# AQA - Changes of state and particle model – GCSE Combined Science Physics

**1.** June/2021/Paper_1F/No.1

**0 1** A student investigated the density of different types of rock.

**Figure 1** shows a piece of limestone.

**Figure 1**

**0 1 . 1** The student was **not** able to calculate the volume of the piece of limestone using measurements taken with a ruler.

What is the reason?

**[1 mark]**

Tick (✓) **one** box.

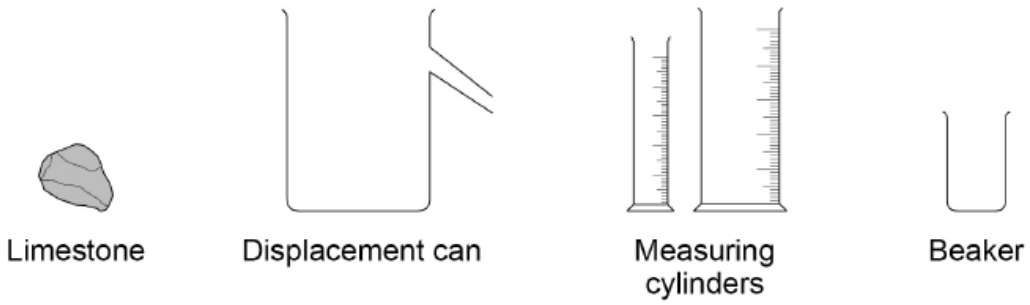
A ruler is not very accurate. ☐

The piece of limestone has an irregular shape. ☐

There is a large uncertainty when using a ruler. ☐

**0 1 . 2** **Figure 2** shows some of the equipment given to the student.

**Figure 2**




Describe a method the student could use to determine the volume of the piece of limestone.

**[4 marks]**

**0 1 . 3** The mass of the piece of limestone was 155 g.

The volume of the piece of limestone was 62 $cm^3$.

Calculate the density of the piece of limestone.

Use the equation:

$$\text{density} = \frac{\text{mass}}{\text{volume}}$$

**[2 marks]**

Density = _____ $g/cm^3$

**0 1 . 4** Density can be measured in $g/cm^3$.

What is another unit for density?

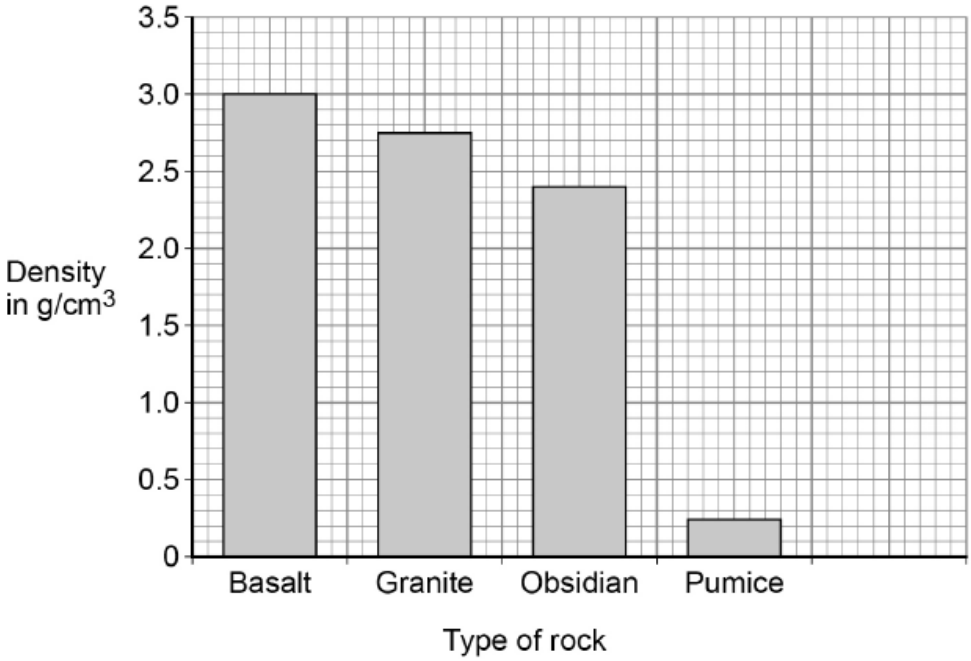
**[1 mark]**

Tick (✓) **one** box.

- $cm/g^3$ ☐
- $kg/m^3$ ☐
- $kg^3/m$ ☐
- $kg^3/cm$ ☐

**Figure 3** gives the density of some other types of rock.

**Figure 3**




The student has a sample of an unknown type of rock.

The density of this rock is 2.4 g/cm$^3$.

**0 1 . 5** Draw a bar on **Figure 3** to show the density of the unknown type of rock.

**[1 mark]**

**0 1 . 6** Complete the sentence.

Choose the answer from the box.

**[1 mark]**

| | | | |
|---|---|---|---|
| **basalt** | **granite** | **obsidian** | **pumice** |

The data in **Figure 3** suggests that the unknown type of rock is _____ .

**0 1 . 7** The student **cannot** be certain that the unknown type of rock is one of the types of rock in **Figure 3**.

Give a reason why.

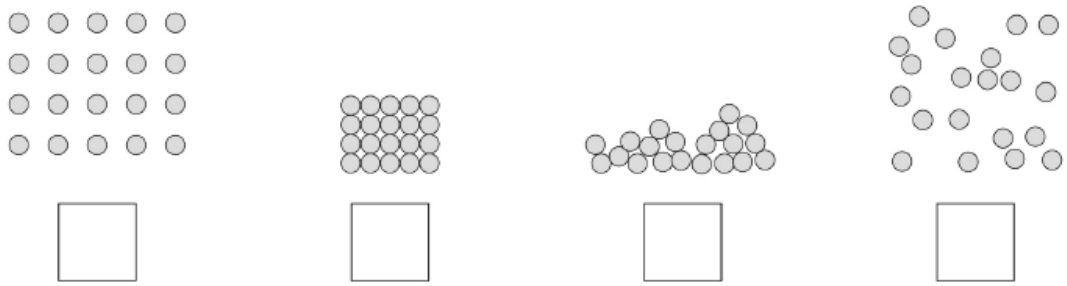
**[1 mark]**

Pumice is a type of rock that has holes in it. The holes contain air.

