12 A student determined the viscosity of a liquid using the falling-ball method.

(a) When the ball is falling at terminal velocity the following equation applies

drag force = weight of ball – upthrust

The density of the liquid was known.

The student used a balance and a digital calliper to make measurements on the ball.

Describe how the student could use her measurements to calculate a value for the drag force acting on the ball.

(4)

(b) When falling through the liquid, the ball reached terminal velocity.

The flow of liquid around the ball was laminar.

Calculate the viscosity of the liquid.

terminal velocity of ball = $5.4 \times 10^{-4}\,m\,s^{-1}$
radius of ball = $0.50 \times 10^{-2}\,m$
drag force = $1.1 \times 10^{-2}\,N$

(2)

Viscosity of liquid = ...

(Total for Question 12 = 6 marks)

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