

Q1.(2018)

a)

A student wanted to determine the density of a small piece of rock.

Describe how the student could measure the volume of the piece of rock.

**[4 marks]**

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b)

The volume of the piece of rock was  $18.0 \text{ cm}^3$ .

The student measured the mass of the piece of rock as 48.6 g.

Calculate the density of the rock in  $\text{g/cm}^3$ .

Use the equation:

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

**[2 marks]**

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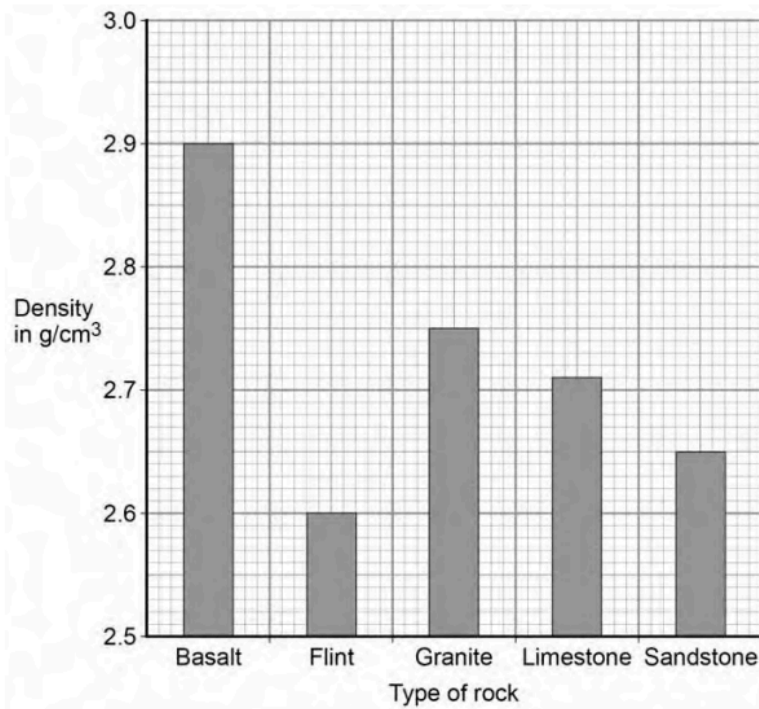
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Density = \_\_\_\_\_  $\text{g/cm}^3$

c)

**Figure 4** shows the densities of different types of rock.

**Figure 4**



What is the most likely type of rock that the student had?

Tick **one** box.

**[1 mark]**

|           |                          |
|-----------|--------------------------|
| Basalt    | <input type="checkbox"/> |
| Flint     | <input type="checkbox"/> |
| Granite   | <input type="checkbox"/> |
| Limestone | <input type="checkbox"/> |
| Sandstone | <input type="checkbox"/> |

d)

Give **one** source of error that may have occurred when the student measured the volume of the rock.

[1 mark]

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e)

How would the error you described in question 04.4 affect the measured volume of the rock?

[1 mark]

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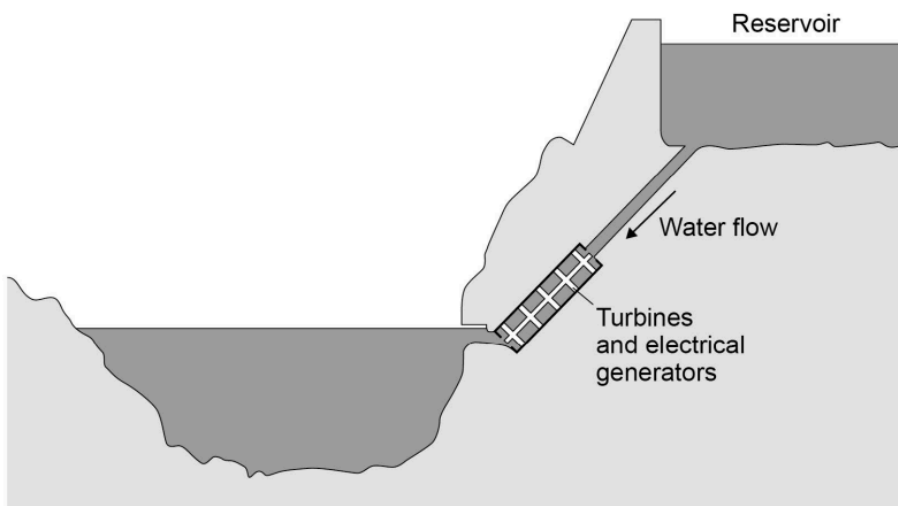
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Q2.(2020)

a)

**Figure 14** shows a hydroelectric power station.

**Figure 14**



Electricity is generated when water from the reservoir flows through the turbines.

