MEGA LECTURE

AQA (GCSE Notes)

Chapter 4: Chemical Changes

Q1. What is formed when a metal reacts with oxygen?

Q2. Why is the reaction between a metal and oxygen called an oxidation reaction?

Q3. Define oxidation in terms of oxygen.

Q4. Define reduction in terms of oxygen.

Q5. What happens to a metal atom when it becomes a positive ion?

Q6. How is the reactivity of a metal related to its ability to form positive ions?

Q7. Why are potassium and sodium placed at the top of the reactivity series?

Q8. What is observed when potassium is added to water?

Q9. Describe the reaction of sodium with water.

Q10. How does lithium react with water at room temperature?

Q11. What type of gas is released when a reactive metal reacts with water?

Q12. What happens to magnesium when it reacts with dilute hydrochloric acid?

Q13. Why does zinc react slowly with dilute acids compared to magnesium?

Q14. Why does copper not react with dilute acids?

Q15. Arrange calcium, zinc, and iron in order of reactivity based on their reactions with acid.

Q16. How can we use reactions with water to compare the reactivity of different metals?

Q17. What safety precautions should be taken when reacting potassium with water?

Q18. What does a fast reaction between a metal and dilute acid indicate about the metal's reactivity?

Q19. What is meant by the term “reactivity series”?

Q20. Which two non-metals are often included in the reactivity series and why?

Q21. Why is hydrogen used as a reference point in the reactivity series?

Q22. What does it mean if a metal is below hydrogen in the reactivity series?

Q23. What is a displacement reaction?

Q24. Describe a displacement reaction between magnesium and copper sulfate.

Q25. Explain how displacement reactions can help us rank metals in the reactivity series.

Q26. Write an example of a displacement reaction involving zinc and another metal compound.

Q27. How can experiments involving reactions with water be used to deduce metal reactivity?

Q28. What would you observe when calcium is placed in water?

Q29. Why does iron not react with cold water?

Q30. How does the reaction of magnesium with water compare to its reaction with acids?

Q31. Suggest a method to compare the reactivity of metals using dilute hydrochloric acid.

Q32. How can gas collection be used to measure the rate of a metal's reaction with acid?

Q33. Why does copper not displace iron from iron sulfate?

Q34. What is observed when iron is added to copper sulfate solution?

Q35. Explain why magnesium can displace zinc from zinc chloride.

Q36. Describe what happens when a metal is oxidised.

Q37. What is the role of oxygen in a metal oxidation reaction?

Q38. What evidence would show that a metal has undergone oxidation?

Q39. How would you demonstrate that magnesium is more reactive than iron using dilute acid?

Q40. How does the tendency to lose electrons relate to metal reactivity?

Q41. Which metal would you expect to react most vigorously with acid: zinc, calcium, or iron?

Q42. What does it mean for a metal to have a strong tendency to form positive ions?

Q43. Why is it important to conduct metal-acid reactions at room temperature for comparison?

Q44. What is meant by "more reactive" in terms of metal behaviour?

Q45. Why is steam not used in these metal reaction comparisons?

Q46. What kind of evidence from a chemical reaction can help identify a more reactive metal?

Q47. Why does magnesium react with acids but copper does not?

Q48. What is the importance of using the same conditions when comparing metal reactivity?

Q49. How can you tell if a displacement reaction has occurred?

Q50. Describe a simple lab experiment to test the reactivity of iron, copper, and magnesium using acids.

Q51. What is the product formed when a metal oxide is reduced by carbon?

Q52. Explain why carbon cannot be used to extract aluminium from its oxide.

Q53. In the extraction of iron, which substance is reduced?

Q54. In the reaction between copper oxide and carbon, which substance is oxidised?

Q55. What evidence suggests that a reduction reaction has taken place?

Q56. How does the position of a metal in the reactivity series affect its method of extraction?

Q57. Why are metals above carbon in the reactivity series not extracted using carbon?

Q58. Describe what happens to oxygen atoms during a reduction reaction.

Q59. Why is carbon often used in metal extraction processes?

