

Name

Class



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# Density

(9 – 1) Topic booklet

# Higher

These questions have been collated from previous years GCSE Mathematics papers.

**You must have:** Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser.

Total Marks

## Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  - *there may be more space than you need.*
- Diagrams are NOT accurately drawn, unless otherwise indicated.
- You must **show all your working out**.
- If the question is a **1H** question you are not allowed to use a calculator.
- If the question is a **2H** or a **3H** question, you may use a calculator to help you answer.

## Information

- The marks for **each** question are shown in brackets
  - *use this as a guide as to how much time to spend on each question.*

## Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

**Answer ALL questions**  
**Write your answers in the space provided.**  
**You must write down all the stages in your working.**

**3** A gold bar has a mass of 12.5 kg.

The density of gold is  $19.3 \text{ g/cm}^3$

Work out the volume of the gold bar.  
Give your answer correct to 3 significant figures.



.....  $\text{cm}^3$

November 2017 – Paper 3H

**(Total for Question 3 is 3 marks)**

**5** Habib has two identical tins.

He puts 600 grams of flour into one of the tins.

The flour fills the tin completely.

The density of the flour is  $0.6 \text{ g/cm}^3$



Habib puts 600 grams of salt into the other tin.

The salt does **not** fill the tin completely.

The volume of the space in the tin that is **not** filled with salt is  $700 \text{ cm}^3$

Work out the density of the salt.

You must show all your working.

.....  $\text{g/cm}^3$

June 2024 – Paper 3H

**(Total for Question 5 is 4 marks)**

6 The density of apple juice is 1.05 grams per  $\text{cm}^3$ .



The density of fruit syrup is 1.4 grams per  $\text{cm}^3$ .

The density of carbonated water is 0.99 grams per  $\text{cm}^3$ .

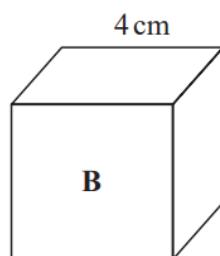
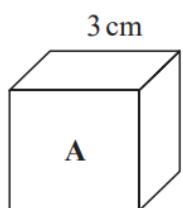
25  $\text{cm}^3$  of apple juice are mixed with 15  $\text{cm}^3$  of fruit syrup and 280  $\text{cm}^3$  of carbonated water to make a drink with a volume of 320  $\text{cm}^3$ .

Work out the density of the drink.

Give your answer correct to 2 decimal places.

..... g/ $\text{cm}^3$

7 Here are two cubes, **A** and **B**.



Cube **A** has a mass of 81 g.

Cube **B** has a mass of 128 g.

Work out

the density of cube **A** : the density of cube **B**

Give your answer in the form  $a : b$ , where  $a$  and  $b$  are integers.

7 Liquid A has a density of  $1.8 \text{ g/cm}^3$   
Liquid B has a density of  $1.2 \text{ g/cm}^3$



$80 \text{ cm}^3$  of liquid A is mixed with  $40 \text{ cm}^3$  of liquid B to make  $120 \text{ cm}^3$  of liquid C.

Work out the density of liquid C.

.....  $\text{g/cm}^3$

8 A solid cuboid is made of metal.

The metal has a density of  $9 \text{ g/cm}^3$   
The volume of the cuboid is  $72 \text{ cm}^3$



Work out the mass of the cuboid.

..... g

12 Zahra mixes 150g of metal A and 150g of metal B to make 300g of an alloy.



Metal A has a density of 19.3 g/cm<sup>3</sup>.

Metal B has a density of 8.9 g/cm<sup>3</sup>.

Work out the density of the alloy.

..... g/cm<sup>3</sup>

Specimen 2 – Paper 3H

**(Total for Question 12 is 4 marks)**

13 Liquid A and liquid B are mixed to make liquid C.

Liquid A has a density of  $70 \text{ kg/m}^3$

Liquid A has a mass of 1400 kg

Liquid B has a density of  $280 \text{ kg/m}^3$

Liquid B has a volume of  $30 \text{ m}^3$

Work out the density of liquid C.

.....  $\text{kg/m}^3$

13 Liquid A and liquid B are mixed together in the ratio 2:13 by volume to make liquid C.



Liquid A has density 1.21 g/cm<sup>3</sup>

Liquid B has density 1.02 g/cm<sup>3</sup>

A cylindrical container is filled completely with liquid C.

The cylinder has radius 3 cm and height 25 cm.

Work out the mass of the liquid in the container.

Give your answer correct to 3 significant figures.

You must show all your working.

