3 **(a)** Explain the origin of upthrust.

....

.... [1]

(b) A buoy is attached to a rope which is anchored to the seabed. Currents in the sea cause the buoy to be displaced so that the rope makes an angle of 25° with the vertical, as shown in Fig. 3.1. The buoy is in equilibrium.
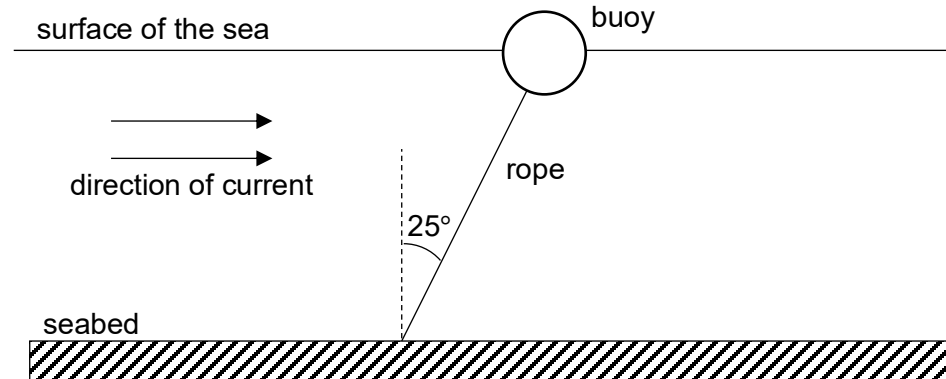

Fig. 3.1

The currents in the sea exert a horizontal force of 140 N on the buoy and the weight of the buoy is 130 N.

(i) Sketch the forces acting on the buoy in Fig. 3.2.

Fig. 3.2

[2]

(ii) Show that the upthrust acting on the buoy is 430 N.

[2]

(iii) Determine the percentage of the volume of the buoy that is submerged in the sea. The density of sea water is 1000 kg m^{-3} and density of the buoy is 230 kg m^{-3}.

percentage of volume of buoy submerged = ... %   [3]

[Total: 8]