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CHEMISTRY

BOOKS - UNIVERSAL BOOK DEPOT 1960 CHEMISTRY (HINGLISH)

ELECTROCHEMISTRY

Ordinary Thinking Objective Questions (Electrolytes and Electrolysis)

1. On electrolysis of a solution of dilute H_2SO_4 between platinum electrodes , the gas evolved at the anoe is

A. SO_2

B. SO_3

C. O_2

D. H_2

Answer: C

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

A. $CaCl_2$ helps in conduction of electricity

B. This mixture has lower melting point than NaCl

C. $Ca(2+)$ can displace Na from NaCl

D. $Ca(2+)$ can reduce Na^+ to Na

Answer: B

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3. Electrolysis of molten anhydrous calcium chloride produces .

A. Calcium

B. Phosphorus

C. Sulphur

D. Sodium

Answer: A

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4. The products formed when an aqueous solution of $NaBr$ is electrolysed in a cell having inert electrodes are :

A. Na and Br_2

B. Na and O_2

C. H_2, Br_2 and NaOH

D. H_2, and O_2

Answer: C

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5. Degree of ionisation of a soltuion produces

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6. Electrolysis of aqueous HCI solution produces

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

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8. During the electrolysis of fused NaCl, which reaction occurs at anode ?

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9. In electrolysis of aqueous copper sulphate, the gas at anode and cathode is .

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10. Use of electrolysis is .

A. Electroplating

B. Electroefining

C. Both (a) and (b)

D. None of these

Answer: C

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11. During electrolysis, the species disharged at cathode are .

A. ions

B. cation

C. anion

D. all of these

Answer: B

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12. During the electrolysis of an electrplyte, the number of ions produced , is directly proportional to the .

A. Time consumed

B. Electro chemical equivalent of electrolysis

C. Quantity of electricity passed

D. Mass of electrons

Answer: C

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13. Which one of the following material conducts electricity

A. Diamond

B. Crystalline sodium chloride

C. Barium sulphate

D. Molten sulphur

Answer: D

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14. Which pair of electrolytes could not be distinguished by the products of electrolysis, using inert electrodes

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15. The electrolyte used in Lechlanche cell is

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16. The passage of current through a solution of certain electrolyte results in the evolution of H_2(g) at cathode and Cl_2(g) at anode. The electrolytic solution is :

A. copper chloride in water

B. aq.NaCl

C. H_2SO_4

D. Water

Answer: B

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17. Which of the following compounds will not undergo decomposition on passing electricity through aqueous solution

A. Sugar

B. Sodium chloride

C. Sodium Bromide

D. Sodium Acetate

Answer: A

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18. Strong electrolytes are those which:

A. Dissolve readily in water

B. Conduct electricity

C. Dissociate into ions at high dilution

D. Completely dissociate into high ions at all dilutions

Answer: D

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19. Electrolysis involves oxidation and reduction respectively at .

A. Anode and cathode

B. Cathode and anode

C. At both the electrodes

D. none of the above

Answer: A

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20. Which of the following reactions canot be a base for electrochemical cell?

A. $H_2 + O_2 \rightarrow H +_2O$

B. $AgNO_3 + Zn \rightarrow Zn\left(NO_3\right)_2 + Ag$

C. $AgNO_3 + NaCl \rightarrow AgCl \downarrow + NaNO_2$

D. $KMnO_4 + FeSO_4 + H_2SO_4 \rightarrow K_2SO_4 + Fe_2\left(SO_4\right)_3 + MnSO_4 + H_2O$

Answer: D

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21. Which of the following aqueous solutions will conduct an electric current quite well?

A. Glycerol

B. HCl

C. Sugar

D. Pure water

Answer: B

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22. On the electrolysis of aqueous solution of sodium sulphate, on cathode we get

A. Na

B. H_2

C. SO_2

D. SO_3

Answer: B

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23. The addition of a polar solvent to a solenoid electrolyte results in

A. Polarization

B. Association

C. Ionization

D. Non- liberation of heat

Answer: C

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24. Electrolysis is a process in which the cations and anions of the electrolyte are

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25. During electrolysis of NaCl solution, part of the reaction is $Na^{+}e^{-}Na$. This is termed as

A. Oxidation

B. Reduction

C. Deposition

D. Cathode reaction

Answer: B

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26. Which of the following properties of pure metal makes it more useful than the corresponding alloy

A. It is harder than corresponding alloy

B. It has high density

C. It can be extraced easily

D. It conducts heat and electricity easily

Answer: D

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27. Which of the following metals will give H_2 on reaction with $NaOH$.

A. Mg

B. Ba

C. Ca

D. Sr

Answer: A

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28. When the sample of copper with zinc impurityn is to be purified by electrolysis, the appropriate electrode are .

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29. Which of the following is not a non-electrolyte ?

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30. Out of the following matals that cannot be obtained by electrolysis of the aquenous solution of their salts is

A. Cu

B. Ag

C. Mg

D. Au

Answer: C

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31. In the electrolysis of aqueous solution of $CuSO_4$ using copper electrodes , the process tha takes place at the anode is

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32. Brine solution on electrolysis will not give.

A. NaOH

B. Cl_2

C. H_2

D. O_2

Answer: D

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33. Which of the following is non-electrolyte ?

A. NaCl

B. $CaCl_2$

C. $C_{12}H_{22}O_{11}$

D. CH_3COOH

Answer:

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34. In a galvanic cell, the electrons flow from :

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35. Which of the following does not conduct electricity ?

A. Fused NaCl

B. Solid NaCl

C. Brine solution

D. Copper

Answer: B

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36. In the electrolytic refining of zinc,

A. Graphite is at the anode

B. The impure metal is at the cathode

C. The metal ion gets reduced at the anode

D. Acidified zinc sulphate is the electrolyte

Answer: D

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37. Pure water does not conduct electricity because it is

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38. Which of the following wil give $H_{2_{(g)}}$ at cathode and $O_{2_{(g)}}$ at anode on electrolysis using platinum electrodes

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39. Electrolyte can conduct electricity because __________.

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40. An electric current passed through aqueous solution of the following which one shall decompose ?

A. Urea

B. Glucose

C. $AgNO_3$

D. Ethyl alcohol

Answer: C

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41. Asseration : A small amount of acid or alkali is added before electrolysis of water.

Reason : Pure water is weak electrolyte.

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42. Asseration : Salts like KCl, KNO_3 i.e., inert electrolytes are used in salt bridge.

Reason : An inert electrolyte can easily be filled in the U-tube.

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Ordinary Thinking Objective Questions (Faradays law of electrolysis)

1. During electrolysis of aqueous $NaOH, 4gofO_2$ gas is liberated at NTP at anode, H_2 gas liberated cathode is

A. 2.8 litres

B. 5.6 litres

C. 11.2 litres

D. 22.4 litres

Answer: B

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2. Electrolysis rules of Faraday states that mass deposited on electrode is proportional to

A. $m \propto l^2$

B. $m \propto Q$

C. $m \propto Q^2$

D. None of these

Answer: B

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3. On the basis of information available from the reaction

$\frac{4}{3}Al + O_2 \rightarrow \frac{2}{3}Al_2O_3, \Delta G = -827kJmol^{-1}$ of O_2, the minimum emf required to carry out of the electrolysis of Al_2O_3 is $\left(F = 96,500Cmol^{-1}\right)$

A. 8.56 V

B. 2.14 V

C. 4.28 V

D. 6.42 V

Answer: B

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

A. $9.0 \times 10^3 g$

B. $8.1 \times 10^4 g$

C. $2.4 \times 10^5 g$

D. $1.3 \times 10^4 g$

Answer: B

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5. During the electrolysis of molten sodium chloride, the time required to produce $0.10 mol$ of chlorine gas using a current of 3 amperes is

A. 330 minutes

B. 55 minutes

C. 110 minutes

D. 220 minutes

Answer: C

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6. The number of electrons delivered at the cathode during electrolysis by a current of 1 ampere in 60 seconds is (charger on electron $= 1.60 \times 10^{-19} C$)

A. 7.48×10^{23}

B. 6×10^{23}

C. 6×10^{20}

D. 3.75×10^{20}

Answer: D

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7. If the current is passed into the solution of the electrolyte

A. Anions move towards anode, cations towards cathode

B. Anions and cations both move towards anode

C. Anions move towards cathode, cations towards anode

D. No movement of ions take place

Answer: A

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8. A certain current liberates $0.5g$ 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. 12.7 gm

B. 15.9 gm

C. 31.8 gm

D. 63.5 gm

Answer: B

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9. On passing one faraday of elecricity throuth the electrolytic cells containing Ag^{+}, Ni^{+3} and Cr^{+3} ion solutions, the deposited Ag $(AT. Wt. = 108) Ni(At. Wt = 59)$ and $Cr(Atwt. = 52)$ is .

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10. The number of electrons required to deposit $1g$ atom of aluminium (At. Wt. = 27) from a solution of aluminium cholride will be (wher N is Avogadro's number)

A. 1N

B. 2N

C. 3N

D. 4N

Answer: C

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11. Charge required to liberated $11.5g$ sodium is .

A. 0.5F

B. 0.1F

C. 1.5F

D. 96500 colombs

Answer: A

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

A. 66g

B. 1.32g

C. 33g

D. 99g

Answer: B

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13. The current in a given wire is 1.8 A. The number of coulombs thaat flow in 1.36 minutes will be ___________.

A. 100C

B. 147C

C. 247C

D. 347C

Answer: B

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14. A current of 96.5 A is passed for 18 min between nickel electrodes in 500 mL solution of $2MNi(NO_3)_2$. The molarity of solution after electrolysis would be:

A. 0.46 M

B. 0.92 M

C. 0.625 M

D. 1.25 M

Answer: B

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15. An apparatus used for the measurement of quantity of electricity is known as

A. Calorimeter

B. Cathetometer

C. Coulometer

D. Colorimeter

Answer: C

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16. The number of Faradays needed to reduce 4 g equivalents of Cu^{2+} to Cu metal will be

A. 1

B. 2

C. $1/2$

D. 4

Answer: D

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17. When 0.04 F of electricity is passed through a solution of $CaSO_4$, then the weight of Ca^{2+} metal deposited at the cathode is

A. 0.2 gm

B. 0.4 gm

C. 0.6 gm

D. 0.8 gm

Answer: D

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18. How many atoms of calcium will be deposited from a solution of $CaCl_2$ by a current of 5mA flowig for 60s?

A. 4.68×10^{18}

B. 4.68×10^{15}

C. 4.68×10^{12}

D. 4.68×10^{9}

Answer: A

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19. Three faradays of electricity are passed through molten Al_2O_3 aqueous solution of $CuSO_4$ and molten $NaCl$ taken in deffernt electrolytic cells. The amout of Al, Cu and Na deposited at the cathodes will be in the ration 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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20. A current of 0.5 amperes is passed for 30 minute through a voltmeter containing $CUSO_4$ Solution. Calculate the mass of Cu deposited at the cathode

A. 3.18 g

B. 0.318 g

C. 0.296 g

D. 0.150 g

Answer: C

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21. Which solution will show highest resistance during the passage of current

A. 0.05 N NaCl

B. 2N NaCl

C. 0.1 N NaCl

D. 1N NaCl

Answer: B

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22. An electrolytic cell contains a solution of Ag_2SO_4 and have platinum electrodes. A current is passed until 1.6gm of O_2 has been liberated at anode. The amount of silver deposited at cathode would be

A. 107.88 gm

B. 1.6 gm

C. 0.8 gm

D. 21.60 gm

Answer: D

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23. One Faraday of electricity when passed through a solution of copper sulphate deposits .

A. 1mole of Cu

B. 1 gm atom of Cu

C. 1molecule of Cu

D. 1 gm equivalent of Cu

Answer: D

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24. In the electrolysis of fused salt, the weight of the substance deposited on an electrode will not depend on:

A. Temperature of the bath

B. Current intensity

C. Electrochemical equivalent of ions

D. Time of electrolysis

Answer: A

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25. Two electrolytic cells, one containing acidified ferrous sulphate and another acidified ferric chloride, are in series. The ratio of masses of Iron deposited at the cathode in the two cells will be

A. $3:1$

B. $2:$

C. $1:1$

D. $3:2$

Answer: D

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26. The value of one Faraday is

A. $95500 Cmol^{-1}$

B. $96550 Cmol^{-1}$

C. $96500 Cmol^{-1}$

D. $98500 Cmol^{-1}$

Answer: C

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27. Amount of electricty that can depostit $108g$ of silver from $AgNO_3$ aikyruib ua

A. 1 ampere

B. 1 coulomb

C. 1 faraday

D. None of the above

Answer: C

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28. From the solution of which of the following one faraday of electricity will liberate one gram atom of metal

A. NaCl

B. $BaCl_2$

C. $CuSO_4$

D. $AlCl_3$

Answer: A

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29. A solution of a salt of a metal was electrolysed for 150 minutes with a current of 0.15 amperes. The weight of metal deposited was $0.783g$. The equivalent weight to the metal is .

A. 55.97 gm

B. 65.97 gm

C. 75.97gm

D. 85.97 gm

Answer: A

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30. An electric current is passed through silver voltameter connected to a water voltmeter. The cathode of the silver voltameter is 0.108g more at the end of the electrolysis. The volume of oxygen evolved at STP:

A. $56cm^3$

B. $550cm^3$

C. $5.6cm^3$

D. $11.2cm^3$

Answer: C

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31. An electric current is passed through silver nitrated solution using silver electrodes . $10.79g$ of silver qas found to be deposited on the cathode fi the same amount of electricity is passed through copper sulphate solutin using copper electrodes. the weihgt of copper deposited on teh cathode is .

A. 6.4 g

B. 2.3 g

C. 12.8 g

D. 3.2 g

Answer: D

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32. The amount of copper deposited by one Faraday current will be maximum in an acidic solution of one litre of

A. 1M Cu_2Cl_2

B. 2M Cu$\left(NO_3\right)_2$

C. 5M $CuSO_4$

D. $5MCu_3\left(PO_4\right)_2$

Answer: A

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33. If the aqueous solutions of the following salts are electrolysed for 1 hour with 10 ampere current, which solution will deposit the maximum mass of the metal at cathode ? The atomic weights are : $Fe = 56, Zn = 65, Ag = 108, Hf = 178$ and $W = 184$.

A. $ZnSO_4$

B. $FeCl_3$

C. $HfCl_4$

D. $AgNO_3$

Answer: D

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34. A direct current deposits deposits 54 g of silver (Atomic mass = 108) during electrolysis. How much aluminimum (Atomic mass =27) would be deposited from aluminium chloride solution by the same amount of electricity ?

A. 4.5g

B. 5.4g

C. 54g

D. 2.7g

Answer: A

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35. A current is passed through two cells connected in series. The first cell contains $X(NO_3)_{3(aq)}$ and the second cell contains $Y(NO_3)_{2(aq)}$. The relative atomic masses of X and Y are in the ratio $1:2$. What is the ratio of liberated mass of X to that of Y ?

A. $3:2$

B. $1:2$

C. $1:3$

D. $3:1$

Answer: C

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36. A current of strength 2.5 amp was passed through $CuSO_4$ solution for 6 minutes 26 seconds. The amount of copper deposited is:-

(Atomic weight of $Cu = 63.5$)

(1 faraday=96500 coulombs)

A. 0.3175 g

B. 3.175 g

C. 0.635 g

D. 6.35 g

Answer: A

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37. Total charge on 1 mole of a monovalent metal ion is equal to

A. 9.65×10^4 coulomb

B. 6.28×10^{18} coulomb

C. 1.6×10^{-19} coulomb

D. None of these

Answer: A

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38. The number of electrons passing per second through a cross-section of copper wire carrying 10^{-6} ampere:

A. 1.6×10^{-19}

B. 6×10^{-35}

C. 6×10^{-16}

D. 6×10^{12}

Answer: D

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39. The same current if passed through solution of silver nitrate and cupric salt connected in series. If the weights of silver deposited is $1.08g$. Calculate the weight of copper deposited

A. 0.6454 g

B. 6.354 g

C. 0.3177 g

D. 3.177 g

Answer: C

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

A. 56

B. 84

C. 112

D. 168

Answer: B

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41. When 9.65 coulomb of electricity is passed through a solution of silver nitrate (Atomic mass of Ag = 108 g mol^{-1}, the amount of silver deposited is :

A. 10.8 gm

B. 5.4 gm

C. 16.2 gm

D. 21.2 gm

Answer: A

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42. Silver is removed electrolytically from $200 mL$ of a $0.1 N$ solution of $AgNO_3$ by a current of $0.1 A$. How long will it take to remove half of the silver from the solution ?

A. 16 sec

B. 96.5 sec

C. 100 sec

D. 10 sec

Answer: B

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43. What current is to be passed for 0.25 sec for deposition of certain weight of metal which is equal to its electrochemical equivalent ?

A. 4A

B. 100A

C. 200A

D. 2A

Answer: A

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44. To deposit $0.6354g$ of copper by electrolysis of aqueous cupric sulpbate solution, the amount of electricity required (in coulmmbs) is.

A. 9650

B. 4825

C. 3860

D. 1930

Answer: D

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45. On passing C ampere of electricity through an electrolyte solution for l secodns, m gram metal deposits on cathode. The eq. wt. of metal is

A. $E = \frac{C \times t}{m \times 96500}$

B. $E = \frac{C \times m}{t \times 96500}$

C. $E = \frac{96500 \times m}{C \times t}$

D. $E = \frac{C \times t \times 96500}{m}$

Answer: a

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46. On passing $0.1F$ of electricity through aluminimum chloride, the amount of aluminimu metal deposited on cathode is $(A1 = 27)$.

A. 0.9gm

B. 0.3 gm

C. 0.27 gm

D. 2.7 gm

Answer: A

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47. Which of the following represents the first law of faraday

A. $E = mc^2$

B. $E = hv$

C. $m = ect$

D. $PV = nRT$

Answer: C

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48. On passing 3 A of electricity for 50 min, 1.8 g of metal deposits. The equivalent mass of metal is

A. 20.5

B. 25.8

C. 19.3

D. 30.7

Answer: C

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49. When 1 ampere of current flows for 1 second through a conductor, this quantity is called __________.

A. Faraday

B. Coulomb

C. E.M.F.

D. Ohm

Answer: B

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50. When electricity is passed through a solution of $AlCl_3$ and $13.5g$ of Al is deposited, the number of $Faradayofe \leq ctricitypassed\mu stbe$......................F`.

A. 0.5

B. 1

C. 1.5

D. 2

Answer: C

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51. The number of coulombs required for the deposition of 107.870 of silver is

A. 96500

B. 48250

C. 1,93,000

D. 10000

Answer: A

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52. Number of faraday's required to generate one gram atom of magnesiu from molten $MgCl_2$ is :

A. 1

B. 2

C. 3

D. 4

Answer: B

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53. Faraday has the dimension of

A. Coulombs

B. Coulomb equivalent

C. Coulomb per equivalent

D. Coulomb per degree kelvin

Answer: C

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54. During the electrolysis of molten NaCl solution, 230 g of sodium metal is deposited on the cathode, then how many moles of chlorine will be obtained at anode?

A. 10

B. 5

C. 35.5

D. 17.0

Answer: B

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55. How many coulombs are required for the oxidation of $1mol$ of H_2O to O_2?

A. 1.93×10^5

B. 9.6×10^4

C. 1.8

D. 3.2

Answer: A

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56. When during electrolusis of a solution of $AgNO_3, 9650$ coulmbs of charge pass through the electroplationg bath, the mass of silver deposited on the cathode will be:

A. 1.08g

B. 10.8g

C. 21.6g

D. 108g

Answer: B

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57. During the process of electroytic refining of copper some metals present as impurity settle as 'anode mud'. These are

A. Sn and Ag

B. Pb and Zn

C. Ag and Au

D. Fe and Ni

Answer: C

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58. What weight of copper will be deposited by passing 2 faradays of electricity through a cupric salt (atomic weight of $Cu = 63.5$) ?

