- What is an equilibrium state?
    - Extent of reaction
    - Optimum condition
    - Least value product
    - All of the mentioned

- What is the driving force in a reaction?
    - Energy given
    - Energy released
    - Free energy
    - None of the mentioned

- What should be the free energy so that reaction is spontaneous?
    - Positive
    - Negative
    - Neutral
    - None of the mentioned

- What is the heat of reaction for hydrolysis of Ethyl Acetate?
    - Greater than zero
    - Less than zero
    - Zero
    - None of the mentioned

- What is meant by ‘Z’ in Arrhenius equation?
    - Energy of activation
    - Gas constant
    - Probability factor

- A battery is an arrangement of electrolytic cells.
    - True
    - False

- Which of the following is not a requirement for a useful battery?
    - It should be light and compact
    - It should have a reasonable life span
    - It should ideally have a constant voltage throughout its lifespan
    - It should supply Alternating Current(AC)

- Which of the following statements is true regarding a primary cell?
    - The electrode reactions can be reversed
    - It can be recharged
    - An example of a primary cell is a mercury cell
    - An example of a primary cell is a nickel-cadmium storage cell

- Secondary cells are also called storage cells.
    - True
    - False

- Which of the following is used as an anode in a dry cell?
    - Zinc
    - Graphite
    - Mercury(II) oxide
    - Nickel

- Why do leak proof dry cells have an iron or steel sheet covering the zinc cylinder?
    - It increases the potential difference between the anode and cathode
    - It acts as a barrier around the zinc cylinder which can develop holes during use
    - It makes it waterproof
    - It prevents the leakage of current

- Which of the following is the electrolyte used in a dry cell?
    - Ammonium chloride
    - Manganese dioxide
    - Potassium hydroxide
    - Sulphuric acid

- Which of the following scientists invented the first dry cell?
    - Carl Gassner
    - Nikola Tesla
    - Antione Lavoisier
    - Georges Leclanché

- A fuel cell is a type of electrochemical cell.
    - True
    - False

- Which of the following is used as an electrolyte in an H_2-O_2 fuel cell?
    - KOH
    - NH_4OH
    - $Fe(OH)_2$
    - $Cu(OH)_2$

- Which of the following can be used as fuel in a fuel cell?
    - Nitrogen
    - Argon
    - Hydrogen
    - Helium

- Which of the following is not a fuel cell?
    - PEM cell
    - Direct methanol cell
    - Solid oxide cell
    - Daniell cell

- Which of the following is not produced in an H_2-O_2 fuel cell?
    - Electricity
    - Pollutants
    - Heat
    - Water

- Which of the following is supplied to the cathode of a fuel cell?
    - Hydrogen
    - Nitrogen
    - Oxygen
    - Chlorine

- Who invented the first fuel cell?
    - Francis Bacon
    - Thomas Grubb
    - Leonard Niedrach
    - William Grove

- What is the maximum theoretical energy efficiency of a fuel cell?
    - 100%
    - 69%
    - 50%
    - 83%

- Which of the following statements regarding fuel cells is false?
    - Because of continuous supply, fuel cells never become dead
    - They do not cause pollution
    - Fuel cells have 100% efficiency practically
    - The cost of catalysts needed for the electrode reactions is high

- Which of the following are the common ways to produce H_2 gas in a fuel cell?
    - Coal and biomass gasification
    - Electrolysis and absorption
    - Steam reforming and electrolysis
    - Electromagnetism and steam reforming

- A galvanic cell converts electrical energy into chemical energy.
    - True
    - False

- Who invented the galvanic cell?
    - Galvani and Volta
    - Henry Cavendish
    - Joseph Priestley
    - Antoine Lavoisier

- Which of the following electrolytes is not preferred in a salt bridge?
    - KCl
    - KNO_3
    - NH_4NO_3
    - NaCl

- Which of the following is false regarding galvanic cells?
    - It converts chemical energy into electrical energy
    - The electrolytes taken in the two beakers are different
    - The reactions taking place are non-spontaneous
    - To set up this cell, a salt bridge is used

- The electrode on which oxidation occurs is called the anode. True or False?
    - True
    - False

- A cell is prepared by dipping a copper rod in 1 M $CuSO_4$ solution and an iron rod in 2 M $FeSO_4$ solution. What are the cathode and anode respectively?
    - Cathode: Iron, Anode: Copper
    - Cathode: Copper, Anode: Iron
    - Cathode: Iron, Anode: Iron
    - Cathode: Copper, Anode: Copper

- Which of the following is the correct order of reactivity of metals?
    - Zn > Mg > Fe > Cu > Ag
    - Zn > Mg > Fe > Ag > Cu
    - Mg > Zn > Fe > Ag > Cu
    - Mg > Zn > Fe > Cu > Ag

