

B.K. BIRLA CENTRE FOR EDUCATION

SARALA BIRLA GROUP OF SCHOOLS
A CBSE DAY-CUM-BOYS' RESIDENTIAL SCHOOL



TERM-1 EXAMINATION 2026-27 CHEMISTRY (043) SET-2

Class: XII
Date: 07/09/26
Name:

Duration : 3 Hrs
Max. Marks: 70
Exam Roll No.:

General Instructions:

- (a) There are 33 questions in this question paper with internal choice.
- (b) SECTION A consists of 16 multiple-choice questions carrying 1 mark each.
- (c) SECTION B consists of 5 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) Use of log tables and calculators is not allowed.

SECTION-A

Q. No. 1 to 12 are multiple-choice questions. Only one of the choices is correct. Select and write the correct choice as well as the answer to these questions.

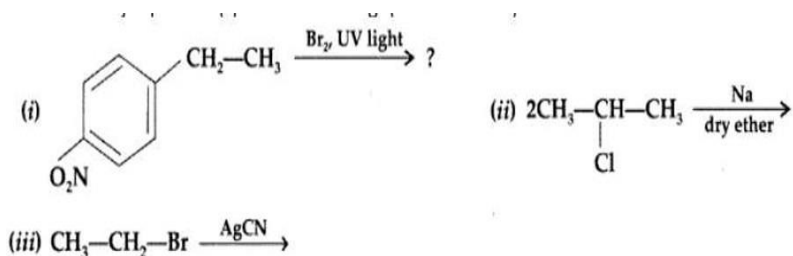
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|----|---|---|
| 1. | For isotonic solutions, which of the following is not equal | 1 |
| | (a) concentration | (b) temperature |
| | (c) osmotic pressure | (d) vapour pressure |
| 2. | For a non-electrolyte solute, the value of Van't Hoff factor is | 1 |
| | (a) 0 | (b) 1 |
| | (c) >1 | (d) <1 |
| 3. | The electrolyte used in the mercury cell is | 1 |
| | (a) paste of NH_4Cl and ZnCl_2 | (b) paste of HgO and carbon |
| | (c) paste of KOH and ZnO | (d) paste of PbO and H_2SO_4 |
| 4. | On increasing temperature, | 1 |
| | (a) ionic conductance increases and electronic conductance decreases. | |
| | (b) ionic conductance decreases and electronic conductance increases. | |
| | (c) both ionic and electronic conductance increase. | |
| | (d) both ionic and electronic conductance decrease. | |
| 5. | What is the order of reaction for the decomposition of Ammonia on platinum surface is | 1 |
| | (a) Zero order reaction | (b) First order reaction |
| | (c) Second order reaction | (d) Fractional order reaction |
| 6. | The rate constant of zero-order reactions has the unit | 1 |
| | (a) s^{-1} | (b) $\text{mol L}^{-1}\text{s}^{-1}$ |
| | (c) $\text{L}^2 \text{mol}^{-2} \text{s}^{-1}$ | (d) $\text{L mol}^{-1}\text{s}^{-1}$ |