Q60. What happens to carbon during the reduction of a metal oxide?

Q61. Give an example of a metal oxide that can be reduced using carbon.

Q62. What does it mean when a substance is said to be oxidised?

Q63. How can you tell from a reaction if a substance has been reduced?

Q64. Write a word equation for the reduction of copper(II) oxide using carbon.

Q65. Why is gold typically not found as a compound in nature?

Q66. Why is it easier to extract metals that are less reactive than carbon?

Q67. What is formed when carbon reacts with oxygen during the reduction of metal oxides?

Q68. In a metal extraction reaction, how can you identify the oxidising agent?

Q69. How does the extraction of iron from iron oxide show a redox reaction?

Q70. What is the importance of redox reactions in metal extraction?

Q71. Define oxidation in terms of electron transfer.

Q72. Define reduction in terms of electron transfer.

Q73. In terms of electrons, what happens to a metal when it is oxidised?

Q74. In terms of electrons, what happens to a metal ion when it is reduced?

Q75. Explain what is meant by a half equation in redox chemistry.

Q76. Write a half equation for the reduction of Cu^{2+} to Cu.

Q77. How can you tell from a half equation which species is gaining electrons?

Q78. How can you tell from a half equation which species is losing electrons?

Q79. In the reaction between zinc and copper sulfate, which metal is oxidised?

Q80. In the same reaction, which metal ion is reduced?

Q81. Why is the reaction between magnesium and copper sulfate a redox reaction?

Q82. Write the ionic equation for the reaction between iron and copper(II) sulfate.

Q83. What are spectator ions in a displacement reaction?

Q84. How do displacement reactions provide evidence for reactivity trends?

Q85. Identify the oxidising agent in the reaction between magnesium and copper(II) sulfate.

Q86. Identify the reducing agent in the reaction between zinc and iron(II) sulfate.

Q87. What is shown by the loss of electrons in a half equation?

Q88. What is shown by the gain of electrons in a half equation?

Q89. Why are displacement reactions examples of redox reactions?

Q90. Explain the change in oxidation state when a metal is oxidised.

Q91. Explain the change in oxidation state when a metal ion is reduced.

Q92. Write an ionic equation for the displacement of silver by copper.

Q93. Why do more reactive metals displace less reactive metals from solutions?

Q94. What is the role of electrons in redox reactions?

Q95. Why are ionic equations useful for showing redox processes?

Q96. How can you balance a half equation for a redox reaction?

Q97. Write the half equation for the oxidation of Zn to Zn^{2+}.

Q98. Write the half equation for the reduction of Fe^{3+} to Fe^{2+}.

Q99. How would you identify the species being reduced in a full redox reaction?

Q100. Describe how you would use experimental data to decide which species has been oxidised.

Q101. What gas is produced when magnesium reacts with hydrochloric acid?

Q102. What salt is formed when zinc reacts with sulfuric acid?

Q103. Write a word equation for the reaction between iron and hydrochloric acid.

Q104. Explain why the reaction between a metal and an acid is a redox reaction.

Q105. In terms of electrons, what happens to magnesium when it reacts with hydrochloric acid?

Q106. In terms of electrons, what happens to hydrogen ions during a reaction with zinc?

Q107. Identify the species being oxidised in the reaction between zinc and hydrochloric acid.

Q108. Identify the species being reduced in the reaction between iron and sulfuric acid.

Q109. Write the balanced symbol equation for the reaction between magnesium and sulfuric acid.

Q110. What is the ionic equation for the reaction between zinc and hydrochloric acid?

Q111. What are the products when an acid reacts with a metal carbonate?

Q112. Describe the products formed when calcium carbonate reacts with nitric acid.

Q113. Write a word equation for the reaction between copper(II) oxide and sulfuric acid.

Q114. Which acid and base combination would produce sodium sulfate?

Q115. What are the products of the reaction between sodium hydroxide and hydrochloric acid?

Q116. What salt is formed when potassium carbonate reacts with nitric acid?

Q117. Why does magnesium react faster with hydrochloric acid than iron?

