

Question Number	Answer	Mark
13ai	<p>Use of trigonometry appropriate for determination of angle (1)</p> <p>Use of $W = mg$ (1)</p> <p>Resolves tension in thread vertically or horizontally (1)</p> <p>Or draw triangle of forces (1)</p> <p>Force of repulsion = 1.2×10^{-3} (N)</p> <p><u>Example of calculation</u></p> <p>$\sin \theta = 13/122$ Angle of thread to vertical $\theta = 6.12^\circ$</p> <p>$T \cos 6.12^\circ = 1.1 \times 10^{-3} \text{ kg} \times 9.81 \text{ N kg}^{-1}$</p> <p>Tension in thread = 0.0109 N</p> <p>Force of repulsion = $0.0109 \sin 6.12^\circ = 1.16 \times 10^{-3}$ N</p>	4
13aii	<p>Use of $F = \frac{Q_1 Q_2}{4\pi\epsilon_0 r^2}$ (accept use of $F = \frac{k Q_1 Q_2}{r^2}$) (1)</p> <p>$Q = 1.7 \times 10^{-7}$ (C) (allow ecf from ai) (1)</p> <p><u>Example of calculation</u></p> <p>$1.16 \times 10^{-3} \text{ N} = 8.99 \times 10^9 \text{ Nm}^2 \text{C}^{-2} \frac{Q^2}{0.47^2 \text{ m}^2}$</p> <p>$Q = 1.69 \times 10^{-7} \text{ C}$</p>	2
13b	<p>Use of $V = \frac{Q}{4\pi\epsilon_0 r}$ (accept use of $V = \frac{kQ}{r}$) (1)</p> <p>$V = 5100 \text{ V}$ (allow ecf from aii) (1)</p> <p><u>Example of calculation</u></p> <p>$V = 8.99 \times 10^9 \text{ Nm}^2 \text{C}^{-2} \frac{(-)1.7 \times 10^{-7} \text{ C}}{0.30 \text{ m}} = (-)5094 \text{ V}$</p>	2
Total for question 13		8