Chemistry Practical Class 11 Determination of one cation in a given salt Viva Questions with Answers

Cations:- Pb^{2+}, Cu^{2+}, As^{3+}, Al^{3+}, Fe^{3+}, Mn^{2+} , Zn^{2+}, Co^{2+}, Ni2+, Ca^{2+}, Sr^{2+}, Ba^{2+}, Mg^{2+}, NH_4^+

Q1. What is the difference between a qualitative and quantitative analysis?

Answer. The primary distinction between qualitative analysis and quantitative analysis in chemistry is that qualitative chemistry determines the presence or absence of various chemical components in a sample, whereas quantitative chemistry determines the amount of various chemical components present in a given sample.

Q2. What is Qualitative Analysis?

Answer. Qualitative analysis is an Analytical chemistry method for determining the elemental composition of inorganic salts. This type of analysis deals with methods for determining the constituents of a compound.

Q3. How is a salt analysis carried out?

Answer. The standard method for testing any unknown sample is to make a solution of it and then test it with various reagents for the ions present in it. Testing with different reagents yields a characteristic reaction of certain ions, which can be a colour change, a solid formation, or any other visible changes.

Q4. Can we use a glass rod instead of platinum wire for performing the flame test? Explain your answer.

Answer. No, we cannot use a glass rod instead of platinum wire for performing the flame test. This is because platinum is unreactive and does not produce a colour in the flame that masks the presence of other metals.

Q5 Why is platinum metal preferred to other metals for the flame test?

Answer. Platinum is chemically inert, which means it does not react with other elements to form oxides or other compounds. When performing a flame test, this stability is desirable because it ensures that we only see the spectrum of what we are burning.

Q6. Give examples of some coloured basic radicals.

Answer. Cu^{2+},Fe^{2+}, Fe^{3+}, Cr^{3+}, Ni^{2+}, Co^{2+} and Mn^{2+}.

Q7. What is the characteristic colour of cations of iron?

Answer. The characteristic colour of cations of iron is light green, yellow and brown.

Q8. What is the characteristic colour of Cu^{2+}?

Answer. The characteristic colour of Cu^{2+} is blue.

Q9. What is the characteristic colour of Ni^{2+}?

Answer. The characteristic colour of Ni^{2+} is bright green.

Q10. What is the characteristic colour of Co^{2+}?

Answer. The characteristic colour of Co^{2+} is blue, red, violet and pink.

Q11. What is the characteristic colour of Mn^{2+}?

Answer. The characteristic colour of cations of Mn^{2+} is light pink.

Q12. Which colour of the flame is observed through the naked eye for Ca^{2+}?

Answer. Brick red

Q13. The green flame with a blue centre is given by which cation?

Answer. Cu^{2+}

Q14. Why does a salt containing lead turn black in colour when placed for a long time in the laboratory?

Answer. Due to the formation of black lead sulphide in the atmosphere as a result of H_2S action.

Q15. Analysis of which group cation gives white fumes in the confirmatory test?
Zero group cation NH_4^+.

Answer. Ammonia gas produced by the action of sodium hydroxide on ammonium salts reacts with hydrochloric acid to produce ammonium chloride, which appears as a dense white fume.

Q16. What is Nessler's reagent?

Answer. Nessler's reagent is a solution of mercury (II) iodide (HgI_2) in potassium iodide (KI) and potassium hydroxide (KOH).
As a confirmatory test for ammonium ion NH_4^+, Nessler's reagent is used.

The presence of NH_4^+ ion is confirmed by the presence of brown or yellow precipitate.

Q17. What is the name of the product formed by reacting NH4+ ions with Nessler's Reagent?

Answer. HgO. Hg(NH2)I basic mercure (II) amido-iodine. Iodide of Millon's base is its common name.

Q18 What is the observation for confirmatory tests for Group - I cation Pb^{2+}?

Answer. Add potassium iodide solution to one part of the solution in a test tube. If a yellow precipitate forms and the ppt dissolves in boiling water and recrystallizes on cooling. This will confirm the presence of Pb^{2+}.

Q19. What is the group reagent of Group I?

Answer. Dilute HCl.

Q20. How can you confirm that the cation in the given salt is Cu^{2+}?

Answer. H_2S gas will be made to pass through the solution which will precipitate the radicals. Dissolve the precipitate in nitric acid. If the formed precipitate dissolves in 50% nitric acid, yielding a blue solution when an excess of NH_4OH is added. This will confirm the presence of Cu^{2+}.

Q21. What is the group reagent of Group II?

Answer. This group consists of Pb^{2+} and Cu^{2+} in the IIA Group and As^{3+} in the IIB Group. The group reagent is H_2S gas in the presence of dil. HCl

Q22. What is the group reagent of Group III?

Answer. Group III cations are precipitated as hydroxides by adding ammonium hydroxide in the presence of ammonium chloride. Thus, in the presence of NH_4Cl, the group reagent for this group is NH_4OH.

Q23. What is the colour of the precipitate formed when ferric hydroxide is dissolved in HCl?

Answer. The reddish-brown precipitate (ferric chloride- $FeCl_3$) is formed when ferric hydroxide is dissolved in HCl

Q24. What is the group reagent of Group IV?

