

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

$$\text{drag force} = \text{weight of ball} - \text{upthrust}$$

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.

$$\text{terminal velocity of ball} = 5.4 \times 10^{-4} \text{ m s}^{-1}$$

$$\text{radius of ball} = 0.50 \times 10^{-2} \text{ m}$$

$$\text{drag force} = 1.1 \times 10^{-2} \text{ N}$$

(2)

Viscosity of liquid = .....

(Total for Question 12 = 6 marks)