Question Number	Answer		Mark
19(a)	The viscosity decreases (with temperature)	**(1)**	**1**
19(b)(i)	Use of $V = (4/3)\pi r^3$ Use of $\rho = m / V$ Use of $W = m g$ $W = 4.76 \times 10^{-3}$ N Example of calculation volume = $(4/3)\pi \times (3.5 \times 10^{-3}\ \text{m})^3 = 1.80 \times 10^{-7}\ \text{m}^3$ $m = 1.80 \times 10^{-7}\ \text{m}^3 \times 2.70 \times 10^3\ \text{kg m}^{-3} = 4.85 \times 10^{-4}$ kg $W = 4.85 \times 10^{-4}\ \text{kg} \times 9.81\ \text{N kg}^{-1} = 4.76 \times 10^{-3}$ N	**(1)** **(1)** **(1)** **(1)**	**4**
19(b)(ii)	Use of $F = 6\pi \eta r v$ Use of U = weight of fluid displaced Comparison of F with $W - U$ and conclusion consistent with student's values Example of calculation $D = 6\pi \times 0.95\ \text{Pa s} \times 0.003\ 5\ \text{m} \times 0.040\ 5\ \text{m} = 2.54 \times 10^{-3}$ N $U = 1.80 \times 10^{-7}\ \text{m}^3 \times 1.26 \times 10^3\ \text{kg m}^{-3} \times 9.81\ \text{N kg}^{-1} = 2.22 \times 10^{-3}$ N $W - U = 4.76 \times 10^{-3}\ \text{N} - 2.22 \times 10^{-3}\ \text{N} = 2.54 \times 10^{-3}$ N $2.54 \times 10^{-3}\ \text{N} = D$ ∴ Stokes law obeyed	**(1)** **(1)** **(1)**	**3**
19(b)(iii)	Low speed **Or** Laminar flow **Or** Small sphere [Accept reference to wide cylinder]	**(1)**	**1**
19(c)	Viscosity of blood is much lower Drag will be lower for given velocity (proportional to diameter) Reducing diameter gives less weight (proportional to cube of diameter) Forces balance at lower speed **Or** Terminal velocity lower Laminar flow needs low speed Viscosity of blood much lower (1) (For the original sphere) drag would be (much) lower at same velocity (1)	**(1)** **(1)** **(1)** **(1)** **(1)**	**5**