Q118. How can you test for the presence of hydrogen gas in a metal-acid reaction?

Q119. What is the role of hydrogen ions in acid-metal reactions?

Q120. Predict the salt formed when zinc carbonate reacts with sulfuric acid.

Q121. What is observed when magnesium is added to dilute sulfuric acid?

Q122. Explain why acid-metal reactions are examples of redox reactions.

Q123. In the reaction between iron and hydrochloric acid, what is the oxidising agent?

Q124. In the same reaction, what is the reducing agent?

Q125. How is a salt formed during a neutralisation reaction?

Q126. What type of reaction occurs between an acid and a metal hydroxide?

Q127. Why is water formed when an acid reacts with a base?

Q128. What is the ionic equation for the neutralisation of hydrochloric acid with sodium hydroxide?

Q129. Which salt is produced when copper(II) carbonate reacts with nitric acid?

Q130. What two products are always formed when an acid reacts with a carbonate?

Q131. How can you test for carbon dioxide gas in a neutralisation reaction?

Q132. What is the difference between a base and an alkali?

Q133. Explain why the choice of acid determines the name of the salt formed.

Q134. What determines the metal ion in the salt formed during neutralisation?

Q135. Predict the salt formed from the reaction between calcium oxide and nitric acid.

Q136. What are the products when iron reacts with sulfuric acid?

Q137. Write a balanced equation for the reaction between magnesium and hydrochloric acid.

Q138. What observations would indicate a reaction is occurring between a metal and acid?

Q139. What type of salt is formed from hydrochloric acid?

Q140. What salt would be formed from the reaction between sodium carbonate and sulfuric acid?

Q141. What is the name of the salt produced from potassium hydroxide and nitric acid?

Q142. Write a balanced symbol equation for the reaction between zinc and nitric acid.

Q143. Explain why no reaction occurs between copper and dilute acids under normal conditions.

Q144. What type of reaction occurs when an acid reacts with a metal oxide?

Q145. Write a word equation for the reaction between iron(III) oxide and hydrochloric acid.

Q146. Predict the salt formed when magnesium reacts with nitric acid.

Q147. Why is carbon dioxide formed when an acid reacts with a metal carbonate?

Q148. How can you determine the formula of a salt formed in a given acid-base reaction?

Q149. What is the general formula for a salt formed from a metal and hydrochloric acid?

Q150. Write the full chemical equation for the reaction between calcium carbonate and sulfuric acid.

Q151. How do you make a pure, dry sample of a soluble salt from an insoluble oxide?

Q152. What is the role of a Bunsen burner in preparing a pure sample of a soluble salt?

Q153. How is dilute acid used in the preparation of a soluble salt from a carbonate?

Q154. Why is excess solid filtered off during the preparation of a salt solution?

Q155. What is the purpose of heating the acid in the preparation of a salt solution?

Q156. How does evaporating the salt solution help in obtaining pure, dry salt crystals?

Q157. What type of apparatus can be used as an alternative to a water bath for evaporating a solution?

Q158. Why must the solid reactant be added until no more reacts with the acid?

Q159. What role does filtration play in the process of making a soluble salt?

Q160. Describe how you would ensure that the salt obtained is pure.

Q161. How can the use of a water bath improve the evaporation process of a salt solution?

Q162. What is the importance of using an insoluble oxide or carbonate in this preparation?

Q163. Explain the steps involved in crystallising a salt from its solution.

Q164. How does the presence of excess insoluble material affect the quality of the salt produced?

Q165. Why is it important to control the heating during the evaporation of the salt solution?

Q166. What precautions should be taken when using a Bunsen burner in the lab?

Q167. How does the reaction between an insoluble carbonate and dilute acid lead to the formation of a salt?

Q168. What happens to the carbon dioxide produced during the reaction of a carbonate with an acid?

Q169. Describe the method used to remove impurities from the salt solution before evaporation.

Q170. How can you check that a salt solution is ready to be evaporated?

Q171. Explain why pure dry samples of salts are important for chemical analysis.

