Sample KCET Chemistry Question Paper and Answer Key PDF

1. Question: (Chemical Bonding)
   - Which of the following molecules has the highest dipole moment?

        - (A) CO_2
        - (B) CH_4
        - (C) NH_3
        - (D) BF_3
   - Answer: (C) NH_3

   - Solution:

        - CO_2 and BF_3 are symmetrical and have zero net dipole moments.
        - CH_4 is tetrahedral and also has a zero net dipole moment due to its symmetry.
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        - NH_3 has a pyramidal structure with a lone pair of electrons, resulting in a net dipole moment.
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2. Question: (Organic Chemistry)
   - Which of the following reagents can be used to distinguish between aldehydes and ketones?

        - (A) Tollens' reagent
        - (B) Fehling's solution
        - (C) Schiff's reagent
        - (D) All of the above
   - Answer: (D) All of the above

   - Solution:

        - Tollens', Fehling's, and Schiff's reagents all react with aldehydes, but not with ketones, thus they can all distinguish between these two functional groups.
3. Question: (Chemical Equilibrium)
   - For the reaction $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$, the equilibrium constant Kp is related to Kc by the equation:

        - (A) $Kp = Kc(RT)^2$
        - (B) $Kp = Kc(RT)^{-2}$
        - (C) $Kp = Kc(RT)^4$
        - (D) $Kp = Kc(RT)^{-4}$

- Answer: (B) $K_p = K_c(RT)^{-2}$
- Solution:

    - $K_p = K_c(RT)^{\Delta n}$, where Δn = (moles of gaseous products) - (moles of gaseous reactants).
    - In this reaction, Δn = 2 - (1 + 3) = -2.
    - Therefore $K_p = K_c(RT)^{-2}$.

4. Question: (Solid State)
    - In a face-centred cubic (FCC) unit cell, the number of atoms per unit cell is:

        - (A) 1
        - (B) 2
        - (C) 4
        - (D) 6
    - Answer: (C) 4

    - Solution:

        - In an FCC unit cell, there are atoms at each of the eight corners and the center of each of the six faces.
        - Number of atoms = (8 corners × 1/8) + (6 faces × 1/2) = 1 + 3 = 4

5. Question: (Solutions)
    - Which of the following is a colligative property?

        - (A) Boiling point
        - (B) Freezing point
        - (C) Osmotic pressure
        - (D) all of the above.
    - Answer: (D) all of the above.

    - Solution:

        - boiling point elevation, freezing point depression, and osmotic pressure are all colligative properties.

6. Question (Periodic table)
    - Which of the following elements has the highest ionization energy?

        - (A) Li
        - (B) Na
        - (C) K
        - (D) He.
    - Answer: (D) He.

- Solution:

  - Helium is a noble gas with a full outer electron shell, making it extremely difficult to remove an electron.
    Therefore it has the highest ionization energy.

7. Question: (Coordination Compounds)
   - Which of the following complexes is an inner orbital complex?

     - (A) $[Co(NH_3)_6]^{3+}$
     - (B) $[CoF_6]^{3-}$
     - (C) $[Fe(H_2O)_6]^{3+}$
     - (D) $[Ni(Cl)_4]^{2-}$
   - Answer: (A) $[Co(NH_3)_6]^{3+}$

   - Solution:

     - $[Co(NH_3)_6]^{3+}$ has a strong field ligand (NH_3) causing pairing of electrons and uses inner d-orbitals (d^2sp^3) for hybridization, making it an inner orbital complex.

8. Question: (Electrochemistry)
   - The standard electrode potential of Zn^{2+}/Zn is -0.76 V and that of Cu^{2+}/Cu is +0.34 V. The standard cell potential of the cell Zn | Zn^{2+} || Cu^{2+} | Cu is:

     - (A) +1.10 V
     - (B) -1.10 V
     - (C) +0.42 V
     - (D) -0.42 V
   - Answer: (A) +1.10 V

   - Solution:

     - E°cell = E°cathode - E°anode
     - E°cell = E°(Cu^{2+}/Cu) - E°(Zn^{2+}/Zn)
     - E°cell = 0.34 V - (-0.76 V) = 1.10 V

9. Question: (Chemical Kinetics)
   - For a first-order reaction, the rate constant is 6.93×10^{-3} s^{-1}. The time taken for 50% completion of the reaction is:

