Question Number	Answer		Mark
20(a)	Use of $C = 4\pi\varepsilon_0 r$	**(1)**	
	Use of $Q = CV$	**(1)**	
	Use of $E = \frac{V}{d}$	**(1)**	
	Use of $F = EQ$	**(1)**	
	$F = 1.6 \times 10^{-3}$ N	**(1)**	**5**
	Example of calculation $C = 4\pi \times 8.85 \times 10^{-12}\ \text{F m}^{-1} \times 3.5 \times 10^{-2}\ \text{m} = 3.89 \times 10^{-12}\ \text{F}$ $Q = 3.89 \times 10^{-12}\text{F} \times 4500\ \text{V} = 1.75 \times 10^{-8}\ \text{C}$ $E = \frac{4500\ \text{V}}{5.0 \times 10^{-2}\ \text{m}} = 9.0 \times 10^{4}\ \text{V m}^{-1}$ $F = 9.0 \times 10^{4}\ \text{N C}^{-1} \times 1.75 \times 10^{-8}\ \text{C} = 1.58 \times 10^{-3}\ \text{N}$		
20(b)	When the sphere touches the plate it is charged with the same polarity The force on the sphere due to the electric field is away from that plate so it moves towards the opposite plate **Or** the sphere is repelled from the plate with the charge of the same sign **Or** the sphere is attracted towards the plate with opposite charge	**(1)**	
	When the sphere touches the charged plate opposite the first it becomes oppositely charged and is repelled from that charged plate (and so on) **Or** When the sphere touches the oppositely charged plate it becomes oppositely charged and is attracted to the first plate (and so on)	**(1)**	
		(1)	**3**
20(c)	(The bell connected to the lightning conductor becomes positively charged so) <u>electrons</u> are attracted to the right-hand side of the sphere	**(1)**	
	The sphere is attracted to the positively charged bell [MP2 dependent on award of MP1]	**(1)**	**2**
	Total for question 20		**10**