**0 1 . 8** Which diagram shows the arrangement of particles in air?

**[1 mark]**

Tick (✓) **one** box.



**0 1 . 9** Complete the sentence.

Choose the answer from the box.

**[1 mark]**

| less than | the same as | more than |
|---|---|---|

The holes containing air cause the density of pumice to

be _____ the density of other types of rock.

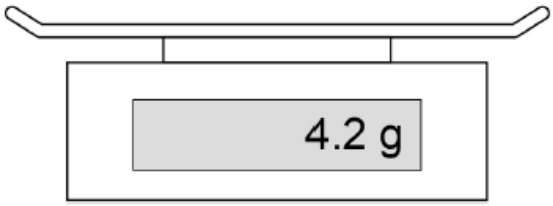
**2.** June/2021/Paper_1H/No.4

**0 4** A student determined the density of a cube made of bronze.

The student used a balance to measure the mass of the bronze cube.

**Figure 5** shows the balance before the cube was added.

**Figure 5**




**0 4 . 1** What type of error is shown on the balance?

**[1 mark]**

**0 4 . 2** How could the student get a correct value for the mass of the cube from the balance?

**[1 mark]**

**0 4 . 3** The student measured the length of the bronze cube using Vernier callipers and then using a micrometer.

**Table 1** shows the results.

**Table 1**

| Equipment | Length in mm |
|---|---|
| Vernier callipers | 20.1 |
| Micrometer | 20.14 |

Complete the sentence.

**[1 mark]**

The results in **Table 1** show that the Vernier callipers and the micrometer have

a different _____ .

The student wanted to determine the density of a bronze coin.

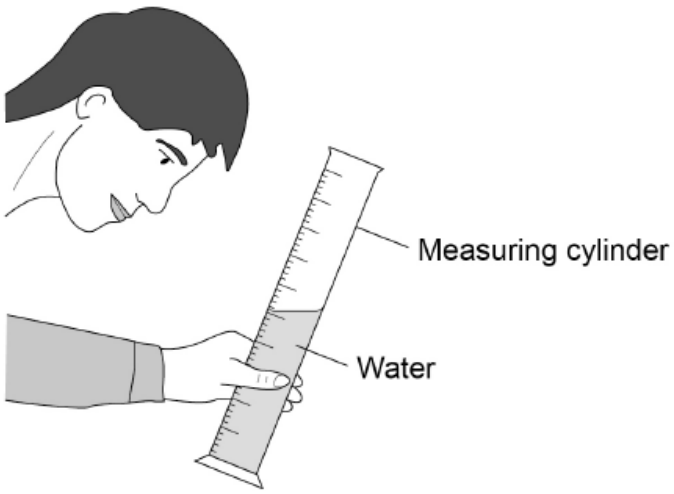
The student had several identical coins.

The volume of each coin was very small.

**0 4 . 4** The student added water to a measuring cylinder.

**Figure 6** shows the student reading the volume of water in the measuring cylinder.

**Figure 6**




Give **two** changes the student should make to increase the accuracy of the volume measurement.

**[2 marks]**

1 _____

_____

2 _____

_____

**0 4 . 5** Describe how the student could use a displacement method to determine an accurate value for the volume of a single coin.

**[3 marks]**

**0 4 . 6** Old penny coins were made from a disc of bronze.

New penny coins are made from a disc of a different metal.

**Figure 7** shows a disc of metal.

**Figure 7**

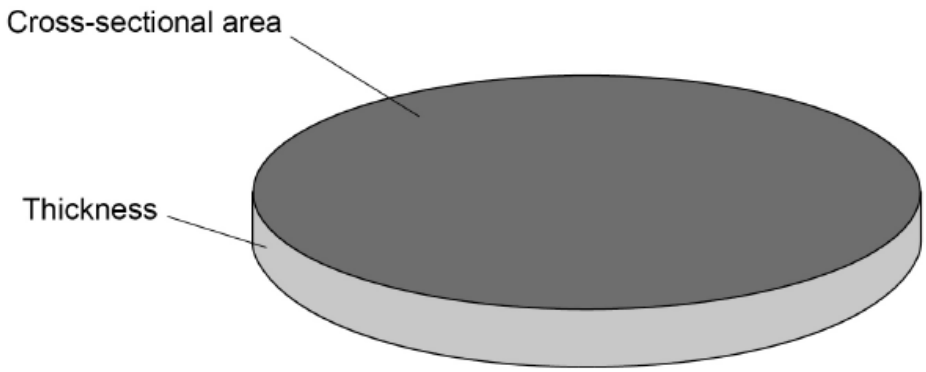



**Table 2** shows information about the discs used to make each coin.

**Table 2**

| Disc | Mass in g | Density in g/cm$^3$ | Thickness in cm |
|---|---|---|---|
| Old penny | 3.6 | 8.9 | 0.16 |
| New penny | 3.6 | **X** | 0.17 |

The discs used to make the old and the new coins have the **same** cross-sectional area.

Calculate value **X** in **Table 2**.

Give your answer to 2 significant figures.

The volume of a disc can be calculated using the equation:

volume of a disc = cross-sectional area × thickness

**[5 marks]**

Density (2 significant figures) = _____ g/cm$^3$