+} + Zn \Leftrightarrow 2Ag + Zn^{2+}$ and $E^{\circ}{}_{cell} = 1.56V$ at $25^{\circ}C$ when concentration of $Zn^{2+} = 0.1M$ and $Ag^{+} = 10M$ in the solution.

$$\left[\text{Hint}: E_{cell} = E^{\circ}{}_{cell} - \frac{RT}{nF} In \frac{[Zn^{2+}]}{[Ag]^2}\right]$$

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19. The emf values of the cell reactions $Fe^{3+} + e^{-} \rightarrow Fe^{2+}$ and $Ce^{2+} \rightarrow Ce^{3+}e^{-}$ are 0.61 V and -0.85 V

respectively. Construct the cell such that the free energy of the cell is negative. Calculate the emf of the cell.

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20. A zinc rod is placed in 0.095 M zinc chloride solution at $25^\circ C$. EmF of this half cell is -0.79V. Calculate $E^\circ_{Zn2+/Zn}$.

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Unit Test

1. 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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2. 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 reason 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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3. 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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4. Which among the folJowing is the strongest reducing agent?

A. F_2

B. Cl_2

C. Zn

D. Li

Answer: D

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5. The emf of a cell with 1 M solutions of reactants and products in solution at $25^{\circ} C$ is called

A. Half cell potential

B. Standard emf

C. Single electrode potential

D. Redox potential

Answer: B

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6. Write a note on sacrificial protection .

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