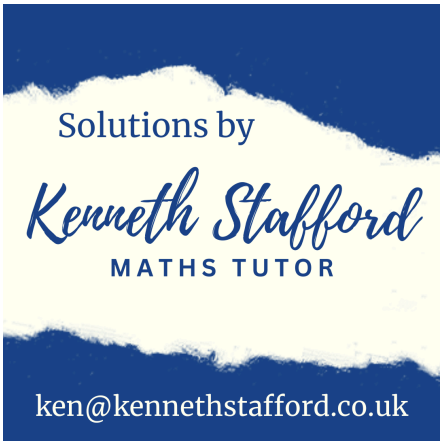
Name: SOLUTIONS

GCSE (1 - 9)

Density (Higher Papers)





These questions represent all of the times that this topic has appeared in unlocked Pearson Edexcel GCSE maths papers as of July 2023. More questions can be found at examq.co.uk

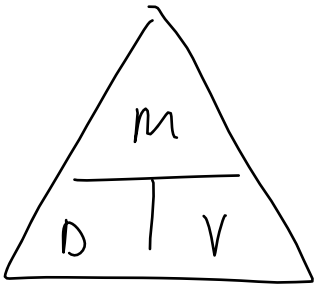
Question	Where the question appeared
1	Edexcel, GCSE, Autumn 2017, Paper 3H, Q3
2	Edexcel, GCSE, Autumn 2018, Paper 2H, Q20
3	Edexcel, GCSE, Autumn 2019, Paper 3H, Q13
4	Edexcel, GCSE, Autumn 2020, Paper 1H, Q13
5	Edexcel, GCSE, Summer 2017, Paper 3H, Q6
6	Edexcel, GCSE, Summer 2018, Paper 2H, Q21
7	Edexcel, GCSE, Summer 2019, Paper 3H, Q13
8	Edexcel, GCSE, Autumn 2021, Paper 2H, Q7
9	Edexcel, GCSE, Summer 2022, Paper 1H, Q7

1

A gold bar has a mass of 12.5 kg. = 12,500g

The density of gold is 19.3 g/cm³

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



Volume = mass / density = 12500 / 19.3 = 647.66

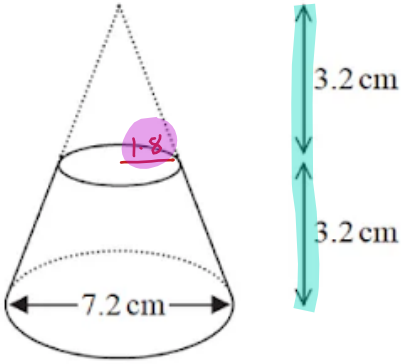
648 cm³

(Total for Question 3 is 3 marks)

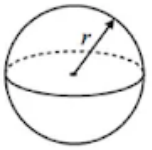
[Edexcel, GCSE, Autumn 2017, Paper 3H, Q3]

2

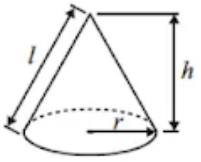
Here is a frustum of a cone.



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

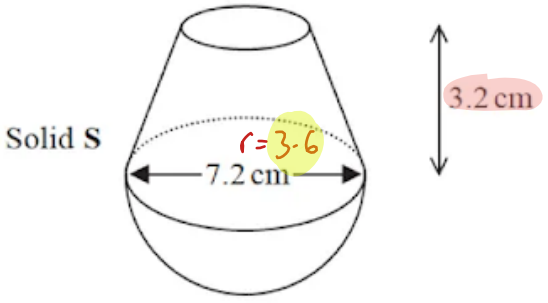


Volume of cone $= \frac{1}{3}\pi r^2 h$



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.



Volume of hemisphere $= \frac{1}{2}\left(\frac{4}{3} \times \pi \times 3.6^3\right) = 97.7$

Mass of hemisphere $= 97.7 \times 4.8 = 469.037$

The density of the frustum is 2.4 g/cm³
The density of the hemisphere is 4.8 g/cm³

Calculate the average density of solid **S**.

Volume of Frustum $= \frac{1}{3}\pi(3.6)^2 \times 6.4 - \frac{1}{3}\pi(1.8)^2 \times 3.2 = 76.00$

Mass of frustum $= 2.4 \times 76.00 = 182.4$

Mass of solid $= 182.4 + 469.037 = 651.4$

Volume of solid $= 76.00 + 97.7 = 173.7$

Density of solid $= 651.4 \div 173.7 = 375$

[3.7 to 3.8]

375 g/cm³

(Total for Question 20 is 5 marks)

[Edexcel, GCSE, Autumn 2018, Paper 2H, Q20]

3

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/cm³
Liquid B has density 1.02 g/cm³

2 + 13 = 15

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.

Volume of cylinder = $\pi r^2 h = \pi \times 3^2 \times 25 = 225\pi = 706.85 cm^3$

$225\pi \div 15 = 15\pi$

Liquid A = $15\pi \times 2 \times 1.21 = 114.04g$

Liquid B = $15\pi \times 13 \times 1.02 = 624.86g$

[738.5 - 739]

Mass of Liquid = 114.04 + 624.86 = 739 ..... g

(Total for Question 13 is 4 marks)

[Edexcel, GCSE, Autumn 2019, Paper 3H, Q13]

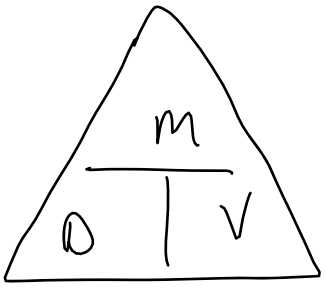
4

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

Liquid **A** has a density of 70 kg/m³
Liquid **A** has a mass of 1400 kg

Liquid **B** has a density of 280 kg/m³
Liquid **B** has a volume of 30 m³

Work out the density of liquid **C**.