Q172. How does a wide range indicator help in measuring the pH of a solution?

Q173. What does a pH value below 7 indicate about a solution?

Q174. How can a pH probe be used to determine the acidity of a solution?

Q175. What is the meaning of pH 7 in terms of solution neutrality?

Q176. How does universal indicator show the approximate pH of a solution?

Q177. Why might it be necessary to use an indicator to measure pH in a practical experiment?

Q178. Explain what is meant by an acidic solution in terms of hydrogen ion concentration.

Q179. How is the pH scale used to identify an alkaline solution?

Q180. What type of color change might you observe when using universal indicator in an acid?

Q181. Describe the visual indication provided by a pH probe when measuring an alkaline solution.

Q182. How can you tell if a solution is neutral using the pH scale?

Q183. Why is it important to know the pH of a solution when performing neutralisation reactions?

Q184. What happens during the neutralisation reaction between an acid and an alkali?

Q185. How do hydrogen ions and hydroxide ions interact in a neutralisation reaction?

Q186. Write a simple word equation to show the reaction between an acid and an alkali.

Q187. How does the pH scale assist in predicting the products of a neutralisation reaction?

Q188. What information does a wide range indicator provide about a salt solution?

Q189. How can you use the pH scale to control the progress of a neutralisation experiment?

Q190. What does a pH reading above 7 imply about the characteristics of a solution?

Q191. How can you demonstrate that a solution has been neutralised using a pH probe?

Q192. What role does water play in the neutralisation reaction?

Q193. How can the use of universal indicator improve the accuracy of pH measurements in the lab?

Q194. Explain how you would prepare a salt solution from an insoluble carbonate.

Q195. Why is it important to heat the acid slowly when preparing a salt solution?

Q196. Describe the changes you expect to see in the solution as it is heated to evaporate the water.

Q197. How can you ensure that the salt crystals formed are dry and free of impurities?

Q198. What steps are taken to confirm that no additional reaction occurs once the salt is fully dissolved?

Q199. How does the concentration of the acid affect the formation of the salt solution?

Q200. What safety measures should be followed when evaporating a salt solution using an electric heater?

Q201. What piece of equipment is used to accurately measure the volume of alkali in a titration?

Q202. What is the purpose of using an indicator in a titration?

Q203. Why should you swirl the conical flask during a titration?

Q204. How can you tell when a titration has reached the end point?

Q205. Which type of indicator is most suitable for a titration between a strong acid and a strong alkali?

Q206. Describe how to rinse the burette before starting a titration.

Q207. What is the correct method for reading the volume in a burette?

Q208. Why is it important to repeat the titration and take an average of concordant results?

Q209. Describe how to fill a pipette safely and accurately.

Q210. What is meant by a concordant result in titration?

Q211. What is the function of the white tile used during titration?

Q212. Describe the steps involved in setting up a titration.

Q213. Why must the acid or alkali be added slowly near the end point of a titration?

Q214. How can the concentration of an unknown acid be determined using titration?

Q215. In a titration, what volume measurements must be taken to calculate concentration?

Q216. What are the units of concentration when calculated in mol/dm^3?

Q217. What formula is used to calculate concentration in mol/dm^3 from moles and volume?

Q218. How is concentration in g/dm^3 calculated from mol/dm^3?

Q219. What information must be known to calculate the number of moles in a titration?

Q220. What is the molar ratio in the reaction between hydrochloric acid and sodium hydroxide?

Q221. How do you calculate the number of moles of acid from its volume and concentration?

Q222. How can you calculate the mass of solute in a solution using concentration and volume?

Q223. What is the key difference between a strong acid and a weak acid?

Q224. Why does a strong acid have a lower pH than a weak acid of the same concentration?

Q225. Give an example of a weak acid and explain its behaviour in water.

Q226. What does it mean for an acid to be fully ionised in solution?

Q227. Why does a weak acid conduct electricity less well than a strong acid?

Q228. What is the effect on hydrogen ion concentration when the pH drops by one unit?

Q229. Explain why the pH scale is logarithmic.

