

GCSE Chemistry

Worksheet: Instrumental methods

TIME 25 min	TOTAL 23 marks	CALCULATOR Allowed	DIFFICULTY Easy, Medium
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Topics: Instrumental methods

NAME _____

CLASS _____

DATE _____

- 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

0 1 . 1

Give **two** advantages of instrumental methods compared with chemical tests.

.....

.....

.....

.....

[2 marks]

0 1 . 2

Give **one** disadvantage of instrumental methods.

.....

.....

[1 mark]

0 2

0 2 . 1

Which of these is an advantage of using an instrumental method rather than a chemical test to identify a metal ion?

Tick (✓) **one** box.

It requires no training to use

☐

It is inexpensive

☐

It gives fast, accurate results

☐

It always needs a large sample

☐

[1 mark]

0 2 . 2

Give **one** example of an instrumental method used to identify metal ions.

.....

.....

[1 mark]

0 3

Elements and compounds can be detected and identified using instrumental methods.

0 3 . 1

Which **two** statements are advantages of instrumental methods compared with chemical tests?

Tick (✓) **two** boxes.

They are accurate

☐

They are cheap to buy

☐

They are rapid

☐

They need large samples

☐

They need no training to use

☐

[2 marks]

0 3 . 2

Instrumental methods are also sensitive.
What does 'sensitive' mean?

.....

.....

[1 mark]

0 4

An instrument measures the concentration of metal ions in water samples. Its display shows readings such as 0.037 mg/dm^3 and 0.041 mg/dm^3 .

0 4 . 1

State the resolution of this instrument.

.....

.....

.....

Resolution = mg/dm^3

[1 mark]

0 4 . 2

Explain what is meant by the resolution of an instrument.

.....

.....

[1 mark]

0 4 . 3

Instrumental methods are described as **sensitive**.

Explain why a sensitive method is especially useful for monitoring drinking water for toxic metal ions.

.....

.....

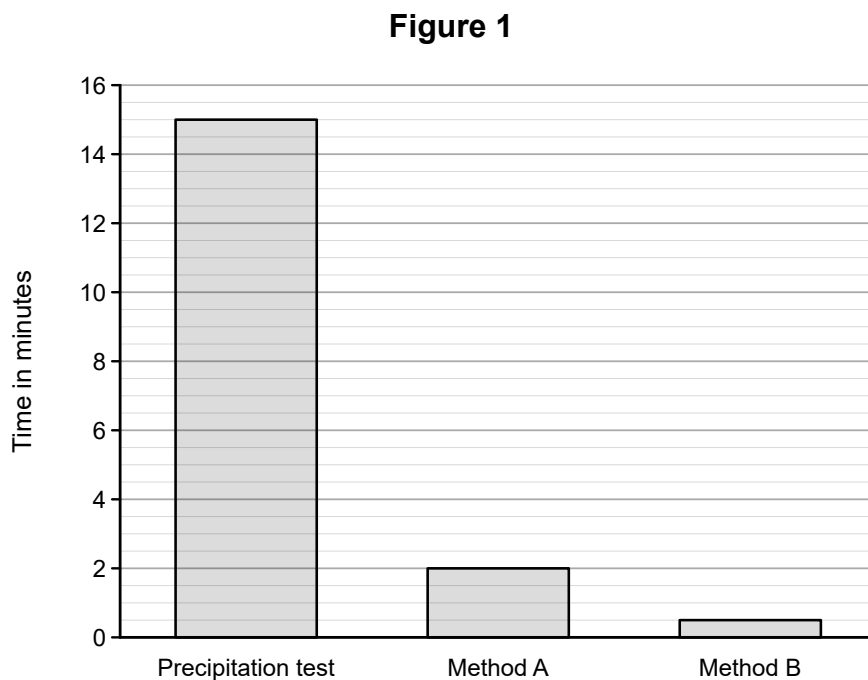
.....

.....

[2 marks]

0 5

Figure 1 shows the time taken to analyse a water sample for a metal ion using three different methods.



0 5 . 1

Use Figure 1 to find how many times faster Method B is than the precipitation test.

.....

.....

.....

.....

Factor =

[2 marks]

0 5 . 2

Suggest **one** reason, other than speed, why a laboratory might still choose the precipitation test for some samples.

.....

.....

[1 mark]

0 6

An art historian wants to find out whether a tiny flake of paint from an old painting contains lead compounds, without damaging the painting.

0 6 . 1

Explain why an instrumental method would be more suitable than a chemical precipitation test for this investigation.

[2 marks]

0 6 . 2

Suggest **one** other advantage of using an instrumental method in this situation, other than sensitivity.

[1 mark]

0 7

A water company tests 2000 samples of drinking water each day for harmful metal ions. The company uses instrumental methods rather than chemical tests.

0 7 . 1

Suggest **two** reasons why the company uses instrumental methods.

[2 marks]

0 7 . 2

Suggest **one** disadvantage of instrumental methods.

[1 mark]

0 7 . 3

Lead ions are harmful even at very low concentrations.

Explain why a precipitation test would **not** be suitable for checking that drinking water is safe.

[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: Instrumental methods · 23 marks

Question 1 (3 marks)

01.1 [2 marks]

- accurate (1)
- sensitive (can detect very small amounts) (1)
- rapid / fast (1)

Any 2 of the points above.

01.2 [1 mark]

- the equipment is expensive / needs trained operators / must be calibrated using reference samples (1)
-

Question 2 (2 marks)

02.1 [1 mark]

Correct: It gives fast, accurate results

02.2 [1 mark]

- flame emission spectroscopy (allow: atomic absorption spectroscopy) (1)
-

Question 3 (3 marks)

03.1 [2 marks]

Correct: They are accurate; They are rapid

03.2 [1 mark]

- can detect very small amounts / very low concentrations of a substance (1)
-

Question 4 (4 marks)

04.1 [1 mark]

Answer: 0.001 mg/dm³

- 0.001 (mg/dm³) (1)

04.2 [1 mark]

- the smallest change in the quantity being measured that gives a change in the reading / that the instrument can show (1)

04.3 [2 marks]

- toxic metal ions can be harmful even at very low concentrations (1)
- a sensitive method can detect (and measure) very small amounts of metal ions that a chemical test would miss, so contamination can be found before it reaches a dangerous level (1)

Question 5 (3 marks)

05.1 [2 marks]

Answer: 30

- $15 \div 0.5$ (1)
- 30 (1)

05.2 [1 mark]

- it is cheaper and needs no expensive equipment or specialist training, which may be good enough when high sensitivity or speed is not essential (1)

Question 6 (3 marks)

06.1 [2 marks]

- only a tiny sample / flake is available, and instrumental methods are far more sensitive, so they can detect metal ions in a very small sample (1)
- a chemical test would need a larger sample and might not give a clearly visible result with such a small amount (1)

06.2 [1 mark]

- it is rapid, so results are obtained quickly (allow: it can give a precise, quantitative result rather than just a yes/no observation) (1)
-

Question 7 (5 marks)

07.1 [2 marks]

- rapid / quick so many samples can be tested each day (1)
- sensitive / can detect very low concentrations of metal ions (1)
- accurate (results are reliable) (1)
- can be automated / need fewer staff (1)

Any 2 of the points above.

07.2 [1 mark]

- the equipment is expensive / needs trained operators / must be calibrated using reference samples (1)

07.3 [2 marks]

- the concentration of lead ions may be too low to form a visible precipitate / the test is not sensitive enough (1)
 - so a harmful concentration could go undetected / the test does not measure the concentration (1)
-