

ESA Study Guide Year 10 Science

Chapter 4: Metals Then and now

Questions from page 61 of *ESA Study Guide Year 10 Science*

Understanding

1. Name two metals used more than 9 000 years ago: _____
2. Why was iron favoured over bronze? _____
3. Explain why so few of the iron tools made during the Iron Age have survived until today.

Thinking

1. Explain why bronze is more useful than copper, even though copper is used to make bronze.
2. In earlier times copper was used to make spearheads, the tips of arrows, and helmets. Now copper is used to make electrical wiring. Explain why the use of copper has changed over time.

Contributing

Research New Zealand's early gold miners.

- Who were New Zealand's first gold miners? _____
- Where did they come from? _____
- What was life like for them during the gold rushes in New Zealand?

Answers (except for 'Contributing') are provided on pages 298 and 299 of *ESA Study Guide Year 10 Science*

ESA Study Guide Year 10 Science

Chapter 4: Metals Metals and non-metals

Questions from page 62 of *ESA Study Guide Year 10 Science*

Understanding

1. What are the two main groups of elements on the periodic table?

2. From the first 20 elements, write the names and symbols of:

a. five metals _____

b. five non-metals _____

c. two metalloids _____

3. What properties of silicon make it useful as a semiconductor?

Thinking

1. Write a list of five things around you that are made of metal.

2. Plastics are sometimes used in place of metals, e.g. for making containers. What are two properties that plastics and metals share?

Contributing

Minerals containing metal compounds are found throughout New Zealand – e.g. minerals containing zinc are found on the Coromandel Peninsula. Mining minerals has positive and negative effects on the environment and for the country. Carry out research to find 2 positive and 2 negative effects.

Answers (except for 'Contributing') are provided on page 299 of *ESA Study Guide Year 10 Science*

ESA Study Guide Year 10 Science

Chapter 4: Metals Physical properties and uses of metals

Questions from page 64 of *ESA Study Guide Year 10 Science*

Understanding

1. Make a list of five common properties of metals.

2. What physical property do only iron, cobalt and nickel have in common?

3. Circle or underline which of the following is *not* a property of iron:

good electrical conductor shiny magnetic good thermal insulator

Thinking

1. Suggest a use for each of the metals in the following table, based on the property given, and explain your answer.

	Metal	Property
a.	Silver	Lustre
b.	Copper	Good thermal conductor
c.	Lead	High density
d.	Gold	Malleable

a. _____

b. _____

c. _____

d. _____

2. Georgia tested a sample of an element to see if it conducted electricity. It did. Georgia decided the element was a metal. Was she right? Explain your answer.

3. Explain why metals are strong and hard to melt.

Answers are provided on page 299 of *ESA Study Guide Year 10 Science*

ESA Study Guide Year 10 Science

Chapter 4: Metals Alloys

Questions from page 66 of *ESA Study Guide Year 10 Science*

Understanding

1. What is an alloy?

2. a. Name the alloy made when copper and zinc are melted together. _____

b. Give two uses of the alloy in a. _____

3. Nitinol is a 'smart alloy'.

a. What is nitinol made of? _____

b. What is nitinol's key property? _____

Thinking

1. Explain how combining metals changes their properties to make an alloy. Give a diagram in your answer.



2. Explain why brass is a more useful substance for making door knockers than copper is.

3. a. What is the difference between low-carbon steel and high-carbon steel?

b. Describe the sort of steel that is used to make the following.

i. Car bodies: _____

ii. Metal cutting tools: _____

Contributing

New Zealand's steel mill is at Glenbrook, south of Auckland. Iron sands mined nearby are turned into flat sheets of steel. Draw a flow chart to show how Glenbrook turns iron sand into steel.

Answers (except for 'Contributing') are provided on page 300 of *ESA Study Guide Year 10 Science*

ESA Study Guide Year 10 Science

Chapter 4: Metals Reactivity

Questions from pages 67, 68 of *ESA Study Guide Year 10 Science*

Understanding

1. Put the following metals in order from least to most reactive: zinc, magnesium, copper, calcium.

2. What does the H^+ in the reactivity series tell you?

3. Decide whether the following statements are true or false.

- a. The most reactive metal is gold. _____
- b. The reactivities of zinc and iron are similar. _____
- c. The metals most likely to be found as native elements are gold, silver and copper. _____

4. Use the reactivity series to help you rule lines to match the jumbled lists of metals and uses in the table alongside.

Metals	Uses
Aluminium	Cutlery
Gold	Steel body of a car
Copper	Jewellery
Silver	Soft drink can
Iron	Cookware

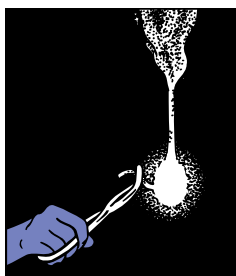
Thinking

1. Archaeologists are very excited when they find gold objects at their sites. Explain why gold objects usually provide more information to archaeologists than do objects made of iron.

