Electrochemistry and Potentiometry Explained

Chemistry · Answer Key · 20 Questions

1. What scientific field deals with potential differences that arise spontaneously in systems?

A) Electrolysis
B) Potentiometry
C) Galvanic cells
D) Electrolytic cells

2. Alessandro Volta discovered in the 19th century that electric current could be generated by what?

A) Light exposure
B) Chemical reactions
C) Mechanical friction
D) Magnetic fields

3. When a zinc rod is placed in water, what charge does the metal rod acquire over time?

A) Positive
B) Neutral
C) Negative
D) Alternating

4. In the context of a zinc rod in water, what happens to the liquid as zinc ions enter the solution?

A) It becomes negatively charged.
B) It remains neutral.
C) It becomes positively charged.
D) It evaporates rapidly.

5. What is reached when the rate of ions leaving a metal rod into a solution equals the rate of ions returning?

A) A chemical reaction
B) An equilibrium state
C) A state of dissolution
D) A phase change

6. In electrolysis of a ZnSO4 solution with a zinc rod as the anode, what is extracted from the rod?

A) Protons
B) Neutrons
C) Electrons
D) Water molecules

7. If a zinc rod is used as a cathode in an electrolytic process, what is supplied to it?

A) A deficit of electrons
B) An excess of electrons
C) Zinc ions
D) Sulfate ions

8. When a metal rod is placed in a solution already containing ions of that metal, what is reached sooner than in pure water?

A) A state of dissolution
B) A chemical reaction
C) An equilibrium state
D) A phase transition

9. The potential difference between a metal rod and its ion solution is dependent on the concentration of meta-ions. How does increasing the concentration of metal ions ([M]) affect the equilibrium of the reaction M ? Mn+ + ne??

A) It shifts the equilibrium further to the right.
B) It has no effect on the equilibrium.
C) It shifts the equilibrium further to the left.
D) It causes the metal to decompose.

10. What is the term for the specific ion concentration where a metal rod will neither send ions into solution nor have ions deposited onto it?

A) Saturation concentration
B) Equilibrium concentration
C) Boundary concentration
D) Solubility limit

11. According to the text, the 'solubility tendency' (oplosdrang) of metals is greater for which type of metals?

A) Noble metals
B) Less reactive metals
C) More reactive metals
D) Metals with low melting points

12. What is the electrochemical normal potential (Eo) defined as?

A) The potential difference at any concentration.
B) The potential difference between a metal rod and a solution of 1 mol/L of its ions.
C) The absolute potential of a metal in a vacuum.
D) The potential difference in pure water.

13. What is the normal potential of the hydrogen electrode (Eo)?

A) +0.00 V
B) -0.76 V
C) +0.34 V
D) 1.00 V

14. In a metal displacement reaction, a metal with a lower normal potential will displace a metal with a higher normal potential from its ionic form. This means the metal with the lower normal potential acts as a stronger:

A) Oxidizer
B) Reducer
C) Electrolyte
D) Catalyst

15. What is the primary function of a salt bridge in an electrochemical cell?

A) To provide a source of electrons.
B) To transport charge between the two half-cells and close the circuit.
C) To increase the concentration of ions in the solutions.
D) To generate heat.

16. A Daniell cell, consisting of zinc and copper half-cells, has an electromotive force (EMK) of approximately:

A) 0.76 V
B) 0.34 V
C) 1.10 V
D) 1.50 V

17. The Nernst equation describes the dependence of a metal rod's potential on its ion concentration and:

A) Pressure
B) Temperature
C) Light intensity
D) Humidity

18. In a Leclanché dry cell, what acts as the cathode?

A) The zinc casing
B) A carbon rod coated with manganese dioxide (MnO_2)
C) Ammonium chloride solution
D) The conductive filler

19. During the charging of a lead-acid battery, what is formed on the positive lead plate?

A) Lead (Pb)
B) Lead sulfate ($PbSO_4$)
C) Lead dioxide (PbO_2)
D) Sulfuric acid (H_2SO_4)

20. When a lead-acid battery is discharging, what happens to the concentration of sulfuric acid?

A) It increases.
B) It remains constant.
C) It decreases.
D) It decomposes.