Q230. What happens to the pH of a solution when it becomes ten times more acidic?

Q231. How does concentration differ from strength in acids?

Q232. What does it mean for a solution to be concentrated?

Q233. What does it mean for a solution to be dilute?

Q234. How can pH values be used to compare the strengths of two acids?

Q235. Why might two acids of equal concentration have different pH values?

Q236. Describe how a pH probe can be used to monitor acid strength.

Q237. How does hydrogen ion concentration affect the acidity of a solution?

Q238. Describe how you would compare the strength of hydrochloric acid and ethanoic acid.

Q239. What is meant by the term "ionisation" in the context of acids in solution?

Q240. How is water formed in a neutralisation reaction?

Q241. Describe what happens to hydrogen ions during a neutralisation reaction.

Q242. How does the hydrogen ion concentration change in a neutral solution?

Q243. Explain how changes in pH relate to changes in ion concentration.

Q244. What is the pH of a neutral solution and why?

Q245. Why is it important to use precise measurements in titration?

Q246. How can titration results be used to identify an unknown concentration?

Q247. In titration, how do you determine the volume of acid needed to neutralise a base?

Q248. How does a strong alkali behave in aqueous solution?

Q249. What is the balanced symbol equation for the reaction between nitric acid and sodium hydroxide?

Q250. Describe the effect of adding a strong acid to a weak alkali on the pH of the solution.

Q251. What happens to the ions in an ionic compound when it is melted?

Q252. Why can molten ionic compounds conduct electricity?

Q253. What are electrolytes?

Q254. Why can't solid ionic compounds conduct electricity?

Q255. What type of electrode attracts positive ions during electrolysis?

Q256. What type of electrode attracts negative ions during electrolysis?

Q257. What is produced when positive ions gain electrons at the cathode?

Q258. What happens to negative ions at the anode?

Q259. Why is electrolysis used to extract metals from their ores?

Q260. What does the term "discharged" mean in electrolysis?

Q261. Explain the movement of ions during electrolysis.

Q262. What is formed at the cathode when lead bromide is electrolysed?

Q263. What is formed at the anode when lead bromide is electrolysed?

Q264. Why are inert electrodes used in electrolysis?

Q265. Name a safer compound that can be used in electrolysis instead of lead bromide.

Q266. Write the ionic formula for zinc chloride.

Q267. Predict the products of electrolysis of molten zinc chloride.

Q268. Which electrode would zinc form at during the electrolysis of zinc chloride?

Q269. Which electrode would chlorine form at during the electrolysis of zinc chloride?

Q270. What does the term "molten" mean?

Q271. What is the role of electricity in electrolysis?

Q272. What is the name of the negative electrode?

Q273. What is the name of the positive electrode?

Q274. Why are the electrodes called “inert”?

Q275. What is meant by a binary ionic compound?

Q276. Describe what happens to bromide ions at the anode during electrolysis of lead bromide.

Q277. Describe what happens to lead ions at the cathode during electrolysis of lead bromide.

Q278. What is the charge on a bromide ion?

Q279. What is the charge on a lead ion in lead bromide?

Q280. What is the purpose of writing half equations in electrolysis?

Q281. Write a word equation for the electrolysis of molten lead bromide.

Q282. What state must the ionic compound be in for electrolysis to work?

Q283. What safety precautions should be taken when carrying out electrolysis of lead bromide?

Q284. What type of reaction takes place at the cathode?

Q285. What type of reaction takes place at the anode?

Q286. Why does a bromide ion lose an electron during electrolysis?

Q287. What happens to electrons at the cathode?

Q288. What happens to electrons at the anode?

Q289. Define the term "electrolysis".

Q290. Why must the ionic compound be molten or in solution for electrolysis?

Q291. What element is formed at the anode during the electrolysis of molten zinc chloride?

Q292. What element is formed at the cathode during the electrolysis of molten zinc chloride?

Q293. What happens to chloride ions at the anode?

Q294. Why is it important to balance half equations?

Q295. Explain why electrons are involved in reactions at both electrodes.

