

**AQA – Energy changes – GCSE 2022 Chemistry**1. **June/2022/Paper\_8462/1F/No.7**

0 7

This question is about small particles.

0 7 . 1

Coarse particles, fine particles and nanoparticles are all small particles.

Which is the largest particle?

**[1 mark]**Tick (✓) **one** box.

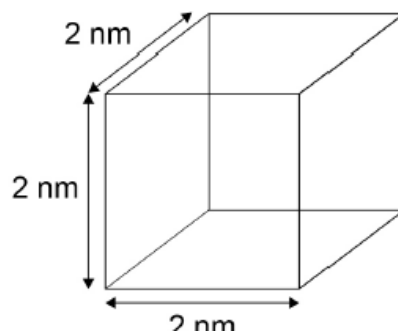
Coarse particle

Fine particle

Nanoparticle

0 7 . 2

Figure 12 shows a cubic nanoparticle.

**Figure 12**

The surface area of the cubic nanoparticle is  $24 \text{ nm}^2$ .

Calculate:

- the volume of the cubic nanoparticle
- the simplest surface area : volume ratio of the cubic nanoparticle.

**[4 marks]**

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Volume = \_\_\_\_\_  $\text{nm}^3$

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Simplest surface area : volume ratio = \_\_\_\_\_ : 1

07.3

Catalysts made of nanoparticles are often more effective than catalysts made of normal sized particles.

Complete the sentences.

[2 marks]

Compared with normal sized particles, the surface area to volume ratio of

nanoparticles is \_\_\_\_\_.

This means that the mass of a nanoparticle catalyst needed to have the same effect

as the same catalyst made of normal sized particles is \_\_\_\_\_.

07.4

Silver nanoparticles can be added to the material used to make socks.

Some facts about silver and bacteria are:

- silver nanoparticles are small enough to be breathed in
- silver is very expensive
- silver can kill bacteria
- bacteria can cause infections
- bacteria can break down sweat to produce unpleasant smells.

Suggest **one** advantage and **one** disadvantage of wearing socks containing silver nanoparticles.

[2 marks]

Advantage \_\_\_\_\_

\_\_\_\_\_

Disadvantage \_\_\_\_\_

\_\_\_\_\_

0 7 . 5 An atom has a radius of  $1 \times 10^{-10}$  m.

A spherical nanoparticle has a radius of  $1 \times 10^{-8}$  m.

How many times larger is the radius of the nanoparticle than the radius of the atom?

[1 mark]

Tick (✓) **one** box.

