Public Library · FBISE / NBF

Chemistry Grade 12 — Chapter 2

Electrochemistry

by Public Library

Independent practice MCQs from the supplied Class 12 Chemistry notes pack. Total: 50 questions.

A. Important / Main Topics

1. A reaction in which a substance loses electrons is called:

(A) Oxidation
(B) Reduction
(C) Neutralization
(D) Disproportionation

Correct Answer: A

Explanation: The notes define oxidation as a reaction in which a substance loses electrons.

2. The oxidation number of an element in its free state is:

(A) +1
(B) 0
(C) -1
(D) +2

Correct Answer: B

Explanation: Rule 1 states that elements in their free (elemental) state have an oxidation number of zero.

3. In a disproportionation reaction:

(A) Two different elements are oxidized and reduced.
(B) An element is only oxidized.
(C) The same element is both oxidized and reduced.
(D) An element is only reduced.

Correct Answer: C

Explanation: A disproportionation reaction is a redox reaction in which the same element is simultaneously oxidized and reduced.

4. The total number of electrons lost by oxidation must equal the total number of electrons gained by reduction. This principle is the basis of:

(A) The Nernst equation
(B) The ideal gas law
(C) Le Chatelier's principle
(D) Balancing redox equations

Correct Answer: D

Explanation: The total number of electrons lost by oxidation must equal the total number of electrons gained by reduction. This principle is the basis of Balancing redox equations.

5. An oxidizing agent is a substance that:

(A) Gains electrons and is reduced.
(B) Loses electrons and is oxidized.
(C) Gains protons and is oxidized.
(D) Loses protons and is reduced.

Correct Answer: A

Explanation: The notes state that an oxidizing agent accepts electrons and causes oxidation, therefore its own oxidation state decreases (it is reduced).

6. The electrode where oxidation occurs is called the:

(A) Cathode

(B) Anode
(C) Salt bridge
(D) Voltmeter

Correct Answer: B

Explanation: The notes define the anode as the electrode at which oxidation occurs.

7. The standard hydrogen electrode (SHE) is assigned a potential of:

(A) 1.00 V
(B) -1.00 V
(C) 0.00 V
(D) 0.76 V

Correct Answer: C

Explanation: The notes state that the standard electrode potential of the SHE is arbitrarily chosen as exactly 0.00 V.

8. The standard cell potential is calculated using the formula:

(A) E^circcell = E^circanode - E^circcathode
(B) E^circcell = E^circcathode + E^circanode
(C) E^circcell = E^circanode + E^circcathode
(D) E^circcell = E^circcathode - E^circanode

Correct Answer: D

Explanation: The standard cell potential is calculated using the formula E^circcell = E^circcathode - E^circanode.

9. In the electrochemical series, elements with the most negative reduction potentials are the:

(A) Strongest reducing agents
(B) Strongest oxidizing agents
(C) Most stable elements
(D) Least reactive elements

Correct Answer: A

Explanation: The notes state that more negative reduction potentials indicate a greater tendency to lose electrons, making the species a stronger reducing agent.

10. A redox reaction is feasible (spontaneous) if the standard cell potential is:

(A) Negative
(B) Positive
(C) Zero
(D) Equal to 1 V

Correct Answer: B

Explanation: The notes state that the cell potential has a positive value for any spontaneous redox reaction.

11. The Faraday constant is the charge of:

(A) One electron
(B) One proton
(C) One mole of electrons
(D) One mole of protons

Correct Answer: C

Explanation: The notes define one Faraday as the amount of electric charge carried by one mole of electrons, approximately 96500 C.

12. The relationship between charge, current, and time is:

(A) Q = I/t
(B) Q = t/I
(C) Q = I + t
(D) Q = I × t

Correct Answer: D

Explanation: The notes give the relation Q = I × t, where Q is charge, I is current, and t is time.

13. In the Winkler method, the titrant used to determine dissolved oxygen is:

(A) Sodium thiosulphate
(B) Potassium iodide
(C) Manganese sulphate
(D) Sulphuric acid

Correct Answer: A

Explanation: The notes state that the iodine produced is titrated with a standard sodium thiosulphate solution.

14. In an electrolytic cell, electrical energy is used to drive a:

(A) Spontaneous reaction
(B) Non-spontaneous reaction
(C) Neutralization reaction
(D) Precipitation reaction

Correct Answer: B

Explanation: The notes state that an electrolytic cell uses electrical energy to drive a non-spontaneous chemical reaction.

