2 A liquid of density ρ fills a container to a depth h, as shown in Fig. 2.1.

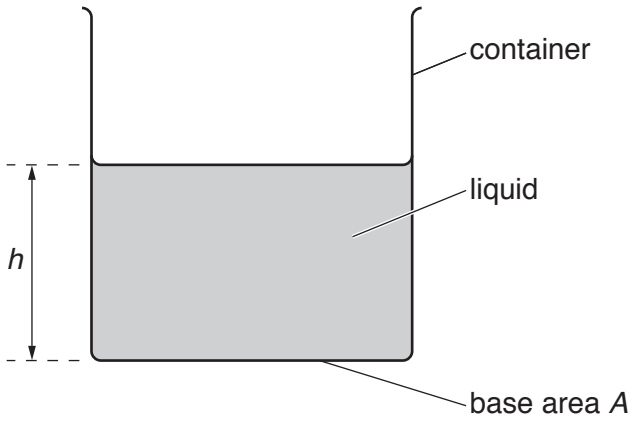

Fig. 2.1

The base of the container has area A.

(a) Derive, from the definitions of pressure and density, the equation

$$p = \rho g h$$

where p is the pressure exerted by the liquid on the base of the container and g is the acceleration of free fall.

[3]

(b) A small solid sphere falls with constant velocity through the liquid.

(i) State

1. the names of the three forces acting on the sphere,

.....

.....

2. a word equation that relates the magnitudes of these forces.

.....

[2]

(ii) State and explain the changes in energy that occur as the sphere falls.

.....

.....

.....

.....[2]

(c) The liquid in the container is liquid L. Liquid M is now added to the container. The two liquids do not mix. The total depth of the liquids is 0.17 m.

Fig. 2.2 shows how the pressure p inside the liquids varies with height x above the base of the container.

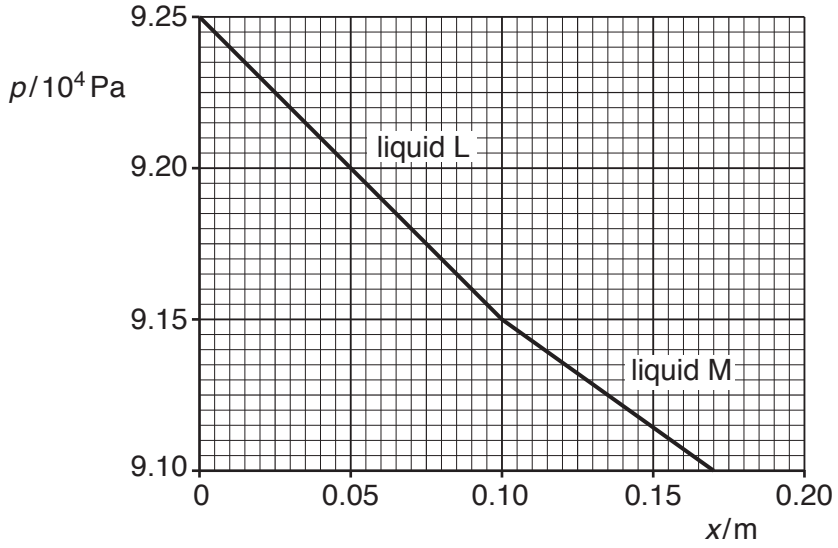

Fig. 2.2

Use Fig. 2.2 to

(i) state the value of atmospheric pressure,

atmospheric pressure = ... Pa [1]

(ii) determine the density of liquid M.

density = ... kg m^{-3} [2]

[Total: 10]