1 **(a)** A beaker in air contains a liquid. The base area of the beaker is A, as shown in Fig. 1.1. The liquid has density ρ and fills the beaker to a height h.

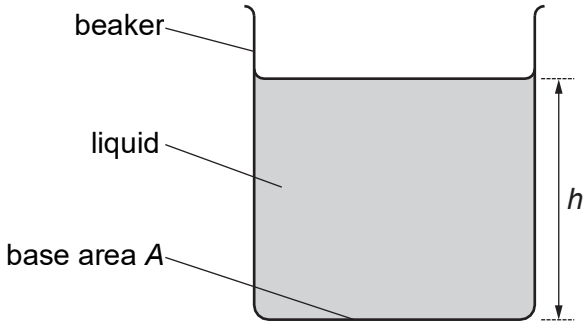

Fig. 1.1

(i) Show that the pressure P due to the liquid at the base of the beaker is given by

$$P = \rho g h$$

where g is the acceleration of free fall.

[1]

(ii) Explain why the equation in **(i)** does not give the total pressure at the base of the beaker.

.....

.....[1]

(iii) Fig. 1.2 shows the variation of the total pressure inside the liquid with depth x below the surface.

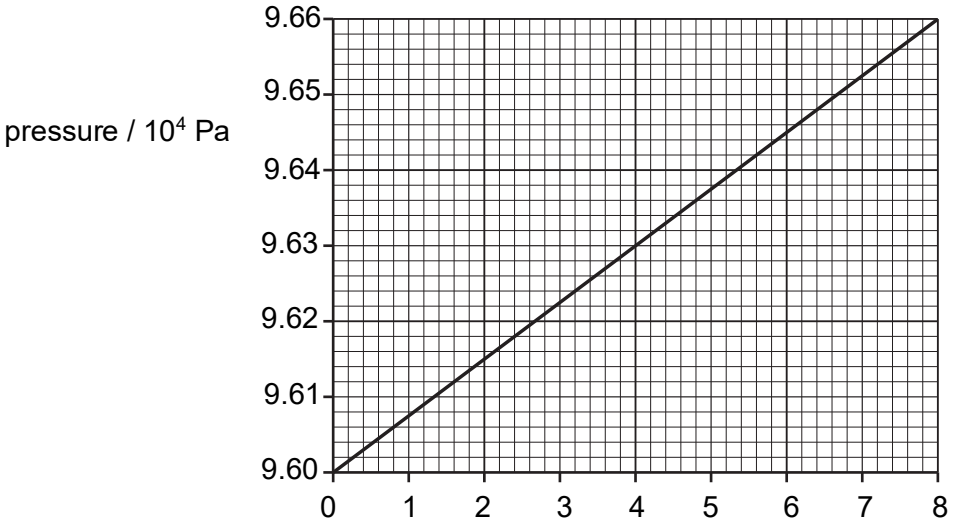

Fig. 1.2

Use Fig. 1.2 to determine the density of the liquid.

density = ... kg m^{-3} [1]

(b) A spherical buoy of density 220 kg m^{-3} floats in equilibrium on the surface of sea water of density 1050 kg m^{-3}, as shown in Fig. 1.3.

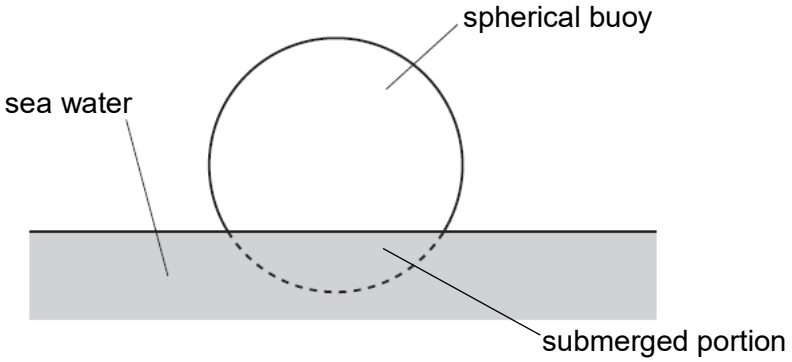

Fig. 1.3 (not to scale)

Determine the percentage of the volume of the buoy that is submerged in water.

percentage = ... % [2]

[Total: 5]