

GCSE Chemistry

Worksheet: Typical properties

TIME 30 min	TOTAL 29 marks	CALCULATOR Allowed	DIFFICULTY Easy, Medium
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Topics: Typical properties

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

Transition metals and their compounds have many uses.

0 1 . 1

Which use of a transition metal depends on it acting as a catalyst?

Tick (✓) **one** box.

Iron used in the Haber process

☐

Copper used for electrical wiring

☐

Titanium used in hip replacements

☐

Gold used in jewellery

☐

[1 mark]

0 1 . 2

Give the typical colour of a solution of a copper(II) compound.

.....

.....

.....

.....

[1 mark]

0 2

Chromium, manganese, iron, cobalt, nickel and copper are transition metals.

0 2 . 1

Which is a typical property of compounds of transition metals?

Tick (✓) **one** box.

They are always white.

☐

They are often coloured.

☐

They are all gases.

☐

They only contain ions with a 1+ charge.

☐

[1 mark]

0 2 . 2

What colour is copper(II) sulfate solution?

.....

.....

.....

[1 mark]

0 2 . 3

Iron is used as a catalyst in the Haber process to make ammonia.

What does a catalyst do?

.....

.....

[1 mark]

0 2 . 4

Iron forms Fe^{2+} ions and Fe^{3+} ions. The oxide ion is O^{2-} .

Give the formula of iron(III) oxide.

.....

.....

[1 mark]

0 3

Cobalt chloride paper is blue when dry and turns pink when water is added. It is used to test for water.

Anhydrous copper(II) sulfate is a white powder that turns blue when water is added.

0 3 . 1

Which typical property of transition metal compounds is shown by cobalt chloride and copper(II) sulfate?

.....

.....

[1 mark]

0 3 . 2

Suggest why sodium sulfate could **not** be used to test for water in the same way.

.....

.....

.....

.....

[2 marks]

0 4

Many transition metals form ions with different charges.

0 4 . 1

Copper forms two oxides, Cu_2O and CuO . The oxide ion is O^{2-} .
Give the charge on the copper ion in each oxide.

.....

.....

.....

.....

[2 marks]

0 4 . 2

Give the formula of the compound formed between Fe^{3+} ions and Cl^- ions.

[1 mark]

0 4 . 3

Solutions that contain Fe^{2+} ions are pale green. Solutions that contain Fe^{3+} ions are yellow-brown.

A student left some iron(II) sulfate solution open to the air for a week. The solution turned yellow-brown.

Suggest what happened to the iron ions.

[1 mark]

0 4 . 4

Many transition metals and their compounds are useful as catalysts.

Name **one** transition metal, or compound of a transition metal, that is used as a catalyst. Name the process or reaction it catalyses.

[2 marks]

0 5

Chromium, manganese, iron, cobalt, nickel and copper are transition metals.

0 5 . 1

Describe the typical properties of transition metals and their compounds. Use examples in your answer.

.....

.....

.....

.....

.....

.....

.....

.....

[4 marks]

0 6

Table 1 shows the colours of four solutions.

Table 1

Solution	Compound dissolved	Colour of solution
A	copper(II) sulfate	blue
B	sodium sulfate	colourless
C	iron(II) sulfate	pale green
D	potassium chloride	colourless

0 6 . 1

Which **two** solutions contain compounds of transition metals? Give a reason from Table 1.

.....

.....

.....

.....

[2 marks]

0 6 . 2

Solutions A, B and C all contain sulfate ions.

Explain what Table 1 shows about the cause of the colours of solutions A and C.

.....

.....

.....

.....

[2 marks]

0 6 . 3

Predict the colour of a solution of copper(II) chloride.

.....

.....

[1 mark]

0 7

Chromium forms the green oxide Cr_2O_3 . Chromium also forms the chloride CrCl_2 , which dissolves in water to form a blue solution.

Oxide ions are O^{2-} . Chloride ions are Cl^- .

0 7 . 1

Deduce the charge on the chromium ion in Cr_2O_3 . Show your working.

.....

.....

.....

.....

[2 marks]

0 7 . 2

Deduce the charge on the chromium ion in CrCl_2 .

.....

.....

.....

.....
[1 mark]

0 7 . 3

Give **two** typical properties of transition metal compounds that are shown by these chromium compounds.

