1)

Which line in the table gives approximate ratios of density and molecular spacing for a substance in its solid, liquid and gas phases?

	density	molecular spacing
	solid : liquid : gas	solid : liquid : gas
A	1000 : 1000 : 1	1 : 1 : 10
B	1000 : 100 : 1	1 : 10 : 1000
C	1000 : 1000 : 1	1 : 1 : 1000
D	1000 : 100 : 1	1 : 10 : 100

2)

The hydrostatic pressure p at a depth h in a liquid of density ρ is given by the formula $p = h\rho g$.

Which equation, or principle of physics, is used in the derivation of this formula?

A density = mass ÷ volume

B potential energy = mgh

C atmospheric pressure decreases with height

D density increases with depth

3)

The density of the material of a rectangular block is determined by measuring the mass and linear dimensions of the block. The table shows the results obtained, together with their uncertainties.

mass	=	$(25.0 \pm 0.1)\,\text{g}$
length	=	$(5.00 \pm 0.01)\,\text{cm}$
breadth	=	$(2.00 \pm 0.01)\,\text{cm}$
height	=	$(1.00 \pm 0.01)\,\text{cm}$

The density is calculated to be $2.50\,\text{g cm}^{-3}$.

What is the uncertainty in this result?

A $\pm 0.01\,\text{g cm}^{-3}$ **B** $\pm 0.02\,\text{g cm}^{-3}$ **C** $\pm 0.05\,\text{g cm}^{-3}$ **D** $\pm 0.13\,\text{g cm}^{-3}$

4)

Liquids X and Y are stored in large open tanks. Liquids X and Y have densities of 800 kg m^{-3} and 1200 kg m^{-3} respectively.

At what depths are the pressures equal?

	depth in liquid X	depth in liquid Y
A	8 m	12 m
B	10 m	10 m
C	15 m	10 m
D	18 m	8 m

5)

A child drinks a liquid of density ρ through a vertical straw.

Atmospheric pressure is p_0 and the child is capable of lowering the pressure at the top of the straw by 10%. The acceleration of free fall is g.

What is the maximum length of straw that would enable the child to drink the liquid?

A $\frac{p_0}{10\rho g}$ **B** $\frac{9p_0}{10\rho g}$ **C** $\frac{p_0}{\rho g}$ **D** $\frac{10p_0}{\rho g}$

6)

At a depth of 20 cm in a liquid of density 1800 kg m^{-3}, the pressure due to the liquid is p.

Another liquid has a density of 1200 kg m^{-3}.

What is the pressure due to this liquid at a depth of 60 cm?

A $\frac{p}{2}$ **B** $\frac{3p}{2}$ **C** $2p$ **D** $3p$

7)

A mass of a liquid of density ρ is thoroughly mixed with an equal mass of another liquid of density 2ρ. No change of the total volume occurs.

What is the density of the liquid mixture?

A $\frac{4}{3}\rho$ **B** $\frac{3}{2}\rho$ **C** $\frac{5}{3}\rho$ **D** 3ρ

8)

(a) (i) Define *density*.

.....

.....

(ii) State the base units in which density is measured.

.....

[2]

9)

A sphere has volume V and is made of metal of density .

(a) Write down an expression for the mass m of the sphere in terms of V and .

.....[1]

(b) The sphere is immersed in a liquid. Explain the apparent loss in the weight of the sphere.

.....

.....

.....

.....[3]

10)

(a) Define *density*.

.....[1]

(b) Liquid of density ρ fills a container to a depth h, as illustrated in Fig. 3.1.

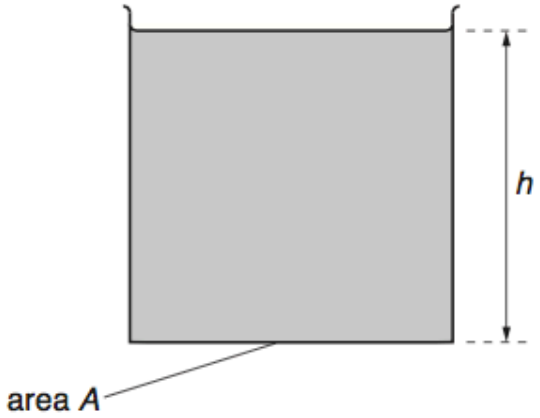

Fig. 3.1

The container has vertical sides and a base of area A.

(i) State, in terms of A, h and ρ, the mass of liquid in the container.

.....[1]

(ii) Hence derive an expression for the pressure p exerted by the liquid on the base of the container. Explain your working.

[2]

(c) The density of liquid water is $1.0\,g\,cm^{-3}$. The density of water vapour at atmospheric pressure is approximately $\frac{1}{1600}\,g\,cm^{-3}$.

Determine the ratio

(i) $\frac{\text{volume of water vapour}}{\text{volume of equal mass of liquid water}}$,

ratio = ...[1]

(ii) $\frac{\text{mean separation of molecules in water vapour}}{\text{mean separation of molecules in liquid water}}$.

ratio = ...[2]

(d) State the evidence for

(i) the molecules in solids and liquids having approximately the same separation,

.....

.....[1]

(ii) strong rigid forces between molecules in solids.

strong: .....

rigid: .....[2]