A. 2.0 gm

B. 3.175 gm

C. 63.5 gm

D. 127.0 gm

Answer: C

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59. In an electroplating experiment m g of silver is deposited, whe 4 amperes of current flows for 2 mimtes. The amout (in g) of silver deposited by 6 amperes of current flowing for 40 seconds will be .

A. 4m

B. m/2

C. m/4

D. 2m

Answer: B

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

A. 1.0

B. 0.5

C. 0.1

D. 2.0

Answer: A

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61. In a metal oxide, there is 20% oxygen by weight. Its equivalent weight is

A. 40

B. 64

C. 72

D. 32

Answer: D

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62. The number of electrons involved in the reaction when one faraday of electricity is pased through an electrolyte is

A. 6×10^{23}

B. 6×10^{-23}

C. 96500

D. 8×10^{19}

Answer: A

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63. One electrolysis 1 mole Al atoms will be deposited by

A. 3 moles of electrons

B. 4 moles of electrons

C. 2 moles of electrons

D. 1 mole of electrons

Answer: A

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64. The atomic weight of Fe is 56. The weight of Fe deposited from $FeCl_3$ solution by passing 0.6 Faraday of electricity is ________.

A. 5.6 g

B. 11.2 g

C. 22.4 g

D. 33.6 g

Answer: B

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65. The amount of silver deposited by passing $241.25C$ of current through silver nitrated solution is .

A. 2.7g

B. 2.7mg

C. 0.27g

D. 0.54g

Answer: C

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66. When 1 F of electricity is passed through acidulated water O_2 evolved is

A. 11.2 dm^3

B. 5.6 dm^3

C. 22.4 dm^3

D. 1.0 dm^3

Answer: B

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67. In the electrolysis of water, one faraday of electrical energy would evovle at STP

A. one mole of oxygen

B. one g atom of oxygen

C. 8 g of oxygen

D. 22.4 litres of oxygen

Answer: C

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68. The volume of H_2 gas at NTP obtained by passing 4 amperes through acidified H_2O for 30 minutes is

A. 0.0836L

B. 0.0432L

C. 0.1672L

D. 0.836L

Answer: D

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69. A current of 2.0A passed for 5 hours through a molten metal salt deposits 22.2 g of metal (At. Wt. =177). The oxidation state of the metal in the metal salt is

A. $+1$

B. $+2$

C. $+3$

D. $+4$

Answer: C

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70. The SI unit of electric current is

A. Ohm

B. Volt

C. Ampere

D. Coulomb

Answer: C

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71. The quantitiy of electricity required to liberate 112 cm^3 of hydrogen at STP from acidified water is

A. 0.1 Faraday

B. 1 faraday

C. 965 coulomb

D. 96500 coulomb

Answer: C

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72. Faraday 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 two moles of electrons

Answer: B

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73. 4 g of copper was dissolved in concentrated nitric acid. The copper nitrate solutio on strong heating gave 5g of its oxide. The equivalent weight of copper is

A. 23

B. 32

C. 12

D. 20

Answer: B

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74. In the electrolysis of acidulated water, it is desired to obtain 1.12 cc of hydrogen per second under STP condition. The current to be passed is:

A. 9.65A

B. 19.3A

C. 0.965A

D. 1.93A

Answer: A

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75. 9.65C of electric current is passed through fused anhydrous magnesium chloride. The magnesium metal thus obtained is completely converted into Grignard reagen t. the number of m oles of the original reagent obtained of

A. 5×10^{-4}

B. 1×10^{-4}

C. 5×10^{-5}

D. 1×10^{-5}

Answer: C

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76. The approximate time duration in hours to electroplate 30 g of calcium from molten calcium chloride using a current of 5 amp is [At. Mass of Ca=40]

A. 8

B. 80

C. 10

D. 16

Answer: A

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77. On passing C ampere of current for time t sec through 1 litre of 2(M) $CuSO_4$ solution (atomic weight of Cu=63.5), the amount of m of Cu (in g) deposited on cathode will be:-

A. $m = \frac{Ct}{(63.5 \times 96500)}$

B. $m = \frac{Ct}{(31.25 \times 96500)}$

C. $m \frac{C \times 96500}{(31.25 \times t)}$

D. $m = \frac{31.75 \times C \times t}{96500}$

Answer: D

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78. Coulomb is equal to

A. Ampere × second

B. Ampere × minute

C. Watt × second

D. Volt × second

Answer: A

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79. The amount of substance deposited by the passage of 1 A of current for 1s is equal to :

A. Equivalent mass

B. Molecular mass

C. Electrochemical equivalent

D. Specific equivalent

Answer: C

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80. When same quantity of electricity is passed for half an hour, the amount of Cu and Cr deposited are respectivley 0.375g and 0.30g. Radio of electrochemical equivalents of Cu and Cr is

A. 0.8

B. 1.25

C. 2.5

D. 1.62

Answer: B

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81. Electrolysis of water with 1 faraday electricity gives

A. 1 mole of oxygen

B. 1 gram equivalent of oxygen

C. 1 molecule of oxygen

D. 1 atom of oxygen

Answer: B

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82. How many coulombs are required in order to reduce 12.3 g of nitrobenzene to niline ?

A. 115800C

B. 5790C

C. 28950C

D. 579000C

Answer: D

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83. On passing a current through a molten aluminium chloride for some time, produced 11.2 lit of Cl_2 at NTP at anode, the quantity of aluminium deposited at cathode is

A. 9g

B. 18g

C. 27g

D. 36g

Answer: A

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84. How many grams of cobalt metal will be deposited when a solution of cobat (II) chloride is electrolyzed with a current of 10 amperes for 109 minutes? (1 Faraday = 96,500C, Atomic mass of Co= 59u)

A. 4

B. 20

C. 40

D. 0.66

Answer: B

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85. A current was passed for two hour through a solution of an acid that liberated 11.2 litre of oxygen at NTP at anode. What will be the amount of copper deposited at the cathode by the same current when passed through a solution of copper sulphate for the same time?

A. 16g

B. 63g

C. 31.5g

D. 8g

Answer: B

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86. During electrolysis of fused aluminium chloride 0.9gm of aluminium was deposited on the cathode. Thevolume of chlorine liberated at the anode will be

A. 2.24 litres

B. 11.2 litres

C. 1.12 litres

D. 5.6 litres

Answer: A

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87. Rgw atomic weight of Al is 27. When a current of $5F$ is passed through a solution of Al^{+++} ions, the qeight of AL deposited is.

A. 27gm

B. 36gm

C. 45gm

D. 39gm

Answer: C

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88. The desired amount of charge for obtaining one mole of Al from Al^{3+}

A. $3 \times 96500C$

B. $96500C$

C. $\frac{96500}{3}C$

D. $\frac{96500}{2}C$

Answer: A

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89. Two platinum electrodes were immersed in a solution of $CuSO_4$ and electric current was passed through the solution. After some time, it was found that colour of $CuSO_4$ disappeared with evolution of gas at the electrode. The colourless solution contains.

A. Platimus sulphate

B. Copper hydroxide

C. copper sulphate

D. sulphuric acid

Answer: D

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90. Equal quantities of electricity are passed through 3 votameters containing $FeSO_4, Fe_2(SO_4)_2$ and $Fe(NO_3)_3$. Cosider the following statements

(A) The amounts of iron deposited I $FeSO_4$ and $Fe_2(SO_4)_3$ are equal

(B) The amount of iron deposited in $Fe(NO_3)_2$ is $2/3^{rd}$ of the amount deposited in $FeSO_4$

(C) The amount of iron deposited in $Fe_2(SO_4)_3$ and $Fe(NO_3)_3$ are equal

A. (A) is correct

B. (B) is correct

C. (C) is correct

D. Both (A) and (B) are correct

Answer: B::C

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91. Assertion : In electrolysis, the quantity of electricity needed for depositing 1 mole silver is different from that required for 1 mole of copper.

Reason : The molecular weights of silver and copper and different.

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

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

C. If assertion is true but reason is false

D. If the assertion and reason both are false.

Answer: B

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92. Statement-I: Equivalent conductance of all electrolytes decreases with increasing concentration.

Because Statement-II: Lesser number of ions ate available per gram equivalent at higher concentration.

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

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

C. If assertion is true but reason is false

D. If the assertion and reason both are false.

Answer: A

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93. STATEMENT 1 : one coulomb of electric charge deposits the weight that is equal to electrochemical equivalent of substance and

STATEMENT 2 One faraday deposits one mole of substance

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

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

C. If assertion is true but reason is false

D. If the assertion and reason both are false.

Answer: C

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94. Assertion A: Copper does not liberate hydrogen from the solution of dilute hydrochloric acid.

Reason (R): Hydrogen is below copper in the electrochemical series.

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

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

C. If assertion is true but reason is false

D. If the assertion and reason both are false.

Answer: D

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Ordinary Thinking Objective Questions (Conductor And conductance)

1. If one end of a piece of a metal is heated, the other end becomes hot after some time. This is due to

A. Energised electrons moving to the other part of the metal

B. Resistance of the metal

C. Mobility of atoms in the metal

D. Minor perturbation in the energy of atoms

Answer: A

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2. Which of the following shows electrical conduction ?

A. Potassium

B. Graphite

C. Diamond

D. Sodium

Answer: B

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3. The resistance of $0.01 N NaCl$ solution at $25^\circ C$ is 200Ω . Cell constant of conductivity cell is $1 cm^{-1}$. The equivalent conductnance is .

A. $5 \times 10^2 \Omega^{-1} cm^2 eq^{-1}$

B. $6 \times 10^3 \Omega^{-1} cm^2 eq^{-1}$

C. $7 \times 10^4 \Omega^{-1} cm^2 eq^{-1}$

D. $8 \times 10^5 \Omega^{-1} eq^{-1}$

Answer: A

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

A. 101.5

B. 139.5

C. 203.5

D. 279.5

Answer: B

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5. Kohlrausch\`s law states that at :

A. infinite dilution, each ion makes definite contribution to cnductance of an 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: B

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6. The equivalent conductance of $M/32$ solution of a weak monobasic acid is 8.0 and at infinite dilution is 400. The dissociation constant of this acid is :

A. 1.25×10^{-5}

B. 1.25×10^{-6}

C. 6.25×10^{-4}

D. 1.25×10^{-4}

Answer: A

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

A. Increase in numbe of ions

B. Increase in ionic mobility of ions

C. 100% ionisation of electrolyte at normal dilution

D. Increase in both i.e., number of ions and ionic mobility of ions

Answer: B

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8. Which of the following expressions correctly represents the equivalent conductance at infinite dilution of $Al_{SO_{4_3}}$. Given that $\overset{\circ}{\Lambda}_{Al^{3+}}$ and $\overset{\circ}{\Lambda}_{SO_4^{2-}}$ are the equivalent conduactance at infinite dilution of the respective ions?

A. $2\overset{0}{\wedge}_{Al^{3+}} + 3\overset{0}{\wedge}_{SO_4^{2-}}$

B. $\overset{0}{\wedge}_{Al^{3+}} + \overset{0}{\wedge}_{SO_4^{2-}}$

C. $\left(\overset{0}{\wedge}_{Al^{3+}} + \overset{0}{\wedge}_{SO_4^{2-}}\right) \times 6$

D. $\frac{1}{3}\overset{\wedge^o}{}Al^{3+} + \left(1\wedge^o\right)\frac{)}{2}SO_4^{2-}$

Answer: B

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9. Limiting molar conductivity of NH_4OH [i.e., $\Lambda^{\circ}_m\left(NH_4OH\right)$] is equal to:

A. $\overset{0}{\wedge}_{m\left(NH_4Cl\right)} + \overset{0}{\wedge}_{m(NaCl)} - \overset{0}{\wedge}_{m(NaOH)}$

B. $\overset{0}{\wedge}_{m(NaOH)} + \overset{0}{\wedge}_{m(NaCl)} - \overset{0}{\wedge}_{m\left(NH_4Cl\right)}$

C. $overet(0)(\wedge)_m(NH_4OH) + \overset{0}{\wedge}_m(NH_4Cl) - \overset{0}{\wedge}_m(HCl)$

D. $\overset{0}{\wedge}_m(NH_4Cl) + \overset{0}{\wedge}_m(NaOH) - \overset{0}{\wedge}_m(NaCl)$

Answer: D

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10. At $25^{\circ}C$ molar conductance of 0.1 molar aqueous solution of ammonium hydroxide is $9.54 ohm^{-1} cm^2 mol^{-1}$ and at infinte dilution its molar conductance is $238 ohm^{-1} cm^2 mol^{-1}$ The degree of ionisation of ammonium hydroxide at the same concentration and termperature is

A. $40.800\ \%$

B. $2.08o\ \%$

C. $20.800\ \%$

D. $4.008\ \%$

Answer: D

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11. The molar conductivity of a $0.5 mol/dm^3$ solution of $AgNO_3$ with electrolytic conductivity of $5.76 \times 10^{-3} Scm^{-1}$ at $298K$ is

A. $28.8S \quad cm^2/mol$

B. $2.88S \quad cm^2/mol$

C. $11.52S \quad cm^2/mol$

D. $0.086S \quad cm^2/mol$

Answer: C

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12. Which of the following statements is not applicable to electrolytic conductors

A. new products show up at the electrodes

B. Ions are responsible for carryng the current

C. Show a positive temperature coefficient for conductance

D. A single stream of electrons flows from cathode to anode

Answer: D

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13. The specific conductivity of N/10 KCl solution at $20^{\circ}C$ is $0.0212 ohm^{-1} cm^{-1}$ and the resistance of the cell containing this solution at $20^{\circ}C$ is 55 ohm. The cell constant is :

A. $1.166 cm^{-1}$

B. $2.173 cm^{-1}$

C. $3.324 cm^{-1}$

D. $4.616 cm^{-1}$

Answer: A

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14. The units of equivalent conductivity are

A. Ohm cm

B. $Ohm^{-1}cm^2$ (gm equivalent)$^{-1}$

C. Ohm cm^2 (gm equivalent)

D. S cm^{-2}

Answer: B

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15. The electrolytic conductance is a direct measure of

A. Resistance

B. Potential

C. concentration

D. Dissociation

Answer: D

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16. The conductivity of a strong electrolyte:

A. Increase on dilution slightly

B. Decrease on dilution

C. Does not change with dilution

D. Depend upon density of electrolytes itself

Answer: A

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17. Which of the following conducts electricity ?

A. Fused NaCl

B. CO_2

C. Br_2

D. Si

Answer: A

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18. At 18° C, the conductance of H^{+} and $CH3COO^{-}$ at infinite dilution are 315 and 35 mho cm^2eq^{-1} respectively. The equivalent conductance of CH_3COOH at infinite dilution is .... mho cm^2eq^{-1}.

A. 350

B. 280

C. 30

D. 315

Answer: A

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19. Specific conductance of 0.1M nitric acid is $6.3 \times 10^{-2} ohm^{-1} cm^{-1}$. The molar conductance of the solution is:

A. 630 $ohm^{-1} cm^{2} \text{mole}^{-1}$

B. 315 $ohm^{-1} cm^{2} \text{mole}^{-1}$

C. 63.0 $ohm^{-1} cm^{2} \text{mole}^{-1}$

D. 6300 $ohm^{-1} cm^{2} \text{mole}^{-1}$

Answer: A

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20. The best conductor of electricity is

A. 1M CH_3COOH solution

B. 1M H_2SO_4 solution

C. 1M HCl solution

D. 1M H_3BO_3 solution

Answer: B

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21. The conductance of a solution of an electrolyte is equal to that of its specific conductance The cell constant of the conductivity cell is equal to

A. Resistance

B. Faraday

C. Zero

D. Unity

Answer: D

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22. The electrical properties and their respective SI units are given below.

Identify the wrongly matched pair:-

A. Electrical property-Specific conductance, SI-unit-Sm^{-1}

B. Electrical property-conductance, SI Unit-S

C. Electrical property-Equivalent Conductance, S m^2 (gm equiv)$^{-1}$

D. Electrical property-Cell constant, SI unit-m

Answer: D

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23. On the basis of the given equivalent conductivity

$\lambda_{\infty}\left(NH_4Cl\right) = 130$

$\lambda_{\infty}\left(OH^{-}\right) = 174$

$\lambda_{\infty}\left(Cl^{-}\right) = 66$

The value of $\lambda_{\infty}\left(NH_4OH\right)$ will be

A. 304

B. 238

C. 108

D. 64

Answer: B

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24. Which one of the following statements is correct

A. The oxidation nubember of oxygen in KO_2 is zero

B. The specific conductance of an electrolyte solution decreases with increase in dilution

C. Sn^{2+} oxidises Fe^{3+}

D. $Zn/ZnSO_4$ is a reference electrode

Answer: B

View Text Solution

25. The limiting molar conductivities of HCl, CH_3COONa and NaCl are respectiley 425, 90 and 125 mho cm^2 mol^{-1} and $25\,^{\circ}C$. The molar conductivity of 0.1M CH_3COCH solution is 7.8 mho cm^2mol^{+1} at the same temperature then degree of dissociation is

A. 0.1

B. 0.20

C. 0.15

D. 0.03

Answer: B

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26. The equivalent conductance of $1M$ benzoic acid is $12.8 ohm^{-1} cm^2$. If the conductance of benzoate ion and H^+ ion are 12 and $288.42 ohm^{-1} cm^2$ respectively. Its degree of dissociation is :

A. 0.39

B. 3.9 %

C. 0.0035

D. 0.039 %

Answer: B

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27. At $25\,^\circ C$, the molar conductances at infinite dilution for the strong electrolytes

$NaOH$, $NaCl$ and $BaCl_2$ are 248×10^{-4}, 126×10^{-4} and $280 \times 10^{-4} Sm^2 mol^{-1}$ respectively. $\Lambda^\circ_m Ba(OH)_2$ in $Sm^2 mol^{-1}$

A. 52.4×10^{-4}

B. 524×10^{-4}

C. 402×10^{-4}

D. 262×10^{-4}

Answer: B

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28. What is the % dissociation of CH_3COOH, if equivalent conductivity at this dilution and at infinite dilution are 148 and 398 S cm^2/mol respectively

A. $37.18\ \%$

B. $47\ \%$

C. $48.78\ \%$

D. $10.8\ \%$

Answer: A

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29. Electrolytic conduction differs from metallic conduction. In case of metallic conduction -

A. The resistance increases with increasing temperature

B. The resistance decreases with increasing temperature

C. The flow of current does not generate heat

D. The resistance is independent of the length of the conductor.

Answer: a

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30. At^3Y, minimum numbers of elecrolyte required for a compound to obtained its conductivity is

A. 2

B. 3

C. 4

D. 1

Answer: A

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31. Which one is NOT a conductor of electricity ?