[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: Typical properties · 29 marks

Question 1 (2 marks)

01.1 [1 mark]

Correct: Iron used in the Haber process

01.2 [1 mark]

Answer: blue

- blue (1)
-

Question 2 (4 marks)

02.1 [1 mark]

Correct: They are often coloured.

02.2 [1 mark]

Answer: blue

- blue (1)
-

02.3 [1 mark]

Answer: It speeds up a reaction without being used up.

- speeds up / increases the rate of a (chemical) reaction (1)

Notes: Ignore 'without being used up' on its own.

02.4 [1 mark]

Answer: Fe₂O₃

- Fe₂O₃ (1)
-

Question 3 (3 marks)

03.1 [1 mark]

Answer: They are coloured.

- they (form) coloured compounds (1)

03.2 [2 marks]

Answer: Sodium is not a transition metal, so its compounds are white or colourless with or without water; there would be no colour change.

- sodium is a Group 1 metal / not a transition metal, so its compounds are white / colourless (1)
- so there would be no colour change when water is added (1)

Question 4 (6 marks)

04.1 [2 marks]

Answer: Cu_2O : 1+; CuO : 2+

- Cu_2O : 1+ / Cu^+ (1)
- CuO : 2+ / Cu^{2+} (1)

04.2 [1 mark]

Answer: FeCl_3

- FeCl_3 (1)

04.3 [1 mark]

Answer: The Fe^{2+} ions changed into Fe^{3+} ions (they were oxidised by oxygen in the air).

- Fe^{2+} ions changed into Fe^{3+} ions / iron(II) was oxidised to iron(III) (1)

04.4 [2 marks]

Answer: e.g. iron, which is the catalyst in the Haber process for making ammonia.

- a named transition metal or transition metal compound used as a catalyst, e.g. iron / manganese(IV) oxide / nickel (1)
- a correct process or reaction for the catalyst named, e.g. iron: the Haber process (making ammonia) / manganese(IV) oxide: decomposition of hydrogen peroxide / nickel: adding hydrogen to alkenes (1)

Notes: The second mark depends on a correct catalyst. Allow other correct pairs, e.g. vanadium(V) oxide in the Contact process.

Question 5 (4 marks)

05.1 [4 marks]

Answer: Transition metals form ions with different charges (e.g. Fe^{2+} and Fe^{3+}), form coloured compounds (e.g. blue copper(II) sulfate) and are useful as catalysts (e.g. iron in the Haber process), unlike Group 1 metals.

Levels of response

- **Level 2 (3–4)** A clear, logically linked answer covering the key points accurately.
- **Level 1 (1–2)** One or two relevant points with little linking.
- **No marks (0)** Nothing relevant or worthy of credit.

Indicative content

- many transition metals form ions with different charges, e.g. Fe^{2+} and Fe^{3+} , Cu^+ and Cu^{2+}
- they form coloured compounds, e.g. copper(II) sulfate is blue, iron(II) compounds are pale green
- transition metals and their compounds are useful as catalysts, e.g. iron in the Haber process, manganese(IV) oxide for decomposing hydrogen peroxide
- by contrast, Group 1 metals only form $1+$ ions and their compounds are white / colourless

Question 6 (5 marks)

06.1 [2 marks]

Answer: A and C; they are coloured.

- A and C (1)
- they are coloured (compounds of transition metals are typically coloured) (1)

06.2 [2 marks]

Answer: Solution B contains sulfate ions but is colourless, so the sulfate ions do not cause the colour; the colour must come from the copper(II) and iron(II) ions.

- solution B also contains sulfate ions but is colourless, so sulfate ions are not coloured (1)
- so the colours are caused by the transition metal ions (Cu^{2+} and Fe^{2+}) (1)

06.3 [1 mark]

Answer: blue

- blue (1)

Notes: Allow green or blue-green.

Question 7 (5 marks)

07.1 [2 marks]

Answer: 3+

- three O^{2-} ions have a total charge of 6^- , which must be balanced by two chromium ions (1)
 - each chromium ion has a charge of 3^+ (1)
-

07.2 [1 mark]

Answer: 2+

- 2^+ (1)
-

07.3 [2 marks]

Answer: The metal forms ions with different charges; the compounds are coloured.

- chromium forms ions with different charges (Cr^{2+} and Cr^{3+}) (1)
 - the compounds are coloured (1)
-