

LONGMAN GCSE CHEMISTRY WORKSHEETS

19: Tin

This sheet looks at the extraction and uses of tin. Don't worry if the metal is unfamiliar to you. The questions can all be answered based on the chemistry you already know.

The extraction of tin

Tin occurs as cassiterite - tin(IV) oxide, SnO_2 . After treatment to remove as much unreactive rocky material as possible, the ore is heated strongly in air. This removes sulphur and arsenic which are present in other minerals often found with the cassiterite.

1. Explain how heating in air removes any sulphur present.

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The purified ore is then converted into metallic tin by heating it with carbon. Carbon monoxide is also produced. Limestone is added to the mixture to produce a slag with remaining impurities in the ore.

2. Write the symbol equation for the conversion of tin(IV) oxide to tin by heating with carbon.

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3. What sort of reaction is this?

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4. One impurity that might be left in the ore is silicon dioxide, SiO_2 . Explain how the limestone converts this into a slag.

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Some uses of tin

Tin is used as one component of the alloy **solder**.

5. What do you understand by the term *alloy*?

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6. Name the other component of solder.

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7. Give a use for solder and say what property or properties of the solder make it especially suitable for that use.

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Large quantities of tin are used to make **tinplate**. Sheet steel is coated with a thin layer of tin in one of two processes. The tin can be coated onto the steel by **hot-dipping** or by **electroplating**.

8. Suggest how pieces of steel might be tin-plated by hot-dipping.

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In electroplating, sheet steel is made one of the electrodes in the electrolysis of tin(II) sulphate solution, SnSO_4 .

9. Should the steel be made the anode or the cathode during the electrolysis? Explain your answer.

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10. Write the electrode equation for the formation of the tin.

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11. What should the other electrode be made of?

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12. Tinplate is used for food cans. Steel alone would go rusty and react with the food. Suggest a reason why pure tin isn't used for food cans.

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Unlike steel coated with zinc (galvanised steel), tin only protects the iron while the layer is unscratched. Once the layer is broken, the iron underneath rusts very quickly. Zinc continues to protect the iron even after the layer is scratched because the more reactive zinc corrodes in preference to the iron. Tin is below iron in the reactivity series.

13. Suggest a reason why galvanised steel isn't used for food cans.

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