	Density	Mass	Volume
A	70	1400	1400 ÷ 70 = 20
B	280	280 x 30 = 8400	30
C	9800 ÷ 50 = 196	1400 + 8400 = 9800	20 + 30 = 50

196 kg/m³

(Total for Question 13 is 3 marks)

[Edexcel, GCSE, Autumn 2020, Paper 1H, Q13]

5

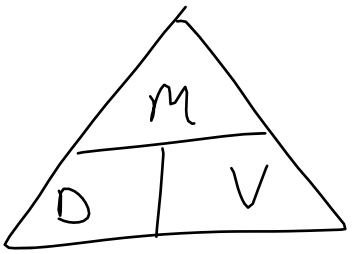
The density of apple juice is 1.05 grams per cm^3.

The density of fruit syrup is 1.4 grams per cm^3.

The density of carbonated water is 0.99 grams per cm^3.

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

Work out the density of the drink.
Give your answer correct to 2 decimal places.



	Density	Mass	Volume
Apple Juice	1.05	1.05 x 25 = 26.25	25
Fruit Syrup	1.4	1.4 x 15 = 21	15
Carbonated Water	0.99	0.99 x 280 = 277.2	280
Drink	1.01	324.45	320

26.25 + 21 + 277.2 = 324.45

324.45 ÷ 320 = 1.0139

[1.01 – 1.014]

1.01 g/cm^3

(Total for Question 6 is 4 marks)

[Edexcel, GCSE, Summer 2017, Paper 3H, Q6]

6

Jackson is trying to find the density, in g/cm³, of a block of wood.
The block of wood is in the shape of a cuboid.

He measures
the length as 13.2 cm, correct to the nearest mm
the width as 16.0 cm, correct to the nearest mm
the height as 21.7 cm, correct to the nearest mm

He measures the mass as 1970 g, correct to the nearest 5 g.

By considering bounds, work out the density of the wood.
Give your answer to a suitable degree of accuracy.

You must show all your working and give a reason for your final answer.

Lower Bound		Upper Bound
13.15	length	13.25
15.95	width	16.05
21.65	height	21.75
1967.5	mass	1972.5

Lower bound of Volume = $13.15 \times 15.95 \times 21.65 = 4540.925$

Upper bound of Volume = $13.25 \times 16.05 \times 21.75 = 4625.409$

Lower bound of Density = $\frac{1967.5}{4625.409} = 0.4253$

Upper bound of Density = $\frac{1972.5}{4540.925} = 0.4344$

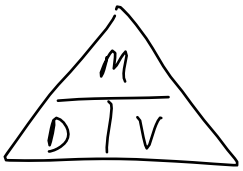
0.43

Lower bound and upper bound both round to 0.43 (to 2 dp)

(Total for Question 21 is 5 marks)

[Edexcel, GCSE, Summer 2018, Paper 2H, Q21]

7



The density of ethanol is 1.09 g/cm³
The density of propylene is 0.97 g/cm³

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.

	Density	Mass	Volume
Ethanol	1·09	1·09 × 60 = 65·4	60
Propylene	0·97	0·97 × 128 = 124·16	128
Antifreeze	189·56 ÷ 188 = 1·0082	65·4 + 124·16 = 189·56	60 + 128 = 188

1·01 g/cm³

(Total for Question 13 is 4 marks)

[Edexcel, GCSE, Summer 2019, Paper 3H, Q13]

8

Liquid **A** has a density of 1.8 g/cm³
Liquid **B** has a density of 1.2 g/cm³

80 cm³ of liquid **A** is mixed with 40 cm³ of liquid **B** to make 120 cm³ of liquid **C**.

Work out the density of liquid **C**.

	Density	Mass	Volume
A	1·8	1·8 x 80 = 144	80
B	1·2	1·2 x 40 = 48	40
C	192 ÷ 120 = 1·6	144 + 48 = 192	80 + 40 = 120

1·6 ..... g/cm³

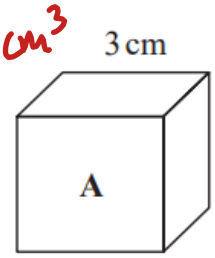
(Total for Question 7 is 3 marks)

[Edexcel, GCSE, Autumn 2021, Paper 2H, Q7]

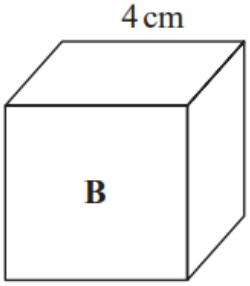
9

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

Volume = $3^3 = 27cm^3$



Volume = $4^3 = 64cm^3$



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

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

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

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.

A

$density = \frac{81}{27} = 3g/cm^3$

B

$density = \frac{128}{64} = 2g/cm^3$

3 : 2

(Total for Question 7 is 3 marks)

[Edexcel, GCSE, Summer 2022, Paper 1H, Q8]