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2023-24

HALF YEARLY EXAM

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HALF YEARLY EXAMINATION, 2023-24
SUBJECT – CHEMISTRY
CLASS - XII

TIME: 3 hrs. **MM: 70**

General Instructions:

a. There are 33 questions in this question paper with internal choice.
b. SECTION A consists of 16questions carrying 1 mark each.
c. SECTION B consists of 5 very short answer questions carrying 2 marks each.
d. SECTION C consists of 7 short answer questions carrying 3 marks each.
e. SECTION D consists of 2 case-based questions carrying 4 marks each.
f. SECTION E consists of 3 long answer questions carrying 5 marks each.
g. All questions are compulsory.
h. The use of log tables and calculators is not allowed.

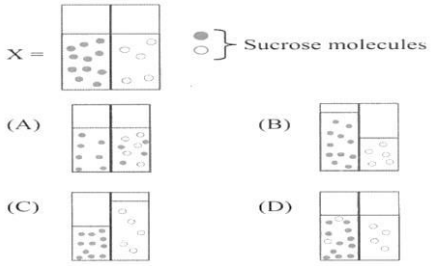
Section A

1. The EAN of platinum in potassium hexachloridoplatinate(IV) is:
    a. 88
    b. 76
    c. 86
    d. 90
2. The geometry of $[Co(CO)_4]^-$ and $[Cd(CN)_4]^{2-}$ are:
    a. square planar and tetrahedral, respectively
    b. tetrahedral and square planar, respectively
    c. both tetrahedral
    d. both square planar
3. Assertion (A): Low spin tetrahedral complexes are rarely observed.
   Reason (R): Crystal field splitting energy is less than pairing energy for tetrahedral complexes.
    a. Both A and R are true and R is the correct explanation of A.
    b. Both A and R are true but R is not the correct explanation of A.
    c. A is true but R is false.
    d. A is false but R is true.
4. Assertion (A): The complex $[Co(NH_3)_3Cl_3]$ does not give precipitate with silver nitrate solution.
   Reason (R): The given complex is non-ionizable.
    a. Both A and R are true and R is the correct explanation of A.
    b. Both A and R are true but R is not the correct explanation of A.
    c. A is true but R is false.
    d. A is false but R is true.
5. Which of the following compound is amphoteric?
    a. $Fe(OH)_2$

b. $Fe(OH)_3$
c. $Cr(OH)_3$
d. $Cr(OH)_2$

6. The pair that has similar atomic radii is
    a. Mn and Re
    b. Mo and W
    c. Sc and Ni
    d. Ti and Hf
7. Assertion (A): $K_2Cr_2O_7$ is used as a primary standard in volumetric analysis.
   Reason (R): It has good solubility in water.
    a. Both A and R are true and R is the correct explanation of A.
    b. Both A and R are true but R is not the correct explanation of A.
    c. A is true but R is false.
    d. A is false but R is true.
8. Assertion (A): Cu cannot liberate hydrogen from acids.
   Reason (R): Because it has positive electrode potential.
    a. Both A and R are true and R is the correct explanation of A.
    b. Both A and R are true but R is not the correct explanation of A.
    c. A is true but R is false.
    d. A is false but R is true.
9. Assertion (A): Rate of reaction increases with increase in temperature.
   Reason (R): The number of collisions increases with increase in temperature.
    a. Both A and R are true and R is the correct explanation of A.
    b. Both A and R are true but R is not the correct explanation of A.
    c. A is true but R is false.
    d. A is false but R is true.
10. Consider the electrolysis of aq.NaCl using Pt electrodes. What is the volume of H_2 at 27 °C and 1 atm pressure obtained by the above electrolytic process, if 852 g of Cl_2 gas is collected at anode?
    a. 325.56 litres
    b. 295.56 litres
    c. 246.96 litres
    d. 188.56 litres
11. Assertion (A): NaOH cannot be stored in a vessel made of aluminium or zinc.
    Reason (R): A protective layer of oxide is formed on the surface of the metal.
    a. Both A and R are true and R is the correct explanation of A.
    b. Both A and R are true but R is not the correct explanation of A.
    c. A is true but R is false.
    d. A is false but R is true.
12. Assertion (A): E^o for Mn^{3+}/Mn^{2+} is more positive than Cr^{3+}/Cr^{2+}.
    Reason (R): The third ionisation energy of Mn is larger than that of Cr.
    a. Both A and R are true and R is the correct explanation of A.
    b. Both A and R are true but R is not the correct explanation of A.
    c. A is true but R is false.
    d. A is false but R is true.
13. Diagram X represents a system in which two aqueous sucrose solutions are separated by a semi-permeable membrane. Which of the following represents the system after a

certain amount of time has passed?



a. Option (C)
b. Option (A)
c. Option (D)
d. Option (B)

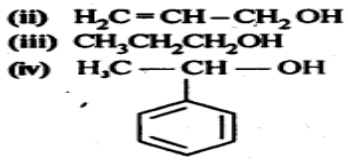
14. The pressure under which liquid and its vapour can coexist in equilibrium is known as:
    a. limiting vapour pressure
    b. saturated vapour pressure
    c. normal vapour pressure
    d. real vapour pressure
15. Assertion (A): Ice melts faster at high altitudes.
    Reason (R): At high altitudes atmospheric pressure is high.
    a. Both A and R are true and R is the correct explanation of A.
    b. Both A and R are true but R is not the correct explanation of A.
    c. A is true but R is false.
    d. A is false but R is true.
16. Assertion (A): Molarity of a solution in liquid state changes with temperature.
    Reason (R): The volume of a solution changes with a change in temperature.
    a. Both A and R are true and R is the correct explanation of A.
    b. Both A and R are true but R is not the correct explanation of A.
    c. A is true but R is false.
    d. A is false but R is true.

