

GCSE Combined Science: Trilogy

Worksheet: Pure substances

TIME 30 min	TOTAL 28 marks	CALCULATOR Allowed	DIFFICULTY Easy, Medium
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Topics: Pure substances

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

In chemistry, the word 'pure' has a special meaning.

0 1 . 1

Which substance is pure in the chemical sense?

Tick (✓) **one** box.

Air

☐

Copper

☐

Fresh orange juice with nothing added

☐

Steel

☐

[1 mark]

0 1 . 2

What is meant by a pure substance in chemistry?

.....

.....

[1 mark]

0 1 . 3

A carton of milk is labelled 'pure milk'.

Explain why the milk is described as pure in everyday language but is **not** pure in the chemical sense.

[2 marks]

0 2

0 2 . 1

A sample of a solid substance melts gradually over a range of temperature from 61 °C to 74 °C.

What does this suggest about the sample?

Tick (✓) **one** box.

It is a pure compound

☐

It is a pure element

☐

It is a mixture

☐

It has a very high boiling point

☐

[1 mark]

0 2 . 2

Give **one** reason for your answer.

[1 mark]

0 3

0 3 . 1

Describe how a student could measure the melting point of a small sample of a solid in the laboratory.

.....

.....

.....

.....

[2 marks]

0 3 . 2

Suggest why only a small amount of solid is used.

.....

.....

[1 mark]

0 4

A student measured the melting points of four solid samples, A, B, C and D.
Table 1 shows the results.

Table 1

Sample	Temperature when melting started in °C	Temperature when melting finished in °C
A	122	122
B	108	116
C	80	80
D	132	139

0 4 . 1

Which **two** samples are most likely to be pure substances?
Give a reason for your answer.

.....

.....

.....

.....

[2 marks]

0 4 . 2

Sample B is benzoic acid that contains an impurity.
Pure benzoic acid melts at 122 °C.
Give **two** ways in which the melting of sample B is different from the melting of pure benzoic acid.

.....

.....

.....

.....

[2 marks]

0 4 . 3

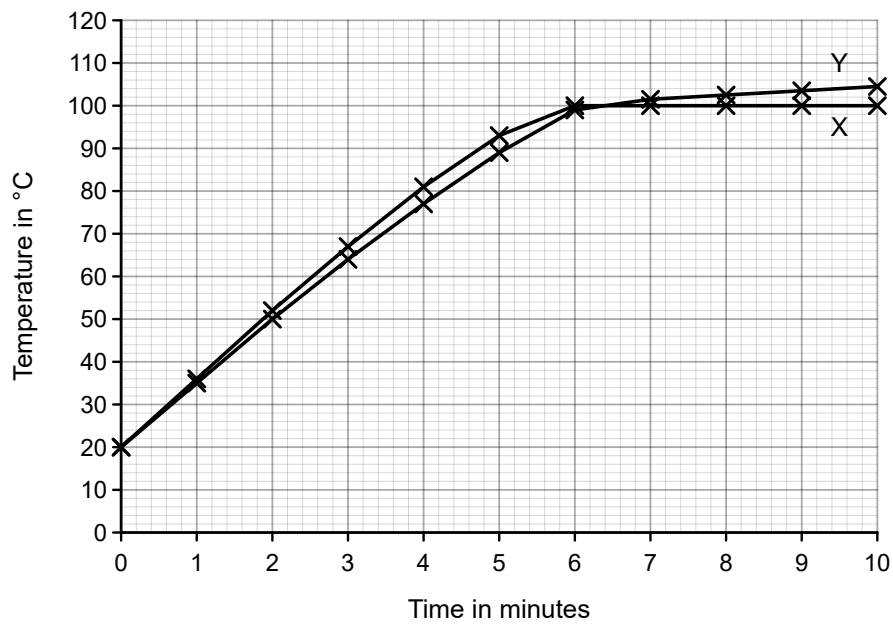
A student said:
'Sample D is the purest sample because it melts at the highest temperatures.'
Explain why the student is wrong.

[1 mark]

0 5

A student heated two colourless liquids, X and Y, and recorded the temperature every minute until both liquids had been boiling for several minutes.
Figure 1 shows the results.

Figure 1



0 5 . 1

Give the boiling point of liquid X.

Boiling point = °C

[1 mark]

0 5 . 2

Liquid X is pure water.
Explain how Figure 1 shows this.

.....

.....

.....

.....

[2 marks]

0 5 . 3

Liquid Y is a solution of sodium chloride in water.
Explain how Figure 1 shows that liquid Y is **not** pure.

.....

.....

.....

.....

[2 marks]

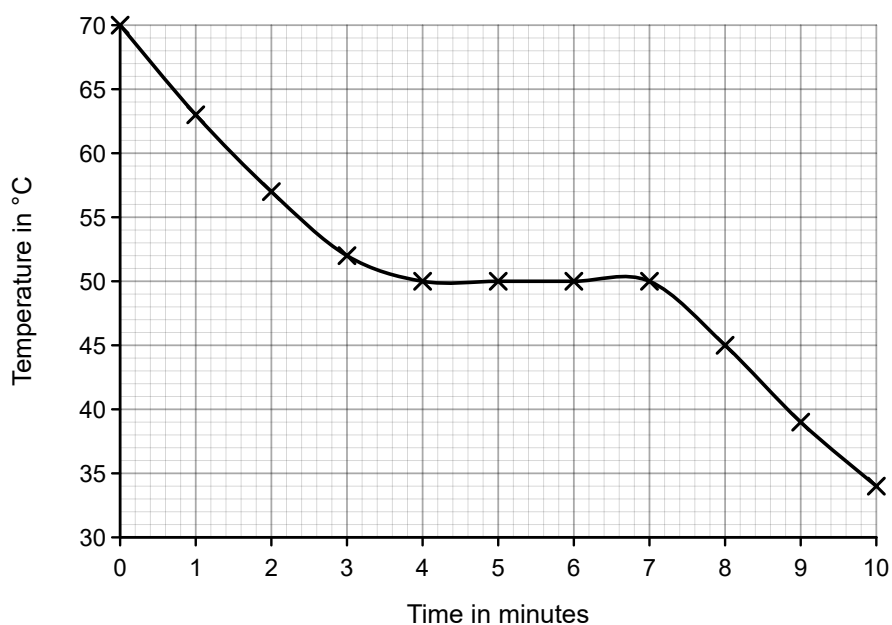
.....

