Question Number	Scheme	Notes	Marks
2	$\frac{x^2}{64}+\frac{y^2}{16}=1$		
(a)	$a=8,\ b=4$ $b^2=a^2\left(1-e^2\right)\Rightarrow 16=64\left(1-e^2\right)\Rightarrow e=...$	Uses any correct eccentricity formula and solves for e	M1
	$e=\frac{\sqrt{3}}{2}$	Correct value. $\pm\frac{\sqrt{3}}{2}$ is A0	A1
			(2)
(b)	$\frac{a}{e}-ae=\frac{"8"}{\frac{"\sqrt{3}"}{2}}-"8"\times"\frac{\sqrt{3}}{2}"$	Uses $\frac{a}{e}-ae$ (or equivalent work) to obtain a numerical value. Their values of $\frac{a}{e}$ and ae must be seen separately. Subtraction may be implied by answer. Condone subtraction the wrong way round.	M1
	$=\frac{16\sqrt{3}}{3}-4\sqrt{3}=\frac{4\sqrt{3}}{3}$ or $\frac{4}{\sqrt{3}}$	Correct distance in simplest form. Mark can be given if subtraction was the wrong way round and answer subsequently made positive.	A1
			(2)
(c)	P is $\left(8\cos\theta,\ 4\sin\theta\right)$	Correct coordinates. May be implied.	B1
	M is $\left(\frac{8\cos\theta+14}{2},\ 4\sin\theta\right)$	Correct coordinates for M (following through on their P) in terms of θ	B1ft
	$x=4\cos\theta+7\Rightarrow\cos\theta=\frac{x-7}{4}$ $y=4\sin\theta\Rightarrow\sin\theta=\frac{y}{4}$ $\cos^2\theta+\sin^2\theta=1\Rightarrow\left(\frac{x-7}{4}\right)^2+\left(\frac{y}{4}\right)^2=1$ $\left\{(x-7)^2+y^2=16\right\}$	M1: Using their M, whose x and y coordinates are linear functions of $\cos\theta$ and $\sin\theta$ respectively, uses a valid algebraic method to eliminate θ to obtain an equation in x and y only. Usually this will involve use of $\cos^2\theta+\sin^2\theta=1$, but there are other valid ways to eliminate θ, so check working carefully. A1: Correct equation of circle with the same denominator for the x and y terms	M1A1
Alt	Consider $M(X, Y)$ $X=\frac{14+x}{2},Y=y$ (where (x,y) are coordinates of P) $x=2X-14,\ y=Y$ Since P is on the ellipse: $\frac{(2X-14)^2}{64}+\frac{Y^2}{16}=1\Rightarrow\frac{4(X-7)^2}{64}+\frac{Y^2}{16}=1$ $\Rightarrow\frac{(X-7)^2}{16}+\frac{Y^2}{16}=1$ $\left\{(X-7)^2+Y^2=16\right\}$	B1: Correct coordinates of M in terms of the Cartesian coordinates of P. May be implied. B1ft: Finds x and y (the coordinates of P) in terms of X and Y (the coordinates of M). Follow through on their equations for X and Y. M1: Substitutes their expressions for x and y (in terms of the coordinates of M) into the equation of the ellipse. A1: Correct equation of circle with the same denominator for the x and y terms	B1 B1ft M1A1
			(4)

(d)	radius $= 4$, centre $(7, 0)$	**Note:** For both marks, follow through on their equation of a circle, which must have come from a genuine attempt at part (c). If this is unclear, please send to review. B1ft: Correct radius or centre B1ft: Correct radius and centre	B1ft B1ft
			(2)
			Total 10