

Home Gameboard

<u>rd</u> Chemistry

Inorganic

Bonding

Sn and Si Chlorides

Sn and Si Chlorides



Tin can form a wide variety of neutral and anionic species with chlorine. For each of the species below, deduce its shape.



 $SnCl_2$ (gas phase).

Part B SnCl_3^-

 $\mathrm{SnCl_3}^-$

Part C SnCl₄

 SnCl_4

 ${\bf Part \, D} \quad {\rm SnCl_6}^{2-}$

 $\mathrm{SnCl_6}^{2-}$

Part E R-Cl bonds

Si-Cl bonds are susceptible to hydrolysis. For example, $(CH_3)_3SiCl$ may be hydrolysed to give $(CH_3)_3SiOH$ which self-condenses to give $(CH_3)_3SiOSi(CH_3)_3$. Hydrolysis of $(CH_3)_2SiCl_2$ occurs in a similar way. However, the subsequent self-condensation yields a polymer with repeat unit $[Si(CH_3)_2O]_n$

Suggest a structure for the intermediate in polymer formation.

Use the structure editor to generate a SMILES string.

Part F Side product

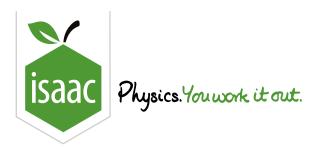
As well forming a polymer, hydrolysis of $(CH_3)_2SiCl_2$ yields a liquid with empirical formula $C_6H_{18}O_3Si_3$.

Suggest a structure for this compound.

Use the structure editor to generate a SMILES string.

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Home Gameboard Chemistry Inorganic Redox Oxidation of Vanadium

Oxidation of Vanadium



A $0.0100 \,\mathrm{mol}$ sample of an oxochloride of vanadium, VOCl_x , required $20.0 \,\mathrm{cm}^3$ of $0.100 \,\mathrm{mol}\,\mathrm{dm}^{-3}$ acidified potassium manganate(VII) for oxidation of the vanadium

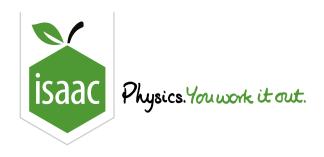
| potassium manganate(VII) for oxidation of the vanadium. |
|---|
| Part A Moles of electrons |
| How many moles of electrons were removed by the ${ m MnO_4}^-$ ions? |
| |
| Part B Change in oxidation state |
| By how much did the oxidation state of vanadium change? Enter, for example, -2 if it went down by two, +2 if it went up by two, 0 if it did not change. |
| |
| Part C Value of x |
| What is the value of x in the formula VOCl_x ? |

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STEM SMART Chemistry Week 49 (extension)

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Gas with Fluorine Reactions

Gas with Fluorine Reactions



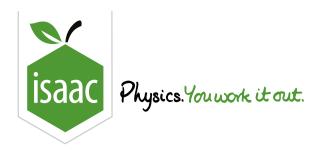
A $0.585\,\mathrm{g}$ sample of a colourless, neutral, monatomic gas **A** occupies a volume of $100\,\mathrm{cm}^3$ at s.t.p. When $1.310\,\mathrm{g}$ of **A** are treated with fluorine at $400\,^\circ\mathrm{C}$, the only product is $2.065\,\mathrm{g}$ of a white solid **B** (melting point, $117\,^\circ\mathrm{C}$). When this white solid is treated with dioxygen difluoride, oxygen gas is given off and $2.446\,\mathrm{g}$ of another white solid **C** (melting point, $50\,^\circ\mathrm{C}$) are formed.

When a mixture of **A** and fluorine is irradiated with a mercury vapour lamp at room temperature, a third white solid **D** (melting point, $129\,^{\circ}$ C) can be isolated. When $0.845\,\mathrm{g}$ of **D** is added to water, there is a brisk effervescence and the resulting solution requires $100\,\mathrm{cm}^3$ of $0.100\,\mathrm{mol\,dm}^{-3}\,\mathrm{NaOH}(\mathrm{aq})$ for neutralisation.

| Part A Gas A |
|---|
| What is the likely identity of gas A ? |
| |
| Part B Solid B |
| What is the formula of white solid B ? |
| |
| |
| Part C Solid C |

What is the formula of white solid C?

| Part D Solid D | |
|--|--|
| What is the formula of white solid D ? | |
| | |
| Part E B shape | |
| By using electron-pair repulsion theory, predict the shape of B . | |
| | |
| Part F C shape | |
| By using electron-pair repulsion theory, predict the shape of C . | |
| Part G D shape | |
| By using electron-pair repulsion theory, predict the shape of D . | |
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Home Gameboard Chemistry Foundations Stoichiometry Aluminium Hydrides

Aluminium Hydrides



Solutions of lithium hydride and aluminium chloride in ethoxyethane are mixed together and the resultant white precipitate filtered off. The filtrate is carefully evaporated to dryness and white crystals, $\bf A$, are obtained. They contain: Li $18.2\,\%$, Al $71.2\,\%$, H $10.6\,\%$ by mass.

A reacts violently with water, producing hydrogen gas and a white precipitate.

Part B Formation of A Write an equation for the formation of A. State symbols are not required. Part C Reaction of A with water

Write an equation for the reaction of **A** with water. State symbols are not required.

Part D Al-Mg alloy

An alloy of aluminium and magnesium is used in boat-building. A $1.75\,\mathrm{g}$ sample of the alloy was dissolved in the minimum volume of $4\,\mathrm{mol}\,\mathrm{dm^3}$ hydrochloric acid and the solution was then made alkaline by the addition of aqueous sodium hydroxide until no further reaction occurred. The resultant mixture was filtered and the residue, \mathbf{B} , rinsed with distilled water, all washings being added to the filtrate, \mathbf{C} . After air drying, $0.18\,\mathrm{g}$ of \mathbf{B} was obtained. Carbon dioxide was passed into \mathbf{C} and a white solid, \mathbf{D} , which contained aluminium, was collected. Heating \mathbf{D} to constant mass gave a residue of mass $3.16\,\mathrm{g}$.

Determine the percentage of aluminium by mass in the alloy to the nearest %.

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