Density

Question Paper 1

Level	IGCSE
Subject	Physics
ExamBoard	CIE
Topic	General Physics
Sub-Topic	Density
Paper Type	(Extended) Theory Paper
Booklet	Question Paper 1

Time Allowed: **63 minutes**

Score: **/51**

Percentage: **/100**

1 Fig. 3.1 shows an oil tank that has a rectangular base of dimensions 2.4 m by 1.5 m.

oil

depth of oil
1.5 m

1.5 m

2.4 m

Fig. 3.1
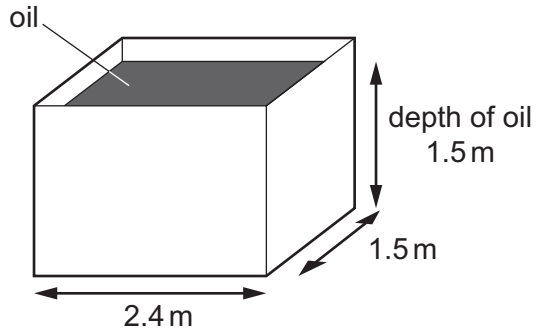
The tank is filled with oil of density 850 kg / m^3 to a depth of 1.5 m.

(a) Calculate

(i) the pressure exerted by the oil on the base of the tank,

pressure = ... [2]

(ii) the force exerted by the oil on the base of the tank.

force = ... [2]

(b) The force calculated in **(a)(ii)** is the weight of the oil.

Calculate the mass of oil in the tank.

mass = ... [1]

(c) When he is checking the level of oil in the tank, a man drops a brass key into the oil and it sinks to the bottom of the oil.

(i) State what this shows about the density of brass.

.... [1]

(ii) Explain how attaching the key to a piece of wood could prevent the key from sinking.

....

....

.... [1]

[Total: 7]

2 A student wishes to find the volume of a piece of wood of irregular shape. Her experiment requires the use of a small brass object of mass 200 g.

(a) Calculate the volume of the brass object. The density of brass is 8.4 g / cm^3.

volume = ...[2]

(b) To find the volume of the piece of wood, the student has a measuring cylinder, a supply of water and the brass object in **(a)**. The piece of wood and the brass object are small enough to be placed in the measuring cylinder.

(i) The piece of wood does not sink in water.

Suggest why.

....[1]

(ii) Describe what the student does to find the volume of the piece of wood, stating the measurements that she makes and any calculations required.

....

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....

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....

....

....[4]

[Total: 7]

3 A student has 500 identical, rectangular sheets of paper. The mass of $1.0\,m^2$ of the paper is $0.080\,kg$.

(a) Using a metre rule, she measures the length of one sheet of paper and its width. The length is $0.300\,m$ and the width is $0.210\,m$.

  (i) Calculate the mass of one sheet of paper.

  mass = ...[1]

  (ii) The student makes a single pile of the 500 sheets of paper.

  With a metre rule, she measures the height of the pile. The height of the pile is $0.048\,m$.

  Calculate the density of the paper.

  density = ...[3]

(b) A second student has only 5 sheets of the same type of paper.

Suggest how this student determines the density of the paper to a similar accuracy. Additional apparatus may be used.

....

....

....

....[2]

[Total: 6]

4   A student has a large number of coins of different diameters, all made of the same metal. She wishes to find the density of the metal by a method involving placing the coins in water.

(a) State the formula needed to calculate the density.

.... [1]

(b) Describe how the measurements of the required quantities are carried out.

....

....

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....

....

....

....

....

....

....

.... [5]

(c) State **one** precaution taken when carrying out the measurements in **(b)** to ensure that the result is as accurate as possible.

....

.... [1]

[Total: 7]

5 A student wishes to determine the density of a small, irregularly shaped stone.

(a) With the aid of a labelled diagram, describe an experiment to determine the volume of the stone.

....

....

....

....

.... [4]

(b) (i) State the other quantity, apart from the volume, that must be measured in order to determine the density.

.... [1]

(ii) State the formula that is used to calculate the density.

....

.... [1]

(c) The student now wishes to determine the volume of a small, irregularly shaped piece of wood that floats in water. He notices that a small lead weight tied to the wood makes it sink in water.

