PHYS 211 Angular Momentum and Conservation of Angular Momentum

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|  | |  | | --- | |  |   61. The uniform rod (length 0.60 m, mass 1.0 kg) in Fig. [11-54](http://edugen.wiley.com/edugen/courses/crs4957/halliday9118/halliday9118c11/halliday9118/halliday9118c11/halliday9118c11xlinks.xform?id=halliday9118c11-fig-0054) rotates in the plane of the figure about an axis through one end, with a rotational inertia of 0.12 kg·m2. As the rod swings through its lowest position, it collides with a 0.20 kg putty wad that sticks to the end of the rod. If the rod's angular speed just before collision is 2.4 rad/s, what is the angular speed of the rod–putty system immediately after collision? http://edugen.wiley.com/edugen/courses/crs4957/halliday9118/halliday9118c11/image_n/nt0058-y.gif  60. In Fig. [11-53](http://edugen.wiley.com/edugen/courses/crs4957/halliday9118/halliday9118c11/halliday9118/halliday9118c11/halliday9118c11xlinks.xform?id=halliday9118c11-fig-0053), a 1.0 g bullet is fired into a 0.50 kg block attached to the end of a 0.60 m nonuniform rod of mass 0.50 kg. The block–rod–bullet system then rotates in the plane of the figure, about a fixed axis at *A*. The rotational inertia of the rod alone about that axis at *A* is 0.060 kg·m2. Treat the block as a particle. (a) What then is the rotational inertia of the block–rod–bullet system about point *A*? (b) If the angular speed of the system about *A* just after impact is 4.5 rad/s, what is the bullet's speed just before impact?   |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | http://edugen.wiley.com/edugen/courses/crs4957/halliday9118/halliday9118c11/image_n/nt0057-y.gif | |  | | --- | |  | | |  |  |  |  | | --- | --- | --- | --- | | |  | | --- | |  | |  | |  | | | |  | |  | |  | |  | |
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44. A Texas cockroach of mass 0.17 kg runs counterclockwise around the rim of a lazy Susan (a circular disk mounted on a vertical axle) that has radius 15 cm, rotational inertia 5.0 × 10-3 kg·m2, and frictionless bearings. The cockroach's speed (relative to the ground) is 2.0 m/s, and the lazy Susan turns clockwise with angular speed *ω*0 = 2.8 rad/s. The cockroach finds a bread crumb on the rim and, of course, stops. (a) What is the angular speed of the lazy Susan after the cockroach stops? (b) Is mechanical energy conserved as it stops?