7. In which of the following pairs are both ions coloured in aqueous solutions? 1
 [Atomic no of Sc = 21, Ti = 22, Ni = 28, Co = 27, Cu = 29]
 (a) Sc^{3+} , Ti^{3+} (b) Sc^{3+} , Co^{2+}
 (c) Ni^{2+} , Cu^{+} (d) Ni^{2+} , Ti^{3+}
8. Which of the following are d-block elements but not regarded as transition elements? 1
 (a) Cu, Ag, Au (b) Zn, Cd, Hg
 (c) Fe, Co, Ni (d) Ru, Rh, Pd
9. The core atom of which of the following biologically significant coordination molecules is cobalt? 1
 (a) Vitamin B12 (b) Haemoglobin
 (c) Chlorophyll (d) Carboxypeptidase-A
10. The coordination number and oxidation state of Cr in $\text{K}_3[\text{Cr}(\text{C}_2\text{O}_4)_3]$ are respectively 1
 (a) 3 and +3 (b) 3 and 0
 (c) 6 and +3 (d) 4 and +2
11. Which reagent will you use for the following reaction? 1
 $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3 \rightarrow \text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{Cl} + \text{CH}_3\text{CH}_2\text{CH}(\text{Cl})\text{CH}_3$
 (a) $\text{Cl}_2/\text{UV light}$ (b) $\text{NaCl} + \text{H}_2\text{SO}_4$
 (c) Cl_2 gas in dark (d) Cl_2 gas in the presence of iron
12. Which of the following alkyl halides will undergo SN_1 reaction most readily? 1
 (a) $(\text{CH}_3)_3\text{C}-\text{F}$ (b) $(\text{CH}_3)_3\text{C}-\text{Cl}$
 (c) $(\text{CH}_3)_3\text{C}-\text{Br}$ (d) $(\text{CH}_3)_3\text{C}-\text{I}$
- Question No. 13 to 16 consist of two statements – Assertion (A) and Reason (R). Answer these questions by selecting the appropriate option given below:
 A. Both A and R are true, and R is the correct explanation of A.
 B. Both A and R are true, and 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. Assertion: When methyl alcohol is added to water, the boiling point of water decreases. 1
 Reason: When a volatile solute is added to a volatile solvent, an elevation in boiling point is observed.
14. Assertion: The presence of a catalyst increases the activation energy of a reaction. 1
 Reason: Catalysts provide an alternative reaction pathway with a lower activation energy.
15. Assertion(A): In the series Sc to Zn the enthalpy of atomisation of Zinc is the lowest. 1
 Reason(R): Zinc has a greater number of unpaired electrons.
16. Assertion: Linkage isomerism arises in coordination compounds containing an ambidentate ligand. 1
 Reason: Ambidentate ligand has two donor atoms.
- SECTION-B
17. (a) What is the significance of Henry's Law constant K_H ? 2
 (b) How the colligative properties change if the solute undergo dissociation in solution?
18. Calculate $\Delta_r G^\circ$ for the following reaction at 298 K : 2
 $2\text{Cr}(s) + 3\text{Fe}^{2+}(aq) \rightarrow 2\text{Cr}^{3+}(aq) + 3\text{Fe}(s)$ Given: $E_{\text{cell}}^0 = 0.30 \text{ V}$

19. Define each of the following: 2
 (a) Specific rate of a reaction. (b) Energy of activation of a reaction.
 OR
 Bring out the difference between order and molecularity of a reaction.
 20. What is Lanthanoid contraction? Give its cause. What are its Consequences? 2
 21. Give a chemical test to distinguish the following pair. 2
 $[\text{Co}(\text{NH}_3)_5\text{Cl}]\text{SO}_4$ and $[\text{Co}(\text{NH}_3)_5(\text{SO}_4)]\text{Cl}$.

SECTION-C

22. (a) State Henry's law. 3
 (b) Which cold drink you prefer one chilled or other one at room temperature and why?
 (c) At the same temperature hydrogen is more soluble in water than Helium. Which of them will have higher value of K_H and why?
 Or
 (a) Account for the reason, marine life like fish prefers to stay at lower level and stay away from the upper layer of water.
 (b) Why freezing/melting point of a substance used as a criterion for testing the purity of a substance?
 (c) Account for the reason for preservation of fruits against bacterial action by adding sugar.
 23. The molar conductivities of sodium acetate, sodium chloride and hydrochloric acid are 83, 127 and 426 $\text{mho cm}^2\text{mol}^{-1}$ at 25°C , respectively. 3
 Calculate the molar conductivity of acetic acid solution.
 24. The half-life for radioactive decay of $\text{C}-14$ is 5800 years. An archaeological artefact 3
 containing wood had only 80% of the $\text{C}-14$ found in a living tree. Estimate the age of the sample. $\log 2 = 0.301$ $\log 8 = 0.903$ $\log 4 = 0.602$ $\log 5 = 0.699$
 25. Assign reasons for the following. 3
 (a) Scandium is a transition element but Zinc is not.
 (b) Silver atom has completely filled d orbital ($4d^{10}$) in its ground state, yet it is transition element.
 (c) In the series Sc ($Z = 21$) to Zn ($Z = 30$), the enthalpy of atomisation of zinc is the lowest.
 26. Write the state of hybridization, the shape and the magnetic behaviour of the following 3
 complex entities : (i) $[\text{Co}(\text{NH}_3)_6]^{3+}$ (at no. $\text{Co} = 27$)
 27. Write the major product(s) in the following: 3



28. Write the structure formula of the following compounds 3
 (i) 1-Bromobutane (ii) 2-Bromobutane (iii) 2-Bromo-2-methylpropane

SECTION-D

29. Read the passage carefully and answer the questions 4

The rate law for a chemical reaction relates the reaction rate with the concentrations or partial pressures of the reactants. For a general reaction, $aA + bB \rightarrow C$ with no intermediate steps in its reaction mechanism, meaning that it is an elementary reaction. The rate law is given by $r = k [A]^x [B]^y$ where $[A]$ and $[B]$ express the concentrations of A and B in moles per litre. Exponents x and y vary for each reaction and are determined experimentally. The value of k varies with conditions that affect reaction rate, such as temperature, pressure, surface area, etc. The sum of these exponents is known as overall reaction order. A zero order reaction has a constant rate that is independent of the concentration of the reactants. A first-order reaction depends on the concentration of only one reactant. A reaction is said to be of second order when the overall order is two. Once we have determined the order of the reaction, we can go back and plug one set of our initial values and solve for k .

