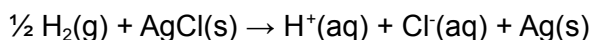


Chemistry Worksheet on Chapter 3 Electrochemistry -Set 1

Q-1: The standard reduction potentials of three metallic cations, A, B, and C, are +0.65, -2.49, and -1.18 V, respectively. The order of the corresponding metal's reducing power is

- a) $B > C > A$
- b) $A > C > B$
- c) $C > B > A$
- d) $C > A > B$

Q-2: The reaction



occurs in the galvanic cell

- a) $\text{Ag}|\text{AgCl}(\text{s})|\text{KCl}(\text{soln})|\text{AgNO}_3|\text{Ag}$
- b) $\text{Pt}|\text{H}_2(\text{g})|\text{KCl}(\text{soln})|\text{AgCl}(\text{s})|\text{Ag}$
- c) $\text{Pt}|\text{H}_2(\text{g})|\text{HCl}(\text{soln})|\text{AgCl}(\text{s})|\text{Ag}$
- d) $\text{Pt}|\text{H}_2(\text{g})|\text{HCl}(\text{soln})|\text{AgNO}_3(\text{soln})|\text{Ag}$

Q-3: Pure water does not conduct electricity because

- a) The melting point is low.
- b) Is easily broken down
- c) Is almost completely unionised
- d) Is neutral

Q-4: Calculate the charge required to oxidise one mole of Mn_3O_4 into MnO_4^{2-} in the presence of an alkaline medium.

Q-5: The amount of substance liberated at an electrode is not directly proportional to:

- a) Time
- b) Current
- c) Electrochemical equivalent
- d) Conductivity

Q-6: In a cell, $\text{Zn}(\text{s})|\text{Zn}^{2+}||\text{H}^+|\text{H}_2(\text{Pt})$; adding H_2SO_4 to the cathode compartment will result in

- a) Decrease E_{cell}
- b) Increase E_{cell}

- c) Adjust the equilibrium to the left
- d) Adjust the equilibrium to the right

Q-7: The E^0 values for the two reduction electrode processes are as follows:

- a) $\text{Ce}^{4+}/\text{Ce}^{3+} = 1.61 \text{ V}$
- b) $\text{Co}^{2+}/\text{Co} = -0.28 \text{ V}$

Calculate the cell potential and ΔG^0 for the cell reaction.

Q-8: Define the following:

- a) Strong Electrolyte
- b) Kohlraush's law
- c) Molar conductivity

Q-9: The following are the standard reduction potentials for single electrodes at 298 K:

Electrode	Electrode potential (Volt)
Mg^{2+}/Mg	-2.34
Pb^{2+}/Pb	-0.1262
Cr^{2+}/Cr	-0.913

From this we can infer that

- a) Pb can reduce both Mg^{2+} and Cr^{2+}
- b) Cr can reduce both Mg^{2+} and Pb^{2+}
- c) Mg can reduce both Pb^{2+} and Cr^{2+}
- d) Mg can reduce both Pb^{2+} but not Cr^{2+}

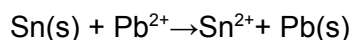
Q-10: Given that $E^0(\text{Fe}^{3+}, \text{Fe}) = -0.4 \text{ V}$ and $E^0(\text{Fe}^{2+}, \text{Fe}) = -0.44 \text{ V}$, the value of $E^0(\text{Fe}^{3+}, \text{Fe}^{2+})$ is

- a) 0.76 V
- b) -0.40 V
- c) -0.76 V
- d) 0.40 V

Q-11: The Nernst equation for the reaction, $\text{A}^{2+} + 2\text{e}^- \rightarrow \text{B}$ in terms of the free energy change is

- a) $\Delta G = \Delta G^\circ + 2.303RT \log([B]/[A])$
- b) $\Delta G = \Delta G^\circ - 2.303RT \log([B]/[A])$
- c) $-\Delta G = -\Delta G^\circ + 2.303RT \log([B]/[A])$
- d) $\Delta G = -\Delta G^\circ + 2.303RT \log([B]/[A])$

Q-12: The standard Gibbs free energy change for the reaction shown below is -2.7kJ/mol



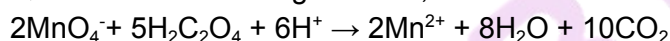
Given that $E^\circ(\text{Pb}^{2+}/\text{Pb})$ is -0.126 V the value of $E^\circ(\text{Sn}^{2+}/\text{Sn})$ in V is _____ (upto two decimal places)

Q-13: A column of 0.05M NaOH solution with a diameter of 1 cm and a length of 50 cm has an electrical resistance of 5.55×10^3 ohm. Determine the resistivity, conductivity, and molar conductivity.

Q-14: Why is it not possible to measure the potential of a single electrode?

Q-15: Explain the distinction between primary and secondary batteries.

Q-16: For the following reaction,



$E^\circ(\text{MnO}_4^-/\text{Mn}^{2+}) = +1.51$ V and $E^\circ(\text{CO}_2/\text{H}_2\text{C}_2\text{O}_4) = -0.49$ V. Calculate the equilibrium constant at 298 K.

Q-17: The electrical conductivity of a metal

- a) Increases with increasing temperature
- b) Decreases with increasing temperature
- c) Is independent of temperature
- d) Shows oscillatory behaviour with temperature

Q-18: The mean ionic activity coefficient of 0.001 molal $\text{ZnSO}_4(\text{aq})$ at 298 K according to the Debye-Huckel limiting law is(Debye Huckel constant is $0.509 \text{ molal}^{-1/2}$)

Q-19: When an Al-NaCl solution is electrolyzed, how does the pH change?

Q-20: The H_2 - O_2 fuel cell was used in the Apollo space programmes.

- (a) Explain why fuel cells are preferred in space missions.
- (b) Discuss the values that influenced the decision to use fuel cells.
- (c) Can fuel cells be used in automobiles?
- (d) How can we increase efficiency of fuel cells ?