CHEMISTRY

BOOKS - MTG WBJEE CHEMISTRY (HINGLISH)

PHYSICAL CHEMISTRY OF SOLUTIONS

Wb Jee Workout Single Option Correct Type 1 Mark

1. Which one of the following is not a property of hydrophilic sols ?

A. High concentration of dispersed phase can be easily attained.

B. Coagulation is reversible.

C. Viscosity and suface tension are about the same as for water.

D. None of water.

Answer: C

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2. Three Faradays of electricity are passed through molten Al_2O_3 , aqueous solutio of $CuSO_4$ and molten NaCl taken in different electrolytic cells. The amount of Al, Cu and Na deposited at the cathodes will be in the ratio of

A. 1 mole : 2 mole : 3 mole

B. 3 mole : 2 mole : 1 mole

C. 1 mole : 1.5 mole : 3 mole

D. 1.5 mole : 2 mole : 3 mole

Answer: C

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3. The number of Faradays required to deposit 1 g equivalent of aluminium (At. Wt. = 27) from a solution of aluminium chloride will be

A. 1

B. 2

C. 3

D. 4

Answer: A

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4. The ability of an ion to bring about coagulation of a given colloid depends upon

A. the size of the ion

B. the sign of the charge alone

C. the magnitude of the charge

D. both magnitude and charge

Answer: D

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5. As_2S_3 sol is

A. positive colloid

B. negative colloid

C. neutral colloid

D. none of these

Answer: B

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6. The resistance of 0.5 N solution of an electrolyte in a conductivity cell was found to be 25 ohm. Calculate the equivalent conductivity of the solution if the electrodes in the cell are 1.6 ci apart and have an area of 3.2 cm^2 ?

A. $10Scm^2eq^{-1}$

B. $15cm^2eq^{-1}$

C. $20Scm^2eq^{-1}$

D. $40Scm^2e$

Answer: D

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7. An aqueous solution containing one mole per litre of $Cu(NO_3)_2$, $AgNO_3$, $Hg(NO_3)_2$ and $Mg(NO_3)_2$ is being electrolysed using

inert electrodes. The values of the standard electrode potentials in volts (reduction potientials) are

$Ag|Ag^{+} = +0.80, 2Hg|Hg^{2+} = 0.79$

$Cu|Cu^{2+} = +0.34, Mg|Mg^{2+} = -2.37$

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

A. Ag,Hg,Cu,Mg

B. Mg,Cu,Hg,Ag

C. Ag,Hg,Cu

D. Cu,Hg,Ag

Answer: C

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8. The dialysis of colloidal solution depends upon

A. nature of the membrane used

B. difference in the temperature of the two liquids

C. nature of particles present in the solution

D. all of these

Answer: D

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9. The increase in the value of molar conductivity of acetic acid with dilution is due to

A. decrease in interionic forces

B. increase in degree of ionisation

C. increase in self ionisation of water

D. none of these

Answer: B

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10. In a mixture of A and B, components show - ve deviations when

A. $\Delta V_{mix} > 0, \Delta S_{mix} > 0$

B. A-B interctions are weaker than A-A and B-B interactions

C. $\Delta V_{mix} = 0, \Delta S_{mix} > 0$

D. A-B interactions are stronger than A-A and B-B interactions

Answer: D

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11. Perptization is a process of

A. reducing the impurities of the electrolytes

B. purification of colloids

C. dispersing precipiatate into colloidal sols

D. movement of colloidal particles in the electrical field.

Answer: C

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12. A liquid which markedly scatters a beam of light (visible in a dark room) but leaves no residue when passed through a filter paper is best described as

A. a suspension

B. a true solution

C. lyophobic sol

D. lyophilic sol.

Answer: C

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13. How many Faradays are required to generate one gram atom of magnesium from $MgCl_2$?

