

GCSE Chemistry

Worksheet: Alloys as useful materials

TIME 30 min	TOTAL 30 marks	CALCULATOR Allowed	DIFFICULTY Easy, Medium
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Topics: Alloys as useful materials

NAME _____	CLASS _____	DATE _____
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- Use black ink or black ball-point pen. Pencil should only be used for drawing.
- Answer all questions in the spaces provided.
- In all calculations, show clearly how you work out your answer.
- The marks for questions are shown in brackets.

0 1

Gold jewellery is often made from 9 carat gold. 24 carat gold is 100% gold.

0 1 . 1

Calculate the percentage of gold, by mass, in 9 carat gold.

.....

.....

.....

.....

Percentage = %

[2 marks]

0 2

0 2 . 1

Which of these is an alloy?

Tick (✓) **one** box.

Pure copper

☐

Pure iron

☐

Steel

☐

Pure aluminium

☐

[1 mark]

0 2 . 2

Give the property of pure gold that means it is usually alloyed before being used for jewellery.

.....

.....

[1 mark]

0 3

Gold jewellery is often made from 18 carat gold. 24 carat gold is 100% gold.

0 3 . 1

Calculate the percentage of gold, by mass, in 18 carat gold.

.....

.....

.....

.....

Percentage = %

[2 marks]

0 4

Most metals in everyday use are alloys.

0 4 . 1

Bronze is an alloy of copper and one other metal.
Name the other metal.

.....

.....

.....

.....

[1 mark]

0 4 . 2

Brass is an alloy of copper and one other metal.
Name the other metal.

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.....

.....
[1 mark]

0 4 . 3

Give **one** use of brass.

.....

.....

[1 mark]

0 4 . 4

Give the property of aluminium alloys that makes them useful for aircraft.

.....

.....

[1 mark]

0 5

Steels are alloys of iron that contain specific amounts of carbon and other metals.
Table 1 gives information about three types of steel.

Table 1

Type of steel	Percentage of carbon	Other metals added	Properties
Low carbon steel	0.1–0.25	none	softer and easily shaped
High carbon steel	0.6–1.5	none	strong but brittle
Stainless steel	less than 0.1	chromium and nickel	hard and resistant to corrosion

0 5 . 1

Suggest which type of steel should be used for each item. Give a reason for each choice.

- car body panels
- surgical instruments

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.....

[4 marks]

0 5 . 2

Suggest why high carbon steel is **not** used for car body panels.

.....

.....

[1 mark]

0 5 . 3

Explain why adding carbon to iron makes the steel harder than pure iron.

[2 marks]

0 6

UK £2 coins are 'bimetallic': an outer ring made from one alloy (nickel-brass) and an inner disc made from a different alloy (cupronickel).

0 6 . 1

Suggest **two** reasons why coins are made from alloys rather than pure metals.

[2 marks]

0 6 . 2

Suggest one reason why using two differently coloured alloys in the same coin (bimetallic) might be useful.

[1 mark]

0 7

Gold used as jewellery is usually an alloy with silver, copper and zinc. The proportion of gold is measured in carats. 24 carat gold is 100% gold.

0 7 . 1

What is the percentage of gold in 18 carat gold?

.....

.....

.....

Percentage = %

[1 mark]

0 7 . 2

A ring is made of 14 carat gold. The mass of the ring is 6.0 g.
Calculate the mass of gold in the ring.

.....

.....

.....

.....

Mass of gold = g

[2 marks]

0 7 . 3

Explain why gold used for jewellery is usually an alloy rather than pure gold.

.....

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.....

.....

[2 marks]

0 8

Table 2 gives information about three aluminium alloys used in aircraft manufacture.

Table 2

Alloy	Main other metal added	Properties	Typical use
Duralumin	copper	high strength	aircraft body panels
Alloy B	magnesium	good corrosion resistance, medium strength	parts exposed to sea air
Alloy C	silicon	easy to cast into shapes	engine parts

0 8 . 1

Suggest why Alloy B, rather than Duralumin, might be chosen for aircraft parts that are frequently exposed to humid, salty sea air.

[1 mark]

0 8 . 2

Explain why pure aluminium is rarely used for aircraft parts, even though it is a lightweight metal.

[2 marks]

0 9

0 9 . 1

Explain why adding a small amount of carbon to iron, to make steel, increases its hardness, using ideas about the structure of metals.

.....

.....

.....

.....

[2 marks]

END OF QUESTIONS

Original practice questions written to match the specification. Not produced by, affiliated with or endorsed by AQA.

Mark scheme

GCSE Chemistry · Worksheet: Alloys as useful materials · 30 marks

Question 1 (2 marks)

01.1 [2 marks]

Answer: 37.5%

- $9 \div 24 \times 100$ (1)
 - 37.5 (%) (1)
-

Question 2 (2 marks)

02.1 [1 mark]

Correct: Steel

02.2 [1 mark]

- pure gold is (too) soft (1)
-

Question 3 (2 marks)

03.1 [2 marks]

Answer: 75%

- $18 \div 24 \times 100$ (1)
 - 75 (%) (1)
-

Question 4 (4 marks)

04.1 [1 mark]

Answer: tin

- tin (1)

04.2 [1 mark]

Answer: zinc

- zinc (1)

04.3 [1 mark]

- musical instruments / door handles / taps / electrical plugs and fittings / ornaments (1)

04.4 [1 mark]

- low density (1)
-

Question 5 (7 marks)

05.1 [4 marks]

- car body panels: low carbon steel (1)
- because it is easily shaped (pressed into panels) (1)
- surgical instruments: stainless steel (1)
- because it is resistant to corrosion (and hard) (1)

05.2 [1 mark]

- it is brittle, so it could crack / it is difficult to shape (1)

05.3 [2 marks]

- carbon atoms are a different size from iron atoms (1)
 - which distorts the layers of iron atoms so they cannot slide over each other as easily (1)
-

Question 6 (3 marks)

06.1 [2 marks]

- alloys can be made harder and more durable than pure metals, so coins resist wear from being handled and used many times (1)
- the colour, appearance and cost of an alloy can be controlled by choosing its composition (1)

06.2 [1 mark]

- it makes the coin instantly recognisable and harder to counterfeit, since forgers must accurately reproduce two different alloys in the correct pattern (1)

Question 7 (5 marks)

07.1 [1 mark]

Answer: 75%

- 75 (%) (1)

07.2 [2 marks]

Answer: 3.5 g

- $14 \div 24 \times 6.0$ (1)
- 3.5 (g) (1)

07.3 [2 marks]

- pure gold is (too) soft (1)
- the other atoms are a different size, which distorts the layers so they cannot slide easily, making the alloy harder (1)

Question 8 (3 marks)

08.1 [1 mark]

- Alloy B has good corrosion resistance, which is more important than maximum strength for parts exposed to a corrosive, salty environment (1)

08.2 [2 marks]

- pure aluminium is too soft / weak for the high-strength demands of aircraft structures (1)
 - alloying it with other metals, e.g. copper or magnesium, distorts the regular layers of atoms, making it harder and stronger while remaining light (1)
-

Question 9 (2 marks)

09.1 [2 marks]

- carbon atoms are a different size from iron atoms (1)
 - this distorts the regular layers of iron atoms, making it harder for the layers to slide over each other, so the alloy is harder than pure iron (1)
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