2. At which end of the reactivity series is potassium, K, (most or least reactive)? _____

Contributing

Here is the middle of a mnemonic to help remember the order of metals in the reactivity series: '... Catches Monkeys and Zebras...' Start and finish the mnemonic with words of your own.



Answers (except for 'Contributing') are provided on page 300 of *ESA Study Guide Year 10 Science*

ESA Study Guide Year 10 Science

Chapter 4: Metals Metals and oxygen

Questions from page 71 of *ESA Study Guide Year 10 Science*

Understanding

1. What percentage of the air is oxygen? _____
2. What product is formed when a metal reacts with oxygen? _____
3. Aluminium is near the top of the reactivity series of metals. Explain why the aluminium metal in a soft drink can does not react with its contents.

4. When copper is left outside it turns green. Explain why.

5. Complete the following equations:
 - a. calcium + oxygen $\rightarrow$ _____
 - b. sodium + _____ $\rightarrow$ sodium oxide
 - c. _____ + oxygen $\rightarrow$ aluminium oxide
 - d. _____ + _____ $\rightarrow$ iron oxide

Thinking

1. Explain why freshly cut sodium goes dull very quickly.

2. Aluminium, when it does react, is a reactive metal. Explain what must happen to a piece of aluminium before it will react.

3. The body and engine in a car are made mostly of steel. Explain how the manufacturers try to reduce corrosion of the steel.

4. Explain why samples of metals often need to be sanded or polished before the metals can take part in chemical reactions.

Contributing

The aluminium produced in New Zealand is some of the purest aluminium in the world. Find out what it is used for and write a brief report on your own paper.

Answers (except for 'Contributing') are provided on page 301 of *ESA Study Guide Year 10 Science*

ESA Study Guide Year 10 Science

Chapter 4: Metals Metals and water

Questions from pages 72, 73 of *ESA Study Guide Year 10 Science*

Understanding

1. Zinc reacts with steam to form a gas.
 - a. What gas forms? _____
 - b. How do you test for this gas? _____

2. Write a word equation to describe the reaction of zinc with water.

3. Explain why copper can be used for hot water pipes.

4. Complete the following equations:
 - a. sodium + water $\rightarrow$ _____ + hydrogen gas
 - b. _____ + water $\rightarrow$ magnesium hydroxide + _____
 - c. calcium + _____ $\rightarrow$ calcium hydroxide + hydrogen gas

Thinking

1. Explain why some metals are useful because they do not react with water.

2. Explain why sometimes a piece of sodium reacting with water bursts into flame.

Contributing

Some metals are 'heavy metals' and are considered dangerous if they get into our waterways. Mercury is a heavy metal. Research the dangers of having a heavy metal such as mercury in our waterways. Explain what damage it can do to the environment, plants, animals and people.

Answers (except for 'Contributing') are provided on page 301 of *ESA Study Guide Year 10 Science*

ESA Study Guide Year 10 Science

Chapter 4: Metals Metals and acids

Questions from page 74 of *ESA Study Guide Year 10 Science*

Understanding

1. a. What products are formed when zinc reacts with sulfuric acid?

- b. Write a word equation for the reaction of zinc with sulfuric acid.

2. If a metal reacts with dilute nitric acid, what type of metal salt forms?

3. In the reaction between iron and sulfuric acid, name the following.

- a. metal: _____

- b. gas produced: _____

- c. reactants: _____ and _____

- d. products: _____ and _____

4. Complete the following word equations:

- a. zinc + sulfuric acid $\rightarrow$ _____ + hydrogen gas

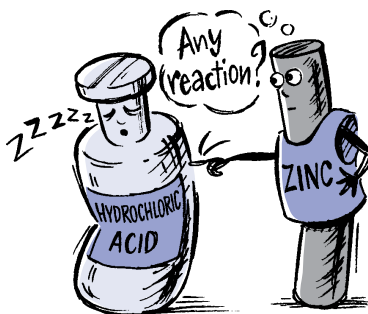
- b. iron + hydrochloric acid $\rightarrow$ _____ + _____

- c. magnesium + _____ $\rightarrow$ magnesium nitrate + hydrogen gas

Thinking

1. The reactions between magnesium and hydrochloric acid; and magnesium and sulfuric acid *look* the same, but they produce different metal salts. Identify the salts produced in each reaction.

2. Compare and contrast the reactions of hydrochloric acid with lead and with zinc. What similarities do you expect to see and what differences do you expect to see?



Answers are provided on pages 301 and 302 of *ESA Study Guide Year 10 Science*