A. 1

B. 2

C. 3

D. 4

Answer: B

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14. In an experiment addition of 4.0 mL of 0.005 M $BaCl_2$ to 16.0 mL of arsenius sulphide sol just causes complete coagulation in 2 hrs. The flocculating value of the effertive ion is

A. CI^- 1.0

B. Cl^-, 2.0

C. Ba^{2+}, 1.0

D. $Ba^{2+}, 0.5$

Answer: C

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15. Which of the following is a hydrophilic colloidal sol?

A. Gold sol

B. Clay particles

C. Starch sol

D. Silver iodide sol

Answer: C

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16. The best electrolyte for coagulation of As_2S_3 sol is

A. NaCl

B. $CuSO_4$

C. $Al(NO_3)_3$

D. $Th(SO_4)_2$

Answer: C

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17. Ferric chloride is applied to stop bleeding because

A. Fe^{3+} ions coagulate negatively charged blood solution

B. Fe^{3+} ions coagulate positively charged blood solution

C. Cl^{-} ions coagulate positively charged blood solution

D. CI^{-} ions coagulate egatively charged blood solution

Answer: A

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18. Surface tension of lyophillic sols is

A. lower than that of H_2O

B. more than that of H_2O

C. equal to that of H_2O

D. none of these

Answer: A

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19. Two aqueous solutions A and B, are separated by a semi-permeable membrane. The osinotic pressure of solution A immediately begins to decrease. Which of the following statements is true?

A. The solvent molecules are moving from the solution of higher osmotic pressure to that of lower osmotic pressure

B. The initial osmotic pressure of solution B is greater than that of solution A.

C. Solvent molecules are moving from solution B into solution A.

D. Both (a) and (b).

Answer: C

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20. Which of the following forms cationic micelles above certain concentration?

A. Sodium dodecyl sulphate

B. Sodium acetate

C. urea

D. Cetyltrimethylammoniumbromide

Answer: D

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21. The ionic conductances of Al^{3+} and SO_4^{2-} at infinite dilution are x and y $ohm^{-1}cm^2$ respectively. If Kohlrausch law is valid then

molar conductance of aluminium sulphate infinite dilution will be

A. $3x + 2y$

B. $2x + 3y$

C. $2x + 2y$

D. $3x + 3y$

Answer: B

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22. A0.020 m solution of each of the following compounds is prepared. Which solution would you expect to freeze at $-0.149^{\circ} C$?

A. $\left[Co(en)_2Cl_2\right]Cl$

B. $Na[Co(EDTA)]$

C. $\left[Cr(py)_5CI\right]Cl_2$

D. $\left[Cr(NH_3)_6\right]Cl_3$

Answer: D

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23. At isoelectric point

A. colloidal particles become neutral

B. colloidal sol becomes highly stable

C. both of (a) and (b)

D. none of these

Answer: A

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24. The substance having highest conductivity at room temperature among the following is

A. 0.1 N HCl

B. 0.1 N NaCl

C. graphite

D. glass.

Answer: C

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25. The specific conductivity of N/10 KCl solution at 20° is $0.212 ohm^{-1} cm^{-1}$ and the resistance of the cell containing this solution of $20^\circ C$ is 55 ohm. The cell constant is

A. $4.616 cm^{-1}$

B. $11.66 cm^{-1}$

C. $2.173 cm^{-1}$

D. $3.324 cm^{-1}$

Answer: A

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26. A colloidal system in which gas bubbles are dispersed in a liquid is known as

A. foam

B. aerosol

C. sol

D. emulsion

Answer: A

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27. The electric charge for electrode deposition of one gram equivalent of a substance is

A. one ampere per second

B. 96,500 coulombs per second

C. one ampere for one hour

D. charge on one mole of electrons.

Answer: D

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28. Arsenic sulphide is a negative sol. The reagent with least precipitating power is

A. $AlCl_3$

B. $NaCl$

C. CaF_2

D. glucose.

Answer: D

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29. Electrolysis of a solution of HSO_4^- ions produces $S_2O_8^2$ .Assuming 75% current efficiency, what current should be employed to achieve a production rate of 1 mol of $S_2O_8^{2-}$ per hour ?

