0 2 Concrete contains cement, water, sand and small stones.

0 2 . 1 Concrete is a mixture designed as a useful product.

What do we call a mixture which has been designed as a useful product?

[1 mark]

Tick (✓) **one** box.

Finite ☐

Formula ☐

Formulation ☐

Fraction ☐

0 2 . 2 Concrete contains cement.

Cement is made by heating a mixture containing silicon dioxide (SiO_2).

Why does silicon dioxide have a very high melting point?

[2 marks]

Tick (✓) **two** boxes.

It has a giant structure ☐

It has a simple molecular structure ☐

It has strong covalent bonds ☐

It has strong ionic bonds ☐

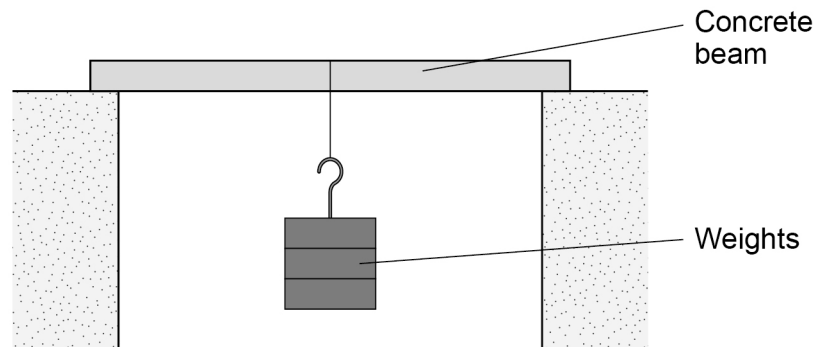It has weak intermolecular forces ☐

Student **A** investigated how the mass of the small stones in concrete affects the strength of a concrete beam. All other variables were kept the same.

The student added weights until the concrete beam broke.

Figure 1 shows the apparatus Student **A** used.

Figure 1

Concrete beam

Weights

| 0 | 2 | . | 3 | Draw **one** line from each type of variable to the correct example of the variable.

[2 marks]

Type of variable **Example of variable**

Length of concrete beam

Control Mass of small stones in concrete

Independent Time taken to add weights

Weight needed to break concrete beam

Turn over ▶

Table 1 shows Student **A**'s results.

Table 1

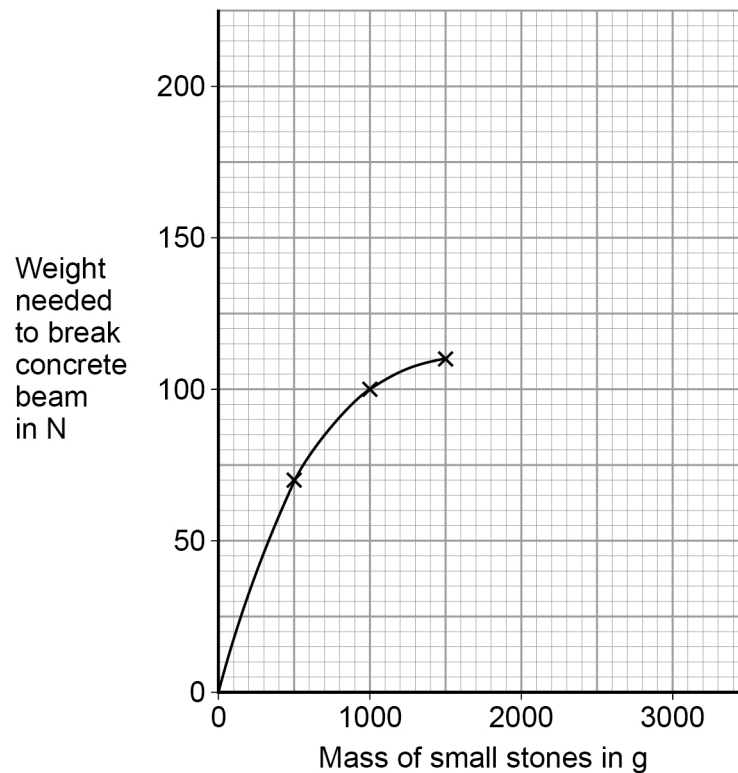| Mass of small stones in grams (g)	Weight needed to break concrete beam in newtons (N)
500	70
1000	100
1500	110
2000	100
2250	85
2500	65
2750	35

0 2 . 4 Plot the data from **Table 1** on **Figure 2**.

The first three points are plotted for you.

Draw the line of best fit.

[3 marks]

Figure 2

IB/M/Jun19/8464/C/2F

0 2 . 5 What mass of small stones would be needed to make the strongest concrete?

Give a reason for your answer.
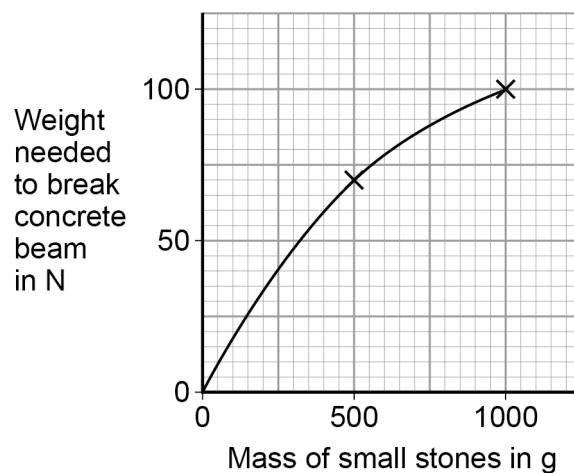
Use **Figure 2**.

[2 marks]

Mass = _____ g

Reason _____

_____

0 2 . 6 Student **B** did a similar investigation.

Figure 3 shows Student **B**'s results.

Figure 3

How could Student **B** improve their investigation?

Use **Figure 2** and **Figure 3**.

[1 mark]

_____

_____

11

Turn over ►

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	formulation		1	AO1 5.8.1.2
02.2	it has a giant structure		1	AO1 5.2.2.6
	it has strong covalent bonds		1	5.2.1.4
02.3			1	AO3
			1	AO2 5.8.1.2
02.4	all points correctly plotted	allow a tolerance of ± ½ a small square allow 1 mark for 3 points correctly plotted	2	AO2.2 5.8.1.2
	line of best fit	allow reasonable attempt at line of best fit using incorrectly plotted points	1	

02.5	1500 (g)	allow range from 1400 (g) to 1600 (g) allow ecf from graph drawn in **Figure 2**	1	AO3 5.8.1.2
	highest point on graph	MP2 dependent on MP1 allow highest / largest / greatest / most weight needed to break concrete. ignore numbers quoted from graph ignore strongest	1	

02.6	take more measurements	allow indication of a greater range of values or allow indication of measurements at smaller intervals ignore repeat the investigation	1	AO3 5.8.1.2

Total			**11**	