Answer **all** the questions in the spaces provided.

1 A hollow, air-filled sphere is attached to the seabed by a vertical cable, as shown in Fig. 1.1.

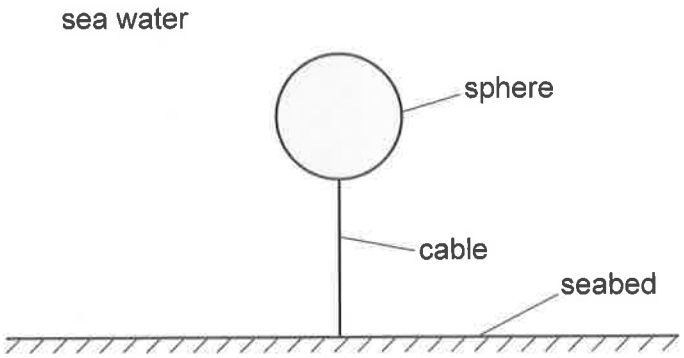

Fig. 1.1

The sphere is rigid and is submerged in deep sea water.

Data for the sphere and sea water are given in Table 1.1.

Table 1.1

radius of sphere	$(0.180 \pm 0.004)\,\text{m}$
average density of sphere	$(85 \pm 1)\,\text{kg m}^{-3}$
density of sea water	$(1020 \pm 5)\,\text{kg m}^{-3}$

(a) Calculate the magnitude of the upthrust U acting on the sphere.

U = ... N [2]

(b) Determine the actual uncertainty in U and state U with its actual uncertainty.

U = ... ± ..... N [3]

(c) The sphere is stationary.

Determine the tension T in the cable.

T = ... N [2]

(d) The cable breaks, and the sphere rises towards the surface of the water.

On Fig. 1.2, sketch a line to show how the acceleration of the sphere varies with time as the sphere rises towards the surface. No calculations are required.

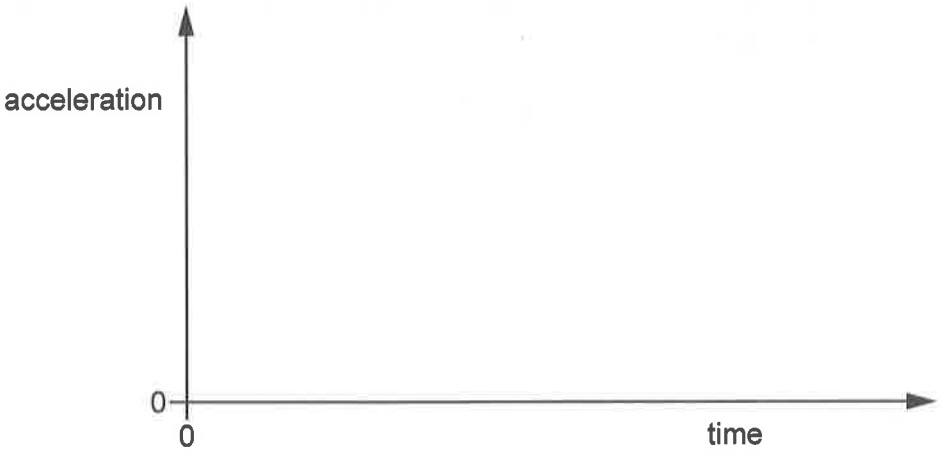

Fig. 1.2

[1]

[Total: 8]