A. NaCl (aqueous)

B. NaCl (solid)

C. NaCl (molten)

D. Ag metal

Answer: B

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32. What is the effect of dilution on the equivalent conductance of strong electrolyte

A. Decrease on dilution

B. Remains unchanged

C. Increase on dilution

D. None of the above

Answer: C

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33. Conductivity (Unit Siemen's 'S') is directly proportional to area of the vessel and the concentration of the solution in it and is inversely proportionals to the length of the vessel, then the unit of constant of proportionality is :

A. Sm mol^{-1}

B. $Sm^2 mol^{-1}$

C. $S^{-2} m^2$ mol

D. $S^2 m^2 mol^{-2}$

Answer: B

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34. The highest electrical conductivity of the following aqueous solutions is of

A. 0.1 M acetic acid

B. 0.1 M chloroacetic acid

C. 0.1 M fluoroacetic acid

D. 0.1 M difluoroacetic acid

Answer: D

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35. The molar conductivities Λ°_{NaOAc} and Λ°_{HCI} at infinite dilution is watter at $25^{\circ} C$ are 91.0 and $426.2 Scm^{\circ}$ /mol respectively. To calculate Λ^{2}_{HOAc}, the additional value required is:

A. $\wedge^{o}_{H_2O}$

B. $\wedge^{o}_{KCl}$

C. $\wedge^{o}_{NaOH}$

D. $\wedge^{o}_{NaCl}$

Answer: D

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36. Resistance of a conductvity cell filled with a solution of an electrolyte of concentration 0.1 M is 100 Ω. The conductivity of this solution is 1.29 Sm^{-1}. Resistance of the same cell when filled with 0.02M of the same solution is 520Ω. the molar conductivity of 0.02M solution of the electrolyte will be:

A. $124 \times 10^{-4} Sm^2 mol^{-1}$

B. $1240 \times 10^{-4} Sm^2 mol^{-1}$

C. $1.24 \times 10^{-4} Sm^2 mol^{-1}$

D. $1.24 \times 10^{-4} Sm^2 mol^{-1}$

Answer: A

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37. The equivalent conductances of two strong electrolytes at infinite dilution in H_2O (where ions move freely through a solution) at $25\,^\circ C$ are given below :

$\Lambda^{\circ}_{CH_3COONa} = 91.0 Scm^2/\text{equi v.}$

$\Lambda^{\circ}_{HCl} = 426.2 Scm^2/\text{equiv.}$ What additional information//quantity one need to calculate Λ° of an aqueous solution of acetic acid ?

A. $(\wedge)^o$ of NaCl

B. $(\wedge)^o$ of CH_3COOK

C. The limiting equivalent conductance of $H^+\left((\wedge)^o H^+\right)$

D. $(\wedge)^o$ of chloroacetic acid $\left(Cl/CH_2COOH\right)$

Answer: A

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38. The molar conductivities of KCl, NaCl and KNO_3 are 152,128 and $111\ \mathrm{S\ cm}^2 mol^{-1}$ respectively. What is the molar conductivity of $NaNO_3$?

A. 101 S $cm^2 mol^{-1}$

B. 87 S $cm^2 mol^{-1}$

C. -101S $cm^2 mol^{-1}$

D. -391S $cm^2 mol^{-1}$

Answer: B

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39. If X is the conductivity of the solution and M is the molarity of the solution, the molar conductivity of the solution is given by _______.

A. $\frac{1000X}{M}$

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

C. $\frac{1000M}{X}$

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

Answer: B

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40. The unit ohm^{-1} is used for

A. Molar conductivity

B. Equivalent conductivity

C. Specific conductivity

D. Conductivity

Answer: D

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41. The correct expression in SI system relating the equivalent conductance $\left(\lambda_C\right)$, specific conductance (κ) and equivalent (C) is:-

A. $\lambda_C = \frac{\kappa}{C}$

B. $\lambda_C = \kappa \times \frac{1000}{C}$

C. $\lambda_C = \frac{\kappa \times 10^{-3}}{C}$

D. $\lambda_C = \frac{\kappa \times 10^{-6}}{C}$

Answer: B

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42. Assertion:Molar conductivity increases with decrease in concentration.

Reason:Conductivity always decrease with decrease in concentration.

A.

B.

C.

D.

Answer:

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43. The molar conductivity is maximum for the solution of concentration ________.

A. 0.001 M

B. 0.005 M

C. 0.002 M

D. 0.004 M

Answer: A

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44. The units of molar conductance are

A. $\Omega^{-1} mol^{-1}$

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

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

D. $\Omega cm^2 mol$

Answer: C

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45. Molar conductance of electrolytic solution $\wedge_m$ is

A. $\propto 1$

B. $\propto (1/A)$

C. $\propto (1/C)$

D. $\propto \left(\sqrt{C}\right)$

Answer: C

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46. Conductivity of a solution is directly proportional to

A. Dilution

B. Number of ions

C. Current density

D. Volume of the solution

Answer: B

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

A. Increases because of the electrolyte conducts better

B. Decreases because of the increased heat

C. Decreases because of the dissociation of the electrolyte is suppressed

D. Increases because the electrolyte is dissociated more

Answer: D

View Text Solution

48. The correct order of equivalent the electrolyte is dissociated more the correct order of equivalent conductances at infinite dilution in water at room temperature for H^+, CH_3COO^- and HO^- ions is

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

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

C. $H^+ > K^+ > HO^- > CH_3OO^-$

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

Answer: B

View Text Solution

49. Equivalent conductivity at infinite dilution for sodium potassium oxalate $\left(COO^-\right)_2Na^+K^+$ will be [given, molar conductivities of oxalate, K^+ and Na^+ ions at infinite dilution are 148.2, 50.1, 73.5 S cm^2mol^{-1}, respectively]

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

B. $67.95 S \quad cm^2 eq^{-1}$

C. $543.6 S \quad cm^2 eq^{-1}$

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

Answer: D

View Text Solution

50. Given $l/a = 0.5 cm^{-1}, R = 50 \text{ohm}, N = 1.0.$ The equivalent conductance of the electrolytic cell is .

A. 10 $ohm^{-1} cm^2 gmeq^{-1}$

B. 20 $ohm^{-1} cm^2 gmeq^{-1}$

C. 300 ohm S $cm^2 eq^{-1}$

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

Answer: A

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51. Conductivity of 0.01M NaCl solution is 0.00147 $ohm^{-1}cm^{-1}$. What happen to this conductivity if extra 100m L of H_2O will be added to the above solution?

A. Increases because of the electrolyte conducts better

B. Decreases because of the increased heat

C. Remains unchanged

D. First increases and then decreases

Answer: B

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52. Unit of ionic mobility is :

A. $m^2 \sec^{-1} \text{volt}^{-1}$

B. $m\sec^{-1}$

C. $m\sec^{-1}$volt

D. m $\sec^{-1}$$\text{volt}^{-1}$

Answer: A

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53. Which of the following statement is incorrect with respect to metallic or electronic conductivity

A. Metallic conductivity depends on the structure of metal and its characteristics

B. Metallic conductivity depends on the number of electrons in the valencshell of atom of metal

C. The electrical conductivity of metal increases with increase in temperature

D. There is no change in the structure of metal during electrical conduction

Answer: C

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54. The factor which is not affecting the conductivity of any solution is

A. Dilution

B. Nature of electrolyte

C. Temperature

D. None of these

Answer: D

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55. It has been observed that gaseous hydrogen chloride is a very poor conductor of electricity but a solutionof hydrogen chloride gas in water is a good conductor of electricity. This is due to the fact that

A. Water is good conductor of electricity

B. Hydrogen chloride gas in water solution ionizes

C. A gas is non-conductor but a liquid conducts electricity

D. Gas does not obey Ohm's law whereas solution does

Answer: B

View Text Solution

56. The questions consist of two atatements each, printed as Assertion and Reason. While answering these questions you are required to choose any one of the following four responses :

Assertion : According to Kohlrausch's law the molar conductivity of a strong electrolyte at infinite dilution is sum of molar conductivities of its ions.

Reason : The current carried by cation and anion is always equal.

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

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

C. If assertion is true but reason is false

D. If the assertion and reason both are false.

Answer: C

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57. Assertion: Electrical conductivity of copper inicreases with increase in temperature.

Reason: The electrical conductivity of metals is due to the motion of electrons.

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

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

C. If assertion is true but reason is false

D. if assertion is false but reason is true.

Answer: D

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58. Assertion: The resistivity for a substance is its resistance when its is one meter long and its area of cross section is one square meter.

Reason: The SI units of resistivity are ohm metre $(\Omega \quad m)$ and ohm centimeter $(\Omega \quad cm)$

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

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

C. If assertion is true but reason is false

D. If the assertion and reason both are false.

Answer: B

View Text Solution

59. Assertion: If $\lambda^{o}_{Na} + \lambda^{o}_{Cl^-}$ are molar limiting conductivity of the sodium and chloride ions respectively, then the limiting molar conductivity for sodium chloride is given by the equation: $\Lambda^{o}_{NaCl} = \lambda^{o}_{Na^+} + \lambda^{o}_{Cl^-}$.

Reason: This is according to Kohlrausch law of independent migration of ions.

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

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

C. If assertion is true but reason is false

D. If the assertion and reason both are false.

Answer: A

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Ordinary Thinking Objective Questions (Cell constant and Electrochemical cells)

1. The molar conductance of NaCl, HCl and CH_3COONa at infinite dilution are 126.45, 426.16 and 91 $ohm^{-1}cm^2mol^{-1}$ respectively. The molar conductance of CH_3COOH at infinite dilution is :

A. $201.28 ohm^{-1}cm^2mol^{-1}$

B. $390.71 ohm^{-1}cm^2mol^{-1}$

C. $698.28 ohm^{-1} cm^2 mol^{-1}$

D. $540.48 ohm^{-1} cm^2 mol^{-1}$

Answer: B

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

A. 0.142 cm^{-1}

B. 0.66 cm^{-1}

C. 0.918 cm^{-1}

D. 1.12 `cm^(-1)

Answer: C

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

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

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

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

D. $\frac{\Delta S}{DelaG}$

Answer: C

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4. A device that convers energy of combustion of fueles like hydrogen and methane, directly into electrical energy is known as .

A. Electrolytic cell

B. Dynamo

C. Ni-Cd cell

D. Fuel cell

Answer: D

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5. When the electric current is passed through a cell having an electrolyte, the positive ions move towards cathode and negative ions toqards the anode. If the cathode is pulled out of the solution .

A. The positive and negative ions will move towards the anode

B. The positive ions will start moving towards the anode, the negative ions will stop moving

C. The negative ions will continue to move towards the anode and the positive ions will stop moving

D. The positive and negative ions will start moving randomly

Answer: D

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6. Among Na, Hg, S, Pt and graphite which can be used as electodes in electrolytic cell having aqueous solutions?

A. Na,Pt and graphite

B. Na and Hg

C. Hg , Pt and graphite only

D. Na and S only

Answer: C

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7. In the reaction

$$Cu_{(s)} + 2Ag^{+}_{(aq)} \rightarrow Cu^{2+}_{(aq)} + 2Ag_{(s)}$$

the reduction half-cell reaction is:-

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

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

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

D. $Ag - e^{-} \rightarrow Ag^{+}$

Answer: C

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8. Which of the following reaction is reaction is used to make a fuel cell .

A. $Cd_{(s)} + 2Ni(OH)_{3(s)} \rightarrow CdO_{(s)} + 2Ni(OH) + H_2O_{(l)}$

B. $Pb_{(s)} + PbO_{2(s)} + 2H_2SO_{4(aq)} \rightarrow 2PbSO_{4(s)} + 2H_2O_{(l)}$

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

D. $2Fe_{(s)} + O_{2(g)} + 4H^{+}_{(aq)} \rightarrow 2Fe^{2+}_{(aq)} + 2H_2O_{(l)}$

Answer: C

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9. Which of the following statement is true for the electrochemical Daniell cell ?

A. Electrons flow from copper electrode to zinc electrode

B. Current flows from zinc electrode to copper electrode

C. Cations move towards copper electrode which is cathode

D. Cations move towards zinc electrode

Answer: C

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10. The chemical reaction

$$2AgCl_{(\text{fused})} + H_{2(g)} \rightarrow 2HCl_{(aq)} + 2Ag_{(s)}$$

taking place in a galvanic cell is represented by the notation

A. $Pt\left|H_{2(g)}, 1\text{bar}\right|1M \quad KCl_{(aq)}/AgCl_{(s)} \mid Ag_{(s)}$

B. $Pt_{(s)}\left|H_{2(g)}, 1\text{bar}\right|1M \quad HCl_{(aq)} \mid \mid 1MAg^{+}_{(aq)} \mid Ag_{(s)}$

C. $Pt_{(s)}\left|H_{2(g)}, 1\text{bar}\right|1M \quad HCl_{(aq)}\left|AgCl_{(s)}\right|Ag_{(s)}$

D. $Pt_{(s)}\left|H_{2(g)}, 1\text{bar}\right|1M \quad HCl_{(aq)} \mid Ag_{(s)} \mid AgCl_{(s)}$

Answer: B

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11. In Cu-Zn cell

A. Reduction occurs at the copper cathode

B. oxidation occurs at the copper cathode

C. Reduction occurs at the anode

D. Chemical energy is converted to light energy

Answer: A

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12. Which of the following is used widely in the manufacture of lead storage battery?

A. Arsenic

B. Lithium

C. Bismuth

D. Antimony

Answer: D

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13. If a spoon of copper metal is placed in a solution of ferrous sulphate:

A. Copper will precipitate out

B. Iron will precipitate out

C. Copper will dissolve

D. No reaction will take place

Answer: D

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14. In an electrolchemical cell

A. Potential energy changes into kinetic energy

B. Kinetic energy changes into potential energy

C. Chemical energy changes into electrical energy

D. Electrical energy changes into chemical energy

Answer: C

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

A. H_2 is cathode and Cu is anode

B. H_2 is anode and Cu is cathode

C. Reduction occurs at H_2 electrode

D. Oxidation occurs at Cu electrode

Answer: B

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16. The acid used in lead storage battery is`

A. H_2SO_4

B. H_3PO_4

C. HCl

D. HNO_3

Answer: A

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17. For gold plating, the electrolyte used is

A. $AuCl_3$

B. $HAuCl_4$

C. $K\left[Au(CN)_2\right]$

D. None of these

Answer: C

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18. $Zn_{(s)}\left|Zn^{2+}_{(aq)}\right|\mid Cu^{2+}_{(aq)}\mid Cu_{(s)}\,(\text{cathode})\,(\text{anode})$ is

A. Weston cell

B. Daniel cell

C. Calomel cell

D. Faraday cell

Answer: B

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19. A weak electrolyte having the limiting equivalent conductance of 400 S $cm^2 g$. equivalent^{-1} at 298 K is 2% ionized in its 0.1N solution. The resistance of this solution (in ohms) in an electrolytic cell of cell constant 0.4 cm^{-1} at this temperature is:-

A. 200

B. 300

C. 400

D. 500

Answer: D

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20. In balancing the half reaction, $S_2O_3^{2-} \rightarrow S$, the number of electrons that must be added is :-

A. 4 on the left

B. 3 on the right

C. 2 on the left

D. 2 on the right

Answer: A

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21. If hydrogen electrodes dipped in two solutions of $pH = 3$ and $pH = 6$ are connected by a salt bridge, the EMF_{cell} is

A. 0.177V

B. 0.3V

C. 0.052V

D. 0.104V

Answer: A

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22. In electroplating, the article to be electoplated serves as:

A. Cathode

B. Electrolyte

C. Anode

D. Conductor

Answer: A

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23. Consider the Galvanic cell $Zn^{-}\left|ZnSO_4\right| \mid CuSO_4 + Cu^{\oplus}$ the reaction at cathode is .

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

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

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

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

Answer: B

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24. The cell reaction $Cu + 2Ag^{+} \rightarrow Cu^{+2} + Ag$ is best represented by

A. $Cu_{(s)}\left|Cu^{+2}_{(aq)}\right| \mid Ag^{+}_{(aq)} \mid Ag$

B. $Pr\left|Cu^{+2}\right| \mid Ag^{+}_{(aq)} \mid Ag_{(s)}$

C. $Cu^{+2}|Cu||Pt|Ag$

D. None of the above representation

Answer: A

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25. During charging of lead storage bttery, the reaction occurring at the cathode is:-

A. $Pb^{2+} + 2e \rightarrow Pb$

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

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

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

Answer: C

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26. Which of the following statements is correct? Galvanic cell converts

A. Chamical energy into electrical energy

B. Electrical energy into chemical energy

C. Metal from its elemental state to the combined state

D. Electrolyte into individual ions

Answer: A

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27. Hydrogen-oxygen fuel cell are used in space-craft to supply

A. Power for heat and light

B. Power for pressure

C. Oxygen

D. Water

Answer: B::D

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28. In the cell $Zn \left| Zn^{2+} \right| \left| Cu^{2+} \right| Cu$, the negaitve terminal is

A. Cu

B. Cu^{2+}

C. Zn

D. Zn^{2+}

Answer: D

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29. When a lead storage battery is charged:

A. Lead dioxide dissolves

B. Sulphuric acid is regenerated

C. The lead electrode becomes coated with lead sulphate

D. The amount of sulphuric acid decreases

Answer: B

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30. In galvanic cell, the salt bridge is used to

A. Complete the circuit

B. Reduce the electric resistance in the cell

C. Separate cathode from anode

D. Carry salts for the chemical reaction

Answer: A

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31. In charging the lead accumulator battery

A. PbO_2 dissolves

B. H_2SO_4 is reproduced

C. $PbSO_4$ deposits on lead electrode

D. Pb deposits on lead eletrode

Answer: B

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32. The site of oxidation in an electrochemical cell is:-

A. The anode

B. The cathode

C. The electrode

D. Reference electrode

Answer: A

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33. Which of the following reaction does not take place at cathode

A. $Ag^{+} + e^{-} \rightarrow Ag$

B. $Cl^{-} \rightarrow Cl + e^{-}$

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

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

Answer: B

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34. In dry cell , reaction which takes place at the anode is ________.

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

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

C. $Mn^{2+} + 2e^{0} \rightarrow Mn_{(s)}$

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

Answer: B

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35. The units of cell constant are ......

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

B. ohm cm

C. cm

D. cm^{-1}/m^{-1}

Answer: D

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36. Mark the false statement

A. A salt bridge is used to eliminate liquid junction potential

B. The Gibbs free energy change, ΔG is related with electromotive force (E), as $\Delta G = -nFE$

C. Nernst equation for single electrode potential is $E = E^o - \frac{RT}{nF}\ln a_{M^{n+}}$

D. The efficiency of a hydrogen oxygen fuel cell is 23%

Answer: C

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37. The standard cell potential of $Zn\left|zn^{2+}_{(aq)}\right|\left|Cu^{2+}_{(aq)}\right|Cu$ cell is 1.10 V . The maximum work obtained by this cell will be ________.

A. 106.15 kJ

B. $-212.30kJ$

C. $-318.45kJ$

D. $-424.60kJ$

Answer: B

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38. The relationship between standard reduction potential of a cell and equilibrium constant is shown by

A. $E^{o}_{cell}=\frac{n}{0.059}\log\ K_c$

B. $E^{o}_{cell}=\frac{0.059}{n}\log\ K_c$

C. $E^{o}_{Cell}=0.059n\ \log\ K_c$

D. $E^{o}_{cell}=\frac{\log\ K_c}{n}$

Answer: B

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39. Calculate the cell constant if the specific conductance of a Solution 0.2 I $\text{ohm}^{-1} cm^{-1}$ and its conductance is 0.04 ohm^{-1}.

