

A Level Chemistry B (Salters)
H433/01 Fundamentals of chemistry

Question Set 22

- 1 (a) Chlorine is manufactured by the electrolysis of sodium chloride solution. The equation is shown below.



Give the half equation for the reaction at the negative electrode during electrolysis and explain why it is reduction.

Half-equation

Explanation

[2]

- 1 (b) A sodium chloride solution contains 24.0% of sodium chloride by mass.

1.0 tonne of this solution is electrolysed.

Calculate the mass of chlorine produced (in tonnes).
Give your answer to an **appropriate** number of significant figures.

mass of chlorine =tonnes [3]

- 1 (c) Industries using chlorine are often located close to the electrolysis plant.

Why is the transportation of chlorine dangerous?

[1]

- 1 (d) (i) Chlorine reacts with alkanes to form chloroalkanes. This reaction begins with the formation of chlorine radicals.

Complete the mechanism below to show the movement of electrons and name the type of bond fission.



Type of bond fission

[2]

- 1 (ii) Once the radicals have formed, they are highly reactive.
Give the equations for **two** propagation steps that occur in the reaction of ethane with chlorine.

[2]

1 (d) (iii) Chlorine radicals in the stratosphere act as homogeneous catalysts in the breakdown of ozone.

Give equations for the catalytic cycle.

Use the equations to explain the terms *homogeneous* and *catalyst*.

[3]

1 (d) (iv) Ozone is also broken down by radiation in the stratosphere.



The bond broken in this reaction has a bond enthalpy of +302 kJ mol⁻¹.

Calculate the wavelength (in m) of radiation required to break this bond.

wavelength = m

[2]

1 (e) Hydrogen chloride can be prepared by reacting potassium chloride with concentrated sulfuric acid.

Give the equation for the reaction.

[1]

1 (f) The reaction in (e) is repeated with potassium iodide. The hydrogen iodide formed is oxidised to iodine and the sulfuric acid is reduced to hydrogen sulfide.

Give the oxidation states of the elements in the compounds.

iodine in HI iodine in I₂

sulfur in H₂SO₄ sulfur in H₂S

Use these oxidation states to write a balanced equation for the reaction of HI with H₂SO₄.

[3]

Total Marks for Question Set 22: 19

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