Answer. CO^{2+}, Ni^{2+}, Mn^{2+}, and Zn^{2+} are the radicals found in this group. On passing H_2S gas through the salt's ammonical solution, these are precipitated as sulphides. Thus, the group's reagent is H_2S gas in the presence of NH_4Cl and NH_4OH.

Q25. How will you confirm the presence of Cobalt ion?

Answer. React the given salt with potassium nitrite in the presence of acetic acid. If the precipitate formed is yellow it will confirm the presence of cobalt ions. The yellow precipitate is of potassium cobalt nitrite.

Q26. How will you analyse for Group IV cations?

Answer. If group-III is not present, pass H_2S gas through the group-III solution for a few minutes. If a precipitate (white, black, or flesh-coloured) appears, it indicates the presence of group-IV cations.

Q27. What is the borax bead test?

Answer. When powdered borax, $Na_2B_4O_7 \cdot 10H_2O$, is heated vigorously in a Bunsen burner flame, it forms a colourless transparent glassy bead known as a borax bead, which is composed of sodium meta borate ($NaBO_2$) and boric oxide (B_2O_3). A borax bead is used to detect metals in a solution.

Q28. Why is the borax bead test not applicable in the case of white salts?

Answer. White salts do not give rise to coloured meta-borates.

Q29. Why is the original solution for cations not prepared in conc. HNO_3 or H_2SO_4?

Answer. Since concentrated HNO_3 acid is a very strong oxidising and nitrating agent, the original solution is not prepared in it. When nitric acid is used for salt analysis, the conc. HNO_3 in the solution can oxidise the ions present.
Concentrated H_2SO_4 has dehydrating properties, it can be used not only as an acid but also as a dehydrating agent in the synthesis of other acids.

Q30. Why cannot conc. HCl is used as a group reagent in place of dil. HCl for the precipitation of Ist group cations?

Answer. The conc. HCl is Not used because high concentrations of ions increase the solubility of group I chloride precipitate through the formation of soluble complex ions.

Q31. How can one prevent the precipitation of Group–IV radicals, with the second group radicals?

Answer. In the presence of HCl, H_2S is passed in the qualitative analysis of cations from the second group. The ionisation of H_2S decreases and lessens as a result of the common ion effect.

Q32. Why is it essential to boil off H_2S gas before precipitation of radicals of the group–III?

Answer. The solution is boiled with conc. nitric acid prior to precipitation of group III cations. If H_2S is not boiled off, it will react with HNO_3 and oxidise to colloidal sulphur, interfering with further analysis.

Q33. Can we use ammonium sulphate instead of ammonium chloride in the group–III?

Answer. In group 3, we cannot use ammonium sulphate instead of ammonium chloride due to the precipitation of Sulphate (SO_4^{2-}), such as $BaSO_4$, which may interfere with the systematic investigation of the salt.

Q34. Why is NH_4OH added before $(NH4_4)_2CO_3$ solution while precipitating group–V cations?

Answer. In salt analysis, a sufficient amount of NH_4Cl is added before adding
This is done to convert NH_4HCO_3, which is usually present in large quantities into $(NH_4)_2CO_3$.

Q35. What is aqua regia?

Answer. Aqua regia is a 3:1 by volume mixture of concentrated HCl and concentrated HNO_3.

Q36. Name a cation, which is not obtained from a metal.

Answer. Ammonium ion (NH_4^+).

Q37. Why are the group–V radicals tested in the order Ba^{2+}, Sr^{2+} and Ca^{2+}?

Answer. Ba^{2+} also gives Sr^{2+} and Ca^{2+} tests. Sr^{2+} also provides Ca^{2+} tests. Therefore, before confirming Sr^{2+}, we must demonstrate the absence of Ba^{2+}, and before confirming Ca^{2+}, we must demonstrate the absence of both Ba^{2+} and Sr^{2+}.

Q38. Why should the solution be concentrated before proceeding to the group–V?

Answer. Before moving on to group 5, the solution is concentrated by adding an excess of NH_4Cl to ensure that the ionic product of group 6 cation, Mg^{2+}, does not exceed its solubility product and thus does not precipitate with group 5 cations.

Q39. If the residue in the dry heating test is white, name the radicals which are absent.

Answer. Cu^{2+}, Mn^{2+}, Co^{2+}, Cr^{2+}, Zn^{2+} and Pb^{2+}.

Q40. What is the preliminary test for Group 1- 5 cations?

Answer. The preliminary test for group 1 - 5 cations are as follows-

Cation	Positive Result
Lead (Pb^{2+})	Formation of a white precipitate
Copper (Cu^{2+})	A black precipitate is formed
Cobalt (Co^{2+}) and Nickel (Ni^{2+}), conduct both confirmatory tests	Formation of a black precipitate
Manganese (Mn^{2+})	A skin-coloured precipitate is formed
Zinc (Zn^{2+})	A greyish-white precipitate is formed
Barium (Ba^{2+})	A yellow precipitate is formed when K_2CrO_4 is added to the solution.
Strontium (Sr^{2+})	A white precipitate is formed when aqueous $(NH_4)_2SO_4$ is added to the solution.
Calcium (Ca^{2+})	A white precipitate is formed when aqueous $(NH_4)_2C_2O_4$ (ammonium oxalate) and NH_4OH are added to the solution.