A. 71.47 A

B. 35.7 A

C. 142.96 A

D. 285.93 A

Answer: A

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30. Equal quantities of electricity are passed through three voltametrs containing $FeSO_4$, $Fe_2(SO_4)_3$ and $Fe(NO_3)_3$ Consider the following statements in this regard :

The amount of iron deposited in $FeSO_4$ and $Fe_2(SO_4)_3$ are equal

2. The amount of iron deposited in $Fe(NO_3)_3$ is two third of the amount of iron deposited in $FeSO_4$.

3 The amount of iron deposited in $Fe_2(SO_4)_3$

and $Fe(NO_3)$ is equal .

Which of the following statements is /are correct ?

A. only 1

B. 1 and 2

C. 2 and 3

D. Only 3

Answer: C

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Wb Jee Workout Single Option Correct Type 2 Mark

1. Give $\Lambda^{\circ}\left(\frac{1}{3}Al^{3+}\right) = 63\Omega^{-1}cm^2mol^{-1}$ and $\Lambda^{\circ}\left(\frac{1}{2}SO_4^{2}\right) = 80\Omega^{-1}$. The value of $\Lambda^{\infty}Al_2(SO_4)_3$ would be

A. $143\Omega^{-1}cm^2mol^{-1}$

B. $206\Omega^{-1}cm^2mol^{-1}$

C. $286\Omega^{-1}cm^2mol^{-1}$

D. $858\Omega^{-1}cm^2mol^{-1}$

Answer: D

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2. Molar conductivities of Li^-, Na^+, K^+ and Rb^+ ions in aqueous solutions are in the following order.

A. $Li^+ > Na^+ = K^+ < Rb^+$

B. $Li^+ > Na^+ > K^+ = Rb^+$

C. $Rb^+ > K^+ > Na^+ > Li^+$

D. $Li^+ > Rb^+ > K^+ > Na^+$

Answer: C

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3. How much amount of KCl must be added to 1 kg of water so that the freezing point is depressed by 2 K?

$\left(K_f \text{for water} = 1.86 kgmol^{-1}\right)$

A. 40 g

B. 20 g

C. 10 g

D. 60 g

Answer: A

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4. The freezing point of water is depressed by 0.37°C in a 0.01 molal NaCl solution. The freezing point of 0.02 molal solution of urea is depressed by

A. $0.37^{\circ}C$

B. $0.74^{\circ} C$

C. $0.185^{\circ} C$

D. $0^{\circ} C$

Answer: A

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5. An electrolyte

A. forms complex ions in solution

B. gives ions only when electricity is passed

C. possesses ions even in soid state

D. gives ions ony when dissolved in water.

Answer: C

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6. The cell constant for an electrical conductivity cell having two electrodes of area A placed at a distance of l is expressed by

A. l / A

B. l^2 / A

C. A / l

D. $\frac{1}{Al}$

Answer: A

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7. The volume of a colloidal particle, V_C cas compared to the volume of a solute particle in a true solution V_S could be

A. $\frac{V_C}{V_S} \cong 10^3$

B. $\frac{V_C}{V_S} \cong 10^{-3}$

C. $\frac{V_C}{V_S} \cong 10^{23}$

D. $\frac{V_C}{V_S} \cong 1$

Answer: A

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8. Which of the following will show a negative deviation from Raoult's law?

A. Acetone-benzene

B. Acetone-ethanol

C. Benzene-methanol

D. Acetone-chloroform

Answer: D

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9. A current of 9.65 A is passed for 3 hours between nickel electrodes in 0.5 L of a 2 M

solution of $Ni(NO_3)_2$. The molarity of the solution after electrolysis would be

A. 0.46 M

B. 0.625 M

C. 0.92 M

D. 1.25 M

Answer: C

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10. Lowering of vapour pressure in 1 motal aqueous solution at $100^{\circ} C$ is

A. 13.44 mm Hg

B. 14.12 mm Hg

C. 31.2 mm Hg

D. 35.2 mm Hg

Answer: A

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11. A solution prepared by dissolving 15 g of non-volatile solute in 270 g of water gave relative lowering of vapour pressure of 0.005. The molecular weight of the solute is

A. 324

B. 200

C. 225

D. 20

Answer: B

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12. A current of 12 ampere is passed through an electrolytic cell containing aqueous $NiSO_4$ solution. Both Ni and H_2 gas are formed at the cathode. The current efficiency is 60% . What is the mass of nickel deposited on the cathode per hour ?