A. 1 cm^{-1}

B. 0 cm^{-1}

C. 5 cm^{-1}

D. 0.2 cm^{-1}

Answer: C

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

A. 1

B. zero

C. 0.5

D. 4

Answer: A

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

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

B. $F_2 \rightarrow 2F^-$

C. $\frac{1}{2}O_2 + 2H^+ \rightarrow H_2O$

D. None of these

Answer: A

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42. In a hydrogen-oxygen fuel cell, combustion of hydrogen occurs to :

A. Produce high purity water

B. Create potential difference between the two electrodes

C. Generate heat

D. Remove adsorbed oxygen from electrode surfaces

Answer: B

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

A. $P_{(H_2)} = 1atm$ and $[H^+] = 2.0M$

B. $P_{(H_2)} = 1atm$ and $[H^+] = 1.0M$

C. $P_{(H_2)} = 2atm$ and $[H^+] = 1.0M$

D. $P_{(H_2)} = 2atm$ and $[H^+] = 2.0M$

Answer: C

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44. The electrode reactions that takes place at the anode of CH_4 - O_2 fuel cell is :

A. $2O_2 + 8H^+ + 8e^- \rightarrow 4H_2O$

B. $CH_4 + 2H_2O \rightarrow CO_2 + 8H^+ + 8e^-$

C. $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$

D. $2H^+ + 2e^- \rightarrow H_2$.

Answer: B

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45. The electrochemical cell stops working after some time because:

A. Electrode potential of both the electrodes becomes zero

B. Electrode potential of both the electrodes becomes equal

C. One of the electrode is eates away

D. The cell reaction gets reversed

Answer: B

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46. The cathode reaction in electrolysis of dilute sulphuric acid with Platinum electrode is

A. Oxidation

B. Reduction

C. Oxidation and reduction both

D. Neutralisation

Answer: B

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47. If the half-cell reaction $A + e^{-} \rightarrow A^{-}$ has a large negative reduction potentials, it follows that:

A. A is readily reduced

B. A is readily oxidised

C. A^{-} is readily reduced

D. A^{-} is readily oxidised

Answer: D

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48. At $25\,^{\circ}C$ specific conductivity of a normal solution of KCI is 0.0022765 ohm. The resistance of cell is 400 ohms. The cell constant is .

A. 0.815

B. 1.016

C. 1.106

D. 2.016

Answer: C

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49. The tendency of an electrode to lose electrons is known as

A. Electrode potential

B. Reduction potential

C. Oxidation potential

D. E.M.F.

Answer: C

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50. What is the cell reaction occurring in Daneill cell (galvanic cell) ?

A. $Cu_{(s)} + ZnSO_{4(aq)} \rightarrow CuSO_{4(aq)} + Zn_{(s)}$

B. $Zn_{(s)} + CuSO_{4(aq)} \rightarrow Cu_{(s)} + ZnSO_{4(aq)}$

C. $Ni_{(s)} + ZnSO_{4(aq)} \rightarrow NiSO_{4(aq)} + Zn_{(s)}$

D. $2Na_{(s)} + CdSO_{4(aq)} \rightarrow Na_2SO_{4(aq)} + Cd_{(s)}$

Answer: B

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51. Anode reaction of a fuel cell is:-

A. $Zn(Hg) + 2OH^- \rightarrow ZnO_{(s)} + H_2O + 2e^-$

B. $Pb_{(s)} + SO^{2-}_{4(aq)} \rightarrow PbSO_{4(s)} + 2e^-$

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

D. $2Fe_{(s)} \rightarrow 2Fe^{2+} + 4e^-$

Answer: C

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52. The cell reaction $Zn + Cu^{2+} \rightarrow Zn^{2+} + Cu$, is best represented by-

A. $Zn\left|Zn^{2+}\right|\left|Cu^{2+}\right|Cu$

B. $Cu\left|Cu^{2+}\right|\left|Zn^{2+}\right|Zn$

C. $Cu\left|Zn^{2+}\right||Zn|Cu^{+}$

D. $Cu^{2+}|Zn|\left|Zn^{2+}\right|Cu$

Answer: A

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

A. 1.02 cm

B. 0.102 cm^{-1}

C. 1.00 cm^{-1}

D. 0.5 cm^{-1}

Answer: C

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54. Which coloruless gas evolves when NH_4CI reacts with zinc in a dry cell battery ?

A. NH_4

B. N_2

C. H_2

D. Cl_2

Answer: C

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

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

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

What is the value of λ_{ClCH_2COOH} ?

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

B. 289.5 $ohm^{-1}cm^2gmeq^{-1}$

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

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

Answer: C

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56. Which of the following statement about galvanic cell is incorrect

A. Anode is positive

B. Oxidation occurs at the electrode with lower reduction potential

C. Cathode is positive

D. Reduction occurs at cathode

Answer: A

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57. When electric current is passed through an ionic hydride in molten state:

A. Hydrogen is obtained at anode

B. Hydrogen is obtainied at cathode

C. No change

D. Hydride ion moves towards cathode

Answer: A

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58. In electrolytic cell, cathode acts as an/a

A. Oxidising agent

B. Reducing agent

C. Either of the two

D. Neither (a) nor (b)

Answer: B

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59. Which of the following is concentration cell

A. $Cu_{(s)}/Cu^{2+}_{(aq.1M)}\ |||\ |Cu^{2+}_{(aq.1M)}/Cu_{(s)}$

B. $Cu_{(s)}/Cu^{2+}_{(aq.0.5M)}//Cu^{2+}_{(aq.0.5M)}/Cu_{(s)}$

C. $Zn_{(s)}/Zn^{2+}_{(aq.0.5M)}/Cu^{2+}_{(aq.1M)}/Cu_{(s)}$

D. . $^{\Theta}Pt/H_{2_{g\ 1\ \text{bar}}}/HCl_{aq}\ \ 0.002M//HCl_{(aq.0.005M)}/H_{2(g.1\text{bar})}/Pt^{\oplus}$

Answer: D

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60. Which of the following reaction occurs at the cathode of a common dry cell

A. $Mn \rightarrow Mn^{2+} + 2e^{-}$

B. $2MnO_2 + Zn^{2+} + 2e^{-} \rightarrow ZnMn_2O_4$

C. $2ZnO_2 + Mn^{2+} + 2e^{-} \rightarrow MnZn_2O_4$

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

Answer: B

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

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

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

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

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

Answer: D

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62. The electrodes of a conductivities cell are 3 cm apart and have a cross-sectional area of 4 cm^2. The cell constant of the cell (in cm^{-1}) is ________

A. 4×3

B. $4/3$

C. $3/4$

D. $9/4$

Answer: C

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63. Cell reaction during discharging of lead storage battery at cathode is :-

A. $Pb_{(s)} + SO_2 + O_2 \rightarrow PbSO_{4(s)}$

B. $Pb_{(s)} + SO^{2-}_{4(aq)} \rightarrow PbSO_{4(s)} + 2e^-$

C. $PbO_{2(s)} + 4H^+_{(aq)} + 2e^- + SO^{2-}_{4(aq)} \Leftrightarrow PbSO_{4(s)} + 2H_2O$

D. $Pb^{2+}_{(aq)} + SO^{2-}_{4(aq)} + PbSO_{4(s)}$

Answer: B

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64. A depolarizer used in dry cell is :

A. Ammonium chloride

B. Manganese dioxide

C. Potassium hydroxide

D. Sodium phosphate

Answer: B

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65. The position of some metals in the electrochemical series in decreasing electropositeve character is given as $Mg > Al > Zn > Cu > Ag$. What will happen if a copper spoon is used to stir a solution of aluminimum nitrate ?

A. The spoon will get coated with Al

B. An alloy of Cu and Al is formed

C. The solution becomes blue

D. There is no reaction

Answer: D

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66. The emf of a Daniell cell at $298K$ is E_1

$Zn\left|ZnSO_4(0.01M)\right|\left|CuSO_4(1.0M)\right|Cu$

When the concentration of $ZNSO_4$ is $1.0M$ and that of $CuSO_4$ is $0.01M$, the emf changed to E_2. What is the relationship between E_1 and $E(2)$?

A. $E_1 - E_2 = 0$

B. $E_1 < E_2$

C. $E_1 > E_2$

D. $E_1 = 10^2 E_2$

Answer: C

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67. Assertion (A): For a Daniell cell :

$Zn\left|Zn^{2+}\right|\left|Cu^{2+}\right|Cu$ with $E_{cell} = 1.1V$, the application of opposite potential greater than $1.1V$ results into the flow of electron from cathod to anode.

Reason (R): Zn is deposited at anode and Cu is dissolved at cathode

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

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

C. If assertion is true but reason is false

D. If the assertion and reason both are false.

Answer: A

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68. Assertion: The cell potential of mercury cell is 1.35V which remains constant.

Reason: In mercury cell, the electrolyte is a paste of KOH and ZnO.

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

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

C. If assertion is true but reason is false

D. If the assertion and reason both are false.

Answer: B

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69. Assertion: For a cell reaction $Zn_{(s)} + Cu^{2+}_{(aq)} \rightarrow Zn^{2+}_{(aq)} + Cu_{(s)}$, at the equilibrium voltmeter gives zero reading.

Reason: At the equilibrium, there is no change in the concentration of Cu^{2+} and Zn^{2+} ions.

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

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

C. If assertion is true but reason is false

D. If the assertion and reason both are false.

Answer: A

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70. Assertion: Galvanic cells containing hydrogen, methane, methanol etc. as fuels are called fuel cells.

Reason: They are designed to convert the energy of combustion of fuels directly into electrical energy.

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

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

C. If assertion is true but reason is false

D. If the assertion and reason both are false.

Answer: A

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71. (A) Identification of cathode and anode is done with the help of thermometer.

(R) Higher is the value of reduction potential. greater would be its reducing power.

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

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

C. If assertion is true but reason is false

D. If the assertion and reason both are false.

Answer: D

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72. (A) An electrochemical cell can be set-up only if the redox reaction is spontaneous.

(R) A reaction is spontaneous if free energy change is negative.

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

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

C. If assertion is true but reason is false

D. If the assertion and reason both are false.

Answer: B

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73. Assertion: In an electrochemical cell anode and cathode are respectively negative and positive electrodes.

Reason: At anode oxidation takes place and at cathode reduction takes place.

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

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

C. If assertion is true but reason is false

D. If the assertion and reason both are false.

Answer: A

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74. Assertion: $Ni/Ni^{2+}(1.0M) \mid \left|Au^{3+}(1.0M)\right|Au$, for this cell emf is 1.75V if $E^{o}_{Au^{3+}/Au} = 1.50$ and $E^{o}_{Ni^{2+}/Ni} = 0.25V$

Reason: Emf of the cell $= E^{o}_{\text{cathode}}$ - E^{o}_{anode}

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

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

C. If assertion is true but reason is false

D. If the assertion and reason both are false.

Answer: A

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75. Assertion: E.m.f. and potential difference are same for cell.

Reason: Both gives the difference in electrode potential under any condition.

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

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

C. If assertion is true but reason is false

D. If the assertion and reason both are false.

Answer: D

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76. K and Cs are used in photoelectric cells.

K and Cs emit electrons on exposure to light.

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

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

C. If assertion is true but reason is false

D. If the assertion and reason both are false.

Answer: A

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Ordinary Thinking Objective Questions (Electrode potential E_{cell}, Nernst equation and ECS)

1. Standard reducation potential at $25^{\circ}C$ of Li^{+}/Li, Ba^{2+}/Ba, Na^{+}/Na and Mg^{+}/Mg are -3.05, -2.90, -2.71 and -2.37 volt respectively. Which one of the following is the strongest oxidising agent ?

A. Na^{+}

B. Li^{+}

C. Ba^{2+}

D. Mg^{2+}

Answer: D

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2. Which of the following displaces Br_2 from an aqueous solution containing bromide ions ?

A. Cl_2

B. Cl^-

C. I_2

D. I_3^-

Answer: A

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

A. The pH of 0.1 M HCl and 0.1 M acetic acid is not the same

B. Acids used in two compartments are different

C. E.M.F of a cell depends on the molarities of acids used

D. The temperature is constant

Answer: A

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4. E° for the cell

$Zn(s)\left|Zn^{2+}(aq)\right|Cu^{2+}(aq) \mid Cu(s)$ is 1.1V at $25^\circ C$ the equilibrium constant for the cell reaction is about

A. 10^{-28}

B. 10^{37}

C. 10^{+18}

D. 10^{+17}

Answer: B

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5. For the cell reaction

$Cu^{2+}\left(C_1, aq.\right) + Zn(s) \Leftrightarrow Zn^{2+}\left(C_2, aq\right) + Cu(s)$

of an electrochemical cell, the change in free energy (ΔG) of a given temperature is a function of

A. ln $\left(C_1\right)$

B. ln $\left(C_2\right)$

C. ln $\left(C_1 + C_2\right)$

D. ln $\left(C_2/C_1\right)$

Answer: D

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6. Which is the strongest reducing agent among alkali metals?

A. Li

B. Na

C. K

D. Cs

Answer: A

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7. Electode potential of Zn^{2+}/Zn is -$0.7V$ and that of $Cu^{2+}/Cusi = 0.34V$.

The EMF of the cell consttructed between these two elctrodes is .

A. 1.10V

B. 0.42V

C. $-1.1V$

D. $-0.42V$

Answer: A

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8. Which one of the following condition will increase the voltage of the cell represented by the equation?

$Cu(s) + 2Ag^{+}(aq) \left(Cu^{2+}(aq) + 2Aq(s) \right.$

A. Increase in the concentration of Ag^{+} ion

B. Increase in the concentration of Cu^{+} ion

C. Increase in the dimension of silver electrode

D. Increase in the dimension of copper electrode

Answer: A

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9. The cell reaction of a cell is

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

if the standard reduction potential of Mg and Cu are -2.37 V and +0.34 V respectively The emf of the cell is

A. 2.03V

B. $-2.03V$

C. $+2.71V$

D. $-2.71V$

Answer: C

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10. The emf of a Daniell cell at $298K$ is E_1

$Zn\left|ZnSO_4(0.01M)\right|\left|CuSO_4(1.0M)\right|Cu$

When the concentration of $ZNSO_4$ is $1.0M$ and that of $CuSO_4$ is $0.01M$, the emf changed to E_2. What is the relationship between E_1 and $E(2)$?

A. $E_2 = 0 \neq E_1$

B. $E_1 > E_2$

C. $E_1 < E_2$

D. $E_1 = E_2$

Answer: B

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11. A hypothetical elecrochemical cell is shown below:

$A^{\ominus}\left|A^+(xM)\right|\left|B^+(yM)\right| \mid B^{\oplus}$

The emf measured is $+0.20V$. The cell reaction is

A. The cell reaction cannot be predicted

B. $A + B^{+} \rightarrow A^{+} + B$

C. $A^{+} + B \rightarrow A + B^{+}$

D. $A^{+} + e^{-} \rightarrow A, B^{+} + e^{-} \rightarrow B$

Answer: B

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12. If $E^{\circ}_{Fe^{2+}}/Fe = -0.441V$

and $E^{\circ}_{Fe^{3+}}/Fe^{2+} = 0.771V$

The standard EMF of the reaction

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

will be:

A. 1.212V

B. 0.111V

C. 0.330V

D. 1.653V

Answer: A

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13. On the basis of the following E° values, the stongest oxidizing agent is $\left[Fe(CN)_6\right]^{4-} \rightarrow \left[Fe(CN)_6\right]^{3-} + e^-, E^{\circ} = -0.35V$

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

A. Fe^{3+}

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

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

D. Fe^{2+}

Answer: A

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14. Standard free energies of formation (I $kJ/$mol) at $298K$ are -237.2, - 394.4 and -8.2 for $H_2O(1), CO_2(g)$ and pentange (g) , respectively . The value of E°_{cell} for the pentane-oxygen fuel cell is .

A. 1.0968V

B. 0.0968

C. 1.968V

D. 2.0968V

Answer: C

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15. Given:

(i) $Cu^{2+} + 2e^- \rightarrow Cu, E^{\circ} = 0.337V$

(ii) $Cu^{2+} + e^- \rightarrow Cu^+, E^{\circ} = 0.153V$

Electrode potential, E° for the reaction, $Cu^+ + e^- \rightarrow Cu$, will be

A. 0.52 V

B. 0.90 V

C. 0.30 V

D. 0.38 V

Answer: A

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16. For the reduction of silver ions with copper metal, the standard cell potential was foound to be $+0.46V$ at $25^{\circ}C$. The value of standard Gibbs energy, ΔG° will be $\left(F = 96, 500Cmol^{-1}\right)$:

A. $-98.0kJ$

B. $-89.0kJ$

C. $-89.0J$

D. $-44.5kJ$

Answer: B

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17. Consider the following relations for *emf* of a electrochemical cell

(i) emf of cell = (Oxidation potential of anode)-(Reduction potential of cathode)

(ii) emf of cell = (Oxidation potential of anode)+(Reduction potential of cathode)

(iii) emf of cell = (Reduction potential of anode)+(Reduction potential of cathode)

(iv) emf of cell = (Oxidation potential of anode)-(Oxidation potential of cathode)

Which of the above realtions are correct?

A. 3 and 1

B. 1 and 2

C. 3 and 4

D. 2 and 4

Answer: D

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18. The electrode potentials for

$Cu^{2+} + e^{-} \rightarrow Cu^{+}$ and

$Cu^{+}e^{-} \rightarrow Cu_{s}$

are $+0.15$V and $+0.50V$ respectively the value of $E^{\circ}_{\frac{Cu^{2+}}{Cu}}$ will be?

A. 0.150 V

B. 0.500V

C. 0.325V

D. 0.650V

Answer: C

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19. Standard electrode potential for Sn^{4+}/Sn^{2+} couple is $+0.15$ V and that for the Cr^{3+}/Cr couple is -0.74V . These two couples in their standard state 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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20. If the E° for a given reaction has a negative value, then which of the following gives the correct relationship for the of ΔG° and k_{aq}?

A. $\Delta G^{\circ} > 0, K_{eq} < 1$

B. $\Delta^{\circ} > 0, K_{eq} > 1$

C. $\Delta G^{+} < 0, K_{eq} > 1$

D. $\Delta G^{\circ} < 0, K_{eq} < 1$

Answer: A

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21. A solution contains Fe^{2+}, Fe^{3+} and T^{-} ions. This solution was treated with iodine at $35^{\circ} C. E^{\circ}$ for Fe^{3+}, Fe^{2+} is $0.77 V$ and E° for $I_2/2I^{-}$ = 0.536 V. The favourable redox reaction is:

A. I^{-} will oxidised to I_2

B. Fe^{2+} will be oxidised to Fe^{3+}

C. I_2 will be reduced to I^{-}

D. There will be no redox reaction

Answer: A

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

$$\frac{2}{3}A1_2O_3 \rightarrow \frac{4}{3}Al + O_2, \Delta_rG = +966KJmol^{-1}$$

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

A. 5.0V

B. 4.5V

C. 3.0V

D. 2.5V

Answer: D

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23. Standard reduction potentials of the half reactions are given below

$F_{2(g)} + 2e^- \rightarrow 2F^-_{(aq)} \qquad E^\circ = +2.85V$

$Cl_{2(g)} + 2e^- \rightarrow 2Cl^-_{(aq)} \qquad E^\circ = +1.36V$

$Br_{2(l)} + 2e^- \rightarrow 2Br^-_{(aq)} \qquad E^\circ = +1.06V$

$I_{2(s)} + 2e^- \rightarrow 2I^-_{(aq)} \qquad E^\circ = +0.53V$

The strongest oxidising and reducing agents respectively are

A. F_2 and I^-

B. Br_2 and Cl^-

C. Cl_2 and Br^-

D. Cl_2 and I_2

Answer: A

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24. Four successive members of the first series of the transition metals are listed below. For which one of them the standard potential $\left(E^\circ_{M^{2+}/M}\right)$ value has a positive sign?

