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SPECA

GCSE Combined Science (AQA Trilogy) · Chemistry

Chemical Changes · Tiered Worksheet

Section A: Foundation

Reactivity series and extraction of metals

1) Explain, in terms of oxygen, why a metal reacting with oxygen is described as oxidation. [1]

2) State what "reduction" means, in terms of oxygen. [1]

3) Copper does not react with dilute hydrochloric acid, but magnesium reacts vigorously with it. Explain this difference in terms of reactivity. [2]

4) Zinc is added to a solution of copper sulfate. Describe what would be observed, and explain why this reaction happens. [3]

5) Metal A reacts vigorously with cold water. Metal C reacts with dilute acid but not with cold water. Metal B does not react with water or dilute acid. Place these three metals in order of reactivity, most reactive first. [2]

6) Explain why gold is found in the Earth as the metal itself, while most metals are found as compounds. [2]

7) Explain why a metal such as zinc can be extracted from its oxide by heating with carbon, but a metal such as aluminium cannot. [2]

Acids, alkalis and salts

8) Name the salt produced, and state the other product, when magnesium reacts with hydrochloric acid. [2]

9) Write a word equation for zinc reacting with sulfuric acid. [2]

10) Complete: acid + alkali → ___ + ___ [2]

11) Complete: acid + metal carbonate → ___ + ___ + ___ [3]

12) Name the salt formed when sodium hydroxide reacts with nitric acid. [1]

13) Name the salt formed when copper oxide reacts with sulfuric acid. [1]

14) Describe the steps used to prepare a pure, dry sample of a soluble salt from an insoluble metal oxide and an acid. [4]

The pH scale and neutralisation

15) State the pH value that is neutral, and state whether values below 7 are acidic or alkaline. [2]

16) Name the ion produced by acids in aqueous solution, and the ion produced by alkalis in aqueous solution. [2]

17) Complete the equation for neutralisation: $H^+ + ___ \rightarrow H_2O$ [1]

18) A solution has a pH of 7. State whether it is acidic, neutral, or alkaline. A second solution has a pH of 12. State whether this solution is acidic, neutral, or alkaline. [2]

Electrolysis

19) Explain why an ionic compound must be molten or dissolved in water before it can undergo electrolysis. [2]

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20) State which electrode positive ions move to during electrolysis, and which electrode negative ions move to. **[2]**

21) Predict the products formed when molten lead bromide is electrolysed using inert electrodes, stating at which electrode each forms. **[2]**

22) Explain why aluminium is extracted by electrolysis rather than reduction with carbon, and explain why cryolite is mixed with the aluminium oxide before electrolysis. **[3]**

23) Predict the products formed at each electrode when a concentrated aqueous solution of sodium chloride is electrolysed with inert electrodes, and predict the product formed at the anode when a halide-free aqueous solution (e.g. copper sulfate solution) is electrolysed instead. **[3]**

Section B: Higher (in addition to Section A)

Redox, strong/weak acids and half equations

24) Define oxidation and reduction in terms of electrons. **[2]**

25) Zinc displaces copper from copper sulfate solution: $Zn + CuSO_4 \rightarrow ZnSO_4 + Cu$. Write the ionic equation for this reaction, and state which species is oxidised and which is reduced, in terms of electron transfer. **[4]**

26) Magnesium reacts with hydrochloric acid: $Mg + 2HCl \rightarrow MgCl_2 + H_2$. Explain, in terms of electron transfer, why this is a redox reaction. **[3]**

27) Distinguish a strong acid from a weak acid, giving an example of each. **[2]**

28) Explain the difference between a "strong" acid and a "concentrated" acid. **[2]**

29) Two solutions have pH 2 and pH 4. State which has the higher hydrogen ion concentration, and by what factor it is higher. **[2]**

30) Write the half equation for the reaction at the cathode, and the half equation for the reaction at the anode, when molten lead bromide is electrolysed. **[2]**

31) Write the half equation for the reaction at the cathode when dilute sulfuric acid is electrolysed using inert electrodes (hydrogen forms at the cathode). **[1]**

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