PH105-001 **Practice Exam 2 - Key** **Fall, 2008**

1. A 4-kg block is released from rest at the top of a 30^o inclined plane at an initial elevation of 2 m above the base of the incline. The speed of the block when it reaches the base of the incline is 5 m/s. How much work was done by friction on the block?

   (a) zero (b) 15 J (c) <u>28 J</u> (d) 49 J (e) 75 J (f) none of these

2. A 0.05-kg mass is loaded into a spring gun and fired vertically into the air. The spring constant is 200 N/m and the spring is compressed 0.15 m. How high above the compressed position does the mass travel into the air?

   (a) 2.1 m (b) <u>4.6 m</u> (c) 7.3 m (d) 9.8 m (e) 15.4 m (f) none of these

3. A 2-kg block is pulled a distance 5 m along a flat surface with a 20-N force at an angle of 30^o above the surface. How much work does the pulling force do?

   (a) 20 J (b) 49 J (c) 66 J (d) <u>87 J</u> (e) 98 J (f) none of these

4. If the coefficient of friction in the above problem is 0.5, how much work is done by friction?

   (a) <u>-24 J</u> (b) 49 J (c) -66 J (d) 98 J (e) -128 J (f) none of these

5. A 3-kg bomb initially at rest explodes into two fragments of masses 1 kg and 2 kg. The speed of the 1-kg fragment is 60 m/s. How much total energy was released in the explosion?

   (a) <u>2700 J</u> (b) 1800 J (c) 900 J (d) 120 J (e) 360 J (f) none of these

6. A 0.5-kg cart traveling at 0.3 m/s strikes and rebounds from a force sensor with a speed of 0.2 m/s. If the time of contact with the force sensor is 0.02 s, what is the average force of contact?

   (a) 7.5 N (b) 5 N (c) 0.005 N (d) <u>12.5 N</u> (e) 0.1 N (f) none of these

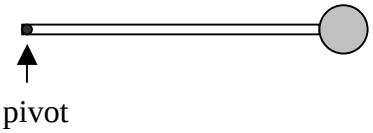
7. A 1000-kg car traveling at 30 m/s makes a rear-end collision with a 2000-kg truck traveling at 10 m/s. If the vehicles stick together, what is their speed just after the collision?

   (a) 15 m/s (b) 12 m/s (c) <u>17 m/s</u> (d) 20 m/s (e) 25 m/s (f) none of these

8. Four 5-kg masses are held at the corners of a 20 cm square by light rods. What is the moment of inertia about an axis that passes through opposite corners of the square?

   (a) 0.4 kg-m^2 (b) <u>0.2 kg-m^2</u> (c) 2 kg-m^2 (d) 1.5 kg-m^2 (e) 0.05 kg-m^2 (f) none of these

9. A pendulum consisting of a 1-kg mass at the end of a light rod of length 0.5 m is released from rest in the horizontal position. What is the initial angular acceleration (rad/s^2) of the pendulum?



   (a) 9.8 (b) <u>19.6</u> (c) 4.9 (d) 0.5 (e) 2.5 (f) none of these

10. A disk ($I = \frac{1}{2} MR^2$) rolls up an inclined plane to an elevation of 4 m before coming to rest. What was the speed of the disk at the bottom of the incline?

    (a) 8.9 m/s (b) <u>7.2 m/s</u> (c) 4.9 m/s (d) 15 m/s (e) 2.2 m/s (f) none of these

11. A clutch consists of two concentric disks with rotational inertia $I_1 = 0.1$ kg-m^2 and $I_2 =$ 0.2 kg-m^2. Initially disk 1 is rotating at 15 rev/s and disk 2 is at rest. The disks are then brought together so that they eventually rotate at a common angular velocity. What is their final angular velocity?

    (a) <u>5 rev/s</u> (b) 10 rev/s (c) 15 rev/s (d) 9 rev/s (e) 2 rev/s (f) none of these

12. How much kinetic energy (if any) is lost in the process of engaging the disks?

    (a) <u>296 J</u> (b) 444 J (c) 148 J (d) zero (e) 100 J (f) none of these

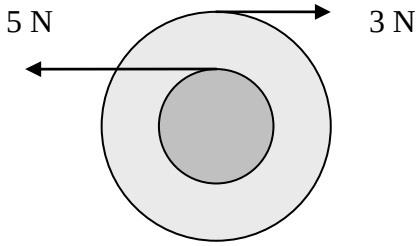
13. A boy stands on the edge of a rotating platform and walks toward the center. Which statement is true? The rotational speed of the platform

    (a) increases (b) decreases (c) doesn't change (d) not enough information

14. Referring to the above problem, which statement is true? The total kinetic energy of the platform and boy

    (a) increases (b) decreases (c) doesn't change (d) not enough information

15. The pulley shown to the right is pivoted to rotate about an axis through the center perpendicular to the page. The two forces shown are applied at points that are 10 cm and 20 cm from the center. In what direction does the pulley rotate?



    (a) Clockwise.
    (b) Counterclockwise.
    (c) The pulley doesn't rotate.
    (d) Need to know the inertia of the pulley.

16. An object is dropped from rest onto the moon's surface from a height of 1.74×10^6 m. (Radius of moon = 1.74×10^6 m, mass of moon = 7.36×10^{22} kg, G = 6.67×10^{-11} N-m^2/kg^2.)

    (a) Is the acceleration of the object constant as it falls? no

    (b) What is the speed of the object just before it hits the surface of the moon?

    v = 1680 m/s

17. The distance of Planet X from the Sun is $4R_E$, where R_E is the Sun-Earth distance. What is the period of orbit of Planet X around the Sun?

    (a) 2 earth years (b) 4 earth years (c) 6 earth years (d) 8 earth years (e) 16 earth years