

Question			Marking details	Marks Available
7	(a)		Because their star is the Sun <b>or</b> they all orbit the Sun <b>or</b> $\frac{M_{star}}{M_{Sun}} = 1$ Accept $M_{star}$ is the same	1
	(b)	(i)		1
		(ii)		1
	(c)	(i)	yes <b>because</b> it's in the habitable zone <b>ecf</b>	1
		(ii)	[no] <b>because</b> it is too hot <b>or</b> too close to star <b>ecf</b>	1
	(d)		Eliminating $r_s$ (1) $\frac{M_s v_s^2}{r_s} = \frac{G M_s M_p}{d^2} \rightarrow \frac{v_s^2}{M_p d / M_s} = \frac{G M_p}{d^2} \text{ or } M_s v_s^2 = \frac{G M_s r_s M_p}{d^2} = \frac{G M_p d M_p}{d^2}$	
			Remainder of algebra convincing (1)	2
	(e)		Because Doppler shift $\propto v_s$ (accept depends on) (1)	
			and $v_s \propto M_p$ or $v_s$ increases with $M_p$ (1)	
			and $v_s \propto M_s^{-0.5}$ or $v_s$ decreases with $M_s$ (1)	
			and $v_s \propto d^{-0.5}$ or $v_s$ decreases with $d$ (1)	4

Question		Marking details	Marks Available
7	(f)	<p>Some comment about most planets being large mass e.g. nearly all masses greater than <math>M_E</math> or average/median mass is close to mass of Jupiter etc. (1)</p> <p>Some comment about <math>d</math> being quite small on average e.g. mean/median <math>d</math> is only about 1AU (not 0AU!) or nearly all planets inside 10 AU etc. (1)</p> <p>The graph says nothing about the size of the star (1)</p> <p><b>Award a maximum of 2 marks only</b></p> <p>Most planets towards top left of graph (by itself) scores 1 mark</p>	2
	(g)	<p>Accept a circle around the correct planet</p> <p>x correct – 1 mark, y correct – 1 mark</p>	2
	(h)	<p><math>\frac{\pi r_1^2}{\pi r_2^2} = 20^2</math> (1)</p> <p>Drops by 0.25% or drops <b>to</b> 99.75% or drops by <math>\frac{1}{400}</math> (1) (correct answer implies first step)</p>	2
	(i)	<p>Radial velocity gives mass (1)</p> <p>Transit gives radius <b>or</b> area <b>or</b> diameter (1)</p> <p>Density = <math>\frac{\text{mass}}{\text{volume}}</math> and volume from area or diameter or radius (1)</p>	3
	<b>Question 7 Total</b>		<b>[20]</b>