15. The standard reduction potential of the mathrmZn²□/Zn half-cell is:

(A) +0.76 V
(B) +0.34 V
(C) -0.76 V
(D) -0.34 V

Correct Answer: C

Explanation: The notes state that the standard reduction potential of zinc is -0.76 V.

16. In the reaction mathrmZn□s□ + Cu²□□aq□ → Zn²□□aq□ + Cu□s□, the reducing agent is:

(A) mathrmCu²□
(B) mathrmZn²□
(C) Cu
(D) Zn

Correct Answer: D

Explanation: Zn loses electrons and is oxidized, so it acts as the reducing agent.

17. In the reaction 2Na + Cl□ → 2NaCl, how does the oxidation number of sodium change?

(A) From 0 to +1
(B) From 0 to -1
(C) From +1 to 0
(D) From +1 to +2

Correct Answer: A

Explanation: Sodium goes from the elemental state (0) to +1 in NaCl, which is an increase (oxidation).

18. In the reaction CH□ + 2O□ → CO□ + 2H□O, which element is reduced?

(A) Carbon
(B) Oxygen
(C) Hydrogen
(D) None

Correct Answer: B

Explanation: Oxygen goes from 0 in O□ to -2 in the products, a decrease, so it is reduced.

19. In the decomposition of hydrogen peroxide, 2H□O□ → 2H□O + O□, the oxygen in H□O□ is:

(A) Only oxidized
(B) Only reduced
(C) Both oxidized and reduced
(D) Neither oxidized nor reduced

Correct Answer: C

Explanation: Oxygen in H□O□ (-1) is reduced to -2 in water and oxidized to 0 in oxygen gas, so it is a disproportionation reaction.

20. In the reaction Fe + CuSO□ → FeSO□ + Cu, what is the oxidizing agent?

(A) Fe
(B) Cu
(C) mathrmFe²□
(D) mathrmCu²□

Correct Answer: D

Explanation: mathrmCu²□ gains electrons and is reduced, so it acts as the oxidizing agent.

21. Which of the following ions is preferentially discharged at the cathode in an aqueous solution?

(A) mathrmCu²□
(B) Na□
(C) mathrmMg²□
(D) mathrmCa²□

Correct Answer: A

Explanation: mathrmCu²□ is less reactive than hydrogen, so it is preferentially discharged at the cathode in aqueous solution.

22. When a zinc electrode is connected to the SHE, the voltmeter reads 0.76 V. What is the standard reduction potential of zinc?

(A) +0.76 V
(B) -0.76 V
(C) +1.52 V
(D) -1.52 V

Correct Answer: B

Explanation: Using E^circcell = E^circcathode - E^circanode with the SHE as cathode (0.00 V): 0.76 = 0.00 - E^circanode, so E^circanode = -0.76 V.

23. The Nernst equation is used to calculate the electrode potential:

(A) Under standard conditions only
(B) At absolute zero
(C) Under non-standard conditions
(D) Only for strong electrolytes

Correct Answer: C

Explanation: The Nernst equation is used to calculate the electrode potential Under non-standard conditions.

24. For the half-reaction mathrmCu²□ + 2e□ → Cu, the Nernst equation is:

(A) E = E^circ - frac0.0592log[mathrmCu²□]
(B) E = E^circ + frac0.0591log[mathrmCu²□]
(C) E = E^circ + frac0.0592ln[mathrmCu²□]
(D) E = E^circ + frac0.0592log[mathrmCu²□]

Correct Answer: D

Explanation: For mathrmCu²□ + 2e□ → Cu, n = 2, and the concentration of the reduced species (solid Cu) is 1, so E = E^circ + frac0.0592log[mathrmCu²□].

25. If the concentration of the oxidized species in a half-cell increases, the electrode potential:

(A) Increases
(B) Decreases
(C) Remains the same
(D) Becomes zero

Correct Answer: A

Explanation: If the concentration of the oxidized species in a half-cell increases, the electrode potential Increases.

B. Less Important / Secondary Topics

26. In a galvanic cell, electrons flow through the external circuit from:

(A) Anode to cathode
(B) Cathode to anode
(C) Salt bridge to cathode
(D) Anode to salt bridge

Correct Answer: A

Explanation: Electrons are released at the anode and travel to the cathode through the external circuit.

