1/ The elbow joint is flexed through an angle of 65°. Express this angle in terms of radians.

[1.134 radians]

2/ A fast twitch muscle has a period between firings of 0.0115s. Calculate the frequency of muscular twitches.

[87hz]

3/ A baseball is spinning with an angular velocity of 135rads/s. Calculate the frequency of rotation of the baseball.

[21.5hz]

4/ A carbon dioxide molecule rotates with a frequency of 6.42×10^9Hz. Calculate its angular velocity.

[40.33×10^9rads/s]

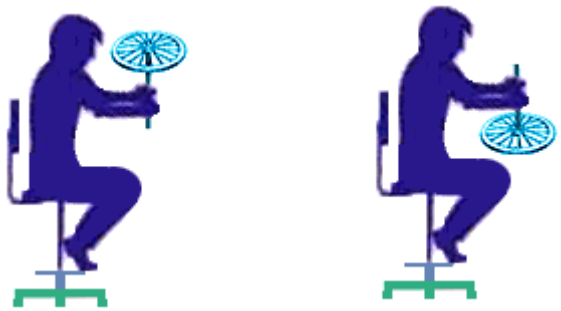
5/ A computer hard disk spins at 754rads/s (7200RPM). It slows down with an angular deceleration of 300rads/s^2. How long does it take to stop and how many revolutions does it do in this time?

[2.51s, 151 revolutions]

6/ A golf ball of radius 0.02134m is rolling across the putting green at a speed of 0.8m/s. Calculate the angular velocity of the golf ball and the centripetal acceleration at the rim of the ball.

[37.5rads/s, 30m/s^2]

7/ A person is sitting still on a swivel chair holding a bicycle wheel rotating at 50rads/s in a horizontal plane. The person then flips the wheel over as shown below. What is the rotation rate of the person after having flipped the wheel. The moments of inertia are I_{person} =15kgm^2 and I_{wheel}=0.9kgm^2.



[6rads/s, about one revolution per second]

8/ Calculate the moment of inertia of a Frisbee of radius 0.14m and mass 0.16kg. Calculate the angular momentum and the rotational kinetic energy of the Frisbee when it is spinning at 65rads/s.

[1.568×10^{-3}kgm^2, 0.102kgm^2/s, 3.31J]

10/ Calculate the moment of inertia of a tennis racket for a rotation parallel to the direction of the strings. The pivot of the rotation is about the handle. Model the tennis racket as follows:

- Treat the handle as a bar of length 0.15cm and mass 0.12kg
- Neglect the contribution of the strings
- Treat the head as a circle of radius 0.12m and mass 0.14kg
- Because the head is rotating around the handle rather than around its centre, you have to add a term $m_{head}d^2$, where d is the distance from the handle to the centre of the racket head (this is an example of the *parallel axis theorem*).

[9.1×10^{-3} kgm²]

11/ Calculate the centripetal force acting on a body of mass 4 kg moving in a circle of radius 2.6m at a frequency of 0.24 hz.

[23.65 N]

12/ Calculate the centrifugal acceleration due to the rotation of the Earth at the equator. What percentage of g due this represent ? Take the radius of the Earth to be 6356.8 km.

[0.0336 ms^{-2}, -0.343 %]

13/ A solid sphere of mass 2.5kg and radius 0.34m rotates at 10hz

i) Calculate its rate of rotation in rad s^{-1}
ii) Calculate its moment of inertia
iii) Calculate its angular momentum
iv) Calculate its rotational kinetic energy

[62.83rad s^{-1}, 0.1156kgm2, 7.263Js, 228J]