CET QUESTIONS ON ELECTROCHEMISTRY

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1. Electrolytic and metallic conductance differs from

1. Electrolytic and metallic conductance increases with increase of temperature
2. Electrolytic conductance increases and metallic conductance decreases with increase of temperature
3. Electrolytic conductance decreases and metallic conductance remains constant with increase of temperature
4. Electrolytic and metallic conductance decreases with increase of temperature

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2. **When a current of 1.25 ampere flows through the solution of chromium (III) sulphate, 1.3 g of chromium is deposited at the cathode in ____ time**

(At mass of Cr=52)

1. 108 min.
2. 9.65 min.
3. 96.5 min.
4. 52 min.

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Solution:

Eq. mass of Cr = At mass/valency

= 52/3 = 17.33

96,500 C current deposites 17.33 g Cr.

∴ to deposite 1.3 g of Cr. Current required

=(1.3 x 96,500)/17.3 = 7237.51 = Q

t = Q/I = 7237.51/1.25

= 5790.01 sec. = 96.5 min.

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3. The time required to liberate 89 cm^3 of H_2 gas at STP if 7 ampere current flows is

1. 109.54 sec.
2. 19.9 sec.
3. 10.954 sec.
4. 101.1 sec.

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Solution:

To discharge 11200 cm^3 H_2 at STP, 96,500 C current is required.

$\therefore$ to discharge 89 cm^3 H_2 at STP required

$$= \frac{89 \times 96{,}500}{11{,}200}$$

$$= 766.83 \text{ C current} = Q$$

$$\therefore t = \frac{Q}{I} = \frac{766.83}{7} = 109.54 \text{ sec.}$$

4. Mathematical statement of Faraday's second law is

1. $W_1/E_2 = W_2/E_1$
2. $E_1/W_2 = E_2/W_1$
3. $E_2/W_1 = E_1/W_2$
4. $W_1/W_2 = E_1/E_2$

5. Same quantity of electric current is passed through the solutions of $CuSO_4$ and $AgNO_3$, 32 g of Cu is deposited at the cathode in first case. The mass of Ag deposited in second case will be

1. 32 g
2. 108 g
3. 10.8 g
4. 320 g

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Solution:

$$\frac{\text{Mass of Cu}}{\text{Mass of Ag}} = \frac{\text{Eq. mass of Cu}}{\text{Eq. mass of Ag}}$$

$$\therefore \frac{32}{\text{Mass of Ag}} = \frac{32}{108}$$

$$\therefore \text{Mass of Ag} = \frac{32 \times 108}{32} = 108 \text{ g}$$

6. Of the followings, which one is conjugate acid and base

1. H_2SO_4 and HSO_4^{-1}
2. H_2SO_4 and HCl
3. HNO_3 and $H3O^+$
4. H_2CO_3 and $H3O^+$

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7. In an electrolytic cell, electrons move from

1. Cathode to anode
2. Anode to cathode
3. Cation to anion
4. Anion to cation

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8. Which among the followings is amphoprotic?

1. H_2SO_4
2. SO_4^{-2}
3. H_3O^+
4. $H_2PO_4^{-1}$ Vikasana - CET 2012

9. Molar conductance and equivalent conductance are same for the electrolyte having

1. Same molecular mass and empirical formula mass
2. Different molecular mass and empirical formula mass
3. Different molecular mass and equivalent mass

4. Same molecular mass and equivalent mass

10. The conjugate base of OH^- is

1. H_2O
2. O^{-2}
3. H_3O^+
4. OH^+

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11. If an acid is weak, its conjugate base is

1. Strong or weak
2. Weak
3. Neutral
4. Strong

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12. For conjugate acid-base pairs

1. $P^{ka}+P^{kb} = 0$
2. $P^{ka} + P^{kb} = 14$
3. $P^{ka} - P^{kb} = 0$
4. $P^{ka} = P^{H}$

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13. When the same quantity of current is passed through silver salt and gold salt solutions deposited 0.583 g of Ag and 0.35 g of Au. The oxidation state of Au in its salt is At mass of Au = 197, Eq. mass of Ag = 108

1. +1 2.+2 3. +4 **4. +3**

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Solution:

$Au^{n+} + ne \rightarrow Au$ Eq. mass of Au = 197/n

$$\frac{\text{Mass of Ag}}{\text{Mass of Au}} = \frac{\text{Eq. mass of Ag}}{\text{Eq. mass of Au}}$$

$$\therefore \frac{0.583}{0.355} = \frac{108}{197/n}$$

$$\therefore n = \frac{197 \times 0.583}{108 \times 0.355} = 2.999 \approx 3$$

14. The degree of dissociation of a weak electrolyte increases

1. On increasing pressure
2. On increasing dilution
3. On adding strong electrolyte containing common ions
4. On decreasing dilution

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15. The Pk_a values of acetic acid, benzoic acid and formic acid are 4.757, 4.257 and 3.752, respectively. Among these acids, which is stronger?