A. 7.883 g

B. 3.941 g

C. 5.91 g

D. 2.645 g

Answer: A

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13. Kohlrausch law states that at

A. infinite dilution, each ion makes definite contribution to conductance of an electrolyte whatever be the nature of the other ion of the electrolyte

B. infinite dilution, each ion makes definite contribution to equivalent conductance of an electrolyte, whatever be the nature of the other ion of the electrolyte

C. finite dilution, each ion makes definite contribution to equivalent conductance of an electrolyte, whatever be the nature of the other ion of the electrolyte

D. infinite dilution each ion makes definite contribution to equivalent conductance

of an electrolyte depending on the nature of the other ion of the electrolyte.

Answer: A

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14. Which of the following will have the highest coagulating power for As_2S_3 colloid ?

A. PO_4^{3-}

B. SO_4^{2-}

C. Al^{3+}

D. Na^{+}

Answer: C

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15. On passing a current of 1.0 ampere for 16 min and 5 seconds through 1 L solution of $CuCl_2$, all copper of the solution was

deposited at cathode. The molarity of $CuCl_2$ solution was

A. 0.1M

B. 0.01 M

C. 0.005 M

D. 0.2 M

Answer: C

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Wb Jee Workout One Or More Than One Option Correct Type 2 Mark

1. Consider following solutions :

I 1 M aqueous glucose solution

II 1 M aqueous sodium chlorice soution

III. 1 M aqueous ammonium phosphate soution

IV 1 M benzoic acid in benzene

Select correct statements for the above solutions.

A. All are isotonic solutions

B. III is hypotonic of I, II and IV

C. IV is hypotonic I, II and III

D. II is hypotone of III but hypertonic of I and IV.

Answer: B::C::D

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2. Which of the following are correct statements?

A. When mixture is more volatile, there is positive deviation from Raoult's law.

B. When mixture is less volatile, there is negative deviation froin Raoult's law

C. Ethanol and water form ideal solution.

D. $CHCl_3$ and water form ideal solution

Answer: A::B

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3. Choose the correct reason(s) for the stability of the lyophobic colloidal particles.

A. Preferential adsorption of ions on their surface from the solution

B. Preferential adsorption of solvent on their surface from the solution.

C. Attraction between different particles having opposite charges on their surface.

D. Potential difference between the fixed layer and the diffused layer of opposite charges around the colloidal particles.

Answer: A::D

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4. 58.5 g of NaCl and 180 g of glucose were separately dissolved in 1000 mL of water. Identify the correct statement regarding the

elevation of boiling point (b.pt.) of the resulting solutions.

A. NaCl solution will show higher elevation of b.pt.

B. Glucose solution will show higher elevation of b.pt.

C. Both the solutions will show equal elevation of b.pt

D. The b.pt. of elevation will be shown by neither of the solutions.

Answer: A

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5. At critical micelle concentration (CMC)

A. the ions of surfactant molecules undergo association to form clusters

B. the turbidity of solution increases abruptly

C. substances like grease, fats, etc. dissolve colloidally

D. colligative properties increase suddenly.

Answer: A::B::C

View Text Solution

6. 5.3 % (w/v) Na_2CO_3 solution and 6.3 % (w/v) $H_2C_2O_4.2H_2O$ solution have same