Answer the following questions:

- (a) Calculate the overall order of the reaction which has the following rate expression:

$$\text{Rate} = k[A]^{1/2}[B]^{3/2} \quad 1$$

- (b) What is the effect of temperature on rate of the reaction? 1

- (c) A first order reaction takes 100 minutes for 50% completion. Calculate the time required for 30% completion of the reaction. ($\log 10 = 1$, $\log 2 = 0.301$) 2

OR

- (d) A first order reaction has a rate constant $1 \times 10^{-3} \text{ s}^{-1}$. 2

How long will 5 gm of this reactant take to reduce to 3 gm? ($\log 3 = 0.4771$, $\log 5 = 0.6990$)

30. Compounds that have the same chemical formula but different structural arrangements are 4

called isomers. Ionization Isomerism - This type of isomerism is due to the exchange of groups between the complex ion and the ions outside it. Coordination isomerism - This isomerism occurs in compounds containing complex anionic and cationic parts and can be thought of as occurring by interchange of some ligands from the cationic part to the anionic part. Linkage isomerism - This isomerism occurs with ambidentate ligands that are capable of coordinating in more than one way. Hydrate isomerism - This isomerism results from the replacement of a coordinated group by a solvent molecule (Solvate Isomerism).

- (a) What type of isomerism is exhibited by $[\text{Co}(\text{ONO})(\text{NH}_3)_5] \text{Cl}$ and $[\text{Co}(\text{NO}_2)(\text{NH}_3)_5] \text{Cl}$? 1

- (b) What type of isomerism is exhibited by $[\text{CrCl}_2(\text{H}_2\text{O})_4] \text{Cl}_2 \cdot \text{H}_2\text{O}$, $[\text{CrCl}(\text{H}_2\text{O})_5] \text{Cl}_2 \cdot \text{H}_2\text{O}$? 1

- (c) What is coordination isomerism? Give one example. 2

OR

- (c) What is an ambidentate ligand? Explain with an example. 2

SECTION-E

31. Attempt either option A or B. 5

A.(i) State two advantages of H_2-O_2 fuel cell over ordinary cell.

(ii) Silver is electrodeposited on a metallic vessel of total surface area 500 cm^2 by passing a current of 0.5 amp for two hours. Calculate the thickness of silver deposited.

[Given: Density of silver = 10.5 g cm^{-3} , Atomic mass of silver = 108 amu, $F = 96,500\text{ C mol}^{-1}$]

OR

B. (i) Define limiting molar conductivity and fuel cell.

(ii) Resistance of a conductivity cell filled with 0.1 mol L^{-1} KCl solution is 100 ohm.

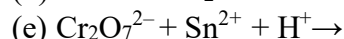
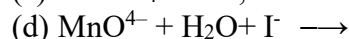
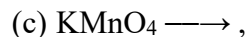
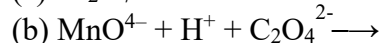
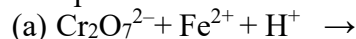
If the resistance of the same cell when filled with 0.02 mol L^{-1} KCl solution is 520 ohm, calculate the conductivity and molar conductivity of 0.02 mol L^{-1} KCl solution.

The conductivity of 0.1 mol L^{-1} KCl solution is $1.29 \times 10^{-2}\text{ ohm}^{-1}\text{ cm}^{-1}$.

32. When a chromite ore (A) is fused with Sodium carbonate in free excess of air and the product is dissolved in water, a yellow solution of the compound(B) is obtained. After treatment of this yellow solution with Sulfuric acid, compound (C) can be crystallized from the solution. When compound (C) is treated with KCl, orange crystals of compound(D) crystallize out. Identify A to D and also explain the reactions. 5

OR

Complete & balance the following reactions: -



33. Explain the following reaction 5

(i) Swarts reaction

(ii) Finkelstein reaction

(iii) Sandmeyer reaction

(iv) Wurtz reaction

(v) Friedel-Crafts reaction

OR

(a) Haloalkanes react with KCN to form alkyl cyanides as the main product, while AgCN forms isocyanides as the product. Explain. 2+3

(b) How will you bring about the following conversions?

(i) Chloro methane to Iodo Methane

(ii) Propene to 1 -Bromo Propane

(iii) Benzene to Biphenyl

*****ALL THE BEST*****