A. $Co(Z = 27)$

B. $Ni(Z = 28)$

C. $Cu(Z = 29)$

D. $Fe(Z = 26)$

Answer: C

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

A. 1.81 V

B. 0.059V

C. 0.59V

D. 0.118V

Answer: C

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26. A button cell used in watched funcations as follwing

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

If half cell potentials are

$Zn^{2+}(aq.) + 2e^- \rightarrow Zn(s), E^\circ = -0.76V$

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

The cell potential will be

A. 1.34V

B. 1.10V

C. 0.42V

D. 0.84V

Answer: B

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27. The pressure of H_2 required to make the potential of H_2 - electrode zero in pure water at 289K is :

A. $10^{-14} atm$

B. $10^{-12} atm$

C. $10^{-10} atm$

D. $10^{-4} atm$

Answer: A

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28. If the E°_{cell} for a given reaction has a positive value, then which of the following gives the correct relationship for the values of ΔG° and K_{eq} :-

A. $\Delta G^{\circ} < 0, K_{eq} < 1$

B. $\Delta G^{\circ} > 0, K_{eq} < 1$

C. $\Delta G^\circ > 0, K_{eq} > 1$

D. $\Delta G^\circ < 0, K_{eq} > 1$

Answer: B

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29. Which of the following has been universally accepted as a reference electrode at all temperature and has been assigned a value of zero volt?

A. Graphite electrode

B. Copper electrode

C. Platinum electrode

D. Standard hydrogen electrode

Answer: D

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30. The emf of a galvanic cell, with electrode potentials of silver $= +0.80V$ and that of copper $= +0.34V$, is .

A. $-1.1V$

B. $+1.1V$

C. $+0.46V$

D. $+0.76V$

Answer: C

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31. What is the single electrode potential of a half-cell for zinc electrode dipping in 0.01 M $ZnSO_4$ solution at $25^\circ C$? The standard electrode potential of Zn/Zn^{2+} system is 0.763 volt at $25^\circ C$.

A. 0.8221 V

B. 8.221 V

C. 0.5282 V

D. 9.232 V

Answer: A

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32. The standard EMF of a galvanic cell involving cell reaction with $n = 2$ is found to be $0.295V$ at $25^{\circ}C$. The equilibrium constant of the reaction would be

A. 2×10^{11}

B. 4×10^{12}

C. 1×10^{2}

D. 1×10^{10}

Answer: D

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33. Which of the following is false for Hg?

A. it can evolve hydrogen from H_2S

B. It is a metal

C. It has high specific heat

D. It is less reactive than hydrogen

Answer: A

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34. The metal that forms a self-protecting film of oxide to prevent corrosion is:

A. Cu

B. Al

C. Na

D. Au

Answer: B

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35. Which one among the followig is the strongest reducing agent

$Fe^{2+} + 2e^- \rightarrow Fe(-0.44V)$

$Ni^{2+} + 2e^- \rightarrow Ni(-0.25V)$

$Sn^{2+} + 2e^- \rightarrow Sn(-0.14V)$

$Fe^{3+} + e^- \rightarrow Fe^{2+}(-0.77V)$.

A. Fe

B. Fe^{2+}

C. Ni

D. Sn

Answer: A

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36. Beryllium is placed above magnesium in the II group. Beryllium dust, therefore, when added to $MgCl_2$ solution will:

A. Have no effect

B. Precipitate Mg metal

C. precipitate MgO

D. Lead to dissolution of Be metal

Answer: A

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37. Four metals A, B, C and D are having standard reduction potential as -3.06, -1.66, -0.40 and 0.80 volt respectively. The most reactive metal is

A. A

B. B

C. C

D. D

Answer: A

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38. Which metal can deposit copper from copper sulphate solution ?

A. Mercury

B. Iron

C. Gald

D. Platinum

Answer: B

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39. In an experiment setup for the measurement of EMF of a half cell using a reference electrode and a salt bridge, when the salt bridge is removes, the voltage

A. Does not change

B. Decreases to half the value

C. Increase to maximum

D. Drops to zero

Answer: D

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40. K, Ca and Li metals may be arranged in the decreasing order of their standard electrode potentials as

A. K, Ca, Li

B. Ca, K, Li

C. Li, Ca, K

D. Ca, Li, K

Answer: B

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41. Which one of the following metals cannot resolve H_2 from acids or H_2O from its compounds ?

A. Hg

B. Al

C. Pb

D. Fe

Answer: A

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42. Reduction Potential

A. it is easily oxidised

B. It is easily reduced

C. It acts as oxidising agent

D. It has redox nature

Answer: C

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43. E° of a cell $aA + bB \rightarrow cC + dD$ is

A. $-\frac{RT}{nF}\log\frac{[C]^C[D]^d}{[A]^a[B]^b}$

B. $-Rt\log\frac{[a]^A[b]^B}{[a]^C[d]^D}$

C. $-\frac{RT}{nF}\log\frac{[C]^c[d]^D}{[A]^a[B]^b}$

D. $-\frac{RT}{nF}\log\frac{[C]^c[d]^D}{[a]^A[B]^b}$

Answer: A

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44. When Zn piece is kept in $CuSO_4$ solution, the copper get precipitated due to standard potential of zinc is

A. $> copper$

B. $< copper$

C. $>$ sulphide

D. $<$ sulphate

Answer: B

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45. Which of the following metal does not react with the solution of copper sulphate

A. Mg

B. Fe

C. Zn

D. Ag

Answer: D

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46. The standard reduction potentials of 4 elements are given below. Which of the following will be the most suitable reducing agent.

$I = -3.04V, II = -1.90V, III = 0V, IV = 1.90V$

A. I

B. II

C. III

D. IV

Answer: A

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47. Aluminium displaces hydrogen from acids, but copper does not. A galvanic cell prepared by combining $Cu \mid Cu^{2+}$ and $Al \mid Al^{3+}$ has an emf of 2.0 V at 298 K. If the potential of copper electrode is + 0.34 V, that of aluminium electrode is

A. $+1.66V$

B. $-1.66V$

C. $+2.34V$

D. $-2.3V$

Answer: B

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48. Which of the following statements is true for fuel cells ?

A. They are more efficient

B. They are free from pollution

C. They run till reactants are active

D. all of these

Answer: D

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49. When an acid cell is charged, then

A. Voltage of cell increases

B. Electrolyte of cell dilutes

C. Resistance of cell increases

D. None of these

Answer: A

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50. $2Ce^{4+} + Co \rightarrow 2Ce^{3+} + Co^{2+}, E^{\circ}_{cell} = 1.89V$

$E^{\circ}_{Co^{2+}/Co} = -0.277V$. Hence $E^{\circ}_{Ce^{4+}/Ce^{3+}}$ is

A. $-1.64V$

B. $+1.61V$

C. $-2.08V$

D. $+2.17V$

Answer: B

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51. The equilibrium constant of the following redox rection at 298 K is 1×10^{8}

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

If the standard reducing potential of iodine becoming iodide is +0.54 V.

what is the standard reduction potential of Fe^{3+}/Fe^{2+} ?

A. $+1.006V$

B. $-1.006V$

C. $+0.77V$

D. $-0.77V$

Answer: C

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52. The electrode potential $E_{Zn^{+2}/Zn}$ of a zinc electrode or $25^{\circ}C$ with an aqueous solution of $0.1MZnSO_4$ is

$$\left[E\left(Zn^{+2}/Zn\right) = -0.76V\right]\left[\text{assume}\frac{2.3-3RT}{F} = 0.06at298K\right]$$

A. $+0.73$

B. -0.79

C. -0.82

D. -0.70

Answer: B

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53. The standard redox potentials for the reactions, $MN^{2+} + 2e^- \rightarrow Mn$ and $Mn^{3+} + e^- are$-1.18V and 1.51V respectively. What is the redox potential for the reaction $Mn^{3+} + 3e^- \rightarrow Mn$?

A. 0.33V

B. 1.69V

C. -0.28V

D. $-0.85V$

Answer: C

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54. The standard electrode potential for the two electrode A^{+}/A and B^{+}/B are respectively 0.5V and 0.75V. The emf of the given cell $A|A^{+}(a=1)||B^{+}(a=1)|$ B will be

A. 1.25V

B. $-1.25V$

C. $-0.25V$

D. $0.25V$

Answer: D

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55. Which will increase the voltage of the cell

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

A. Increase in the concentration of Ag^{+} ion

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

C. Increase in size of the silver rod none of these

D. None of these

Answer: A

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56. Copper cannot replace________from solution

A. Fe

B. Au

C. Hg

D. Ag

Answer: A

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57. If Zn^{2+}/Zn electrode is diluted 100 times, then the charge in reduction potential is

A. Increase of 59 mV

B. Decrease of 59 mV

C. Increase of 29.5 mV

D. Decrease of 29.5 mV

Answer: A

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58. The voltage of a cell whose half-cells are given below is

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

$Cu^{2+} + 2e^{-} \rightarrow Cu(s), E^{\circ} = +0.34V$

standard EMF of the cell is

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59. In the electrochemical cell

$H_2(g), 1 \text{ atm} \left| H^+(1M) \| Cu^{2+}(1M) \right| Cu(s)$, which one of the following statements is true?

A. H_2 is cathode, Cu is anode

B. Oxidation occurs at Cu electrode

C. Reduction occurs at H_2 electrode

D. H_2 is anode, Cu is cathode

Answer: D

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60. The element which can displace three other halogens from their compound is :

A. Cl

B. F

C. Br

D. I

Answer: B

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61. The cell reaction of the galvanic cell : $Cu_{(s)}\left|Cu^{2+}_{(aq)}\right|| Hg^{2+}_{(aq)}|Hg_{(l)}$ is

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

B. $Hg + Cu^{2+} \rightarrow Cu^{2+} + Hg^{+}$

C. $Cu + H > oCuHg$

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

Answer: d

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62. For the following cell reaction,

$$Ag\left|Ag^{+}\right|AgCl|Cl^{\ominus}\left|Cl_2, Pt\right.$$

$$\Delta G_f^o(AgCl) = -109kJ/mol$$

$$\Delta G_f^o\left(Cl^{\ominus}\right) = -129kJ/mol$$

$$\Delta G_f^o\left(Ag^{+}\right) = 78kJ/mol$$

E^o of the ell is:-

A. $-0.60V$

B. $0.60V$

C. $6.0V$

D. None of these

Answer: A

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63. The standard electrode potential a Ag^{+}/Ag is +0.80 V and of Cu^{2+}/Cu is +0.34 V. These electrodes are connected through a salt bridge and if :

A. copper electrode work like anode then E^{o}_{cell} is +0.45V

B. Silver electrode work like anode then E^{o}_{cell} is -0.34V

C. Copper electrode work like anode then E^{o}_{cell} is +0.46V

D. Silver electrode work like cathode then E^{o}_{cell} is-0.34V

Answer: C

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64. The potential of the cell for the reaction, $M(s) + 2H^{+}(1M) \rightarrow H_2(g)(1atm) + M^{2+}(0.1m)'$ is 1.500 V. The standard reduction potential for M^{2+} / M(s) couple is :

A. 0.1470V

B. -1.470V

C. 14.70V

D. None of these

Answer: B

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65. The potential of standard hydrogen electrode is zero. This implies that

A. $\Delta G_f^o\left(H^+, aq\right) = 0$

B. $\Delta H_f^o\left(H^+, aq\right) = 0$

C. $\Delta G_f^o\left(H^+, aq\right) < 0$

D. $\Delta G_f^o\left(H^+, aq\right) > 0$

Answer: A

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66. If the half cel reactions are given as

(i) $Fe^{2+}(Aq) + 2e^- \rightarrow Fe(s), E^\circ = -0.44V$

(ii) $2H^+(sq) + \frac{1}{2}O_2(g) + 2e^- \rightarrow H_2O(l)E^\circ = +1.23V$

The E° for the reaction

$Fe(s) + 2H^+ + \frac{1}{2}O_2(g) \rightarrow Fe^{2+}(aq) + H_2O(l)$ will be

A. $+1.67V$

B. $-1.67V$

C. $+0.79V$

D. $-0.79V$

Answer: A

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67. The E^o values of the following reduction reactions are given

$Fe^{3+}_{(aq)} + e \rightarrow Fe^{2+}_{(aq)}, E^o = 0.771V$

$Fe^{2+}_{(aq)} \rightarrow 2e \rightarrow Fe_{(s)}, E^o = -0.447V$

What will be the free energy change for the reaction

$$Fe^{3+}_{(aq)} + 3e^{-} \rightarrow Fe_{(s)} \quad \left(1F = 96485C \text{ mol}^{-1}\right)$$

A. $+18.51kJ \quad mol^{-1}$

B. $+11.87kJ \quad mol^{-1}$

C. $-8.10kJ \quad mol^{-1}$

D. $-10.41kJ \quad mol^{-1}$

Answer: B

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68. Consider the cell

$Pt\left|H_{2(g,1atm)}\right|H^{+}_{(aq.1M)}\left|\right|Fe^{3+}_{(aq)}, Fe^{2+}_{(aq)}\left|\right|Pt_{(s)}$ Given that $E^{o}_{Fe^{3+}|Fe^{2+}} = 0.771V$ the ratio of conc. Of $Fe^{2+}_{(aq)}$ to $Fe^{3+}_{(aq)}$ is, when the cell potential is 0.830V

A. 0.101

B. 0.924

C. 0.12

D. None of these

Answer: A

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69. The standard reduction potential for $Li^+/Li, Zn^{2+}/Zn, H^+/H_2$ and Ag^+/Ag is -3.05, -0.762, 0.00 and +0.80V. Which of the following has highest reducing capacity

A. Ag

B. H_2 is anode and Cu is cathode

C. Zn

D. Li

Answer: D

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70. When $E^{\circ}_{Ag^{+}/Ag} = 0.8V$ and $E_{Zn^{2+}/Zn}$

$= - 0.76V$. Which of the following is correct?

A. Ag^{+} can be reduced by H_2

B. Ag can oxidise H_2 into H^{+}

C. Zn^{2+} can be reduced by H_2

D. Ag and reduce Zn^{2+} ion

Answer: A

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71. Electrode potentials $\left(E^{\circ}_{\text{red}}\right)$ of 4 element A,B, C,D are -1.36,-0.32,0,-1.26V respectively. The decreasing reactivity order of these elements is

A. A,D,B and C

B. C,B,D and A

C. B,D,A and C

D. C,A,,D and B

Answer: B

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72. Amongst the following electrodes the one with zero electrode potential is

A. Calomel electrode

B. Standard hydrogen electrode

C. Glass electrode

D. Gas electrode

Answer: B

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73. In which of the following cell the energy of combustion of the reaction is directly converted into electricity?

A. Leclanche cell

B. Concentration cell

C. Fuel cell

D. Lead storage battery

Answer: C

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74. What is the potential of a cell containing hydrogen electrodes, the negative one in contact with $10^{-10}MH^{+}$ and positive one in contract with $0.025MH^{+}$?

A. 0.18 V

B. 0.28 V

C. 0.38V

D. 0.48V

Answer: C

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75. If the ΔG° of a cell reaction $AgCl + e^{-} \rightarrow Ag + Cl^{-}$ is -21.20 kJ, the standard emf of cell is

A. 0.229V

B. 0.220V

C. $-0.220V$

D. $-0.110V$

Answer: B

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76. Reduction potentials of four elements P, Q, R, S is $-2.90V, 0.34V, 1.2V$ and $-0.76V$. The decreasing order of reducing power is

A. PgtQgtRgtS

B. QgtPgtRgtS

C. RgtQgtSgtP

D. PgtSgtQgtR

Answer: D

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77. Zinc displaces copper from the solution of its salt because

A. Atomic number of zinc is more than that of copper

B. Zinc salt is more soluble in water tha the copper salt

C. Gibbs free energy of zinc is less than that of copper

D. Zinc is placed higher than copper in electro-chemical series

Answer: D

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78. The reaction is spontaneous if the cell potenital is .

A. Positive

B. Negative

C. Zero

D. Infinite

Answer: A

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79. Reduction potentials of A,B,C and D are 0.8 V 0.79 V, 0.34 V and -2.37 V respectively which element displaces all the other three elements

A. B

B. A

C. D

D. C

Answer: C

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80. (i) $Cu + 2HCl_2 + H_2(g)\left[E_{Cu_{2+}/Cu^{\circ}} = .34V\right]$

(ii)$Zn + 2HCl \rightarrow ZNCl + (2) + H_2((g))\left[E\left(ZN^{2+}/ZN^{\circ} = -0.76V\right]\right.$

(iii) $Ag + 2HCl \rightarrow AgCl + (1)/(2)H_2(g)\left[E\left(Ag^+/Ag\right)^{\circ} = +0.80V\right]$

Which of the following reaction is feasible ?

A. (ii)

B. (i)

C. (iii)

D. All the above

Answer: A

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81. In a galvanic cell the following reaction takes place at $298\ ^{\circ}K$

$Cr_2O_7^{2-} + 14H^{+} + 6Fe^{2+} \rightarrow 2Cr^{3+} + 6Fe^{3+} + 7H_2O$ given that

$: E^{o}\left(Cr_2O_7^{2-}, H^{+}, Cr^{3+}/Pt\right) = 1.33V$

$E^{o}\left(Fe^{3+}, Fe^{2+}/Pt\right) = 0.77V$. The standard e.m.f. of the cell is

A. (1.33+0.77)V

B. (1.33-0.77)V

C. $-(1.33 + 0.77)V$

D. $(-1.33 + 0.77)V$

Answer: B

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82. Write a mathematical expression for Standard Cell Potential.

