Section E: Solids, Liquids and Gases

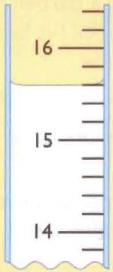
Exam-Style Questions

1 *a)* Write a word equation for calculating the density of a substance. *[2]*

b) Martha does an experiment to measure the density of liquid. In this experiment she measures the volume of the liquid in a measuring cylinder calibrated in cm^3 and then she weighs the measuring cylinder on an electronic balance calibrated in grams.

She does this for eight different amounts of liquid.

(i) The figure shows an example of the measuring cylinder she used. State the volume of liquid in the cylinder. *[2]*



(ii) Here are her results.

Volume of liquid	10	20	30	40	50	60	70	80
Mass of liquid	42.1	54.0	65.9	78.5	90.0	102.0	113.9	126.1

Use her results to plot a graph of mass against volume. *[6]*

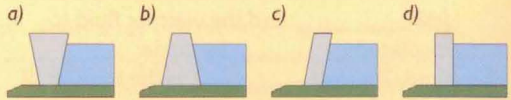
(iii) One of her results looks a little strange. State which one and give a possible reason for it. *[2]*

(iv) She expected the graph to pass through the 0,0 point on her scale, but it does not. State why it ought to pass through this point and give a likely reason why it did not. *[2]*

(v) Use Martha's graph to calculate the density of the liquid she used in this experiment. *[4]*

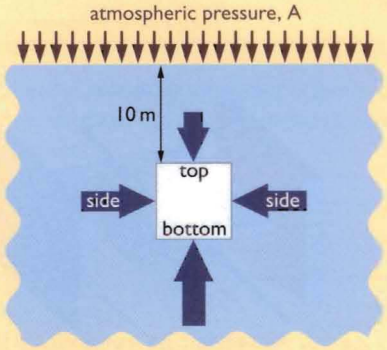
(vi) State why it is better to produce a graph of a range of results rather than just use one set of mass and volume readings. *[2]*

2 A reservoir is made by building a dam across a river. Here are some possible cross-sections of shapes that might be used for the dam:



State which shape is the most suitable and give your reason. *[3]*

3 The figure opposite shows a 5 metre cube completely submerged in water, at a depth of 10 m below the water surface.



Note: The cube is **not** drawn to scale

a) Water exerts a pressure on both sides of the cube as shown. Explain why there is no resultant horizontal force on the cube. *[3]*

b) The density of water is 1000 kg/m^3. Calculate the extra pressure (in addition to the pressure of the atmosphere) that acts on:

(i) the top surface of the cube, and

(ii) the bottom surface of the cube. *[4]*

c) Use your answers to b) to calculate the total force acting:

(i) downwards on the top surface, and

(ii) upwards on the bottom surface. *[4]*

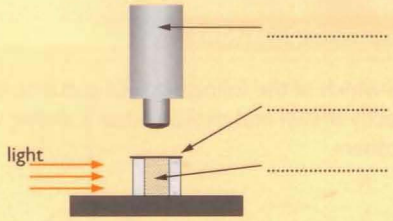
d) State the size and magnitude of the force which acts on the cube as a result of the pressure of the water. State the name of this force. *[3]*

e) Can you say whether the cube will move up or down or remain stationary? Give your reasons. *[3]*

4 Complete the following sentences about the effect of heat on ice taken from a freezer:

Initially the temperature of the ice will _____. When it reaches the _____ point of 0°C the ice will begin to _____. When all the ice has changed from the _____ state to the _____ state, its temperature will continue to _____ as a result of being heated. During this time some of the _____ will turn to a _____; this process is called _____. When the _____ point of 100°C is reached the temperature will stop rising until all the_____ has turned to _____. *[12]*

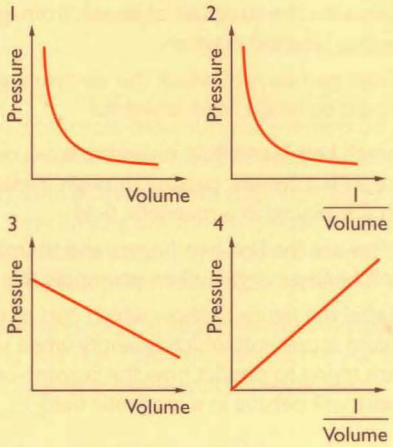
5 *a)* Label this diagram of a simple experiment to demonstrate Brownian motion in air. *[3]*



b) Describe, with the aid of a diagram, what you would expect to observe. *[3]*

c) This experiment led to a better understanding of the way gases behave. State the conclusions about the motion of air molecules that were drawn from the observations of Brownian motion. *[3]*

6 In an experiment to investigate the relationship between the pressure and volume of a fixed amount of gas at constant temperature, a class produced the following graphs of pressure against volume:



Which answer below lists the graphs that accurately represent the relationship?

A: none of them

B: 1 and 3

C: 2 and 3

D: 1 and 4

E: 1 only *[2]*

7 *a)* The air in a rigid steel container is at a pressure of 50 kPa when the temperature is - 23°C. The container has a safety valve which releases the gas when the pressure in the container reaches 300 kPa. When heated, at what temperature, in °C, will the pressure valve release? *[4]*

b) Explain why, in terms of the behaviour of the air molecules, the gas exerts a different pressure on the walls of the container as the temperature is changed. *[2]*