

16 A small, spherical air bubble moves upwards in a glass of water. The drag force on the bubble can be calculated using Stokes' law.

(a) State the condition needed for Stokes' law to apply to the bubble.

(1)

(b) The bubble moves upwards at a constant velocity.

The volume of the bubble is  $5.3 \times 10^{-11} \text{ m}^3$ .

(i) Show that the upthrust on the bubble is about  $5 \times 10^{-7} \text{ N}$ .

density of water =  $998 \text{ kg m}^{-3}$

(2)

(ii) The bubble moves upwards at a constant velocity of  $0.035 \text{ m s}^{-1}$ .

Deduce whether Stokes' law applies to the bubble.

You may ignore the weight of the bubble.

viscosity of water =  $9.5 \times 10^{-4} \text{ Pa s}$

(4)

(Total for Question 16 = 7 marks)