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

B. E_{anode} - E_{cathode}

C. E_{cathode} - E_{anode}

D. E_{left} - E_{right}

Answer: C

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83. Oxidation and reduction take place in a cell, then its electromotive force will be

A. Positive

B. Negative

C. Zero

D. Stable

Answer: A

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

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

A. $\frac{RT}{f}\frac{\ln\left(P_1\right)}{P_2}$

B. $\frac{RT}{2f}\frac{\ln\left(P_1\right)}{P_2}$

C. $\frac{RT}{f}\frac{\ln\left(P_2\right)}{P_1}$

D. None of these

Answer: B

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85. Enf of a cell in terms of reduction potential of its left and right electrodes is :

A. $E = E_{\text{left}} - E_{\text{right}}$

B. $E = E_{\text{left}} + E_{right}$

C. $E = E_{right} - E_{\text{left}}$

D. $E - \left(E_{right} + E_{\text{left}}\right)$

Answer: C

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86. Consider the following reaction,

$Zn(s) + Cu^{2+}(0.1M) \rightarrow Zn^{2+}(1M) + Cu(s)$ above reaction, taking place in a cell, E°_{cell} is $1.10V$. E_{cell} for the cell will be $\left(2.303\frac{RT}{F} = 0.0591\right)$

A. 2.14 volt

B. 1.80 volt

C. 1.07 volt

D. 0.82 volt

Answer: C

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87. In a cell that untillizes the reaction ,

$Zn_{(s)} + 2H^{+}_{(aq)} \rightarrow Zn^{2+}_{(aq.)} + H_{2(g)}$, adedition of H_2SO_4 to cathode compartment will :

A. Increase the E and shift equilibrium to the right

B. Lower the E and shift equilibrium to the right

C. Lower the E and shift equilibrium to the left

D. Increase the E and shift equilibrium to the left

Answer: A

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88. The standard e.m.f of a cell, involving one electron change is found to be 0.591 V at $25^{\circ}C$. The equilibrium constant of the reaction is : $\left(F = 96, 500 Cmol^{-1}\right.$: R=8.314 $Jk^{-1}mol^{-1}$

A. 1.0×10^{10}

B. 1.0×10^{5}

C. 1.0×10^{1}

D. 1.0×10^{30}

Answer: A

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89. Consider the following E° values E° values $E^\circ_{Fe^{3+}/Fe^{2+}} = 0.77v$, $E^\circ_{Sn^{2+}/Sn} =$ - 0.14 under standard condition the potential for the reaction $Sn_s + 2Fe^{3+}(aq) \rightarrow 2Fe^{2+}(aq) + Sn^{2+}(aq)$ is :

A. 0.91 V

B. 1.40V

C. 1.68V

D. 0.63V

Answer: A

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90. The $E^\circ_{M^{3+}/M^{2+}}$ values for Cr, Mn, Fe and Co are $0.41, +1.57, +0.77$ and $+1.97$V respectively .For which one of these metal the change in oxidation state from $+2$ to $+3$ is easiest:

A. Fe

B. Mn

C. Cr

D. Co

Answer: C

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91. For a spontaneous reaction the ΔG, equilibrium constant (K) and E°_{cell} will be respectively

A. $-ve, \ > 1, \ +ve$

B. $+ve, \ > 1, \ -ve$

C. $-ve, \ < 1, \ -ve$

D. $-ve, \ > 1, \ -ve$

Answer: A

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92. The cell $Zn\left|Zn^{2+}(1M)\right|\left|Cu^{2+}(1M)\right|Cu\left(E^{\circ}\_(cell) = 1.10V\right)$ was allowed to be completely discharged at 298 K. The relative concentration of Zn^{2+} to Cu^{2+} $\left(\frac{[Zn^{2+}]}{[Cu^{2+}]}\right)$ is :

A. Antilog (24.08)

B. 37.3

C. $10^{37.3}$

D. 9.65×10^{4}

Answer: C

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93. Given $E^{\circ}_{Cr^{3+}/Cr} = 0.72V, E^{\circ}_{Fe^{2+}/Fe} =$ - $0.42V$. The potential for the $cellCr\left|Cr^{3+}(0.1M)\right|$ | $Fe^{2+}(0.01M)$| Fe is :

A. 0.339V

B. $-0.339V$

C. $-0.26V$

D. $0.26V$

Answer: D

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94. $E^{\circ}_{Fe^{3+}/Fe} = -0.036V, E^{\circ}_{Fe^{2+}/Fe} = -0.0439V$. The value of standard electrode potential for the change, $Fe^{3+}(aq) + e^{-} \rightarrow Fe^{2+}(aq)$ will be

A. $-0.072V$

B. $0.385V$

C. $0.020V$

D. $-0.270V$

Answer: C

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95. The correct order of $E^{\circ}_{M^{2+}/M}$ Values with negative sign for the four successive elements Cr, Mn, Fe and Co is:

A. CrgtMngtFegtCo

B. MngtCrgtFegtCo

C. CrgtFegtMngtCo

D. FegtMngtCrgtCo

Answer: B

Watch Video Solution

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

A. $X = Ni, Y = Fe$

B. $X = Ni, Y = Zn$

C. $X = Fe, Y = Zn$

D. $X = Zn, Y = Ni$

Answer: D

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97. The tendencies of the electrodes made up of Cu, Zn and Ag to release electrons when dipped in their respective salt solutions decrease in the order :

A. ZngtAggtCu

B. CugtZngtAg

C. ZngtCugtAg

D. AggtCugtZn

Answer: C

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98. Will Fe be oxidised to Fe^{2+} by reaction with 1.0 M HCl? E° for $Fe/Fe^{2+} = +0.44$ volt.

A. Yes

B. No

C. May be

D. Can't say

Answer: A

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99. Which of the following has highest electrode potential

A. Li

B. Cu

C. Au

D. Al

Answer: C

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100. Which of the following is most electropositive ?

A. Carbon

B. Calcium

C. Chlorine

D. Potassium

Answer: D

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101. For the feasibility of a redox reaction in a cell, the emf should be.

A. Positive

B. Fixed

C. Zero

D. Negative

Answer: A

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102. Which of the following statements (or equation) is correct

A. The unit of cell e.m.f. is V cm^{-1}

B. $\Delta G = -\dfrac{nF}{E_{cell}}$

C. In galvanic cell, cchemical energy is transformed into electrical energy

D. Oxidation state of Mn in potassium permanganate is +6

Answer: C

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103. The standard reduction electrode potentials of the three electrodes P,Q and R are respectively -1.76V, 0.34V and 0.8V. Then

A. Metal Q will displace the cation of P from its aqueous solution and deposit the metal P

B. Both metals Q and R will displace the cation of P from its aqueous solution and deposit the metal P

C. Metal R will displace the cation of P from its aqueous solution and deposit the metal R

D. Metal P will displae the cation of R from its aqueous solution and deposit the metal R

Answer: D

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104. Consider the reaction $M^{n+}_{(aq)} + ne^- \rightarrow M_{(s)}$. The standard reduction potential values of the element M_1, M_2 and M_3 are -0.34V,-3.05 and -1.66V respectively. The order of their reducing power will be:-

A. $M_1 > M_2 > M_3$

B. $M_3 > M_2 > M_1$

C. $M_1 > M_3 > M_2$

D. $M_2 > M_3 > M_1$

Answer: D

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105. Calculate the reduction potential of a half cell consisting of a platinum electrode immersed in $2.0 M Fe^{2+}$ and $0.02 M Fe^{3+}$ solution. Given $E^{\circ}_{Fe^{3+}/Fe^{2+}} = 0.771V$.

A. 0.653V

B. 0.889V

C. 0.683V

D. 2.771V

Answer: A

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106. Aluminium is more reactive than iron. But aluminium is less easily corroded than iron because.

A. Al is noble metal

B. Iron forms both mono and divalent ions

C. Oxygen forms a protective oxide layer

D. Fe undergoes reaction easily with H_2O

Answer: C

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107. What is wrongly stated about electrochemical series

A. It is the representation of element in order of increasing or decreasing standard electrode reduction potential

B. It does not compare the relative reactivity of metals

C. It compares relative strengths of oxidising agents

D. H_2 is centrally placed element

Answer: B

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108. The e.f.m. of the cell $Ag\left|Ag^{+}(0.1M)\right|\left|Ag^{+}(1M)\right|Ag$ at 298K is

A. 0.0059V

B. 0.059V

C. 5.9V

D. 0.59V

Answer: B

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109. The standard electrode potentials $\left(E^{\circ}\right)$ for Ocl^{-}/Cl^{-} and $Cl^{-}/\frac{1}{2}Cl_2$ respectively are 0.94 V and $-1.36V$. The E° value for $Ocl^{-}/\frac{1}{2}Cl^2$ will be:

A. $-0.42V$

B. $-2.20V$

C. $0.52V$

D. $1.04V$

Answer: C

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110. Normal aluminimum electrode cupled with normal hydrogen electrode gives an emf of $1.66V$. So the standard electrode potential of aluminimu is ,

A. $-1.66V$

B. $+1.66V$

C. $-0.83V$

D. $+0.83V$

Answer: A

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111. A cell constructed by coupling a standard copper electrode and a standard magnesium electrode has EMF to 2.7 volts. If the standard reduction potential of copper electrode is +0.34 volt that of magnesium electrode is:-

A. $+3.04$volts

B. -3.04 volts

C. $+2.36$ volts

D. -2.36 volts

Answer: D

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112. The hydrogen electrode is dpped in a solution of pH=3 at $25^{\circ}C$. The potential of the cell would be (the value of 2.303RT/F is 0.059V)

A. 0.177V

B. -$0.177V$

C. $0.087V$

D. $0.059V$

Answer: B

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113. The standard electrode potential of Zn^{2+}/Zn and Ag^{+}/Ag are -0.763 and +0.799V respectively. The standard potential of the cell is:-

A. 1.56V

B. 0.036V

C. -1.562V

D. 0.799V

Answer: A

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

A. A will gradually dissolve

B. B will deposit on A

C. No reaction will occur

D. Water wil decompose into H_2 and O_2

Answer: B

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115. The reaction: $Zn^{2+}(aq) + 2e^{-} \rightarrow Zn(s)$ has a electrode potential of -0.76 V. This means-

A. Zn can't replace hydrogen from acids

B. Zn is a reducing agent

C. Zn is an oxidising agent

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

Answer: B

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116. The standard oxidation potentials of Ze and Ag in water at $25^{\circ}C$ are

$Zn(s) \rightarrow Zn^{2+} + 2e \quad \left[E^{\circ} = 0.76V\right]$

$Ag(s) \rightarrow Ag^{+} + e \quad \left[E^{\circ} = -0.80V\right]$

Which of the following reactions actually takes place ?

A. $Zn_{(s)} + 2Ag^{+}_{(aq)} \rightarrow Zn^{++}_{(aq)} + 2Ag_{(s)}$

B. $Zn^{++}_{(aq)} + 2Ag_{(s)} \rightarrow 2At^{+}_{(aq)} + Zn_{(s)}$

C. $Zn_{(s)} + Ag_{(s)} \rightarrow Zn^{++}_{(aq)} + Ag^{+}_{(aq)}$

D. $Zn^{++}_{(aq)} + Ag^{+}_{(aq)} \rightarrow Zn_{(s)} + Ag_{(s)}$

Answer: A

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117. Aluminium displaces hydrogen from dilute HCl whereas silver does not. The e.m.f. of a cell prepared by combining Al/Al^{3+} and Ag/Ag^{+} is 2.46V. The reduction potential of silver electrode is +0.80V. The reduction potential of aluminium electrode is

A. $+1.66V$

B. $-3.26V$

C. $3.26V$

D. $-1.66V$

Answer: D

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118. The standard electrode potential is measured by

A. Electrometer

B. Voltmeter

C. Pyrometer

D. Galvanometer

Answer: B

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119. when compared to ΔG° for the formation of $A1_2O_3$ the Δg° for the formation of Cr_2O_3 is

A. same

B. Upredicted

C. Higher

D. Lower

Answer: C

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120. If E_1, E_2 and E_3 are the emf values of the three galvanic cells respectivley

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

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

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

Which one of the following is true.

A. $E_2 > E_3 > E_1$

B. $E_3 > E_2 > E_1$

C. $E_1 > E_2 > E_3$

D. $E_1 > E_3 > E_2$

Answer: B

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

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

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

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

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

Answer: B

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122. Li occupies higher position in the electrochemical series of metals as compared to Cu since

A. The standard reduction potential of Li^+/Li is lowerr than that of Cu^{2+}/Cu

B. The standard reduction potential of Cu^{2+}/Cu is lower than that of Li^+/Li

C. The standard oxidation potential of Li/Li^{+} is lower than that of Cu/Cu^{2+}

D. Li is smaller in size as compared to Cu

Answer: A

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123. Which of the following expression is correct?

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

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

C. $\Delta G^{\circ} = -2.303RTnFE^{\circ}_{cell}$

D. $\Delta G^{\circ} = -nF \log K_C$

Answer: A

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124. Given $E^\circ\left(Zn^{2+}/Zn\right) = -0.76V$

$E^\circ\left(Ni^{2+}/Ni\right) = -0.25V$

Calculate the EMF of the cell where the following reaction is taking place

$Zn_{(s)} + Ni^{2+}_{(aq)} \rightarrow Zn^{2+}_{(aq)} + Ni_{(s)}$

A. $0.51V$

B. 1.01V

C. $-0.51V$

D. 0.25V

Answer: A

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125. The standerd potential at 25° for the following Half rection is given :

$Zn^{2+} + 2e^- \rightarrow Zn, E^\circ = -0.762V$

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

When Zinc dust is added to the solution of $MgCl_2$.

A. $ZnCl_2$ is formed

B. Zinc dissolves in the solution

C. No reaction takes place

D. Mg is precipitated

Answer: C

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126. What is E° for electrode represented by $Pt, O_2(1atm)/2H^+(1m)$

A. Unpredictable

B. Zero

C. 0.018V

D. 0.118V

Answer: B

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127. The oxide that is not reduced by hydrogen is

A. Ag_2O

B. K_2O

C. Fe_2O_3

D. P_4O_{10}

Answer: B

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128. Arrange the following in the order of their decreasing electrode potentials:Mg, K, Ba,Ca

A. K,Ba,Ca,Mg

B. Ca,Mg,K,Ba

C. Ba,Ca,K,Mg

D. Mg,Ca,Ba,K

Answer: D

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129. $Zn^{2+} \rightarrow Zn_{(s)}, E^{\circ} = -0.76V$

$Cu^{2+} \rightarrow Cu_{(s)}, E^{\circ} = -0.34V$

which of the following is spontaneous

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

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

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

D. none of these

Answer: B

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

$E^\circ_{cell} = 0.79V, E^\circ_{Cr_2O_7^{2-}} = 1.33V, E^o_{I_2}$ is

A. $-0.10V$

B. $+0.18V$

C. $-0.54V$

D. $0.54V$

Answer: D

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131. $Zn(s) + Cl_2(1atm) \rightarrow Zn^{2+} + 2Cl^-. E^o_{cell}$ of the cell is 2.12 V. To increase

E

A. $\left[Zn^{2+}\right]$ should be increased

B. $\left[Zn^{2+}\right]$ should be decreased

C. $\left[Cl^-\right]$ should be decreased

D. P_{Cl_2} should be decreased

Answer: B::C

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132. Which is the CORRECT Nernst equation for reaction taking place in the following cell ?

$Mg_{(s)} | Mg^{2+}_{(aq)} || Cl^{-}_{(aq)} | Cl_{2(g)}(1atm) | Pt$

A. $E_{cell} = E^{o}_{cell} - \frac{0.0592}{n} \times \log\left(\frac{[Cl^{-}]^2}{[Mg^{2+}]}\right)$

B. $E_{cell} = E^{o}_{cell} - \frac{0.0591}{n} \times \log\left(\frac{[M^{2+}]}{[Cl^{-}]}\right)$

C. $E_{cell} = E^{\circ}_{cell} - \frac{0.592}{n} \times \log[Mg^{2+}][Cl^{-}]^2$

D. $E_{cell} = E^{\circ}_{cell} - \frac{0.0591}{n} \times \log\left(\frac{[Mg^{2+}]}{[Cl^{-}]^2}\right)$

Answer: C

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133. $Ag_{(s)}\left|Ag^{+}_{(aq)}(0.01M)\right|\left|Ag^{+}_{(aq)}(0.1M)\right|Ag_{(s)}E^{\circ}_{Ag_{(s)}/Ag_{(aq)}}$ = 0.80volt

A. Cell cannot function as anode and cathode are of same material

B. $E_{cell} = 0.0592V$

C. $E_{cell} = 0.80V$

D. $E_{cell} = 0.0296V$

Answer: B

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134. The e.m.f. of the following cell at 25 ∘ C is ________. F e (s) | | F e S O 4 (a q) (0.1 M) | | | | C u S O 4 (a q) (0.01 M) | | C u s (E ∘ F e 2 + | | F e = − 0.44 V and E ∘ c u 2 + | C u = 0.337 V)

A. x cannot be predicted

B. x=0.01M

C. $x > 0.01M$

D. $x < 0.01M$

Answer: B

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135. Which equation gives relation between concentration of ions in solution , electrode potential (E) and standard electrode potential $\left(E^{\circ}?\right)$

A. Kohlrausch's equation

B. Nernst's equation

C. Ohm's equation

D. Faraday's equation

Answer: B

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136. The correct representation of Nernst`s equaion is .

A. $E_{M^{n+}/M} = E^{o}_{M^{n+}/M} + \frac{0.0591}{n} \log\left(M^{n+}\right)$

B. $E_{M^{n+}/M} = E^{\circ}_{M^{n+}/M} - \frac{0.0591}{n} \log\left(M^{n+}\right)$

C. $E_{M^{n+}/M} = E^{o}_{M^{n+}/M} + \frac{n}{0.0591} \log\left(M^{n+}\right)$

D. none of these

Answer: A

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137. (i) Copper metal dissolves in 1M silver nitrate solution and crystals of silver metal get deposited.

(ii) Siler metal does not react with 1M zinc nitrate solution.

Zinc metal dissolves in 1M copper sulphate solution and copper metal gets deposited

Hence the order of decreasing strength of the three metals as reducing agents will be

A. $cu > Ag > Zn$

B. $Ag > Cu > Zn$

C. $Zn > Cu > Ag$

D. $Cu > Zn > Ag$

Answer: C

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138. Standard electrode potential of Zn and Fe are known to be (i) -0.76V and (ii) -0.44V respectively. How does it explain that galvanization prevents rusting of iron while zinc slowly dissolves away

A. Since (i) is less than (ii), zinc becomes the cathode and iron the anode

B. Since (i) is less than (ii), zinc becomes the anode and iron the cathode

C. Since (i) is more than (ii), zinc becomes the anode and iron the cathode

D. Since (i) is more than (ii), zinc becomes the cathode and iron the anode

Answer: B

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139. Assertion: In the electrolysis of aqueous NaCl, Na is preferentially discharged at mercury cathode forming sodium amalgam.

Reason: It is due to the fact that hydrogen gas a high over voltage at mercury cathode.

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

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

C. If assertion is true but reason is false

D. If the assertion and reason both are false.

Answer: A

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140. Assertion : A larger dry cell has higher emf.

Reason : The emf of a dry cell is proportional to its size.

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

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

C. If assertion is true but reason is false

D. If the assertion and reason both are false.

Answer: D

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141. Assertion(A): Whne acidified $ZnSO_4$ solution is electrolyzed between Zn electrodes, it is Zn that is deposited at the cathode and $H_2(g)$ is not evolved.

Reason (R): The electrode potential of Zn is more negative than hydrogen as the overpotential for hydrogen evolution in Zn is quite large.

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

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

C. If assertion is true but reason is false

D. If the assertion and reason both are false.

Answer: A

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142. Statement-1: Gold chloride $\left(AuCl_3\right)$ solution cannot be stored in a vessel made of copper, iron, nickel, chromium, zinc or tin.

Statement-2 Gold is a very precious metal.

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

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

C. If assertion is true but reason is false

D. If the assertion and reason both are false.

Answer: B

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143. Assertion: A negative value of standard reduction potential means that reduction takes place on this electrode with reference to standard hydrogen electrode.

Reason: The standard electrode potential of a half cell has a fixed value.

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

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

C. If assertion is true but reason is false

D. If assertion is false but reason is true.

Answer: D

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144. Assertion: Weston is a standard cell.

Reason: its e.m.f. does not change with temperature.

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

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

C. If assertion is true but reason is false

D. If the assertion and reason both are false.

Answer: A

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145. Statement-1: Zinc displaces copper from copper sulphate solution.

Statement-2: The E°_{298} of Zn is -0.76 volts and that of Cu is +0.34 volts.

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

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

C. If assertion is true but reason is false

D. If the assertion and reason both are false.

Answer: A

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146. The emf of a Daniell cell at $298K$ is E_1

$$Zn\left|ZnSO_4(0.01M)\right|\left|CuSO_4(1.0M)\right|Cu$$

When the concentration of $ZNSO_4$ is $1.0M$ and that of $CuSO_4$ is $0.01M$, the emf changed to E_2. What is the relationship between E_1 and $E(2)$?

A. $E_1 < E_2$

B. $E_1 > E_2$

C. $E_2 = 0 \neq E_1$

D. $E_1 = E_2$

Answer: B

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Ordinary Thinking Objective Questions (Corrosion)

1. Which of the following is a highly corrosive salt?

A. $FeCl_2$

B. $PbCl_2$

C. Hg_2Cl_2

D. $HgCl_2$

Answer: D

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2. Which metal is used as a coating on steel to prevent corrosion:-

A. Na

B. Ca

C. K

D. Zn

Answer: D

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3. Which metal is used as a coating on steel to prevent corrosion where the cell reactions are:-

A. Fe is oxidised to Fe^{2+} and issolved oxygen oxygen in water is reduced to $\overset{\ominus}{O}H$

B. Fe is oxidised to Fe^{3+} and H_2O is reduced to O_2^{2-}

C. Fe is oxidised to Fe^{2+} and H_2O is reduced to O_2^-

D. Fe is oxidised to Fe^{2+} and H_2O is reduced to O_2

Answer: A

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4. If an iron rod is dipped in $CuSO_4$ solution

A. Blue colour of the solution turns green

B. Brown layer is deposited on iron rod

C. No change occurs in the colour of the solution

D. Blue colour of the solution vanishes

Answer: B

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5. The rusting of iron is catalysed by which of the following ?