Write down the equation which links density ( $\rho$ ), mass ( $m$ ) and volume ( $V$ ).

[1 mark]

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b)

The reservoir stores  $6\,500\,000\text{ m}^3$  of water.

The density of the water is  $998\text{ kg/m}^3$ .

Calculate the mass of water in the reservoir.

Give your answer in standard form.

**[4 marks]**

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Mass (in standard form) = \_\_\_\_\_ kg

c)

Write down the equation which links energy transferred ( $E$ ), power ( $P$ ) and time ( $t$ ).

**[1 mark]**

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d)

The electrical generators can provide  $1.5 \times 10^9\text{ W}$  of power for a maximum of 5 hours.

Calculate the maximum energy that can be transferred by the electrical generators.

**[3 marks]**

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Energy transferred = \_\_\_\_\_ J

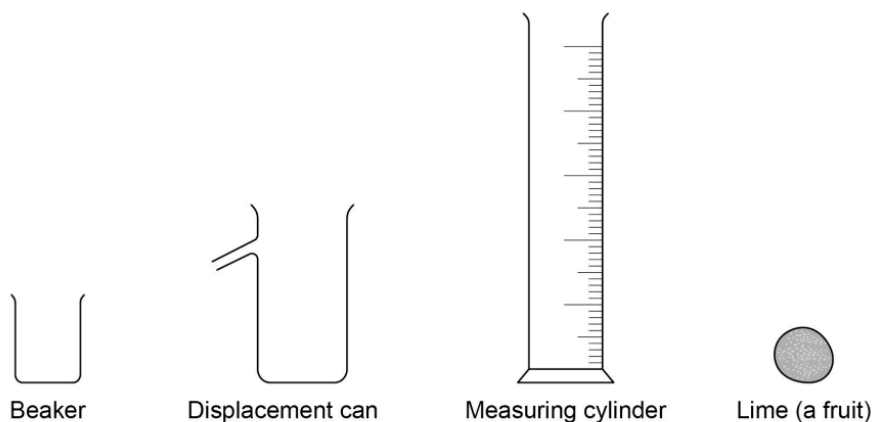
Q3.(2021)

a)

A student investigated the density of different fruits.

To determine the density of each fruit, the student measured the volume of each fruit.

**Figure 3** shows the equipment the student could have used.

**Figure 3**

Describe a method the student could have used to measure the volume of the lime.

**[4 marks]**

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b)

The student measured the volume of each fruit three times and then calculated a mean value.

The three measurements for a grape were

2.1 cm<sup>3</sup>    2.1 cm<sup>3</sup>    2.4 cm<sup>3</sup>

Calculate the mean value.

**[2 marks]**

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Mean value = \_\_\_\_\_ cm<sup>3</sup>

c)

What are the advantages of taking three measurements and calculating a mean value?

[2 marks]

Tick (✓) **two** boxes.

Allows anomalous results to be identified and ignored.

☐

Improves the resolution of the volume measurement.

☐

Increases the precision of the measured volumes.

☐

Reduces the effect of random errors when using the equipment.

☐

Stops all types of error when using the equipment.

☐

d)

The mass of an apple was 84.0 g.

The volume of the apple was 120 cm<sup>3</sup>.

Calculate the density of the apple.

Give your answer in g/cm<sup>3</sup>.

Use the equation:

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

[2 marks]

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Density = \_\_\_\_\_ g/cm<sup>3</sup>

Q4.(2022)

a)

**Figure 14** shows a rock found by a student on a beach.

To help identify the type of rock, the student took measurements to determine its density.

**Figure 14**



Describe a method the student could use to determine the density of the rock.

**[6 marks]**

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b)

The student determined the density of the rock to be  $2.55 \pm 0.10 \text{ g/cm}^3$ .

What are the maximum and minimum values for the density of the rock?

