17 Water is dropped into a container of oil. The water forms small spherical droplets that move slowly downwards.

(a) A droplet moves downwards at a constant speed. The flow of oil around the droplet is laminar.

(i) State what is meant by laminar flow.

(1)

.....

.....

(ii) State the condition necessary for the speed of the droplet to be constant.

(1)

.....

.....

(b) A spherical droplet has a volume of $3.35 \times 10^{-8}\,m^3$.

(i) Calculate the weight of the droplet.

density of water = $1.00 \times 10^3\,kg\,m^{-3}$

(3)

Weight of droplet = ...

(ii) Show that the upthrust on the water droplet when it's completely submerged in oil is about $3 \times 10^{-4}\,N$.

density of oil = $0.94 \times 10^3\,kg\,m^{-3}$

(2)

(iii) Calculate the terminal velocity of this water droplet in the oil.

viscosity of oil = $0.11\,Pa\,s$

(4)

Terminal velocity = ...

(Total for Question 17 = 11 marks)