A. Fe

B. O_2

C. Zn

D. H^+

Answer: D

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6. Assertion (A): Galvanized iron does not rust.

Reason (R): Zn has a more negative electrode potential than Fe.

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

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

C. If assertion is true but reason is false

D. If the assertion and reason both are false.

Answer: A

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Critical Thinking Objective Question

1. The mass of carbon anode consumed (giving only carbon dioxide) in the production of $270kg$ of aluminium metal from bauxite by the Hall process is

A. 180kg

B. 270kg

C. 540 kg

D. 90kg

Answer: D

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2. $4.5g$ of aluminium (at mass $27u$) is deposited at cathode from Al^{3+} solution by a certain quantity of electric charge. The volume of hydrogen gas produced at STP from H^{+} ions in solution by the same quantity of electric charge will be:

A. 22.4L

B. 44.8L

C. 5.6L

D. 11.2L

Answer: C

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3. The standard emf of the cell

$Zn + Cu^{2+} \rightarrow Cu + Zn^{2+}$ is 1.10V at

$25^{\circ}C$ the emf of the cell when 0.1 M $Cu^{2}+$ and 0.1 M Zn^{2+} solution are used will be

A. 1.10V

B. 0.110V

C. $-1.10V$

D. $-0.110V$

Answer: A

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4. Consider two half cells based on the reaction $Ag^{+}_{(aq)}e \rightarrow Ag_{(s)}$.t he left half cell contain Ag^{+} ions at concentration of Ag^{+} ions, but just enough $NaCl_{(aq)}$ has been added to completely precipitate the $Ag^{+}_{(aq)}$ as $AgCl$. If the emf of the cell is 0.29V, then $\log_{10}K_{sp}$ would have been

A. 9.804

B. -9.804

C. -4.902

D. 10.004

Answer: C

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5. A current of 10.0A is passed through 1.0L of 1.0M HCl solution for 965 seconds, pH of the solution at the end of the experiment is:-

A. 0

B. 0.2

C. 0.8

D. none of the above

Answer: D

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6. On the basis of electrochemical theory of aqueous corrosion, the reaction occurring at the cathode is

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

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

C. $Fe^{2+}_{(aq)} \rightarrow Fe^{3+}_{(aq)} + e^{-}$

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

Answer: A

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7. What will be the reduction potential of a hydrogen electrode which is filled with HCl solution of pH value 1.0? (at 298 Kelvin)

A. $-59.15V$

B. $+59.15V$

C. $+59.15mV$

D. $-59.15mV$

Answer: D

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8. The limiting molar conductivities $\wedge^{\circ}$ for NaCl , KBr , and KCl are 126 , 152 and 150 Scm^2mol^{-1} respectively. The $\wedge^{\circ}$ for NaBr________.

A. 278 S cm^2mol^{-1}

B. 176 S cm^2mol^{-1}

C. 128S cm^2mol^{-1}

D. 302 S cm^2mol^{-1}

Answer: C

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9. Aluminium oxide may be electorlysed at $1000\,^{\circ}C$ to furnish aluminim metal (Atomic Mass $= 27$ amu, $1F = 96, 500C$). The cathode reaction is

$Al^{3} + 3d^{-} \rightarrow Al^{\circ}$

To prepare $5.12kg$ of aluminimu metal by this method woold require .

A. $5.49 \times 10^{7}C$ of electricity

B. $1.83 \times 10^{7}C$ of electricity

C. $5.49 \times 10^{4}C$ of electricity

D. $5, 49 \times 10^{1}C$ of electricity

Answer: A

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10.

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

Calculate $\wedge_{HOAc}^{\infty}$ using appropriate molar conductance of the electrolytes listed above at infinite dilution in H_2O at $25\,^{\circ}C$

A. 517.2

B. 552.7

C. 390.7

D. 217.5

Answer: C

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11. During spontaneous ischage of an electrochemical cell Gibb's free energy will

A. Increase

B. Decrease

C. Not change

D. Be infinity

Answer: B

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12. In which of the following pairs, the constants/quantities are not mathematically related to each other?

A. Gibb's free energy an standard cell potential

B. Equilibriu constant and standard cell potential

C. Rate constant and activation energy

D. Rate constant and standard cell potential

Answer: D

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13. Small quantities of compounds TX, TY and TZ are put into separate test tubes containing X, Y and Z solutions. TX does not react with any of these. TY reacts with both X and Z. TZ reacts only with X. The decreasing order of ease of oxidation of the anions $X^{-}, Y^{-} \text{ and } Z^{-}$ is

A. Y^{-}, Z^{-}, X^{-}

B. Z^{-}, X^{-}, Y^{-}

C. Y^{-}, X^{-}, Z^{-}

D. X^{-}, Z^{-}, Y^{-}

Answer: A

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

A. 0.059V

B. 0.59V

C. 0.00V

D. 0.51V

Answer: B

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15. Which of the following curve gives the variation of $\wedge_m^\infty$ with $\sqrt{c}$ for CH_3COOH

A.

B.

C.

D. None of these

Answer: D

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16. "Maintenance free" batteries now in use in place of common batteries have

A. Electrode made of lead-lead oxide

B. Electrodes made of calcium-containing lead alloy

C. Non aqueous solvents as medium

D. Platinum electrodes

Answer: B

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Jee Section (Only one choice correct answer)

1. The standard reduction potentials at $25^{\circ} C$ for the following half reactions are given against each:

$Zn^{2+}(a.q) + 2e^{-} \Leftrightarrow Zn(s): \quad -0.762$

$Cr^{3+}(a.q)3e^{-} \Leftrightarrow Cr(s), \quad -0.740$

$2H^{+} + 2e^{-} \Leftrightarrow H_2(g), \quad 0.00$

$Fe^{3+} + e^{-} \Leftrightarrow Fe^{2+}, \quad 0.77$

Which is the strongest reducing agent?

A. Zn(s)

B. Cr(s)

C. $H_2(g)$

D. $Fe^{2+}(aq)$

Answer: A

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2. Which has ability to release bromine from KBr ?

A. I_2

B. Cl_2

C. HI

D. SO_2

Answer: B

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3. Faraday's laws of electrolysis are related to the

A. Atomic number of the reaction

B. Atomic number of the anion

C. Equivalent weight of the electrode

D. Speed of the cation.

Answer: C

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4. In electrolysis of dilute H_2SO_4 using platinum electrodes .

A. H_2 is evolved at cathode

B. NH_3 is produced at anode

C. Cl_2 is obtained at cathode

D. O_2 is produced

Answer: A

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5. 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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6. A solution containing $1mol$ per litre of each $Cu(NO_3)_2$, $AgNO_3$, and $Hg_2(NO_3)_2$ is being electrolyzed by using inert electrodes. The values of standard electrode potentials in volts (reduction potential) are

$Ag|Ag^{\oplus} = +0.80, 2Hg|Hg_2^{2+} = +0.79$

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

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

A. Ag,Hg,Cu,Mg

B. Mg,Cu,Hg,Ag

C. Ag,Hg,Cu

D. Cu,Hg,Ag

Answer: A

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7. The reaction

$$\frac{1}{2}H_2(g) + AgCl(s) \Leftrightarrow H^+(aq) + Cl^-(aq) + Ag(s)$$

occurs in the galvanic cell

A. $Ag|AgCl(s)|KCl(\text{soln})\Big|AgNO_3(\text{soln})\Big|Ag$

B. $Pt\Big|H_2(g)\Big|HCl(\text{soln})\Big|AgNO_3(\text{soln})\Big|Ag$

C. $Pt\Big|H_2(g)\Big|HCl(\text{soln})|AgCl(s)|Ag$

D. $Pt\Big|H_2(g)\Big|KCl(\text{soln})|AgCl(s)|Ag$

Answer: C

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8. When a lead storage battery is discharged

A. SO_2 is evolved

B. Lead sulphate is consumed

C. Lead is formed

D. Sulphuric acid is consumed

Answer: D

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9. The standard oxidation potential E° for the half cell reactions are

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

$Fe \rightarrow Fe^{2+} + 2e^{-} E^{\circ} = +0.41V$

EMF of the cell reaction

$Fe^{2+} + Zn \rightarrow Zn^{2+} + Fe$ will be

A. $-0.35V$

B. $+0.35V$

C. $+1.17V$

D. $-1.17V$

Answer: B

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10. When a copper wire is placed I a solution of $AgNO_3$, the solution acquires blue colour. This due to the formation of .

A. Cu^{2+} ions

B. Cu^{+} ions

C. Soluble complexof copper with $AgNO_3$

D. Cu^{-} ion by the reduction of Cu

Answer: A

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11. Which one of the following metals can not be obtained on electrolysis of aqueous solution of its salts?

A. Ag

B. Mg

C. Cu

D. Cr

Answer: B

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12. The standard reduction potential for Fe^{2+}/Fe and Sn^{2+}/Sn electrodes are -0.44 and -0.14 volt respectively. For the given cell reaction $Fe^{2+} + Sn \rightarrow Fe + Sn^{2+}$, the standard EMF is.

A. $+0.30V$

B. $-0.58V$

C. $+0.58V$

D. $-0.30V$

Answer: D

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13. Cu^{+} ion is not stable in aqueous solution because because of dispropotionation reaction. E° value of disproportionation of Cu^{+} is $\left[E^{\circ}_{Cu^{2+}/Cu^{+}} = +0.15V, E^{\circ}_{Cu^{2+}/Cu} = 0.34V\right]$

A. $-0.49V$

B. $0.19V$

C. $-0.38V$

D. $0.38V$

Answer: B

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14. The requrierd charege for one equivalent weifht of silver deposited on cathode is.

A. $9.65 \times 10^7 C$

B. $9.65 \times 10^4 C$

C. $9.65 \times 10^3 C$

D. $9.65 \times 10^5 C$

Answer: B

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15. A dilute aqueous solution of Na_2SO_4 is electrolyzed using platinum electrodes. The products at the anode and cathode are :

A. O_2, H_2

B. $S_2O_8^{2-}, Na$

C. O_2, Na

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

Answer: A

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16. The standard reduction potentials of $Cu^{2+} \mid Cu$ and $Cu^{2+} \mid Cu^{\oplus}$ are $0.337V$ and $0.153V$, respectively. The standard electrode potential fo $Cu^{\oplus} \mid Cu$ half cell is

A. 0.184V

B. 0.827V

C. 0.521

D. 0.490V

Answer: C

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17. A standard hydrogen electrode has zero electrode potential because :

A. Hydrogen is easier to oxidise

B. This electrode potential is assumed to be zero

C. Hydrogen atom has only one electron

D. Hydrogen is the lightest element.

Answer: B

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18. The standard reduction potential values of three metallic cations, $X, Y,$ and Z are 0.52, -3.03, and $-0.18V$, respectively. The order of reducing power of the corresponding metal is

A. $Y > Z > X$

B. $X > Y > Z$

C. $Z > Y > X$

D. $Z > X > Y$

Answer: A

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19. The emf of the cell in which the following reactions,

$Zn(s) + Ni^{2+}(0.1M) \rightarrow Zn^{2+}(1.0M) + Ni(s)$ occurs, is found to 0.5105 V at 298 K. The standard emf of the cell is :

A. 0.54

B. 0.4810V

C. 0.5696V

D. $-0.5400V$

Answer: B

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

A. Y will oxidize X and not Z

B. Y will oxidize Z and not X

C. Y will oxidize both X and Z

D. Y will reduce both X and Z

Answer: A

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21. For a cell reaction involvinig a two electron change, the standard emf of the cell is found to be 0.295 V at 25° C. The equilibrium constant of the reaction at $25^{\circ}C$ will be:

A. 1×10^{-10}

B. 29.5×10^{-2}

C. 10

D. 1×10^{10}

Answer: D

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22. For the electrochemical cell $\left(M \mid M^{+}\right) \mid \mid \left(X^{-} \mid X\right)$

$E^{\circ}\left(M^{+}/M\right) = 0.44V$ and $E^{\circ}\left(X/X^{-}\right) = 0.33V$

From this data one can deduce that :

A. $M + X \rightarrow M^{+} + X^{-}$ is the spontaneous reaction

B. $M^{+} + X^{-} \rightarrow M + X$ is the spontaneous reaction

C. $E_{cell} = 0.77V$

D. $E_{cell} = -0.77V$

Answer: B

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23. Which of the following liberate hydrogen on reaction with dilute H_2SO_4 ?

A. Fe

B. Cu

C. Al

D. Hg

Answer: C

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24. A galvanic cell is set up from a zinc bar weighing 50g and 1.0 litre, 1.0M, $CuSO_4$ solution. How long would the cell run, assuming it delivers a steady current of 1.0 ampere

A. 48hrs

B. 41hrs

C. 21hrs

D. 1hr

Answer: C

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25. Saturated solution of KNO_3 is used to make "salt bridge" because .

A. Velocity of K^+ is greater than that of NO_3^-

B. Velocity of NO_3^- is greater than that of K^+

C. Velocities of both K^+ and NO_3^- are nearly the same

D. KNO_3 is highly soluble in water

Answer: C

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

A. LiClgtNaClgtKCl

B. KClgtNaClgtLiCl

C. NaClgtKClgtLiCl

D. LiClgtKClgtNaCl

Answer: B

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27. Standard electrode potential data are useful for understanding the suitability of an oxidant in a redox titration. Some half cell reaction and their standard potentials are given below:

$MnO_4^-(aq) + 8H^+(aq) + 5e^- \rightarrow Mn^{2+}(aq) + 4H_2O(l)E^\circ = 1.51V$

$Cr_2O_7^{2-}(aq) + 14H^+(aq) + 6e^- \rightarrow 2Cr^{3+}(aq) + 7H_2O(l), E^\circ = 1.38V$

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

$CI_2(g) + 2e^- \rightarrow 2CI^-(aq), E^\circ = 1.40V$

Identify the only correct statement regarding quantitative estimation of aqueous $Fe(NO_3)_2$

A. MnO_4^- can be used in aqueous HCl

B. $Cr_2O_7^{2-}$ can be used in aqueous HCl

C. MnO_4^- can be used in aqueous H_2SO_4

D. $Cr_2O_7^{2-}$ can be used in aqueous H_2SO_4

Answer: A

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

A. Cathode to anode in solution

B. Cathode to anode through external supply

C. Cathode to anode through internal supply

D. Anode to cathode through internal supply

Answer: C

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29. The emf of the cell,

$$Zn\left|Zn^{2+}(0.01M)\right|\left|Fe^{2+}(0.001M)\right|Fe$$

at 298 K is 0.2905 then the value of equilibrium constant for the cell reaction is:

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

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

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

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

Answer: B

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30. The rusting of iron takes place as follows :

$$2H^{\oplus} + 2e^{-} + \frac{1}{2}O_2 \rightarrow H_2O(l), \quad E^{c-} = +1.23V$$

$$Fe^{2+} + 2e^{-} \rightarrow Fe(s), \quad E^{c-} = -0.44V$$

Calculae ΔG^{c-} for the net process.

A. $-322kJ \quad mol^{-1}$

B. $-161kJ \quad mol^{-1}$

C. $-152kJ \quad mol^{-1}$

D. $-76kJ \quad mol^{-1}$

Answer: A

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31. Electrolysis of dilute aqueous $NaCl$ solution was carried out by passing $10mA$ current. The time required to liberate $0.01mol$ of H_2 gas at the cathode is $\left(1F = 96500Cmol^{-1}\right)$

A. 9.65×10^4sec

B. 19.3×10^4sec

C. 28.95×10^4sec

D. 38.6×10^4sec

Answer: B

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32. $AgNO_{3(aq)}$ was added to an aqueous KCl solution gradually and the conductivity of the solution was measured. The plot of conductance (∧) versus the value of $AgNO_3$ is

A. (P)

B. (Q)

C. (R)

D. (S)

Answer: D

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33. Consider the following cell reaction.

$2Fe(s) + O_2(g) + 4H^+(aq) \rightarrow 2Fe^{2+}(aq) + 2H_2O(l),$

$E^\circ = 1.67V$

At $\left[Fe^{2+}\right] = 10^{-3}M, P\left(O_2\right) = 0.1$ atm and pH=3, the cell potential at $25^\circ C$ is

A. 1.47V

B. 1.77V

C. 1.87V

D. 1.57V

Answer: D

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34. Given

$E^{0}_{cr^{3+}/Cr} = -0.74V, E^{0}_{MnO_4/Mn^{2+}} = 1.51cm$

$E^{0}_{Cr_2O_7^{2-}/Cr^{3+}} = 1.33V, E^{0}_{Cl/Cl^{-}} = 1.36V$

Based on the data given above, strongest oxidising agent will be:

A. Cl

B. Cr^{3+}

C. Mn^{2+}

D. MnO_4^{-}

Answer: D

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35. Given below are the half -cell reactions

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

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

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

A. $-2.69V$, the reaction will not occur

B. $-2.69V$, the reaction will occur

C. $-0.33V$, the reaction will not occur

D. $-0.33V$, the reaction will occur

Answer: A

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36. Resistance of 0.2 M solution of an electrolyte is 50Ω. The specific conductance of the solution of 0.5 M solution of same electrolyte is $1.4Sm^{-1}$ and resistance of same solution of the same electrolyte is 280Ω. The molar conductivity of 0.5 M solutions of the electrolyte is $5m^2mol^{-1}$ is

A. 5×10^{-4}

B. 5×10^{-3}

C. 5×10^{3}

D. 5×10^{2}

Answer: A

Watch Video Solution

37. The equivalent conductance of NaCl at concentration C and at infinite dilution are λ_C and λ_∞, respectively. The correct relationship between λ_C and λ_∞ is given as (where, the constant B is positive)

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

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

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

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

Answer: C

Watch Video Solution

38. In a galvanic cell, the salt bridge.

A. Does not participipate chemically in the cell reation

B. stops the diffusion of ions from one electrode to another

C. Is necessary for the occurrence of the cell reaction

D. Ensures mixing of the two electrolytic solution

Answer: A

Watch Video Solution

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

A. 0g

B. 63.5g

C. 2g

D. 127g

Answer: B

Watch Video Solution

40. For the following electrochemical cell at $298K$

$$Pt(s) + H_2(g, 1\text{bar})\left|H^+(aq, 1M)\right|\left|M^{4+}(aq), M^{2+}(aq)\right|Pt(s)$$

$$E_{cell} = 0.092V \text{ when } \frac{\left[M^{2+}(aq)\right]}{\left[M^{4+}(aq)\right]} = 10^x$$

Given, $E^\circ_{M^{4+}/M^{2+}} = 0.151V, 2.303\frac{RT}{F} = 0.059$

The value of x is-

A. -2

B. -1

C. 1

D. 2

Answer: D

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41. For the following cell,

$Zn(s)\left|ZnSO_4(aq)\right|\left|CuSO_4(aq)\right| \mid Cu(s)$

When the concentration of Zn^{2+} is 10 times the concentration of Cu^{2+}, the expression for ΔG

(in J mol^{-1})

[F is Faraday constant, R is gas constant] T is temperaure, $E^{\circ}(\text{cell}) = 1.1V$

A. 2.303RT+1.1F

B. 1.1F

C. 2.303RT-2.2F

D. $-2.2F$

Answer: C

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42. How long (approximate) should water be electrolysed by passing through 100 amperes current so that the oxygen released can completely burn 27.66 g of diborane?

