

Electrochemistry

Assertion & Reason Type Questions

consists of two statements, one is Assertion (A) and the other is Reason (R). Give answer:

- a. Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
- b. Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).
- c. Assertion (A) is true but Reason (R) is false.
- d. Assertion (A) is false but Reason (R) is true.

Q 1. Assertion (A): Cu is less reactive than hydrogen.

Reason (R): $E^\circ \text{Cu}^{2+}/\text{Cu}$ is negative.

Answer : (c) Reason is false because $E^\circ \text{Cu}^{2+}/\text{Cu} = +0.34$ volt, i.e., positive.

Q 2. Assertion(A): E_{cell} should have a positive value for the cell to function.

Reason (R): $E_{\text{cathode}} < E_{\text{anode}}$

Answer : (c) $E_{\text{cell}} = E_{\text{cathode}} - E_{\text{anode}}$

We know that E_{cell} should have a positive value. This is true only when $E_{\text{cathode}} > E_{\text{anode}}$

Hence, Reason (R) is false.

Q 3. Assertion (A): $E^\circ \text{Cu}^{2+}/\text{Cu}$ is positive (+0.34 V).

Reason (R): Copper has high $\Delta_{\text{a}}H^\circ$ and low $\Delta_{\text{hyd}}H^\circ$.

Answer : (a) $E^\circ_{\text{Cu}^{2+}/\text{Cu}}$ is positive because of high atomisation enthalpy and low hydration enthalpy of copper. Also, the high energy to transform Cu(s) to $\text{Cu}^{2+}(\text{aq})$ is not balanced by hydration enthalpy. Hence, Reason (R) is the correct explanation of Assertion (A).

Q 4. Assertion (A): Conductivity of all electrolytes decreases on dilution.

Reason (R): On dilution number of ions per unit volume decreases.

Answer : (a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

Q 5. Assertion (A): Conductivity decreases with decrease in concentration of electrolyte.

Reason (R): Number of ions per unit volume that carry the current in a solution decreases on dilution.

Answer : (a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

Q 6. Assertion (A): Molar conductivity decreases with increase in concentration.

Reason (R): When concentration approaches zero, the molar conductivity is known as limiting molar conductivity.

Answer : (b) Molar conductivity decreases with increase in concentration. Hence, Assertion (A) is true. In limiting molar conductivity, the concentration of the electrolyte approaches zero. So, Reason (R) is true, but Reason (R) is not the correct explanation of Assertion (A).

Q 7. Assertion (A): A_m for weak electrolytes shows a sharp decrease when the electrolytic solution is diluted.

Reason (R): For weak electrolytes, degree of dissociation increases with dilution of solution.

Answer : (d) A_m for weak electrolytes shows a sharp increase when the electrolytic solution is diluted because on adding excess water to increase the dilution, the degree of dissociation increases leading to increase in the number of ions in the solution. Hence, Reason (R) is true but Assertion (A) is false.

Q 8. Assertion (A): Limiting molar conductivity (A_m°) is obtained by the extrapolation of the A_m versus $C^{1/2}$ curve of strong electrolyte.

Reason (R): A_m° for weak electrolytes is obtained by using Kohlrausch's law.

Answer : (b) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).

Q 9. Assertion (A): Mercury cell does not give steady potential.

Reason (R): In the cell reaction, ions are not involved in solution.

Answer : (d) Assertion (A) is false but Reason (R) is true.

Q 10. Assertion (A): Electrolysis of NaCl solution gives chlorine at anode instead of O_2 .

Reason (R): Formation of oxygen at anode requires overvoltage.

Answer : (a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

Q11. Assertion (A): For measuring resistance of an ionic solution, an AC source is used.

Reason (R): Concentration of ionic solution will change if DC source is used.

Answer : (a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

Q 12. Assertion (A): During electrolysis of aqueous copper sulphate solution using copper electrodes hydrogen gas is released at the cathode.

Reason (R): The electrode potential of Cu^{2+}/Cu is greater than that of H^+/H_2 .

Answer : (d) During electrolysis, Cu will deposit at cathode. Hence, Assertion (A) is false but Reason (R) is true.

Q13. Assertion : The resistivity for a substance is its resistance when it is one meter long and its area of cross section is one square meter.

Reason : The SI units of resistivity is ohm metre (m).

Q14. Assertion : On increasing dilution, the specific conductance keep on increasing.

Reason : On increasing dilution, degree of ionisation of weak electrolyte increases and molality of ions also increases.

Q15. Assertion : Galvanised iron does not rust.

Reason : Zinc has a more negative electrode potential than iron.

ANSWER KEY 13 to 15

Q13 : (b)

Q14 : (d) The specific conductivity decreases while equivalent and molar conductivities increase with dilution.

Q15 : (a) Zinc metal which has a more negative electrode potential than iron will provide electrons in preference of the iron, and therefore corrodes first. Only when all the zinc has been oxidised, the iron start to rust.