Describe how the student can adapt the experiment in **(a)** to determine the volume of the wood. You may draw a diagram.

....

....

....

....

....

....

.... [2]

[Total: 8]

6 **(a)** Define *density*.

....

....[1]

(b) The density of aluminium is $2.70 \, \text{g/cm}^3$. The thickness of a rectangular sheet of aluminium foil varies, but is much less than 1 mm.

A student wishes to find the average thickness. She obtains the following measurements.

mass of sheet = 60.7 g
length of sheet = 50.0 cm
width of sheet = 30.0 cm

Calculate the student's values for

(i) the volume of the sheet,

volume = ...[2]

(ii) the average thickness of the sheet.

thickness = ...[2]

(c) Another student, provided with a means of cutting the sheet, decides to find its average thickness using a single measuring instrument. Assume the surfaces of the sheet are perfectly smooth.

(i) Name a measuring instrument she could use.

....[1]

(ii) Describe the procedure she should follow to obtain an accurate value of the average thickness of the sheet.

Details of how to read the instrument are not required.

....

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....

....

....

....[3]

[Total: 9]

7 Fig. 1.1 shows a side view of a large tank in a marine visitor attraction.

sea-water

viewing panel

tank

•M
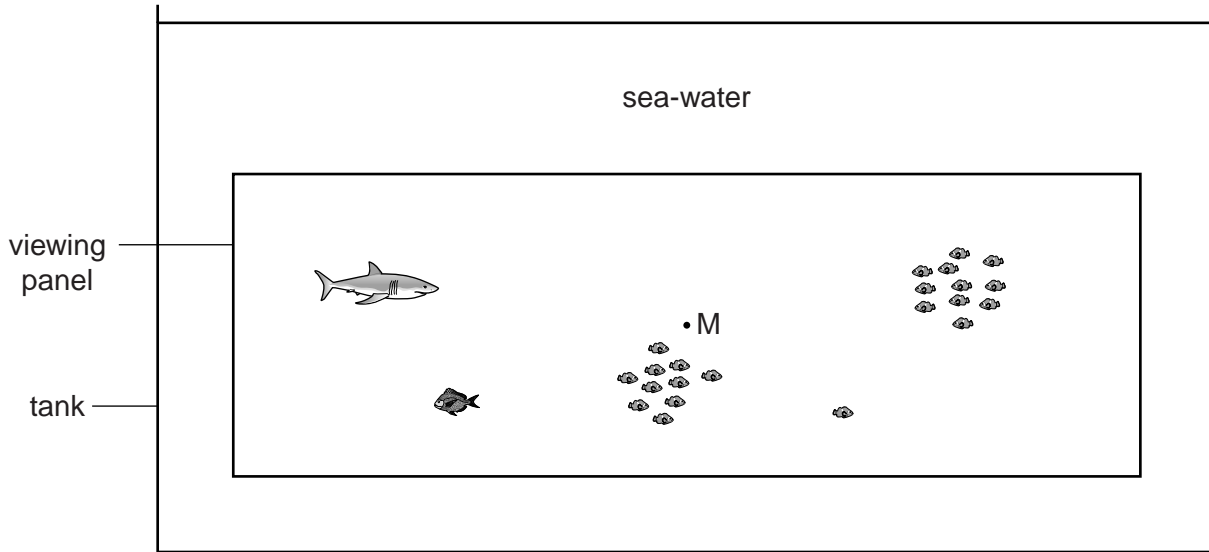
Fig. 1.1 (not to scale)

The tank is 51 m long and 20 m wide. The sea-water in the tank is 11 m deep and has a density of 1030 kg/m^3.

(a) Calculate the mass of water in the tank.

mass = ... [3]

(b) The pressure at point M, halfway down the large viewing panel, is 60 kPa more than atmospheric pressure.

Calculate the depth of M below the surface of the water.

depth = ... [2]

(c) The viewing panel is 32.8 m wide and 8.3 m high.

Calculate the outward force of the water on the panel. Assume that the pressure at M is the average pressure on the whole panel.

force = ... [2]

[Total: 7]