2 **(a)** Explain what is meant by *upthrust*.

……

…… [1]

(b) Before a small balloon is inflated, its mass is 1.30 g as recorded on an electronic mass balance. The balloon is inflated with air so that it is spherical in shape with a diameter of 22.0 cm.

(i) The density of air is 1.21 kg m^{-3}. Calculate the mass of air displaced by the balloon.

mass of air displaced = …….. g [2]

(ii) The inflated balloon gives reading of 1.55 g when placed on the balance. Calculate the mass of air in the balloon.

mass of air in balloon = …… g [2]

(iii) Explain why the value in **(b)(ii)** is larger than the value in **(b)(i).**

……..

…….. [1]

(c) A 2.10 g nut is now tied to the balloon with a light cotton thread. The balloon is dropped from a height of 4.00 m.

(i) Calculate the acceleration of the balloon and nut at the start of their descent.

acceleration = …….. m s^{-2} [2]

(ii) Explain why the acceleration will approach zero as the balloon descends.

……..

……..

……..

…….. [2]