0 6

A student melted a solid, P, and then let it cool. The student recorded the temperature every minute as it cooled.

Figure 2 shows the results.

Figure 2



0 6 . 1

Use Figure 2 to find the melting point of P.

.....

.....

.....

Melting point = °C

[1 mark]

0 6 . 2

Explain why the temperature of P stayed constant between 4 and 7 minutes.

.....

.....

.....

.....

[2 marks]

0 6 . 3

A second student cooled an impure sample of P.
Describe how the cooling curve for the impure sample would differ from Figure 2.

.....

.....

.....

.....

[2 marks]

0 7

Table 2 shows the melting ranges of four samples of the same drug.

Table 2

Sample	Melting range in °C
1	116–120
2	108–120
3	120–121
4	113–119

0 7 . 1

Calculate the width of the melting range of sample 2.

.....

.....

.....

Range = °C

[1 mark]

0 7 . 2

Which sample is the purest?
Give a reason for your answer.

.....

.....

.....

.....

[2 marks]

0 7 . 3

The pure drug melts at 121 °C.
Suggest why sample 3 melts over a small range, rather than sharply at 121 °C.

.....

.....

[1 mark]

END OF QUESTIONS

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

Mark scheme

GCSE Combined Science: Trilogy · Worksheet: Pure substances · 28 marks

Question 1 (4 marks)

01.1 [1 mark]

Correct: Copper

01.2 [1 mark]

- a single element or (a single) compound (not mixed with any other substance) (1)

Notes: Allow 'contains only one substance'. Do not accept 'has nothing added to it'.

01.3 [2 marks]

- (in everyday language pure means) nothing has been added / it is in its natural state (1)
 - (in chemistry) milk is a mixture / milk contains different substances (e.g. water, fats, proteins) (1)
-
-

Question 2 (2 marks)

02.1 [1 mark]

Correct: It is a mixture

02.2 [1 mark]

- a pure substance melts at a single, sharp temperature (not over a range) (1)
-

Question 3 (3 marks)

03.1 [2 marks]

- put a small amount of the solid in a melting point tube (a thin capillary tube) attached to a thermometer, or in an electric melting point apparatus (1)
- heat slowly and record the temperature at which the solid starts to melt and the temperature at which it has completely melted (1)

Notes: Allow other valid methods, e.g. heating the solid slowly in a boiling tube in a water or oil bath, with a thermometer in the solid, and recording the temperatures over which it melts.

03.2 [1 mark]

- a small sample heats through evenly and quickly, so the temperatures at which it starts and finishes melting can be measured precisely (1)

Question 4 (5 marks)

04.1 [2 marks]

Answer: A and C: they melt at a specific temperature

- A and C (1)
- they melt at a specific / single temperature (1)

Notes: Both letters are needed for the first mark. Allow 'sharp melting point' or 'do not melt over a range of temperatures'.

04.2 [2 marks]

- B melts at a lower temperature (than 122 °C) / B starts to melt at 108 °C (1)
- B melts over a range of temperatures / from 108 °C to 116 °C (1)

04.3 [1 mark]

- D melts over a range of temperatures (132–139 °C) so it is a mixture / impure (a pure substance melts at a specific temperature, whatever that temperature is) (1)
-

Question 5 (5 marks)

05.1 [1 mark]

Answer: 100 °C

- 100 (°C) (1)

05.2 [2 marks]

- the temperature stays constant while X boils / X boils at a fixed temperature (1)
- (X boils) at 100 °C, the boiling point of (pure) water (1)

05.3 [2 marks]

- Y boils above 100 °C / at a higher temperature than pure water (1)
- the temperature of Y keeps rising while it boils / Y does not boil at a fixed temperature (1)

Question 6 (5 marks)

06.1 [1 mark]

Answer: 50 °C

- 50 (°C) (1)

Notes: Allow 49–51.

06.2 [2 marks]

- P is freezing (changing from a liquid to a solid) (1)
- energy is released as P freezes, which balances the energy P transfers to the surroundings, so there is no overall change in temperature (1)

06.3 [2 marks]

- the temperature would not stay constant / there would be no flat plateau while freezing (1)
 - freezing would start below 50 °C and continue over a range of temperatures (1)
-

Question 7 (4 marks)

07.1 [1 mark]

Answer: 12 °C

- 12 (°C) (1)

07.2 [2 marks]

Answer: Sample 3

- sample 3 (1)
- it has the narrowest melting range / melts closest to a single, sharp temperature (1)

07.3 [1 mark]

- sample 3 still contains a very small amount of impurity, which makes it start to melt slightly below 121 °C (1)

Notes: Allow: the temperature rises slightly while the sample is melting / the sample was heated too quickly.