..... g

13 The density of ethanol is  $1.09 \text{ g/cm}^3$

The density of propylene is  $0.97 \text{ g/cm}^3$



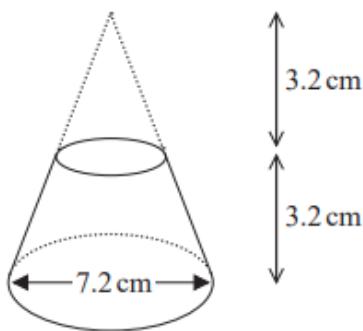
60 litres of ethanol are mixed with 128 litres of propylene to make 188 litres of antifreeze.

Work out the density of the antifreeze.

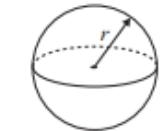
Give your answer correct to 2 decimal places.

.....  $\text{g/cm}^3$

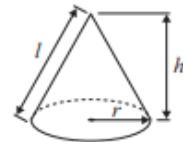
20 Here is a frustum of a cone.



$$\text{Volume of sphere} = \frac{4}{3} \pi r^3$$

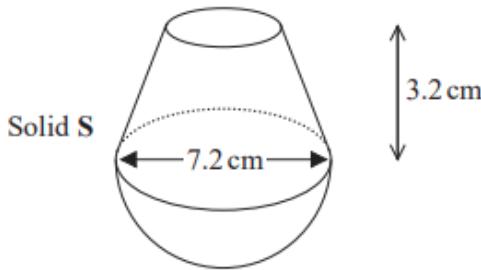


$$\text{Volume of cone} = \frac{1}{3} \pi r^2 h$$



The diagram shows that the frustum is made by removing a cone with height 3.2 cm from a solid cone with height 6.4 cm and base diameter 7.2 cm.

The frustum is joined to a solid hemisphere of diameter 7.2 cm to form the solid S shown below.



The density of the frustum is  $2.4 \text{ g/cm}^3$   
The density of the hemisphere is  $4.8 \text{ g/cm}^3$

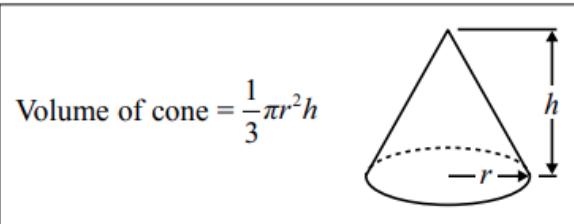
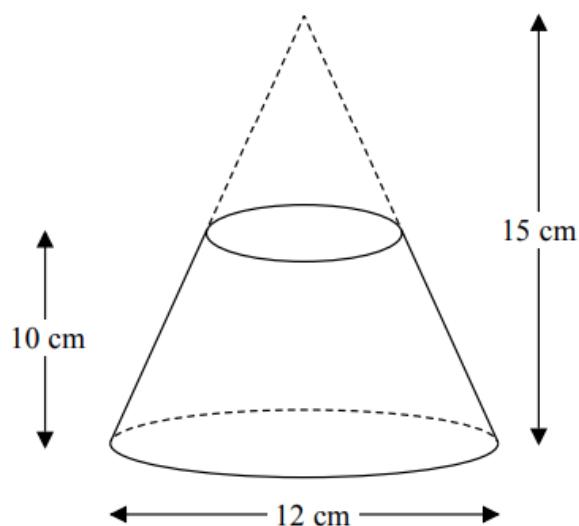
Calculate the average density of solid S.

..... g/cm<sup>3</sup>

November 2018 – Paper 2H

**(Total for Question 20 is 5 marks)**

22 A frustum is made by removing a small cone from a large cone as shown in the diagram.

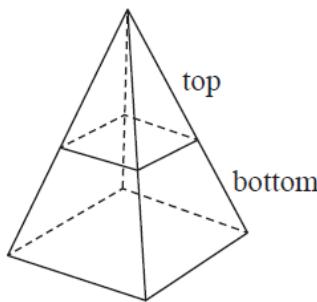


The frustum is made from glass.  
The glass has a density of  $2.5 \text{ g/cm}^3$

Work out the mass of the frustum.  
Give your answer to an appropriate degree of accuracy.

..... g

25 The pyramid **P** is formed from two parts made of different materials.



The top part of **P** has a mass of 92.8 g and is made from material with a density of  $2.9 \text{ g/cm}^3$

The bottom part of **P** has a mass of 972.8 g

The average density of **P** is  $4.7 \text{ g/cm}^3$

Calculate the volume of the top part of **P** as a percentage of the total volume of **P**.

Give your answer correct to 1 decimal place.

You must show all your working.

.....%