Question Number	Answer		Mark
19(a)(i)	• See mass = $4\pi r^3 \rho / 3$ • See $6\pi\eta v\ r = 4\pi r^3 \rho g / 3$ • Suitable algebra	1 1 1	(3)
19(a)(ii)	• Use of $r = \sqrt{\frac{9\eta v}{2\rho g}}$ • $r = 2.2 \times 10^{-6}$ m Example of calculation $r = \sqrt{(9 \times 1.86 \times 10^{-5}\ \text{Pa s} \times 5.35 \times 10^{-4}\ \text{m s}^{-1} / 2 \times 904\ \text{kg m}^{-3} \times 9.81\ \text{N kg}^{-1})}$ $= 2.247 \times 10^{-6}$ m	1 1	(2)
19(a)(iii)	• Use of $W = mg$ • Use of $E = V / d$ • Use of $F = EQ$ • $Q = 4.8 \times 10^{-19}$ C Example of calculation $W = 3.03 \times 10^{-14}$ kg $\times$ 9.81 N kg^{-1} $= 2.97 \times 10^{-13}$ N $E = 9910$ V / 0.016 m $= 619\,000$ V m^{-1} 2.97×10^{-13} N $= 619\,000$ V m$^{-1} \times Q$ $Q = 4.8 \times 10^{-19}$ C	1 1 1 1	(4)
19(b)	• The maxima are integer multiples of 1.6×10^{-19} C **Or** The peaks are at intervals of 1.6×10^{-19} C • The spread about the maxima is small • This could be due to experimental error, so the statement is supported	1 1 1	(3)
19(c)	• (Since $r = \sqrt{\frac{9\eta v}{2\rho g}}$,) if the viscosity is too small, then (calculated) r will be too small • Therefore the value used as the mass/weight of the droplet (to balance the upward electrical force) must be too small • The electrical force will be smaller, so the charge will be smaller **Or** • If the charge is smaller, the electrical force is smaller • Therefore the value used as the mass/weight of the droplet (to balance the upward electrical force) must be too small • (Since $r = \sqrt{\frac{9\eta v}{2\rho g}}$,) if the (calculated) r is too small, it is because viscosity is too small	1 1 1	(3)
	Total for Question 19		**15**