

- 2 (a) Explain the origin of upthrust acting on a body in a fluid.

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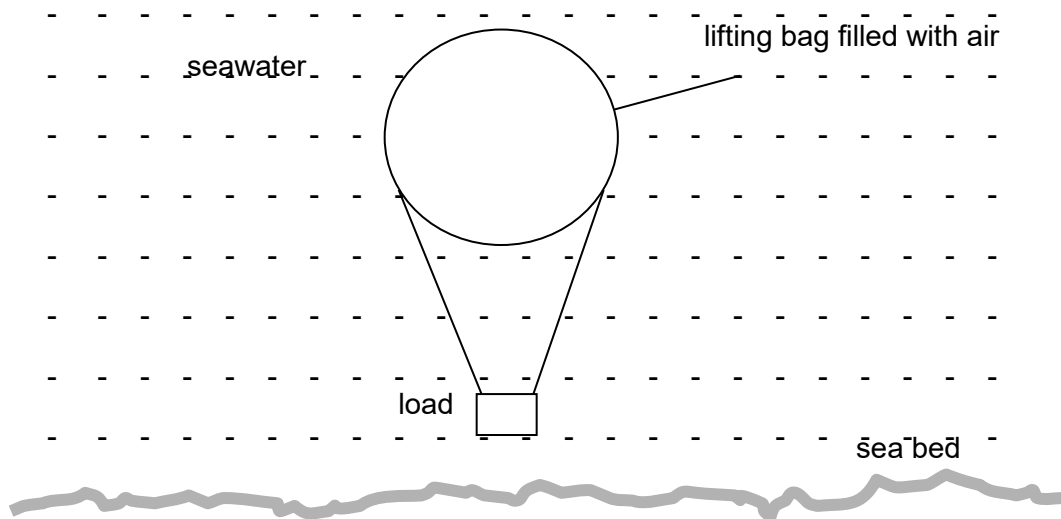
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- (b) In order to lift a submerged load of 600 kg from a seabed, a lifting bag made of an elastic material of negligible mass is filled with air and attached to the load, as shown in Fig. 2.1. The density of seawater is  $1050 \text{ kg m}^{-3}$  and the lifting bag contains  $0.700 \text{ m}^3$  of air of density  $1.27 \text{ kg m}^{-3}$  such that the load ascends with a constant speed.

The volume of the load is negligible compared to the volume of the lifting bag.



**Fig. 2.1** (not to scale)

- (i) Calculate the upthrust on the lifting bag when its volume is  $0.700 \text{ m}^3$ .

upthrust = ..... N [2]

(ii) Calculate the total drag force on the bag and load.

total drag force = ..... N [2]

(iii) Explain why in practice, to maintain a constant speed of ascent, air has to be released continuously from the lifting bag. Temperature change during the ascent is negligible.

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