Assess Quizzes from the o-book – Explanations for the answers.

Chapter 3 Review – Support

Q	Reason
1	By definition, centripetal acceleration is directed towards the centre
2	$T = \frac{20s}{5rev} = 4\,s\ per\ rev$ $T = 4\,s$
3	f =revolutions/seconds =6/60 =0.1 s^{-1}= 0.1 Hz
4	Time (T) for 1 revolution = 10 s. No. of revolutions in 25 s = 25/10 = 2.5
5	The horizontal force is the centripetal force and this is always directed towards the centre.
6	Newton's 1st law says that an object will continue in its uniform state of motion unless acted on by an outside force. Once the string breaks there is no force in the horizontal plane so the ball keeps moving in a straight line at a tangent to its circular motion.
7	$F_c = \frac{mv^2}{r}$ $F_c \propto v^2$, for constant r and m Thus, needs an increased force
8	$F_c = \frac{mv^2}{r}$ $r \propto v^2$, for constant F_c and m Thus, an increase in ***v*** leads to an increase in ***r***
9	Acceleration is defined as the rate of change of velocity. If the direction is changing then velocity is changing and hence it is accelerating.
10	There is no change in speed so as $E_k = ½ mv^2$, it remains constant (it is a scalar and not a vector so the change in direction on thevelocity vector makes no difference. E_p = mgh and as the height remains constant (horizontal circle), the potential energy (E_P) is constant too.

Chapter 3 Review – Consolidate

Q	Reason

Assess Quizzes from the o-book – Explanations for the answers.

1	$F_{net} = \frac{mv^2}{r}$ $v = \sqrt{\frac{F_c r}{m}} = \sqrt{\frac{8 \times 12}{4}}$ $= 1.5\, m\, s^{-1}$
2	$a_{c(1)} = \frac{v^2}{r}$ $a_{c(2)} = \frac{(2v)^2}{r} = \frac{4v^2}{r}$ $= 4a_{c(1)}\ (quadruples)$
3	$v = \frac{2\pi r}{T} = \frac{2\pi \times 20}{5} = 2.51\, m\, s^{-1}$ $F_c = \frac{mv^2}{r} = \frac{2.0 \times (2.51)^2}{2.0}$ $= 6.3\, N$ $F_P = F_c = 6.3\, N$
4	***v*** is directed at a tangent to the radius, acceleration, ***a***, is directed along the radius towards the centre. Note that force is also directed along the radius In case you're ever asked.
5	$F_c = \frac{mv^2}{r}$ $400 = \frac{10 \times v^2}{10}$ $v = \sqrt{400}$ $= 20\, m\, s^{-1}$

Chapter 3 Review – Extend

Q	Reason

Assess Quizzes from the o-book – Explanations for the answers.

1	$F_c = \frac{mv^2}{r} \Rightarrow mv^2 = F_c r$ $E_K = \frac{1}{2}mv^2 \Rightarrow mv^2 = 2E_K$ $F_c r = 2E_K$ $F_c = \frac{2E_K}{r}$
2	$F_c = \frac{mv^2}{R}$ $F_c = \frac{mv_2{}^2}{2R}$ $\frac{mv^2}{R} = \frac{mv_2{}^2}{2R}$ $\frac{v^2}{1} = \frac{v_2{}^2}{2}$ $v_2{}^2 = 2v^2$ $v_2 = \sqrt{2v^2}$ $= \sqrt{2} \times v$ $= v\sqrt{2}$
3	F_c is directed towards the centre and the stopper does not move any distance in the direction of the force. Thus, as $W = Fs$ $= F \times 0$ $= 0$
4	$C = 2\pi r$ $4 \times 314 = 2\pi \times r$ $r = \frac{4 \times 314}{2\pi} = 200\,m$ $F_c = \frac{mv^2}{r} = \frac{2000 \times 10^2}{200}$ $F_c = 1000\,N$
5	The frictional force will be the same in both cases as the mass of the coin and the surface are unchanged. It is friction that provides the centripetal force so F_C must also be the same in both cases.

Assess Quizzes from the o-book – Explanations for the answers.

	$F_{c(case1)} = F_{c(case2)}$ $\frac{mv^2}{r} = \frac{m{v_2}^2}{r_2}$ $\frac{v^2}{8} = \frac{{v_2}^2}{r_2}$ $\frac{v^2}{8} = \frac{(2v)^2}{r_2}$ $\frac{v^2}{8} = \frac{4v^2}{r_2}$ $\frac{1}{8} = \frac{4}{r_2}$ $r_2 = 32\,cm$