A. molality

B. molarity

C. normality

D. mole fraction.

Answer: B::C

View Text Solution

7. Which of the following statements are false for a solution of chloroform and acetone?

A. The solution formed is an ideal solution

B. The solution formed is a non-ideal solution with positive deviation from Raoult's law

C. The solution formed is a non-ideal solution with negative deviation from Raoult's law.

D. The solution behaves ideally or non-ideally depending upon its composition.

Answer: A::B::D

View Text Solution

8. The correct relationships among the following are :

A. $E_{\text{cell}} = \frac{RT}{nF} InF$

B. Cell constant $(G^{\cdot})$ = Conductivity (K) $\times$ Resistance (R)

C. $1Sm^{-1} = 100Scm^{-1}$

D. Equilibrium constant $(K) = e^{-\Delta G^{\circ}/RT}$

Answer: B::D

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9. The solutions which are isotonic with 6 % (w/V) solution of urea are

A. 18 % (w/V) solution of glucose

B. 0.5 M solutions of $BaCl_2$

C. 1 M solution of socrose

D. 1 M solution of acetic acid.

Answer: A::C

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10. Which statements (s) is/are true about osmoitc pressure(π) volume (V) and temperature (T) ?

A. $\pi \propto \frac{1}{V}$ if T is constant.

B. $\pi \propto C$ if T is constant.

C. $\pi \propto$ V if T is constant.

D. π / C is constant if T is constant.

Answer: A::B::D

View Text Solution

Wb Jee Previous Years Questions Single Option Correct Type 1 Mark

1. The correct order of equivalent conductances at infinite dilution in water at room temperature of H^+, K^+, CH_3COO^- and $HO^- ionsis$

A. $HO^- > H^+ > K^+ > CH_3COO^-$

B. $H^+ < HO^- > K^+ > CH_3COO^-$

C. $H^+ > K^+ > HO^- > CH_3COO^-$

D. $H^+ > K^+ > CH_3COO^- > HO^-$

Answer: B

View Text Solution

2. A conductivity cells has been calibrated with a 0.01 M 1:1 electrolyte solution (specific conductance,) $K = \left(1.25 \times 10^{-3} Scm^{-1}\right)$ in the cell and the measured resistance was 800 ohms at $25^\circ C$. The cell constant will be

A. $1.02cm^{-1}$

B. $0.102cm^{-1}$

C. $1.00cm^{-1}$

D. $0.5cm^{-1}$

Answer: C

View Text Solution

3. The measured freezing point depresion for a 0.1 m aqueous CH_3COOH solution is $0.19^{\circ}C$. The acid dissociation constant, K_a at

this concentration will be (Given K_f, the molal cryoscopic constant $= 1.86$ K kg mol^{-1})

A. 4.76×10^{-5}

B. 4×10^{-5}

C. 8×10^{-5}

D. 2×10^{-5}

Answer: B

View Text Solution

4. Equivalent conductivity at infinite dilution for sodium- potassium oxalate $\left(\left(COO^{-}\right)_{2}Na^{+}K^{+}\right)$ will be [Given molar conductivities of oxalate, K^{+} and Na^{+} ions at infinite dilution are 148.2, 50.1, 73.5 S $cm^{2}mol^{-2}$ respecitively '

A. $271.8Scm^{2}eq^{-1}$

B. $67.95Scm^{2}eq^{-1}$

C. $543.6Scm^{2}eq^{-1}$

D. $135.9cm^{2}eq^{-1}$

Answer: D

View Text Solution

5. The amount of electrolytes required to coagulate a given amount of AgI colloidal solutio n (-ve charge) will be in the order

A. $NaNO_3 > Al(NO_3)_3 > Ba(NO_3)_2$

B. $Al(NO_3)_3 > Ba(NO_3)_2 > NaNO_3$

C. $Al(NO_3)_3 > NaNO_3 > Ba(NO_3)_2$

D. $NaNO_3 > Ba(NO_3)_2 > Al(NO_3)_3$

Answer: D

View Text Solution

6. The quantity of electricity needed to separately electrolyse 1 M solution of $ZnSO_4$, $AlCl_3$ and $AgNO_3$ completely is in the ratio of

A. $2:3:1$

B. $2:1:1$

C. $2:1:3$

D. $2:2:1$

Answer: A

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7. At at certain temperature, the value of the slope of the plot of osmotic pressure (π) against concentration $\left(C \in molL^{-1}\right)$ of a certain polymer solution is 291 R. The temperature at which osmotic pressure is measured is (R is gas constant)