27. The purpose of the salt bridge in a galvanic cell is to:

(A) Allow electrons to flow
(B) Maintain electrical neutrality by allowing ions to flow
(C) Provide energy for the reaction
(D) Measure the cell potential

Correct Answer: B

Explanation: The purpose of the salt bridge in a galvanic cell is to Maintain electrical neutrality by allowing ions to flow.

28. Which of the following is a characteristic of an electrolytic cell?

(A) The reaction is spontaneous.
(B) It converts chemical energy to electrical energy.
(C) An external power source is required.
(D) The anode is negative.

Correct Answer: C

Explanation: The notes state that an electrolytic cell requires an external power source to drive a non-spontaneous reaction.

29. In the Winkler method, the brown precipitate formed after adding MnSO□ and alkaline iodide is:

(A) I□
(B) MnSO□
(C) Na□S□O□
(D) MnO□

Correct Answer: D

Explanation: Oxygen oxidizes mathrmMn^{2}□ to MnO□, which is a brown precipitate.

30. A high Biological Oxygen Demand (BOD) indicates:

(A) A high level of organic pollution
(B) A high level of dissolved oxygen
(C) A low level of organic waste
(D) A neutral pH

Correct Answer: A

Explanation: A high BOD indicates a greater quantity of organic waste and a lower level of dissolved oxygen, which is a sign of pollution.

31. Which process is used to extract magnesium?

(A) Reduction with carbon
(B) Electrolysis of molten magnesium chloride
(C) Heating magnesium carbonate
(D) Reacting magnesium with acid

Correct Answer: B

Explanation: The notes state that magnesium is commonly produced by the electrolysis of molten magnesium chloride.

32. The relation between the Faraday constant, Avogadro constant, and the charge on the electron is:

(A) F = e/N_A
(B) F = N_A/e

(C) F = N_A × e
(D) F = e² × N_A

Correct Answer: C

Explanation: The relation between the Faraday constant, Avogadro constant, and the charge on the electron is F = N_A × e.

33. The charge on one mole of electrons is approximately:

(A) 1.602 × 10□¹⁹ C
(B) 6.022 × 10²³ C
(C) 8.314 C
(D) 96500 C

Correct Answer: D

Explanation: The notes state that one Faraday is approximately 96500 C, which is the charge on one mole of electrons.

34. In the electrolysis of concentrated aqueous NaCl, what is produced at the anode?

(A) Cl□
(B) O□
(C) H□
(D) Na

Correct Answer: A

Explanation: Cl□ — this correctly answers the question.

35. In the electrolysis of dilute aqueous NaCl, what is produced at the anode?

(A) Cl□
(B) O□
(C) H□
(D) Na

Correct Answer: B

Explanation: In dilute aqueous NaCl, the low concentration of Cl□ means water (or OH□) is preferentially oxidized at the anode, producing oxygen gas.

36. A galvanic cell is constructed with E^circcathode = +0.80 V and E^circanode = -0.76 V. What is E^circcell?

(A) 0.04 V
(B) -1.56 V
(C) 1.56 V
(D) 0.76 V

Correct Answer: C

Explanation: 1.56 V — this correctly answers the question.

37. A half-cell has E^circ = +0.34 V. The concentration of the oxidized species is 0.1 M and n = 2. Using the simplified Nernst equation with 0.059, the new potential is approximately:

(A) 0.34 V
(B) 0.37 V
(C) 0.40 V
(D) 0.31 V

Correct Answer: D

Explanation: A half-cell has E^circ = +0.34 V. The concentration of the oxidized species is 0.1 M and n = 2. Using the simplified Nernst equation with 0.059, the new potential is approximately 0.31 V.

38. A ten-fold decrease in the concentration of the oxidized species changes the potential by:

(A) A decrease of 0.059/n V
(B) An increase of 0.059/n V
(C) An increase of 2 × 0.059/n V
(D) No change

Correct Answer: A

Explanation: A ten-fold decrease makes the log term -1, so the potential decreases by 0.059/n V.

39. For the reaction mathrmMnO□□ + 8H□ + 5e□ → Mn²□ + 4H□O, the number of Faradays required to reduce one mole of MnO□□ is:

(A) 2
(B) 5
(C) 3
(D) 8

Correct Answer: B

Explanation: Five electrons are transferred in the half-reaction, so 5 Faradays are required per mole.

