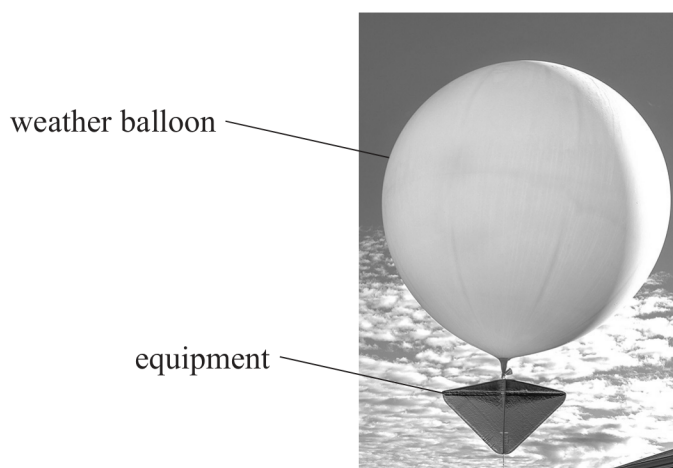


- 17 Scientists use weather balloons to carry equipment into the upper atmosphere to monitor weather conditions. The photograph shows a weather balloon.



(Source: © Edward Haylan/Shutterstock)

Upthrust acts on the balloon. The balloon is released and accelerates upwards.

- (a) State what is meant by upthrust.

(1)

- (b) (i) When the balloon is released, the initial upward acceleration is 4.80 m s^{-2} .

Show that the weight of the balloon and equipment is about 13 N.

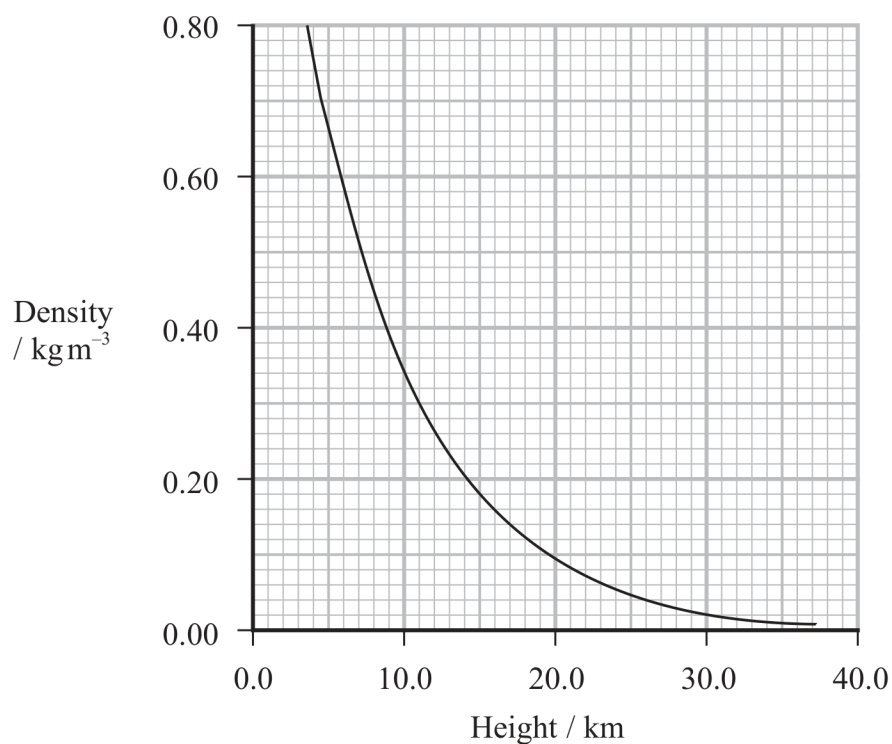
volume of balloon and equipment = 1.63 m^3

density of air at ground level = 1.23 kg m^{-3}

(3)



(ii) The graph shows how the density of air decreases with height above the ground.



The scientists want to make measurements at a height of 25 km where the balloon would stop rising.

The balloon will expand as it rises and will burst if its volume exceeds 50 m³.

Deduce whether the weather balloon could support the equipment at a height of 25 km, without bursting.

(4)

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*(c) A weather balloon made of a strong material will rise and eventually stop expanding. It will continue to rise until it reaches a maximum height.

Explain how and why the velocity of the weather balloon changes from release until it reaches its maximum height.

Ignore the effects of viscous drag force.

(6)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

(Total for Question 17 = 14 marks)