1(a)	velocity and acceleration both have constant magnitude
	velocity is (always) perpendicular to acceleration
1(b)(i)	$v = R\omega$
1(b)(ii)	$a = R\omega^2$ **or** $a = v^2 / R$
	$a = v\omega$
1(c)(i)	$x = R \sin \theta$
1(c)(ii)	$\theta = \omega t$
1(c)(iii)	clear substitution of $\theta = \omega t$ into $x = R \sin \theta$ leading to $x = R \sin \omega t$
1(c)(iv)	equation is of the form $x = x_0 \sin \omega t$ (so simple harmonic motion)
1(d)(i)	amplitude = 0.46 / 2 = 0.23 m
1(d)(ii)	$\omega = 2\pi / T$
	period = 2π / 1.9 = 3.3 s
1(d)(iii)	$a_0 = \omega^2 x_0$
	$= 1.9^2 \times 0.23$ $= 0.83$ m s^{-2}
1(e)	shadow on screen, labelled A, above left-hand edge of the circular path

1(a)(i)	radius = $6.37 \times 10^6 \times \cos 52.2° = 3.90 \times 10^6$ m
1(a)(ii)	period = 24 hours
	$v = 2\pi r / T$ **or** $v = r\omega$ **and** $\omega = 2\pi / T$
	$v = (2\pi \times 3.90 \times 10^6) / (24 \times 60 \times 60)$ $= 280$ m s^{-1}
1(b)(i)	$F = mv^2 / r$
	$= (58.6 \times 280^2) / (3.90 \times 10^6)$ $= 1.2$ N
1(b)(ii)	arrow pointing horizontally to the left
1(b)(iii)	arrow from student pointing along the dotted line, labelled 'weight'
	upwards arrow from student pointing in a direction to the left of normal and above the tangent to the Earth, labelled 'contact force'

1(a)	arrow vertically downwards labelled 'weight' <u>and</u> arrow perpendicular to cone, inwards and upwards, labelled 'normal contact force'
1(b)	vertical component of contact force = weight (so no resultant force vertically)
	horizontal component of contact force is resultant force towards centre (of circle)
1(c)	$a = v^2 / r$
	$a = g \tan 52°$
	$9.81 \times \tan 52° = v^2 / 0.15$ leading to $v = 1.4$ m s^{-1}
1(d)	$v = r\omega$ <u>or</u> $a = r\omega^2$
	$\omega = 1.4 / 0.15$ or $\sqrt{(9.81 \times \tan 52° / 0.15)}$ $= 9.3$ rad s^{-1}
1(e)	same resultant force / same acceleration so v^2 is proportional to r (so if speed increases radius must also increase)