2 times

10 times

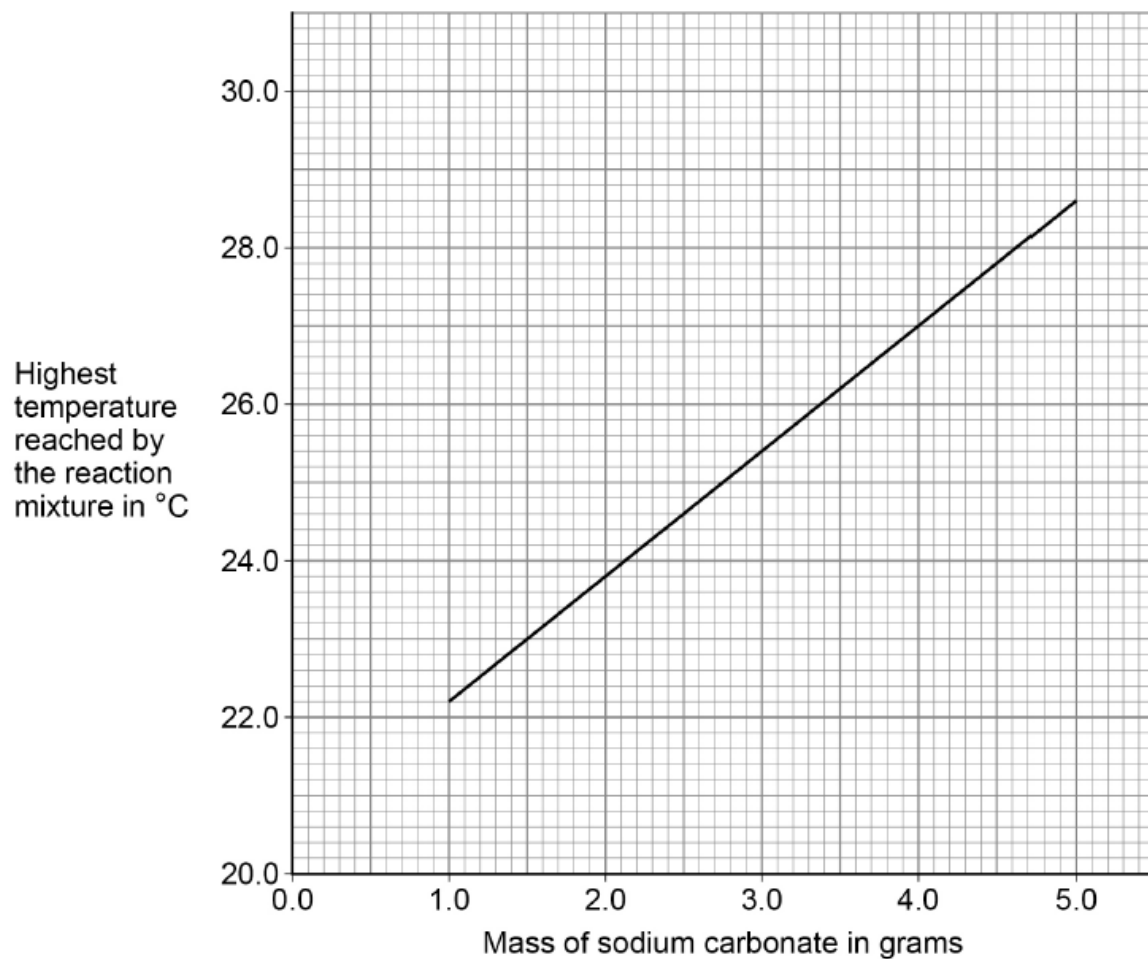
100 times

200 times



Figure 17 shows a line of best fit drawn through the student's results.

Figure 17



1 0 . 2 Determine the gradient of the line of best fit in **Figure 17**.

Use the equation:

$$\text{Gradient} = \frac{\text{Change in highest temperature}}{\text{Change in mass}}$$

Give the unit.

[5 marks]

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Gradient = \_\_\_\_\_ Unit \_\_\_\_\_

1 0 . 3 The initial temperature of the reaction mixture is where the line of best fit would meet the *y*-axis.

Determine the initial temperature of the reaction mixture.

Show your working on **Figure 17**.

[2 marks]

Initial temperature of the reaction mixture = \_\_\_\_\_ °C

1 0 . 4

Another student repeated the investigation but added sodium carbonate until the sodium carbonate was in excess.

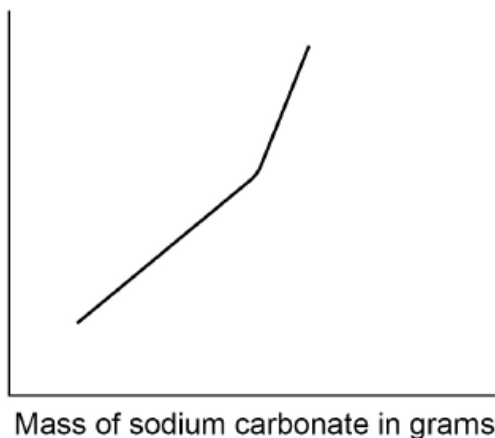
Which sketch graph shows the results obtained when sodium carbonate was added until in excess?

[1 mark]

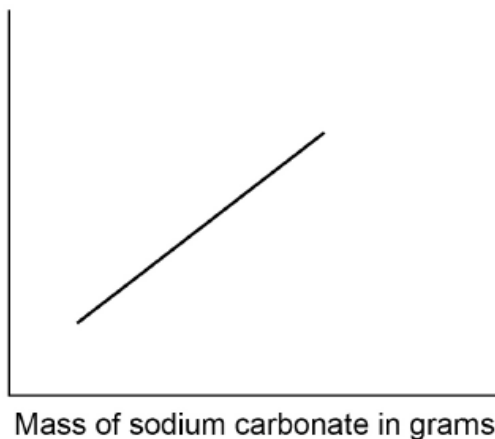
Tick (✓) **one** box.