40. A constant current of 0.01 A is passed through molten ZnCl□ for one hour. The charge passed is:

(A) 0.01 C
(B) 3.6 C
(C) 36 C
(D) 360 C

Correct Answer: C

Explanation: A constant current of 0.01 A is passed through molten ZnCl□ for one hour. The charge passed is 36 C.

41. In the same electrolysis, the number of Faradays passed is approximately:

(A) 3.73 × 10□³ F
(B) 3.73 × 10□² F
(C) 3.73 F
(D) 3.73 × 10□⁴ F

Correct Answer: D

Explanation: In the same electrolysis, the number of Faradays passed is approximately 3.73 × 10□⁴ F.

42. To deposit one mole of copper from mathrmCu²□, the amount of electricity required is:

(A) 2 F
(B) 1 F
(C) 3 F
(D) 4 F

Correct Answer: A

Explanation: To deposit one mole of copper from mathrmCu²□, the amount of electricity required is 2 F.

43. In the Winkler method, the stoichiometric relationship between O□ and mathrmS□O□²□ is:

(A) 1 mole O□ : 1 mole mathrmS□O□²□
(B) 1 mole O□ : 4 moles mathrmS□O□²□
(C) 1 mole O□ : 2 moles mathrmS□O□²□
(D) 1 mole O□ : 8 moles mathrmS□O□²□

Correct Answer: B

Explanation: In the Winkler method, the stoichiometric relationship between O□ and mathrmS□O□²□ is 1 mole O□ : 4 moles mathrmS□O□²□.

44. A cell with E^circcell = +1.10 V is constructed. Which statement is correct?

(A) The reaction is non-spontaneous.
(B) The cell is at equilibrium.
(C) The reaction is spontaneous.
(D) The cell is an electrolytic cell.

Correct Answer: C

Explanation: The reaction is spontaneous. — this correctly answers the question.

45. Which of the following is the strongest oxidizing agent based on the given standard reduction potentials?

(A) mathrmZn²□ (-0.76 V)

(B) mathrmCu²□ (+0.34 V)
(C) mathrmFe²□ (-0.44 V)
(D) Ag□ (+0.80 V)

Correct Answer: D

Explanation: The species with the most positive reduction potential is the strongest oxidizing agent.

46. The reaction between MnO□□ (+1.52 V) and mathrmC□O□²□ (+0.49 V) has a standard cell potential of:

(A) +1.03 V
(B) -1.03 V
(C) +2.01 V
(D) -2.01 V

Correct Answer: A

Explanation: The reaction between MnO□□ (+1.52 V) and mathrmC□O□²□ (+0.49 V) has a standard cell potential of +1.03 V.

47. In the electrolysis of aqueous CuSO□, what is produced at the cathode?

(A) H□ gas
(B) Cu metal
(C) O□ gas
(D) SO□ gas

Correct Answer: B

Explanation: mathrmCu²□ is less reactive than hydrogen, so it is preferentially reduced at the cathode, depositing copper metal.

48. The reaction between mathrmCu²□ and I□ proceeds despite a negative standard cell potential because:

(A) The temperature is high.
(B) The reaction is exothermic.
(C) CuI precipitates, removing the product and shifting the equilibrium.
(D) I□ is a strong oxidizing agent.

Correct Answer: C

Explanation: The reaction between mathrmCu²□ and I□ proceeds despite a negative standard cell potential because CuI precipitates, removing the product and shifting the equilibrium..

49. Which of the following is the correct order of reactivity of halogenoalkanes with aqueous silver nitrate?

(A) R-F > R-Cl > R-Br > R-I
(B) R-Cl > R-Br > R-I > R-F
(C) R-Br > R-I > R-Cl > R-F
(D) R-I > R-Br > R-Cl > R-F

Correct Answer: D

Explanation: The C-X bond strength decreases down the group, so the re.

50. A galvanic cell is made of a zinc half-cell and a copper half-cell. Which electrode is the anode and what is the cell potential?

(A) Zinc is the anode; E^circcell = 1.10 V
(B) Copper is the anode; E^circcell = 1.10 V
(C) Zinc is the anode; E^circcell = -1.10 V
(D) Copper is the anode; E^circcell = -1.10 V

Correct Answer: A

Explanation: Zinc has the more negative reduction potential (-0.76 V), so it is the anode. E^circcell = 0.34 - (-0.76) = 1.10 V.