A. $271^{\circ}C$

B. $18^{\circ}C$

C. $564K$

D. $18K$

Answer: B

View Text Solution

8. At a particular temperature the ratio of equivalent conductance to specific conductance of a 0.01 (N) NaCl solution is

A. $10^5 cm^3$

B. $10^3 cm^3$

C. $10 cm^3$

D. $10^5 cm$

Answer: A

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9. If P^∞ and P are the vapour pressures of the pure solvent and solution and n_1 and n_2 are the moles of solute and solvent repectively in

the soluiton then the correct relation between

P and p° is

A. $P^\circ = P\left[\frac{n-1}{n_1+n_2}\right]$

B. $P^\circ = P\left[\frac{n_2}{n_1+n_2}\right]$

C. $P = P^\circ\left[\frac{n_2}{n_1+n_2}\right]$

D. $P = P^\circ\left[\frac{n_1}{n_1+n_2}\right]$

Answer: C

View Text Solution

10. The order of equivalent conductance at infinite dilution for $LiCl$, $NaCl$ and KCl is

A. $LiCl > NaCl > KCl$

B. $KCl > NaCl > LiCl$

C. $NaCl > KCl > LiCl$

D. $LiCl > KCl > NaCl$

Answer: B

View Text Solution

11. Point out the false statment .

A. colloidal sols are homogeneous.

B. Colloids carry + ve or -ve charges

C. Colloids show Tyndall effect.

D. The size range of colloidal particles is 10-1000 Å

Answer: A

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12. Assuming the compounds to be completely dissociated in aqueous solution, identify the pair of the solutions that can be expected to is isotonic at the same temperature.

A. 0.01 M Urea and 0.01 M NaCl

B. 0.02 M NaCl and 0.01 M Na_2SO_4

C. $0.03MNaCl$ and $0.02MMgCl_2$

D. 0.01 M Sucrose and 0.02 M glucose.

Answer: C

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View Text Solution

13. How many faradays are required to reduce 1 mole of $Cr_2O_7^{2-}$ to Cr^{3+} in acid medium ?

A. 2

B. 3

C. 5

D. 6

Answer: D

View Text Solution

14. What amount of electricity can deposit 1 mole of Al metal at cathode when passed through molten $AlCl_3$?

A. $0.3F$

B. $1F$

C. $3F$

D. $1/3F$

Answer: C

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15. The charge carried by 1 millimole of M^{n+} ions is 193 coulombs. The value of n is

A. 1

B. 2

C. 3

D. 4

Answer: B

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16. If electrolysis of aqueous $CuSO_4$ solution is carried out using Cu- electrons, the reaction taking place at the anode is

A. $H^+ + e^- \rightarrow H$

B. $Cu^{2+}_{(aq)} + 2e^- \Rightarrow Cu_s$

C. $SO^{2-}_{4\,(aq)} - 2e^- \rightarrow SO_4$

D. $Cu_s - 2e^- \rightarrow Cu_{(aq)}{}^{2+}$

Answer: D

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Wb Jee Previous Years Questions Single Option Correct Type 2 Mark

1. At $25^{\circ} C$, the molar conductance of 0.007 M hydrofluoric acid is 150 mho $cm^{2}\ mol^{-1}$ and its Λ_{m}° = 500 mho $cm^{2}\ mol^{-1}$. The value of the dissociation constant of the acid at the given concentration at $25^{\circ} C$ is

A. 7×10^{-4} M

B. $7 \times 10^{-5} M$

C. $9 \times 10^{-3} M$

D. $9 \times 10^{-4} M$

Answer: D

View Text Solution

2. To observe an elevation of boiling point of 0.05 $^{\circ} C$, the amount of solute (Mol. Wt = 100) to be added to 100 g of water $(K_b = 0.5)$ is

A. 2g

B. 0.5 g

C. 1 g

D. 0.75 g

Answer: C

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