**[1 mark]**

Maximum density = \_\_\_\_\_  $\text{g/cm}^3$

Minimum density = \_\_\_\_\_  $\text{g/cm}^3$

c)

**Table 3** gives the density of five different types of rock.

**Table 3**

| Type of rock | Density in g/cm <sup>3</sup> |
|--------------|------------------------------|
| Basalt       | $2.90 \pm 0.10$              |
| Chalk        | $2.35 \pm 0.15$              |
| Flint        | $2.60 \pm 0.10$              |
| Sandstone    | $2.20 \pm 0.20$              |
| Slate        | $2.90 \pm 0.20$              |

Which two types of rock in **Table 3** could be the type of rock the student had?

**[1 mark]**

Tick (✓) **one** box.

Basalt or chalk

☐

Chalk or flint

☐

Flint or sandstone

☐

Sandstone or slate

☐

d)

The student only took one set of measurements to determine the density of the rock.

Explain why taking the measurements more than once may improve the accuracy of the density value.

**[2 marks]**

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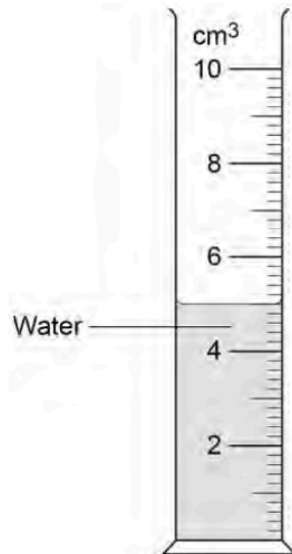
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Q5.(2024)

a)

**Figure 8** shows a measuring cylinder containing some water.

**Figure 8**



What range of volumes can be measured using the measuring cylinder?

**[1 mark]**

Tick (✓) **one** box.

0.0 to 0.2  $\text{cm}^3$

☐

0.0 to 2.0  $\text{cm}^3$

☐

0.0 to 10.0  $\text{cm}^3$

☐

b)

A student used the measuring cylinder to measure the volume of a metal ring.

The student tied the metal ring to some very thin string and lowered the ring into the measuring cylinder.

The student could have used thick string instead of thin string.

How would using thick string have affected the measured volume of the metal ring?

[1 mark]

Tick (✓) **one** box.

The measured volume would be smaller.

☐

The measured volume would not be affected.

☐

The measured volume would be larger.

☐

c)

**Table 1** shows the results.

**Table 1**

| Volume of water<br>in cm <sup>3</sup> | Volume of water and ring<br>in cm <sup>3</sup> | Volume of ring<br>in cm <sup>3</sup> |
|---------------------------------------|------------------------------------------------|--------------------------------------|
| 5.0                                   | 5.4                                            | <b>X</b>                             |

Calculate value **X** in **Table 1**.

[1 mark]

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**X** = \_\_\_\_\_ cm<sup>3</sup>

d)

The student measured the volume of the ring three times.

The results were all the same.

Which of the following describes the student's results?

[1 mark]

Tick (✓) **one** box.

The results are anomalies.

☐

The results are repeatable.

☐

The results contain random errors.

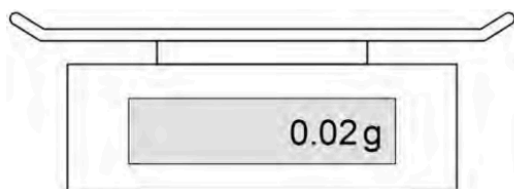
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e)

The student used a balance to measure the mass of the ring.

**Figure 9** shows the balance.

**Figure 9**



The student noticed that the balance had a reading of 0.02 g when there was no object on the balance.

How should the student correct this error **after** the mass of the ring had been measured?

[1 mark]

Tick (✓) **one** box.

Add 0.02 to the measurement

☐

Divide the measurement by 0.02

☐

Multiply the measurement by 0.02

☐

Subtract 0.02 from the measurement

☐

f)

Write down the equation which links density ( $\rho$ ), mass ( $m$ ) and volume ( $V$ ).

**[1 mark]**

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g)

A different metal ring has a volume of  $0.3 \text{ cm}^3$ .

The density of this ring is  $22 \text{ g/cm}^3$ .

Calculate the mass of this ring.

Give your answer in grams.

**[3 marks]**

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Mass = \_\_\_\_\_ g