Q296. What equipment is needed to carry out electrolysis of molten lead bromide?

Q297. What is observed at the cathode during electrolysis of molten lead bromide?

Q298. What is observed at the anode during electrolysis of molten lead bromide?

Q299. What gas is released during the electrolysis of molten bromide compounds?

Q300. Why does electrolysis not work on solid ionic compounds?

Q301. Why is electrolysis used to extract metals that are too reactive to be reduced by carbon?

Q302. What is electrolysis?

Q303. Why is a large amount of energy needed during the electrolysis of molten compounds?

Q304. Why is aluminium extracted using electrolysis instead of carbon?

Q305. What role does cryolite play in the extraction of aluminium?

Q306. Why is aluminium oxide mixed with cryolite before electrolysis?

Q307. What is the function of the carbon anode during the extraction of aluminium?

Q308. Why must the carbon anode be replaced regularly during the electrolysis of aluminium oxide?

Q309. Write the general rule for what happens at the cathode during the electrolysis of aqueous solutions.

Q310. What happens at the anode during the electrolysis of an aqueous solution that contains no halide ions?

Q311. Why is hydrogen produced at the cathode if the metal in the solution is more reactive than hydrogen?

Q312. What product is formed at the anode when a halide ion is present in the aqueous solution?

Q313. What ions are produced when water molecules break down in an aqueous solution?

Q314. Why is water involved in the electrolysis of aqueous solutions?

Q315. What is the significance of using inert electrodes in the electrolysis of aqueous solutions?

Q316. What kind of hypothesis might you develop when investigating the electrolysis of an aqueous solution?

Q317. In an experiment, how could you test what gas is released at the cathode?

Q318. In an experiment, how could you test what gas is released at the anode?

Q319. Predict the products of electrolysis when sodium chloride solution is electrolysed.

Q320. Predict the products of electrolysis when copper sulfate solution is electrolysed.

Q321. Why is copper produced at the cathode when copper sulfate solution is electrolysed?

Q322. Explain why oxygen is produced at the anode when copper sulfate solution is electrolysed.

Q323. What are half equations?

Q324. Write the half equation for the formation of hydrogen gas at the cathode.

Q325. Write the half equation for the production of oxygen gas from hydroxide ions.

Q326. How can you tell if a reaction at an electrode is a reduction?

Q327. How can you tell if a reaction at an electrode is an oxidation?

Q328. Why do positive ions move to the negative electrode during electrolysis?

Q329. Why do negative ions move to the positive electrode during electrolysis?

Q330. In electrolysis, what does it mean if electrons are gained at an electrode?

Q331. In electrolysis, what does it mean if electrons are lost at an electrode?

Q332. Describe what happens to aluminium ions at the cathode during electrolysis.

Q333. Describe what happens to oxide ions at the anode during aluminium extraction.

Q334. Why is it important to control the temperature during electrolysis of molten compounds?

Q335. Why is cryolite used instead of just melting aluminium oxide on its own?

Q336. What are the environmental concerns of using large amounts of energy in electrolysis?

Q337. How does electrolysis contribute to carbon dioxide emissions in aluminium production?

Q338. What is observed at the anode during the electrolysis of a salt solution without halide ions?

Q339. Why do bubbles form at electrodes during electrolysis?

Q340. What is the state of aluminium during its extraction by electrolysis?

Q341. What happens to the mass of the anode during the extraction of aluminium over time?

Q342. Why is it necessary to purify solutions before electrolysis in industry?

Q343. What would happen if reactive electrodes were used instead of inert ones in aqueous electrolysis?

Q344. Why do the products of electrolysis depend on the reactivity of the metal?

Q345. How is the overall process of electrolysis different for molten and aqueous solutions?

Q346. What product forms at the cathode during the electrolysis of potassium nitrate solution?

Q347. What product forms at the anode during the electrolysis of potassium nitrate solution?

Q348. Why is a d.c. power source used in electrolysis instead of a.c.?

Q349. Why is it important to balance half equations?

Q350. How can you identify unknown gases produced during an electrolysis experiment?