- Which of the following is a correct method to calculate the EMF of a galvanic cell?
    - Standard EMF of the cell = [Standard reduction potential of the reduction half reaction] + [Standard reduction potential of the oxidation half reaction]
    - Standard EMF of the cell = [Standard oxidation potential of the oxidation half reaction] – [Standard reduction potential of the reduction half reaction]
    - E°cell = E°cathode – E°anode
    - Standard EMF of the cell = [Standard reduction potential of the right-hand side electrode] + [Standard reduction potential of the left-hand side electrode]

- What is the EMF of a galvanic cell if E°cathode = 0.80 volts and E°anode = -0.76 volts?
    - 1.56 volts
    - 0.04 volts
    - -1.56 volts
    - -0.04 volts

- What is the EMF of a galvanic cell if the standard oxidation potential of the oxidation half-reaction is 0.64 volts and the standard reduction potential of the reduction half-reaction is 0.48 volts?
    - 1.48 volts
    - 1.12 volts
    - 1.36 volts
    - 0.96 volts

- What is the EMF of a galvanic cell if the standard reduction potential of the reduction half-reaction is -0.38 volts and the standard reduction potential of the oxidation half-reaction is 0.52 volts?
    - -0.9 volts
    - -0.6 volts
    - 0.9 volts
    - 0.6 volts

- What is the standard reduction potential of the cathode of a galvanic cell if the standard EMF of the cell and the standard reduction potential of the anode are 2.71 and -2.37 respectively?
    - 0.68 volts
    - -0.68 volts
    - -0.34 volts
    - 0.34 volts

- The standard oxidation potential of Ni/Ni2+ electrode is 0.3 V. If this is combined with a hydrogen electrode in acid solution, at what pH of the solution with the measured e.m.f. be zero at 25°C? (Assume [Ni2+] = 1M)
    - 5.08
    - 4
    - 4.5
    - 5.25

- Calculate the equilibrium constant for the reaction Fe + CuSO4 ⇌ FeSO4 + Cu at 25°C. (Given E°(OP/Fe) = 0.5 V°, E°(OP/Cu) = -0.4 V)
    - 3.46 × 1030
    - 3.46 × 1026
    - 3.22 × 1030
    - 3.22 × 1026

- Calculate the e.m.f. of the half-cell given below.
  Pt, H_2 | HCl at 1-atmosphere pressure and 0.1 M. Given, E°(OP) = 2 V.
    - 4 V
    - 5.6 V
    - 3.4 V
    - 5.4 V

- The equilibrium constant for a cell reaction, Cu(g) + 2Ag+(aq) → Cu2+(aq) + 2Ag (s) is 4 × 1016. Find E° (cell) for the cell reaction.
    - 0.63 V
    - 0.49 V
    - 1.23 V
    - 3.24 V

- What is the correct Nernst equation for M2+ (aq) + 2e+ → M (s) at 45°C?
    - E°(M2+/M) + 0.315log10 (1 / [M]+2)
    - E° (M2+/M) + 0.0425log10 (1 / [M]+2)
    - E° (M2+/M) + 0.0315log10 (1 / [M]+2)
    - E° (M2+/M) + 0.0326log10 (1 / [M]+2)

- The e.m.f and the standard e.m.f of a cell in the following reaction is 5 V and 5.06 V at room temperature, Ni(s) + 2Ag+(n) → Ni2+(0.02M) + 2Ag(s). What is the concentration of Ag+ ions?
    - 0.0125 M
    - 0.0314 M
    - 0.0625 M
    - 0.0174 M

- What is the value of universal gas constant in Nernst equation when the potential is given in volts?
    - 8.314 J $mol^{-1}K^{-1}$
    - 0.0821 L atm $mol^{-1}K^{-1}$
    - 8.205 m3 atm $mol^{-1}K^{-1}$
    - 1.987 cal $mol^{-1}K^{-1}$

- First law of thermodynamics deals with
    - Conservation of mass
    - Conservation of momentum
    - Conservation of energy
    - Conservation of pressure

- Equation of the first law of thermodynamics is
    - Internal Energy= Heat added into work done
    - Internal Energy= Heat rejected into work done
    - Internal Energy= Heat added divided by work done
    - Internal Energy=Heat added plus work done

- An increase in enthalpy leads to an increase in
    - Increase in pressure
    - Increase in volume
    - Increase in internal energy
    - Increase in mass

- What reaction takes place during photosynthesis?
    - Exothermic reaction
    - Endothermic reaction
    - Redox reaction
    - Combustion reaction