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)

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

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

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

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

(2)

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

Deduce whether Stokes' law applies to the bubble.

You may ignore the weight of the bubble.

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

(4)

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(Total for Question 16 = 7 marks)