Section B

17. Distinguish between homoleptic and hetroleptic ligands.
18. Write some characteristics of interstitial compounds.
19. Define the terms – i) Order of a reactionii) Molecularity of a reaction.
20. How is standard electrode potential of a cell related to :-
    1) Equilibrium constant? 2) Gibbs free energy change.
21. Define the term –solubility?

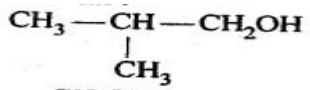
Section C

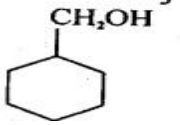
22. **Classify the following as primary, secondary and tertiary alcohols.**



23. **Write structures of the following compounds:**
    (i) 2-Chloro-3-methylpentane
    (ii) 1-Chloro-4-ethylcydohexane
    (iii) 4-tert. Butyl-3-iodoheptane

24. **Why is sulphuric acid not used during the reaction of alcohols with KI?**
25. **Write structures of different dihalogen derivatives of propane.**
26. **Show how are the following alcohols prepared by the reaction of a suitable Grignard reagent on methanal ?**

(i) 

(ii) 

27. What is geometric isomerism? When can a compound show.
(1) Cis – Trans isomerism (2) Fac and Mer isomerism.

28. How do optical isomer differ from each other

Section D

29. **Question No. 1 to 5 are based on the given text. Read the text carefully and answer the questions:**

The actinoids include the fourteen elements from Th to Lr. The actinoids are radioactive elements and the earlier members have relatively long half-lives, the latter ones have half-life values ranging from a day to 3 minutes for lawrencium. The latter members could be prepared only in nanogram quantities. Actinoids show a greater range of oxidation states. The elements, in the first half of the series frequently exhibit higher oxidation states. The actinoids resemble the lanthanoids in having more compounds in +3 state than in the +4 state. All the actinoids are believed to have the electronic configuration of $7s^2$ and variable occupancy of the 5f and 6d subshells. The magnetic properties of the actinoids are more complex than those of the lanthanoids. The variation in the magnetic susceptibility of the actinoids with the number of unpaired 5f electrons is roughly parallel to the corresponding results for the lanthanoid.

1. The electronic configurations of Am is
   a. [Rn] $5f^8 7s^2$
   b. [Rn] $5f^{10} 7s^2$
   c. [Rn] $5f^7 7s^2$
   d. [Rn] $5f^9 7s^2$
2. actinoids show in general oxidation state of
   a. +5
   b. +3
   c. +6
   d. +4
3. A member of the lanthanoid series which is well known to exhibit +4 oxidation state is
   a. Cerium (Z=58)
   b. Holmium (Z=67)
   c. Terbium (Z=65)
   d. Neodymium (Z=60)
4. The 5f electrons of actinoid are more effectively shielded from the nuclear charge than the 4f electrons of the corresponding lanthanoid because

i) the outer electrons are less firmly held

ii) outer electrons are available for bonding in the actinoids
iii) the outer electron is tightly held
iv) both (a) and (b)

30. **Question No. 1 to 4 are based on the given text. Read the text carefully and answer the questions:**

The electrochemical cell shown below is concentration cell.

$M|M^{2+}$ (saturated solution of a sparingly soluble salt, MX_2) || M^{2+} (0.001 mol dm^{-3})|M

The emf of the cell depends on the difference in concentrations of M^{2+} ions at the two electrodes. The emf of the cell at 298 K is 0.059 V

1. The solubility product (K_{sp}, mol^3 dm^{-9}) of MX_2 at 298 K based on the information available for the given concentration cell is (take 2.303 R 298/F = 0.059)
   a. 10^{-12}
   b. 10^{-12}
   c. 10^{-15}
   d. 10^{-15}
2. value of G (in kj mol^{-1}) for the given cell is (take 1 F = 96500 C mol^{-1})
   a. 10.5
   b. -3.7
   c. 3.7
   d. -11.4
3. The solubility product of a saturated solution of Ag_2CrO_4 in water at 298 K if the emf of the cell $Ag|Ag^+$ (satd. Ag_2CrO_4 soln) || Ag^+ (0.1 M) | Ag is 0.164 V at 298 K, is
   a. 3.359 10^{-12} mol^3 L^{-3}
   b. 4.135 10^{-12} mol^3 L^{-3}
   c. 1.158 10^{-12} mol^3 L^{-3}
   d. 2.287 10^{-12} mol^3 L^{-3}
4. To calculate the emf of the cell, which of the following options is correct?
   a. emf = $E_{cathode}$ - E_{anode}
   b. emf = E_{anode} + $E_{cathode}$
   c. None of these
   d. emf = E_{anode} - $E_{cathode}$

Section E

31. Explain construction and working of standard Hydrogen electrode?

32. Silver atom has completely filled **d** orbitals $(4d^{10})$ in its ground state. How can you say that it is a transition element?

33. In the series Sc (**Z** = 21) to Zn (**Z** = 30), the enthalpy of atomization of zinc is the lowest, i.e., $126 kJ mol^{-1}$. Why?

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