1 Fig. 1.1 is the top view of a rectangular paddling pool of constant depth. The pool is filled with sea water.

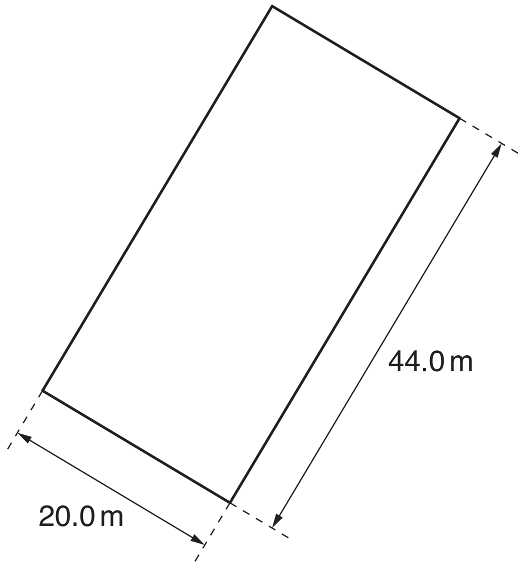

Fig. 1.1 (not to scale)

(a) The volume of the sea water in the pool is 264 m^3.

Calculate the depth of the pool.

depth = ... [3]

(b) The mass of the sea water in the pool is 2.70×10^5 kg.
Calculate the density of the sea water. Give your answer to 3 significant figures.

density = ... [2]

(c) Calculate the pressure due to the sea water at the bottom of the pool.

pressure = ... [2]

(d) State a suitable instrument for measuring the dimensions given in Fig. 1.1.

.... [1]

[Total: 8]

MARKING SCHEME:

(a)	(A = 44 × 20 =) 880 (m^2)	**C1**
	V = A × depth in any form OR (d =) V / A	**C1**
	(d = 264 / 880 =) 0.30 m	**A1**
(b)	ρ = m / V in any form OR (ρ =) m / V	**C1**
	(ρ = 2.7 × 10^5 / 264 =) 1020 kg / m^3	**A1**
(c)	p = ρgh in any form OR (p =) ρgh	**C1**
	(p = 1020 × 10 × 0.3 =) 3 100 Pa	**A1**
(d)	tape measure	**B1**

2 Fig. 1.1 is the top view of a tank in an aquarium. The tank is filled with salt water.

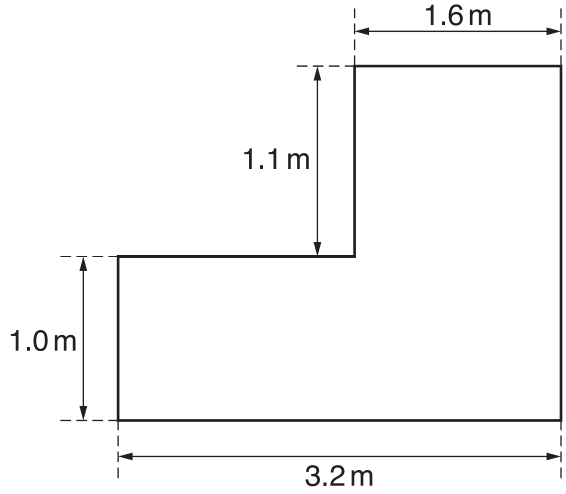

Fig. 1.1 (not to scale)

The depth of the water in the tank is 2.0 m.

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

volume = ... [3]

(b) The density of the water in the tank is 1.1×10^3 kg / m^3.

Calculate the mass of the water in the tank.

mass = ... [2]

(c) Calculate the pressure due to the water at a level of 0.80 m above the base of the tank.

pressure = ... [3]

[Total: 8]

MARKING SCHEME:

ʼa)	attempt to use 2 rectangles for A	**C1**
	A = ((1 × 3.2) + (1.1 × 1.6) = 3.2 + 1.76 =) 4.96 (m^2)	**C1**
	9.9 m^3	**A1**
(b)	$\rho = m / V$ OR $m = \rho V$ OR (m =) 9.9 × 1.1 × 10^3	**C1**
	(m =) 1.1 × 10^4 kg	**A1**
(c)	depth of water = 1.2 m	**C1**
	(P =) ρgh OR (P = 1.1 × 10^3 × 10 × 1.2)	**C1**
	(P =) 1.3 × 10^4 Pa	**A1**

2 Fig. 2.1 shows a hollow metal cylinder containing air, floating in the sea.

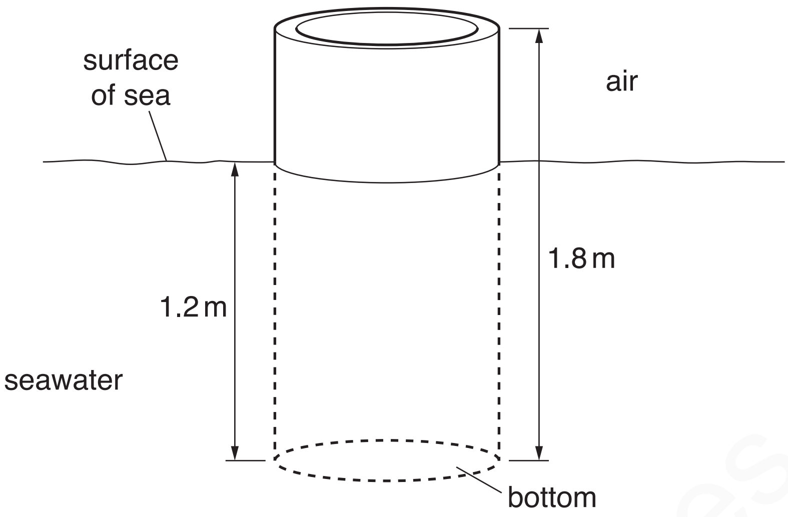

Fig. 2.1

(a) The density of the metal used to make the cylinder is greater than the density of seawater.

Explain why the cylinder floats.

....

....[1]

(b) The cylinder has a length of 1.8 m. It floats with 1.2 m submerged in the sea. The bottom of the cylinder has an area of cross-section of 0.80 m^2.

The density of seawater is 1020 kg / m^3. Calculate the force exerted on the bottom of the cylinder due to the depth of the seawater.

force = ...[4]

(c) Deduce the weight of the cylinder. Explain your answer.

weight = ...

explanation ....

....

[2]

[Total: 7]

MARKING SCHEME:

2(a)	average/overall/combined density (of the metal and air contained) less (than density of sea water)	**1**
2(b)	(P =) $h \times \rho \times g$ **OR** (V=) $A \times l$ in any form	**1**
	(P= 1.2 × 1020 × 10 =) 12 000 (Pa) **OR** (V= 0.8 × 1.2 =) 0.96 (m^3)	**1**
	$P = F \div A$ **OR** (F =) $P \times A$ **OR** (W =) $V \times \rho \times g$	**1**
	(F = 12240 × 0.80 =) 9800 N **OR** (F = W =) 9800 N	**1**
2(c)	same numerical answer as **(b)**	**1**
	resultant/net (vertical) force = 0 **OR** downward force = upward force **OR** forces are balanced	**1**