1. Acetic acid
2. Formic acid
3. Benzoic acid
4. none

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16. At 90°C, pure water has concentration of $H_3O^+ = 1 \times 10^{-6}$ M. The value of k_w at the same temperature is

1. 10^{-6}
2. 10^{-12}
3. 10^{-14}
4. 10^{-7}

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17. Sodium is added to a solution of acetic acid. Then P^H of solution

1. Decreases
2. Increases
3. Unchanged
4. Changed

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18. The P^H of 10^{-8} molar aqueous solution of HCl is

1. 8
2. -6
3. 6 to 7
4. 7 to 8

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19. More acid is added to solution of $P^H = 5$ in order to reduce the $P^H = 2$. The increase in H^+ ion concentration is

1. 100 times
2. 3 times
3. 5 times
4. 1000 times

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20. Which pair will show common ion effect?

1. $BaCl_2 + Ba(NO_3)_2$
2. $NaCl + HCl$
3. $CH_3\text{-}COOH + NaOH$
4. $NH_4\text{-}OH + NH_4Cl$

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21 Which of the salt solution would be acidic?

1. Na_2SO_4
2. $NaHSO_3$
3. K_2SO_4
4. Na_2SO_3

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22. Which of the following cannot be considered as Lewis acid?

1. H^+
2. $AlCl_3$
3. NH_4^+
4. BF_3

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23. **Which of the following pair is Lewis base as well as Bronstead base?**

1. NH_3 and H_2O
2. NaOH and NH_3
3. NaOH and HCl
4. NH_3 and BF_3

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24. Which of the following does not make any change in P^H, when added to 10 ml dilute HCl?

1. 5 ml pure water
2. 20 ml pure water
3. 10 ml HCl
4. 20 ml same dilute HCl

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25. k_a of acetic acid is 1.8×10^{-5}. If the ratio of concentration of salt to acid is 1 M, them P^H of the solution is

1. 3.7
2. 4.7
3. 5.3
4. 1.4

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26. In an electroplating, the article to be electroplated acts as

1. Cathode
2. Electrolyte
3. Anode
4. Conductor

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27. P^H of a mixture of two solutions of P^H 3 and 4, in the ratio 1:4 is

1. 3.8
2. 3.2
3. 3.55
4. 3.5

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Solution:

$$[H^+] = \frac{1 \times 10^{-3} + 4 \times 10^{-4}}{5}$$

$$= \frac{0.001 + 0.0004}{5} = \frac{0.0014}{5}$$

$$= 0.00028 = 2.8 \times 10^{-4}$$

$$P^H = -\log [H^+] = -\log 2.8 \times 10^{-4}$$

$$= 4 - 0.4472 = 3.5528$$

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28. P^H of the solution produced when an equal volume of solutions having $P^H = 5$ and $P^H = 4$ are mixed, is

1. 4.3
2. 4.04
3. 3.5
4. 3.56

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Solution:

$$[H^+] = \frac{1 \times 10^{-5} + 1 \times 10^{-4}}{2}$$

$$= \frac{0.00001 + 0.0001}{2} = \frac{0.00011}{2}$$

$$= 0.000055 = 5.5 \times 10^{-5}\ m$$

$$P^H = -\log_{10} [H^+] = -\log 5.5 \times 10^{-5}$$

$$= 5 - 0.7404 = 4.2596 \approx 4.3$$

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29. The P^H of solution produced by mixing 250 cm^3 of a solution of P^H 3 and 750 cm^3 of a solution P^H 5 is

1. 4.5
2. 4
3. 3.3
4. 3.6

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Solution:

$$[H^+] = \frac{250 \times 10^{-3} + 750 \times 10^{-5}}{250 + 750}$$

$$= \frac{0.25 + 0.0075}{1000} = \frac{0.2575}{1000}$$

$$= 0.0002575 = 2.575 \times 10^{-4}$$

$$P^H = -\log [H^+] = -\log 2.575 \times 10^{-4}$$

$$= 4 - 0.4108$$

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$$= 3.5892 \approx 3.6$$

30. The buffer action of blood is due to the presence of

1. HCl and NaCl
2. Amino acids and NH_3
3. Urea and Na^+
4. Bicarbonate ions and carbonic acid

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31. A solution of ammonium acetate is neutral because

1. both the acid and base forming a salt are weak electrolytes
2. both the acid and base forming a salt are strong electrolytes
3. dissociation constants of weak acid and weak base are same
4. ammonium acetate does not undergo hydrolysis

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32. A solution is called super-saturated if

1. Ionic product > solubility product
2. Ionic produce < solubility product
3. Ionic produce = solubility product
4. None of the above

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33. In an electro-chemical cell,

1. electrical energy is converted into chemical energy
2. chemical energy is converted into electrical energy
3. chemical energy is converted into heat
4. electrical energy is converted into heat

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34. The hydrogen electrode is dipped in a solution of P^H 3 at 25°C. The potential attained by it is

