A single conservative force F = 2∗x−4, acts on a 2.0 kg particle. As the particle moves along the x-axis from x = 2.0m to x = 4.0m, calculate the following: a. The work done by the force F on the particle. Ans: 4J b. The change in the potential energy of the particle, Ans: -4J c. The kinetic energy the particle has at x = 4 if its speed is 3m/s at x = 12. Ans: 13J, work = integral of fx, U -integral fx, work = change in ke

A boy starts at rest and slides down a frictionless slide as in the figure below. The bottom of the track is a height h above the ground. The boy then leaves the track horizontally, striking the ground a distance d as shown. Using energy methods, determine the initial height H of the boy in terms of h and d. (Use any variable or symbol stated above as necessary.) Ans: h + (d2 /(4h))

A mass (M1=4kg), connected by a light cord to a mass (M2=2kg), slides on a smooth surface (see figure below). The pulley (radius=0.1m) rotates about a frictionless axle. The acceleration of M2 is 2.0 m/s2 . What is the moment of inertia of the pulley? Ans: 0.14 kg*m2 .
Find torques from each mass (t2 = m2a, t1-w1=-m1a) and then t1-t2 = I (a/r) (a/r = ang acc)

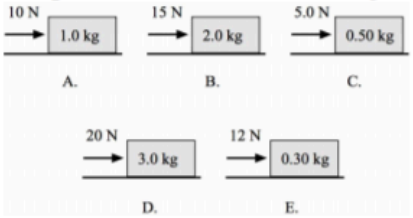
A 2.0-kg block slides down a frictionless incline from point A to point B (distance AB=2m). A force (P=3N) acts on the block between A and B, as shown. If the kinetic energy of the block at A is 10 J, what is the kinetic energy of the block at B? Find overall sum of forces from weight and p (-p = 6 and w = wsin(30)) multiply by distance 2, and then work equals change in kinetic energy

The calculations of both the torque and the moment of inertia depend on _____. Ans: Location of the rotational axis.

The figure below shows a bird's-eye view of a system of two identical balls (mass M=5kg) connected by a light rod (negligible mass, length = 2m) that rotates about a vertical axis through its center. A force F=10N is applied as shown. a. Calculate the net torque applied on the system τ? Ans: 10 N.m. b. Calculate the moment of inertia of the system I? Ans: 10 kg*m2 . c. Calculate the angular acceleration α? Ans: 1 rad/s2. Torque = force * distance = 10, I = 5+5 = 10, ang accel = 1, t = Iangaccel

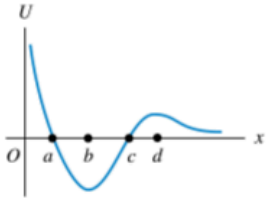
1. In which one of the following situations is zero net work done?
   Ans: A box is pulled across a rough floor at constant velocity

2. Each of the boxes, with masses noted, is pulled for 10 m across a level, frictionless floor by the noted force. Which box experiences the smallest change in kinetic energy?
   Ans: C



3. The graph shows the potential energy U for a particle that moves along the x-axis. The only force that acts on the particle is the force associated with U. At which of the labeled x-coordinates is there *zero* force on the particle?

   Ans: at $x = b$ and $x = d$



4. How much work must be done to stop a 1500 kg car traveling at 105 km/h?
   Ans: -6.38×10^5 J

3. F = -dU/dt, U= - integral fx
4. . How much work must be done to stop a 1500 kg car traveling at 105 km/h? Ans: −6.38 x 105 J : 105km/h = 29.1667^2, W = -1500*29.1667^2*.5 = -638020.8335

A constant force of 10N in the negative y direction acts on a particle as it moves from the origin to the point r = (2*i + 3*j – 1*k) m [note: i, j and k are unit vectors]. How much work is done by the given force; during this displacement? [Hint: force is a vector] Ans: −30 J 3*-10 = -30.

A man of mass 100 kg runs up a flight of stairs 15 m high in 25 s, knowing that this man is 50% efficient, then how much power does he expend? Ans: 1176 W. W = 15*9.8*100=14700, 1470025=588/50*100 = 1176

Moment of inertia is Ans: the rotational equivalent of mass

9. Two points are located on a rigid wheel that is rotating with decreasing angular velocity about a fixed axis. Point A is located on the rim of the wheel and point B is halfway between the rim and the axis. Which one of the following statements concerning this situation is true? Ans: Both points have the same angular velocity

Complete the following statement: When a non-zero net torque is applied to a rigid object, it always produces a Ans: change in angular velocity

11. The center of gravity of an object is at the same position as the center of mass when Ans: the object is located in a region where g is uniform over the entire object

12. When the sum of the external forces and the sum of the external torques on a body are both zero, we can conclude that Ans: the body may have constant linear or constant angular velocity, or both simultaneously

. A computer hard disk starts from rest; then speeds up with an angular acceleration of 190 rad/s2 until it reaches its final angular speed of 600 rpm. How many revolutions the disk made, when it reaches its maximum angular speed? 600rpm = 62.8318 rad/s, kinetmatic to find 1.7 turns

The rigid object shown is rotated about an axis perpendicular to the paper and through point P. The total kinetic energy of the object as it rotates is equal to 3J. If M = 0.5kg and L = 1.0m, what is the angular velocity of the object? Neglect the mass of the connecting rods and treat the masses as single objects with no shape. Find each I, .5Iw=.5mv^2 conserved. 3/1.5*.5 = w^2 = 4, w =2

A seesaw has length 8m and uniform mass 10kg and is resting at an angle of 60° with respect to the ground (see figure below). The pivot is located at 5m from the end of the seesaw. Calculate the torque applied on the seesaw due to its mass? Torque from weight = 10*9.8*cos(60)*1 = 49, -49 bc CW

. A 60kg, 5m long beam is supported, but not attached to, the two posts in the figure. A 40kg boy starts walking along the beam. How close can he get to the right end of the beam without it falling over? Ans: 1.25 m, set torques = to each other, you find distance of boy is .75, 2-.75 = 1.25

. A traffic light hangs from a pole as shown in the figure. The uniform aluminum pole AB is 8.0 m long and has a mass of 10.0 kg. The mass of the traffic light is 15.0 kg. (Assume the positive directions are upward and to the right.). Determine the tension in the horizontal massless cable CD? Set torques = 0, use sin for all,