     - (A) 100 s
     - (B) 1000 s
     - (C) 10 s
     - (D) 10000 s
   - Answer: (A) 100 s

- Solution:

  - For a first-order reaction, $t_{1/2} = 0.693/k$
  - $t_{1/2} = 0.693 / (6.93 \times 10^{-3}\ s^{-1}) = 100\ s$

10. Question: (p-Block Elements)
    - Which of the following oxides is amphoteric?

      - (A) CO_2
      - (B) SiO_2
      - (C) SnO_2
      - (D) CaO
    - Answer: (C) SnO_2

    - Solution:

      - SnO_2 (tin dioxide) is amphoteric, meaning it can react with both acids and bases.

11. Question: (Biomolecules)
    - Which of the following is a reducing sugar?

      - (A) Sucrose
      - (B) Glucose
      - (C) Starch
      - (D) Cellulose
    - Answer: (B) Glucose

    - Solution:

      - Glucose is a reducing sugar because it has a free aldehyde or ketone group that can reduce other substances.

12. Question: (General Organic Chemistry)
    - The IUPAC name of $CH_3CH(Cl)CH_2CHO$ is:

      - (A) 3-chlorobutanal
      - (B) 2-chlorobutanal
      - (C) 1-chlorobutanal
      - (D) 4-chlorobutanal
    - Answer: (A) 3-chlorobutanol

    - Solution:

      - The longest chain contains 4 carbons (butane), and the aldehyde group (-CHO) is at carbon 1. Chlorine is at carbon 3. Thus, 3-chlorobutanal.

13. Question: (Metallurgy)

- Which of the following is used as a depressant in the froth floatation process for the separation of zinc sulphide and lead sulphide?

    - (A) Sodium ethyl xanthate
    - (B) Pine oil
    - (C) Sodium cyanide
    - (D) Cresols
- Answer: (C) Sodium cyanide

- Solution:

    - Sodium cyanide (NaCN) is used as a depressant to selectively prevent ZnS from coming into the froth, allowing PbS to be separated.

14. Question: (d- and f-Block Elements)
    - Which of the following ions is coloured in an aqueous solution?

        - (A) Zn^{2+}
        - (B) Ti^{4+}
        - (C) Cu^{2+}
        - (D) Sc^{3+}
    - Answer: (C) Cu^{2+}

    - Solution:

        - Cu^{2+} has an incomplete d-orbital configuration (d^9), allowing for d-d transitions, which result in colour. The others have either filled or empty d-orbitals.

15. Question: (Polymers)
    - Which of the following is a condensation polymer?

        - (A) Polyethylene
        - (B) PVC (Polyvinyl chloride)
        - (C) Nylon 6,6
        - (D) Teflon
    - Answer: (C) Nylon 6,6

    - Solution:

        - Nylon 6,6 is formed by the condensation reaction between adipic acid and hexamethylenediamine, with the elimination of water molecules.

16. Question: (Surface Chemistry)
    - The phenomenon of adsorption finds application in:

        - (A) Production of high vacuum
        - (B) Heterogeneous catalysis

- ○ (C) Removal of colouring matter from solutions
- ○ (D) All of the above
- Answer: (D) All of the above

- Solution:

  - ○ Adsorption is used in all the mentioned applications.
17. Question: (Environmental Chemistry)
    - Which of the following is a primary pollutant in the atmosphere?

      - ○ (A) PAN (Peroxyacetyl nitrate)
      - ○ (B) Smog
      - ○ (C) CO (Carbon monoxide)
      - ○ (D) H_2SO_4
    - Answer: (C) CO (Carbon monoxide)

    - Solution:

      - ○ Carbon monoxide is directly emitted from sources (like incomplete combustion), making it a primary pollutant. PAN, smog, and sulfuric acid are secondary pollutants, formed from primary pollutants.
18. Question: (Chemical Thermodynamics)
    - For an endothermic reaction, which of the following statements is true?

      - ○ (A) ΔH is negative.
      - ○ (B) ΔH is positive
      - ○ (C) ΔS is negative
      - ○ (D) ΔG is negative
    - Answer: (B) ΔH is positive

    - Solution:

      - ○ Endothermic reactions absorb heat from the surroundings, so ΔH (enthalpy change) is positive.