**A. Acids and alkalis, indicators, strong and weak acids and reactions with metals**

1. Zinc reacts with hydrochloric acid.
   1. Write a word and a balanced symbol equation, with state symbols, to show this reaction. (3)

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* 1. HT: write an ionic equation for the reaction. (2)

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* 1. HT: Give both half equations to show the electron transfers taking place. (2)

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* 1. HT: Explain why this reaction is a redox reaction. (4)

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1. Acids can be described as weak or strong.
   1. HT: Explain why ethanoic acid (found in vinegar) is described as a weak acid, whereas nitric acid is a strong acid. (4)

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* 1. HT: Magnesium reacts with ethanoic acid and nitric acid. What difference would you see if magnesium carbonate was reacted with ethanoic acid of the same concentration as nitric acid? (2)

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1. Explain the difference between acids and alkalis in terms of hydrogen ions and pH. (4)

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1. Explain the difference between an alkali and a base. (1)

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1. Describe the effect of adding a strong acid to each of the following indicators: (3)
   1. Litmus

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* 1. Methyl orange

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* 1. Phenolphthalein

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1. HT: You are given a 0.50mol/dm3 solution of nitric acid (strong) and ethanoic acid (weak).
   1. Calculate the concentration of each acid, giving your answer in g/dm3 to 3 significant figures. (2)

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* 1. The solution of ethanoic acid has a pH of 4 and the solution of nitric acid a pH of 1. How many times greater is the concentration of H+ ions in the nitric acid compared to the concentration in the ethanoic acid? (2)

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1. HT: Explain the difference between a dilute and concentrated acid. Why can an acid be both weak and concentrated? (6)

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**B. Reactions of acids: Neutralisation, salts and titration**

1. A student carried out a reaction by adding zinc to sulfuric acid. Write a word equation for the reaction and explain how they would test the gas produced to identify it. (3)

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1. Describe an acid-alkali neutralisation reaction in terms of ions. (3)

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1. Describe how to carry out an acid-alkali titration to prepare a pure, dry salt. (6)

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1. Complete the following table to indicate the solubility of the following substances in water. (5)

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| --- | --- |
| Substance | Solubility in water |
| Ammonium nitrate |  |
| Sodium chloride |  |
| Lead sulfate |  |
| Calcium carbonate |  |
| Sodium carbonate |  |

1. For the following reactions predict whether a precipitate will form. Name the precipitate if one is formed. (2)
   1. Sulfuric acid + calcium

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* 1. Sulfuric acid + sodium

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1. Magnesium carbonate reacts with nitric acid. The equation is shown below:

MgCO3(aq) + 2 HNO3(aq) ---> Mg(NO3)2(aq) + H2O(l) + CO2(g)

***Extended writing:***

Plan a method to produce dry crystals of magnesium nitrate. (6)

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1. A titration is carried out between hydrochloric acid and sodium hydroxide.
   1. The following results show the volumes of acid added to neutralize the sodium hydroxide.

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| --- | --- | --- | --- | --- |
|  | **Rough** | **Trial 1** | **Trial 2** | **Trial 3** |
| **Volume of acid added (cm3)** | 15.70 | 15.30 | 15.25 | 15.30 |

Calculate the mean volume of solution added and explain your answer. (3)

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* 1. HT: In another investigation, it takes 27.00cm3 of hydrochloric acid to neutralise 25.00cm3 of sodium hydroxide at a concentration of 1.0 mol/dm3. Calculate the concentration of hydrochloric acid in g/cm3. (4)

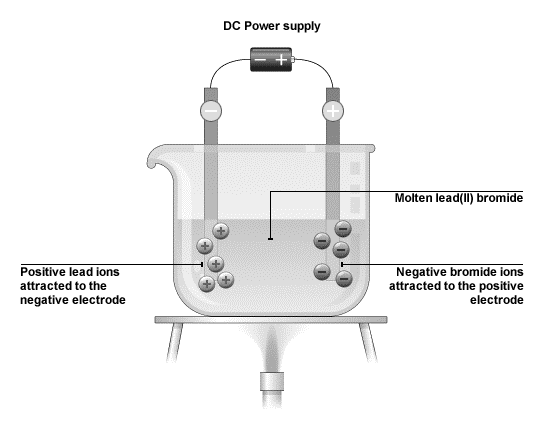
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**C. Electrolysis of a molten ionic compound; electrolysis of an aqueous solution**

1. The diagram shows how molten lead bromide is electrolysed. Lead bromide contains Pb2+ and Br- ions.



* 1. Explain why molten lead bromide conducts electricity. (1)

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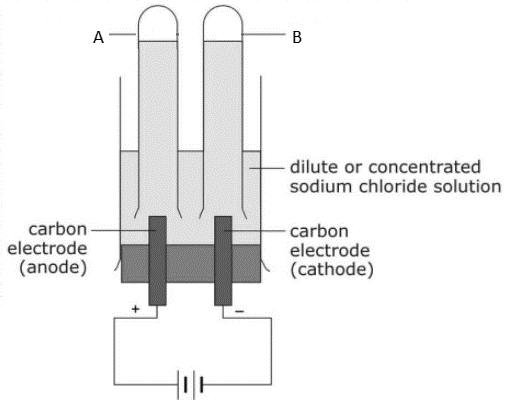
1. HT: Write the half equations, including the state symbols, for the changes at the anode and cathode. (4)

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1. The diagram shows how sodium chloride is electrolysed in the laboratory:



1. Name the products A and B? (2)

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1. Give one use of substance A. (1)

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1. A few drops of universal indicator was added to the solution after the reaction and it turned blue. Explain why. (2)

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1. HT: Write the half equations, including the state symbols, for the changes as the anode and cathode. (4)

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**D. Electrolysis: Purification of copper**

1. Explain the formation of products in the electrolysis of copper sulfate solution using copper electrodes. (3)

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1. Explain how the electrolysis of copper sulfate solution with copper electrodes can be used to purify copper. (4)

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