1. 0.177 V
2. -0.177 V
3. 0.087 V
4. 0.0591 V

Solution:

$EH_2 = 0.0591 \times P^H = -0.0591 \times 3 = -0.1773V$

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35. Magnesium can be used to protect iron structures from corrosion, since

1. magnesium is less electropositive element
2. magnesium is light metal
3. magnesium is cheap
4. magnesium acts as anode and get oxidised in preference to iron

36. emf of the cell is measured accurately using

1. voltmeter
2. potentiometer
3. Galvanometer
4. Ammeter

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37. **Aluminium is more reactive than iron. But aluminium is less easily corroded than ion**

1. Aluminium is p-block element
2. Aluminium forms a protective oxide film over its surface
3. Iron reacts easily with water
4. Iron forms both divalent and trivalent ions

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38. For sparingly soluble salt of the type A_2B, solubility and solubility product are related as

1. $k_{sp} = S^3$
2. $k_{sp} = S^2$
3. $k_{sp} = \sqrt{S^3}$
4. $k_{sp} = 4S^3$

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39. Second group metal sulphides have ___ solubility product

1. Smaller
2. Larger
3. Equal
4. None

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40.In SHE platinised platinum foil is used because

1. It prevents poisoning
2. It prevents reaction of metal with HCl
3. It increases efficiency of adsorption of H_2
4. It prevents reaction of metal with the external wire

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41. In an electro-chemical cell, current move from

1. Anode to cathode
2. Cathode to anode
3. Cation to anion
4. Anion to cation

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42. Arrangement of metals Al, Cu, Fe, Mg and Zn in the order which they displace each other. Given that $E^0Mg = -2.37V$, $E^0Al = -1.66V$, $E^0Cu = +0.34V$, $E^0Fe = -0.44V$ and $E^0Zn = -0.76V$

1. Mg>Al>Zn>Fe>Cu
2. Mg>Al>Zn>Cu>Fe
3. Al>Zn>Mg>Fe>Cu
4. Mg>Zn>Al>Fe>Cu

Solution:

The metal which have more –ve SRP value can displace the metal which have less –ve SRP value from its salt solution.

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43. The potential of copper electrode dipped in 0.1 M $CuSO_4$ solution at 25°C is [Given E^0_{Cu} = 0.34V]

1. 0.34V
2. 0.31V
3. 0.349V
4. 0.28V

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Solution:

$$ECu = E^0Cu + \frac{0.0591}{2}.\log_{10} 1 \times 10^{-1}$$

$$= 0.34 + \frac{0.0591}{2} \times -1$$

$$= 0.34 - 0.0295$$

$$= 0.3105V$$

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44. The relation between standard free energy change and standard emf of the cell is

1. $\Delta G^0 = -nE_{cell}$
2. $\Delta G^0 = -nFE^0_{cell}$
3. $\Delta G = nFE_{cell}$
4. $\Delta G^0 = \frac{nF}{E^0_{cell}}$

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45. The maximum work done from the Daniel cell, if its E^0cell is 1.1 volt. [Zn|Zn^{+2}(1M) || Cu^{+2} (1M)|Cu]

1. -2.12 kJ
2. 21.23 kJ
3. -212.3 kJ
4. 2123 kJ

Solution:

$\Delta G^0 = -nFE^0 = -2 \times 96500 \times 1.1$

$= 212300J = -212.3\ kJ$

46. Cell reaction is spontaneous, when

1. E^0_{red} is positive
2. ΔG^0 is positive
3. E^0_{red} is negative
4. ΔG^0 is negative

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47. The ksp of CuS, Ag_2S and HgS are 10^{-31}, 10^{-44} and 10^{-54}, respectively.

Which sulphide is ppted earlier?

1. CuS
2. Ag_2S
3. HgS
4. All the sulphides

Solution:

The sulphide having smaller k_{sp} value can ppt earlier.

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48. Solubility product of a sparingly soluble salt AX_2 is 3.2×10^{-11}. Its solubility in $mol|dm^3$ is

1) 5.6×10^{-6}
2) 3.1×10^{-4}
3) 2×10^{-4}
4) 4×10^{-4}

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49. **The dissociation constants of formic acid and acetic acid are 1.77 x 10-4 and 1.77 x 10-5, respectively. The relative strengths of two acids is**

1. 3.18
2. 100
3. 6.36
4. 5

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Solution:

$$\frac{\text{Acedic strength of } H-COOH}{\text{Acedic strength of } CH_3-COOH} = \frac{\sqrt{ka \times a}}{\sqrt{ka \times a}} = \sqrt{\frac{ka.HCOOH}{ka.CH_3COOH}}$$

$$= \sqrt{\frac{1.77 \times 10^{-4}}{1.77 \times 10^{-5}}} = \sqrt{10} = 3.18$$

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50. Buffer capacity of buffer solution is maximum when

1. $P^H = 0$
2. [salt] / [acid] = 1
3. [salt] > [acid]
4. [salt] < [acid]

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THANK YOU

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