(Atomic weight of B = 10.8 u)

A. 0.8 hours

B. 3.2 hours

C. 1.6 hours

D. 6.4 hous

Answer: B

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43. Among the following metals, the strongest reducing agent is

A. Mn^{2+}

B. Cr^{3+}

C. Cl^{-}

D. Zn

Answer: D

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Jee Section (More than one choice correct answer)

1. Which of the following is displaced by Fe ?

A. Ag

B. Hg

C. Zn

D. Na

Answer: A

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2. For the reduction of NO_3^{c-} ion in an aqueous solution, E^{c-} is $+0.96V$, the values of E^{c-} for some metal ions are given below :

$i.\ V^{2+}(aq) + 2e^- \rightarrow V, \quad E^{c-} = -1.19V$

$ii.\ Fe^{3+}(aq) + 3e^- \rightarrow Fe, \quad E^{c-} = -0.04V$

$iii.\ Au^{3+}(aq) + 3e^- \rightarrow Au, \quad E^{c-} = +140V$

$iv.\ Hg^{2+}(aq) + 2e^- \rightarrow Hg, \quad E^{c-} = +0.86V$

The pair(s) of metals that is / are oxidized by NO_3^{c-} in aqueous solution is / are

A. V and Hg

B. Hg and Fe

C. Fe and Su

D. Fe and V

Answer: A::B::D

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3. Reduction electrode potentials of half cells

(1) $Pt(H_2)|H^+(C_f)$, $(2)Pt(cl_2)||(Cl^-)(C_2)$ and (3) $Ag^+|Ag^+(C_3)$ on increasing C_1C_2, and C_3 (all gases are at 1 atm pressure)

A. Will increase on increasing C_1, C_2 and C_3

B. Will decrease on increasing C_1, C_2 and C_3

C. Will decrease on increasing C_1 and C_3 and increase on increasing C_2

D. Will remain constant if C_1 or C_2 is doubled and p_1 or p_2 is made four times.

Answer: C::D

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4. There is blue colour formation if:

A. Cu electrode is placed inside $AgNO_3$ solution

B. Cu electrode is placed inside $ZnSO_4$ solution

C. Cu electrode is placed inside dil HNO_3

D. Cu electrode is placed inside dil H_2SO_4

Answer: A::C

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5. The formation of rust on the surface of iron occurs through the reaction (s) .

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

B. $O_2(g) + 4H^+(aq) + 4r^- \rightarrow 2H_2O(l)$ at cathode

C. $4Fe^{2+}(aq) + O_2(g) + 4H_2O(l) \rightarrow 2Fe_2O_3(s) + 8H^+$

D. $Fe_2O_3(s) + xH_2O(l) \rightarrow Fe_2O_3.xH_2O$

Answer: A

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6. In which case $\left(E_{\text{cell}} - E^{\circ}_{\text{cell}}\right)$ is zero

A. $Cu\left|Cu^{2+}(0.01M)\right|\left|Ag^{+}(0.1M)\right|Ag$

B. $Pt\left(H_2\right)|pH = 1|\left|Zn^{2+}(0.01M)\right|Zn$

C. $Pt\left(H_2\right)|pH = 1|\left|Zn^{2+}(1M)\right|Zn$

D. $Pt\left(H_2\right)\left|H^{+}(0.01M)\right|\left|Zn^{2+}(0.1M)\right|Zn$

Answer: A::B

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7. Reaction taking place in a fuel cells are:

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

B. Reaction in (a) at the cathode

C. $2H_2(g) + 4OH^-(aq) \rightarrow 4H_2O(l) + 4e^-$ at the anode

D. Reaction in (c) at the cathode

Answer: A::C

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8. It is not adviasable to:

A. Stir sugar solution with a steel spoon

B. Stiir copper sulphate solution with a silver spoon

C. Stir copper sulphate solution with a zinc spoon

D. Stir silver nitrate solution with a copper spoon

Answer: C::D

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9. By passageof 1 F of electricity

A. 1 mol of Cu is deposited

B. 0.5 mol of Mgis deposited

C. 9g of Al is deposited

D. 5.6 L of O_2 gas evolved at anode

Answer: B::C::D

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10. In the following electrochemical cell :

$Zn \left| Zn^{2+} \right|\left| H^{\oplus} \right| \left(H_2\right) Pt$

$E_{cell} = E^{c-}{}_{\cdot cell}$. This will be when

A. $\left[Zn^{2+}\right] = \left[H^+\right] = 1M$ and $pH_2 = 1atm$

B. $\left[Zn^{2+}\right] = 0.01M, \left[H^+\right] = 0.1M$ and $pH_2 = 1atm$

C. $\left[Zn^{2+}\right] = 1M, \left[H^+\right] = 0.1M$ and $pH_2 = 0.1atm$

D. $\left[Zn^{2+}\right] = \left[H^+\right] = 0.1M$ and $pH_2 = 0.1atm$

Answer: A::B

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Jee Section (Reasoning type question)

1. Statement 1: The standard emf $\left(E^{\circ}_{cell}\right)$ of following concentration cell is zero.

$Zn(s)\left|ZnSO_4\left(C_1\right)\right|\left|ZnSO_4\left(C_2\right)\right|Zn(s)$

Statement 2: The electrolyte concentration cell will be is greater in cathodic half-cell.

A. Statement 1 is true, statement 2 is true, statement 2 is a correct explanation for statement 1

B. Statement 1 is true, statement 2 is true, statement 2 is not a correct explanation for statement 1

C. Statement 1 is true, statement 2 is false

D. statement 1 is false,statement 2 is true

Answer: B

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2. Statement -1 : During the electrolysis of water, two faraday of charge will produce a total of 33.6 litre of gases at STP at electrodes.

Statement -2 : In the electrolysis of water, two faraday of charge will produce half mole of H_2 gas and one fourth mole of O_2 gas.

A. Statement 1 is true, statement 2 is true, statement 2 is a correct explanation for statement 1

B. Statement 1 is true, statement 2 is true, statement 2 is not a correct explanation for statement 1

C. Statement 1 is true, statement 2 is false

D. statement 1 is false,statement 2 is true

Answer: C

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3. Statement-I: In the Daniel cell, if concentration of Cu^{2+} and Zn^{2+} ions are doubled the emf of the cell will not change.

Because Statement-II: If the concentration of ions in contact with the metals is doubled, the electrode potential is doubled.

A. Statement 1 is true, statement 2 is true, statement 2 is a correct explanation for statement 1

B. Statement 1 is true, statement 2 is true, statement 2 is not a correct explanation for statement 1

C. Statement 1 is true, statement 2 is false

D. statement 1 is false,statement 2 is true

Answer: D

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Jee Section (Comprehension Type question)

1. Tollen reagent is used for the detection of aldehydes. When a solution of $AgNO_3$ is added to glucose with NH_4OH, then gluconic acid is formed.

$Ag^{\oplus} + e^- \rightarrow Ag, \quad E^{c-}._{red} = 0.8V$

$C_6H_{12}O_6 \rightarrow C_6H_{12}O_7 + \text{Gluconicacid} 2H^{\oplus} + 2e^-, \quad E^{c-}._{oxid} = -0.05V$

$\left[Ag\left(NH_3\right)_2\right]^{\oplus} + e^- \rightarrow Ag(s) + 2NH_3, \quad E^{c-}._{red} = 0.337V$

$\left[Use 2.303 \times \frac{RT}{F} = 0.0592 \text{ and } \frac{F}{RT} = 38.92 at 298K\right]$

$2Ag^{\oplus} + C_6H^{12}O_6 + H_2O \rightarrow 2Ag^s + C_6H_{12}O_7 + 2H^{\oplus}$ Find $\ln K$ of this reaction.

A. 66.13

B. 58.38

C. 28.30

D. 46.29

Answer: B

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2. Tollen reagent is used for the detection of aldehydes. When a solution of $AgNO_3$ is added to glucose with NH_4OH, then gluconic acid is formed.

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$\left[Use2.303 \times \frac{RT}{F} = 0.0592 \text{ and } \frac{F}{RT} = 38.92at298K\right]$

When ammonia is added to the solution, pH is raised to 11. Which half cell reaction is affected by pH and by how much ?

A. E_{oxi} will increase by a factor of 0.65 from $E^{\circ}_{0\ \text{xi}}$

B. $E_{\otimes i}$ will decrease by a factor of 0.65 from E°_{oxi}

C. E_{red} will increase by a factor of 0.65 from E°_{red}

D. E_{red} will decrease by a factor of 0.65 from E°_{red}.

Answer: C

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3. Ammonia is always added in this reaction. Which of the following must be incorrect

A. NH_3 combines with Ag^+ to form a complex

B. $Ag(NH_3)_2^+$ is a stronger oxidising reagent than Ag^+

C. In absence of NH_3 silver salt of gluconic acid is formed

D. NH_3 has affected the standard reduction potential of glucose/gluconic acid electrode

Answer: D

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4. Redox reactions play a pivotal role in chemistry and biology. The values standard redox potential $\left(E^{c-}\right)$ of two half cell reactions decided which way the reaction is expected to preceed. A simple example is a Daniell cell in which zinc goes into solution and copper sets deposited. Given below are a set of half cell reactions (acidic medium) along with their $E^{c-}(V$

with respect to normal hydrogen electrode) values. Using this data, obtain correct explanations for Question.

$I_2 + 2e^- \rightarrow 2I^{c-}, \quad E^{c-} = 0.54$

$Cl_2 + 2e^- \rightarrow 2Cl^{c-}, \quad E^{c-} = 1.36$

$Mn^{3+} + e^- \rightarrow Mn^{2+}, \quad E^{c-} = 1.50$

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

$O_2 + 4H^{\oplus} + 4e^- \rightarrow 2H_2O, \quad E^{c-} = 1.23$

Among the following, identify the correct statement.

A. Chloride ion oxidised O_2

B. Fe^{2+} is oxidised by iodine

C. Iodide ion is oxidised by chlorine

D. Mn^{2+} is oxidised by chlorine

Answer: C

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$O_2 + 4H^{\oplus} + 4e^- \rightarrow 2H_2O, \quad E^{C-} = 1.23$

While Fe^{3+} is stable, Mn^{3+} is not stable in acid solution because

A. O_2 oxidises Mn^{2+} to Mn^{3+}

B. O_2 oxidises both Mn^{2+} to Mn^{3+} and Fe^{2+} to Fe^{3+}

C. Fe^{3+} oxidises H_2O to O_2

D. Mn^{3+} oxidises H_2O to O_2

Answer: D

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Sodium fusion extract obtained from aniline on treatment with iron (II)

sulphate and H_2SO_4 in the presence of air gives a Prussion blue precipitate. The blue colour is due to the formation of

A. $Fe_4\left[Fe(CN)_6\right]_3$

B. $Fe_3\left[Fe(CN)_6\right]_2$

C. $Fe_4\left[Fe(CN)_6\right]_2$

D. $Fe_3\left[Fe(CN)_6\right]_3$

Answer: A

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7. Chemical reactions involve interation of atoms and molecules. A large number of atoms / molecules (approximately $6.023 \times 10^{23}\big)$ are present in a few grams of any chemical compound varying with their atomic / molecular masses. To handle such large numbers conveniently, the mole concept was introduced. This concept has implications in diverse areas such as analytical chemistry, biochemistry, electrochemistry, and radiochemistry. The following example illustrates a typical case, involving chemical / electrochemical reaction, which requires a clear understanding of the mole concept.

A $4.0M$ aqueous solution of $NaCl$ is prepared and $500mL$ of this solution is electrolyzed. This leads to the evolution of chlorine gas at one of the electrodes (atomic mass of Na is 23 and Hg is $200)(1F = 96500C)$.

The total number of moles of chlorine gas evolved is

A. 0.5

B. 1.0

C. 2.0

D. 3.0

Answer: B

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8. Chemical reaction involve interaction of atoms and molecules. A large number of atoms/molecules (approximately 6.022×10^{23})are present in a few grams of any chemical compound varying with their atomic/molrcular mass. To handle such a large numbers conveniently, the mole concept was introduced. This concept has implications in diverse areas such as analytical in diverse areas such as analytical chemistry, biochemistry, electrochemistry and radiochemistry. The following example illustrates a typical case, involving chemical/ electrochemical reaction, which requires a clear understanding of the mole concept.

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If cathode is a Hg electrode, the maximum weight(g) of amalgam formed from the solution is

A. 200

B. 225

C. 400

D. 446

Answer: D

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The total charge in couloms required to complete the electrolysis

A. 24125

B. 48250

C. 96500

D. 193000

Answer: D

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10. The concentration of potassium ions inside a biological cell is at least twenty times higher than the outside. The resulting potential difference across the cell is important in several processes such as transmission of nerve impulses and maintaining the ion balance. A simple mode for such a concentration cell involving a metal M is :

$M_{(s)}\left|M^{\circ}_{(aq.)}0.05\text{molar}\right|\left|M^{\circ}_{(aq.)}1\text{molar}\right|M_{(s)}$

For the above electrolytic cell the magnitude of the cell potential $|E_{cell}| = 70mV$

For the above cell :

A. $E_{cell} < 0, \Delta G > 0$

B. $E_{cell} > 0, \Delta G < 0$

C. $E_{cell} < 0, \Delta G^{\circ} > 0$

D. $E_{cell} > 0, \Delta G^{\circ} < 0$

Answer: B

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11. The concentration of potassium ions inside a biological cell is at least 20 times higher than outside. The resulting potential difference across the cell is important in several processes such as transmission of nerve impulses and maintaining the ion balance. A simplel model for a concentration cell involving a metal M is

$M(s) \mid M^{\oplus}(aq, 0.05 \text{ molar})) \mid \mid M^{\oplus}(aq, 1 \text{ molar}) \mid M(s)$

For the abov electrolytic cell, the magnitude of the cell potential is $\left|E_{cell}\right| = 70mV.$

If the 0.05 moolar solution of $M^{\oplus}$ is replaced by a 0.0025 molar $M^{\oplus}$ solution, then the magnitude of the cell potential would be

A. 35 mV

B. 70 mV

C. 140 mV

D. 700 mV

Answer: C

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12. The electrochemical cell shown below is a concentration cell.

$$M\left|M^{2+}\left(\begin{array}{c}\text{Saturated solution}\\ \text{of sparingly soluble}\\ \text{salt, } MX_2\end{array}\right)\right\|\left|M^{2+}\left(0.001\ \text{mol dm}^{-3}\right)\right|M$$

The emf of the cell depends on the difference in concentrations of M^{2+} ions at the two electrodes. The emf of the cell at 298 K is 0.059 V.

The solubility product $\left(K_{sp}, mol^3dm^{-9}\right)$ of MX_2 at 298 K based on the information available for the given concentration cell is $(\text{take } 2.303 \times R \times 298/F = 0.059V)$:

A. 4×10^{-15}

B. 5.7

C. 1×10^{-12}

D. 4×10^{-12}

Answer: A

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13. The electrochemical cell shown below is a concentration cell

M / M^{2+} (saturated solution of a sparingly soluble salt, MX_2) | $\left|M^{2+}\left(0.001 moldm^{-3}\right)\right|M$

The emf of the cell depends on the difference in concentrations of Mn^{2+} ions at the two electrodes. The emf of the cell at $298K$ is $0.059V$.

The value of $\Delta G\left(kJ\text{mol}^{-1}\right)$ for the given cell is : (take $1F = 96500C\text{mol}^{-1}$)

A. -5.7

B. 5.7

C. 11.4

D. -11.4

Answer: D

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Jee Section (Integer type Questions)

1. The molar conductivity of a solution of a weak acid $HX(0.01M)$ is 10 times smalller than the molar conductivity of a solution of a weak acid $HY(0.10M)$. If $\lambda^{\circ}_{X^-} = \lambda^{\circ}_{Y^-}$, the difference in their pK_a values, $pK_a(HX) - pK_a(HY)$, is (consider degree of ionisation of both acids to be $< < 1$):

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2. The conductance of a 0.0015 M aqueous solution of a weak monobasic acid was determined by using a conductivity cell consisting of Pt electrodes. The distance between the electrodes is 120 cm with an area of cross section of $1cm^2$. The conductance of this solution was found to be

$5 \times 10^{-7} S$. The pH of the solution is 4. The value of limiting molar conductivity $\left(\Lambda^{\circ}\right)$ of this monobasic acid in aqueous solution is $Z \times 10^{2} Scm^{-1} mol^{-1}$. The value of Z is ....

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3. An alloy of Pb-Ag weighing $1.08g$ was dissolved in dilute HNO_3 and the volume made to 100 mL.A ? Silver electrode was dipped in the solution and the emf of the cell dipped in the solution and the emf of the cell set-up as $Pt(s), H_2(g)\left|H^{+}(1M)\right|\left|Ag^{+}(aq.)\right|Ag(s)$ was $0.62V$. If E°_{cell} is $0.80V$, what is the percentage of Ag in the alloy ? (At $25^{\circ}C, RT/F = 0.06$)

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4. The half cell potentials of a halfcell $A^{(x+n)+}, A^{x+} \mid pt$ were found to be as follows :

% of reduced form	24.4	48.8
Half cell potential (V)	0.101	0.115

Determinwe the value of n.

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5. ΔG for the reaction :

$$\frac{4}{3}Al + O_2 \rightarrow \frac{2}{3}Al_2O_3$$

is $-772 kJ mol^{-1}$ of O_2.

Calculate the minimum EMF in volts required to carry out an electrolysis of Al_2O_3

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Jee Section (Matrix Match type questions)

1. An aqueous solution of X is added slowly to an aqueous solution of Y as shows in column I. the variation in conductivity of these reaction is give in column II. Match column I with column II.

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2. The standard reduction potential data at $25\,^{\circ}C$ is given below

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

$$E^{\circ}\left(Cu^{2+}. Cu\right) = +0.34V, E^{\circ}\left(Cu^{+}. Cu\right) = +0.52V,$$

$$E^{\circ}\left(O_2(g) + 4H^{+} + 4e^{-} \rightarrow 2H_2O\right) = +1.23V$$

$$E^{\circ}\left(O_2(g)\right) + 2H_2O + 4e^{-} \rightarrow 4OH\Big) = +0.40V$$

$$E^{\circ}\left(Cr^{2+}. Cr\right) = -0.74V$$

$$E^{\circ}\left(Cr^{2+}. Cr\right) = -0.91V$$

Match E° of the redox pair in column I with the values given in column II

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Jee Section JEE (Advanced) 2018 (Numberic answer Type Questions)

1. For the electrochemical cell,

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

the standard emf of the cell is 2.70 V at 300 K. When the concentration of Mg^{2+} is chaged to x M, the cell potential changes to 2.67 V at 300 K. The value of x is ______ .

(Given $\frac{F}{R} = 11500 kV^{-1}$. where F is the Faraday constant and R is the gas constant, ln (10) = 2.30)

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2. Consider an electrochemical cell : $A_{(s)} \mid A^{n+}\left((aq, 2M) \mid \mid B^{2n+}\left((aq, 1M) \mid B_s\right.\right.$ The value of ΔH° for the cell reaction is twice that of ΔG° at 300K . If the emf of the cell is zero, the ΔS° (in JK^(-1mol^(-1)) $ofthecellreactionpermo \le ofBf$ or $medat300Kis\_\_\_\_\_\_.(Given\ln(2) = 0.7, R($ 8.3JK^(-1)mol^(-1)`. H, S and G are enthalpy , entropy and gibbs energy, respectively).

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