**A**

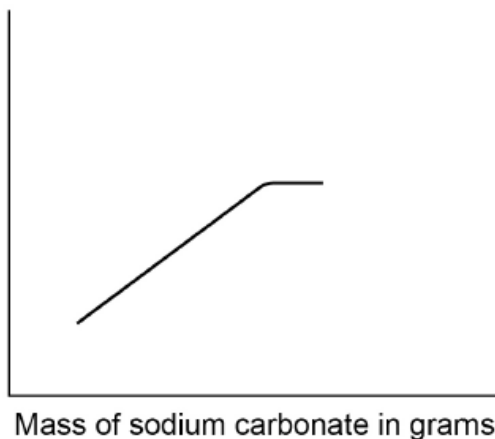
Highest temperature reached by the reaction mixture in °C

**B**

Highest temperature reached by the reaction mixture in °C

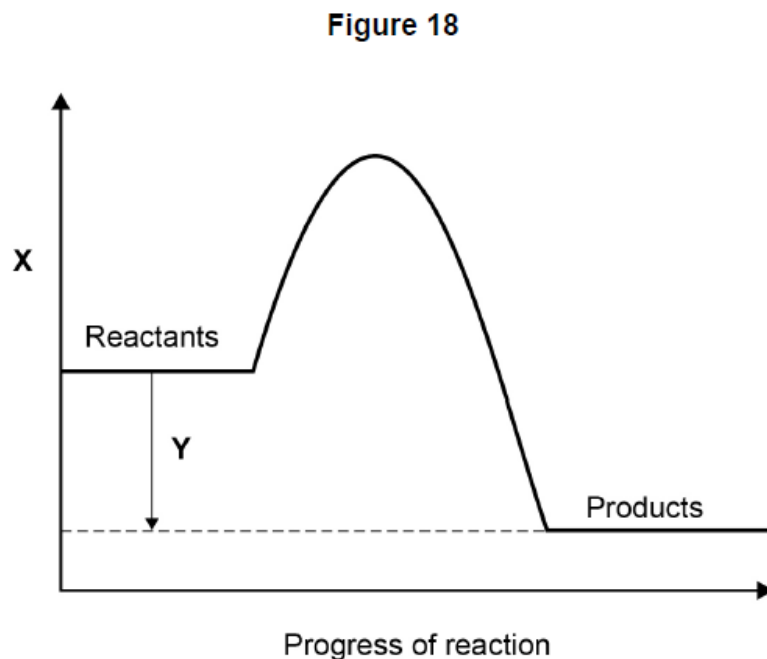
**C**

Highest temperature reached by the reaction mixture in °C





**Figure 18** shows a reaction profile for the reaction of sodium carbonate with hydrochloric acid.



1 0 . 5 What do labels **X** and **Y** represent on **Figure 18**?

[2 marks]

**X** \_\_\_\_\_

**Y** \_\_\_\_\_

1 0 . 6 How does the reaction profile show that the reaction is exothermic?

Use **Figure 18**.

[1 mark]

