Horizontal Circular Motion w/s

1. $m = 2.5 \times 10^{-2}\ kg$

$V = 5.0\ m/s$

$r = 2.0\ m$

$$F_c = \frac{mv^2}{r} = \frac{(2.5\times10^{-2})(5.0)^2}{2.0}$$

$$\boxed{= .31\ N}$$

2. $m = .225\ kg$

$r = .750\ m$

$F_{c,max} = 1.50\ N$

$$F_c = \frac{mv^2}{r}$$

$$v = \sqrt{\frac{rF_c}{m}}$$

$$= \sqrt{\frac{(.750)(1.50)}{.225}}$$

$$\boxed{= 2.24\ m/s}$$

$$V = \frac{2\pi r}{T}$$

$$T = \frac{2\pi r}{v} = \frac{(2)(\pi)(.750)}{2.24}$$

$$= 2.10\ s/rev$$

$$\frac{1\ rev}{2.10\ s} \times \frac{60\ s}{1\ min} = \boxed{28.6\ rev/min}$$

3. $M_e = 9.11\times10^{-31}\ kg$

$r = .020\ m$

$V = 3.0\times10^{6}\ m/s$

$$F_c = \frac{mv^2}{r}$$

$$= \frac{(9.11\times10^{-31})(3.0\times10^{6})^2}{.020}$$

$$= 4.10\times10^{-16}\ N$$

$m_p = 1.67\times10^{-27}\ kg$ $\quad F_c = \frac{mv^2}{r}$

$$V = \sqrt{\frac{rF_c}{m}}$$

$$= \sqrt{\frac{(.020)(4.10\times10^{-16})}{1.67\times10^{-27}}}$$

$$\boxed{= 7.0\times10^{4}\ m/s}$$

4. $r = 150.\ m$

$V = 13.4\ m/s$

$m = 1000.\ kg$

$F_{c,max} = 1500.\ N$

a)

$$F_c = \frac{mv^2}{r}$$

$$= \frac{(1000.)(13.4)^2}{150.}$$

$$\boxed{= 1.20\times10^{3}\ N}$$

b) $\quad F_c = \frac{mv^2}{r}$

$$V = \sqrt{\frac{rF_c}{m}}$$

$$= \sqrt{\frac{(150.)(1500.)}{1000.}}$$

$$\boxed{= 15.0\ m/s}$$

5. $m = 25.0\ kg$

$V = 1.93\ m/s$

$r = 12.5\ m$

a)

$$a_c = \frac{v^2}{r}$$

$$= \frac{(1.93)^2}{12.5}$$

$$\boxed{= .298\ m/s^2}$$

b) $\quad F_c = m\frac{v^2}{r}$

$$= \frac{(25.0)(1.93)^2}{12.5}$$

$$\boxed{= 7.45\ N}$$

(6.) $m = \frac{13500}{9.80} = 1380\ kg$

$v = 13.89\ m/s$

$r = 2.00 \times 10^2\ m$

a) $a_c = \frac{v^2}{r} = \frac{13.89^2}{2.00 \times 10^2}$

$= .965\ m/s^2$

b) $F_c = \frac{mv^2}{r} = \frac{(1380)(13.89)^2}{2.00 \times 10^2}$

$= 1330\ N$

c) $F_c = \frac{mv^2}{r}$

F_F (in this case)

$F_F = \frac{mv^2}{r}$

$u_s mg = \frac{mv^2}{r}$

$u_s = \frac{v^2}{gr}$

$= \frac{(13.89)^2}{(9.80)(2.00 \times 10^2)}$

$= .0984$

d) $F_c = \frac{mv^2}{r}$ $\quad u_s = .050$

$F_F = \frac{mv^2}{r}$

$umg = \frac{mv^2}{r}$

$v = \sqrt{rug}$

$= \sqrt{(2.00 \times 10^2)(.050)(9.80)}$

$= 9.9\ m/s$

(7.) $m = 2.00 \times 10^3\ kg$

$r = 20.0\ m$

$u_s = .70$

$F_c = \frac{mv^2}{r}$

$F_F = \frac{mv^2}{r}$

$umg = \frac{mv^2}{r}$

$v = \sqrt{rug}$

$= \sqrt{(20.0)(.70)(9.80)}$

$= 12\ m/s$