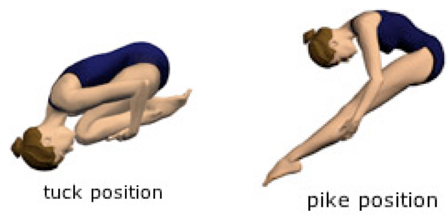
Chapter 8 Problem Set 6 **Name** ______________________________

Physics I **Date** ____________ **Period** ___________

1. A skater has a moment of inertia of 100 m^2kg with arms outstretched and 75 m^2kg with arms tucked in close to his body. If he starts to spin at 2 rotations per second with outstretched arms, what will be his angular velocity with arms tucked in?



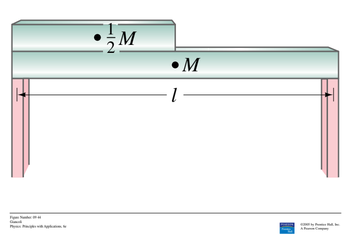
2. Divers change their body position in midair while rotating about their center of mass. In one dive, the diver leaves the board with her body nearly straight, then tucks into a somersault position. If the moment of inertia of the diver in a straight position is 14 kg m^2 and in a tucked position is 4.0 kg$\cdot$$m^2$ by what factor is her angular velocity increased when she is tucked than when straight?

3. A skater is initially spinning at a rate of 10 rad/s with a rotational inertia of 2.5 kg m^2 when her arms are extended. What is her angular velocity after she pulls her arms in and reduces her rotational inertia to 1.6 kg m^2?

4. The rotational inertia for a diver in a pike position is about 15.5 kg$\cdot$$m^2$ it is only 8 kg$\cdot$$m^2$ in a tuck position. If the diver gives himself an initial angular momentum of 106 kg$\cdot$$m^2$/s as he jumps off the platform, how much angular velocity will the diver have after drawing himself into a tuck position? into a pike position?

5. Stars have structure, and the center region of a star is called the core. Suppose a supergiant star has a core of radius 5×10^5 m and which rotates one time per month, which is about what our sun does. When this supergiant goes supernova, its core will be compressed by the explosion around it as well as by its own gravitation and will collapse to become a neutron star, perhaps to a radius of about 10 km. What will be its new rate of rotation in revolutions per second?

Chapter 9



7. (II) A uniform steel beam has a mass of 940 kg. On it is resting half of an identical beam, as shown in Fig. 9–44 (above). What is the vertical support force at each end? [Hint: ℓ could be any length. You may simply just stick with ℓ or you could give it any value you want.]