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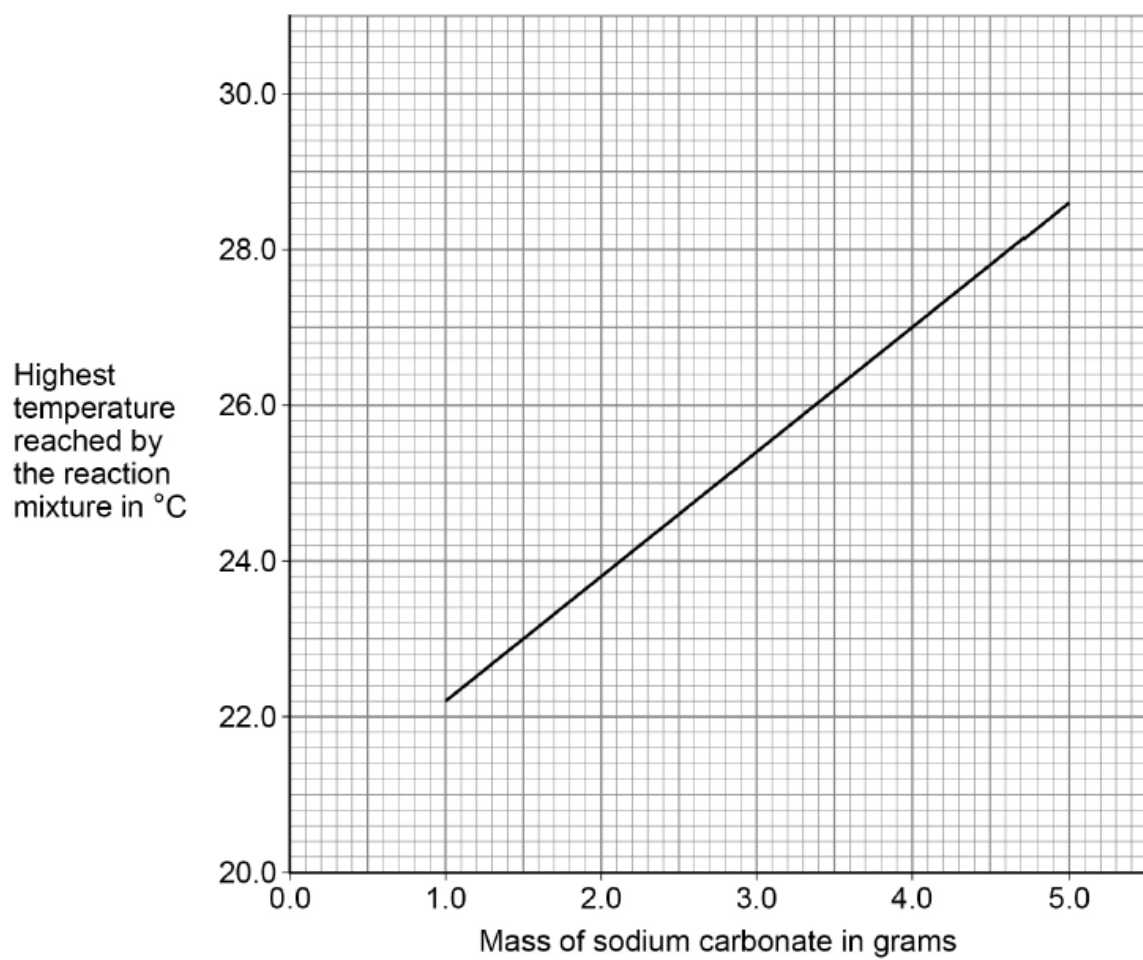


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Figure 3 shows a line of best fit drawn through the student's results.

Figure 3



0 2 . 2 Determine the gradient of the line of best fit in **Figure 3**.

Use the equation:

$$\text{Gradient} = \frac{\text{Change in highest temperature}}{\text{Change in mass}}$$

Give the unit.

[5 marks]

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Gradient = \_\_\_\_\_ Unit \_\_\_\_\_

0 2 . 3 The initial temperature of the reaction mixture is where the line of best fit would meet the y-axis.

Determine the initial temperature of the reaction mixture.

Show your working on **Figure 3**.

[2 marks]

Initial temperature of the reaction mixture = \_\_\_\_\_ °C

0 2 . 4

Another student repeated the investigation but added sodium carbonate until the sodium carbonate was in excess.

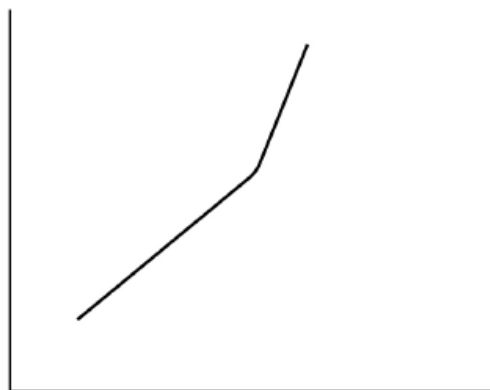
Which sketch graph shows the results obtained when sodium carbonate was added until in excess?

