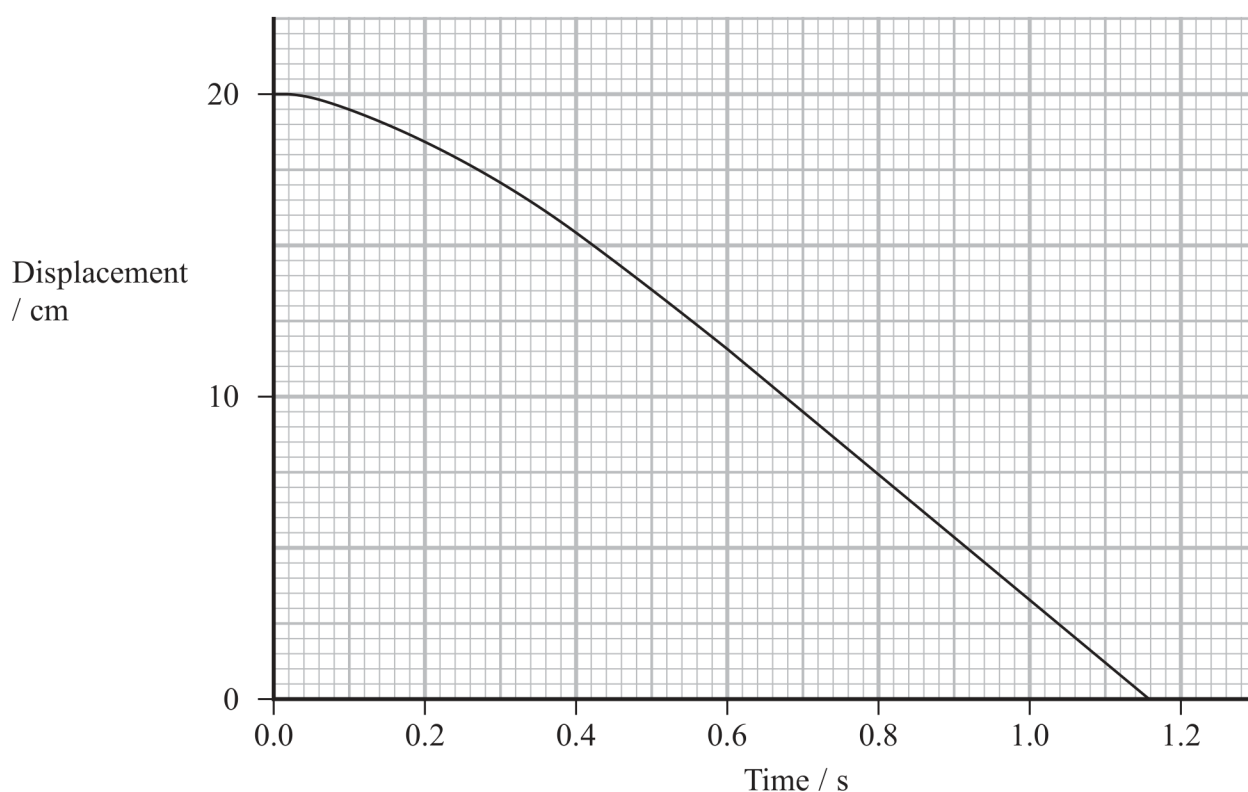


18 A student carried out an experiment using a data logger to record the motion of a ball-bearing as it fell through a liquid.

- (a) State the conditions under which Stokes' law applies to an object moving through a fluid.

(2)

- (b) The graph obtained by the student is shown below.



- (i) Explain the shape of the graph.

(3)



- (ii) The ball-bearing had a diameter of 1.6 mm.

The difference between the upthrust on the ball-bearing and the weight of the ball-bearing is 1.45×10^{-4} N.

Calculate the viscosity of the liquid. Assume that Stokes' law applies.

(4)

Viscosity = Pa s

- (iii) The student heated the liquid and repeated the experiment.

The ball-bearing took less time to fall a given distance in the liquid when the liquid was at a higher temperature.

Explain why. Assume the density of the liquid is constant.

(4)

(Total for Question 18 = 13 marks)