[1 mark]

Tick (✓) one box.

**A**

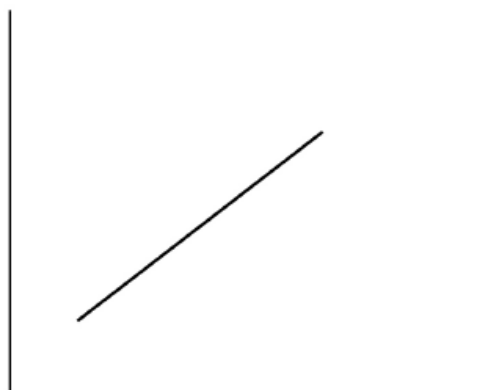
Highest temperature reached by the reaction mixture in °C



Mass of sodium carbonate in grams

**B**

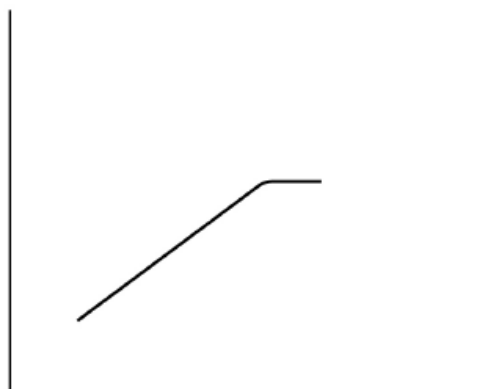
Highest temperature reached by the reaction mixture in °C



Mass of sodium carbonate in grams

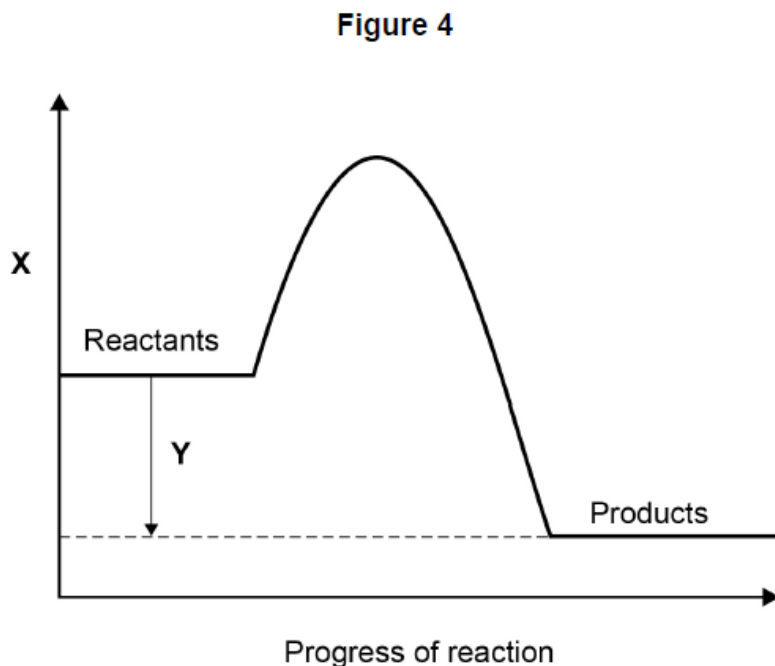
**C**

Highest temperature reached by the reaction mixture in °C



Mass of sodium carbonate in grams

**Figure 4** shows a reaction profile for the reaction of sodium carbonate with hydrochloric acid.



**0 2 . 5** What do labels **X** and **Y** represent on **Figure 4**?

[2 marks]

**X** \_\_\_\_\_

**Y** \_\_\_\_\_

**0 2 . 6** How does the reaction profile show that the reaction is exothermic?

Use **Figure 4**.

[1 mark]

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