

Phys 1301 Practice Recitation Exam III

1) Arrange the following in the increasing order of angular speed: A – 175 deg/sec, B - 2×10^4 rad/hr, C - 45 rev/min, D – a second hand of a clock

- A) C, A, D, B
- B) D, B, A, C
- C) B, C, D, C
- D) D, A, C, B

2) A disk, a hoop, and a solid sphere are released at the same time at the top of an inclined plane. They all roll without slipping. They all have the same mass, and the same radius. In what order do they reach the bottom? [$I_{\text{disk}} = \frac{1}{2} MR^2$, $I_{\text{hoop}} = MR^2$, $I_{\text{sphere}} = \frac{2}{5} MR^2$]

- A) sphere, hoop, disk
- B) hoop, sphere, disk
- C) sphere, disk, hoop
- D) disk, hoop, sphere

3) A child is riding a merry-go-round, which has an instantaneous angular speed of 1.25 rad/s and an angular acceleration of 0.745 rad/s^2 . The child is standing 4.65 m from the center of the merry-go-round. What is the magnitude of the acceleration of the child?

- A) 8.05 m/s^2
- B) 7.27 m/s^2
- C) 2.58 m/s^2
- D) 3.46 m/s^2

4) A figure skater is spinning slowly with arms outstretched. She brings her arms in close to her body and her moment of inertia decreases by $1/2$. By what factor does her rotational kinetic energy change?

- A) 2
- B) 4
- C) $1/2$
- D) It doesn't change.

5) A 5.00-m-long ladder, weighing 200 N, rests against a smooth vertical wall with its base on a horizontal rough floor, a distance of 1.20 m away from the wall. The center of mass of the ladder is 2.50 m from its base, and the coefficient of static friction between the ladder and the floor is 0.200. How far up the ladder, measured along the ladder, can a 600-N person climb before the ladder begins to slip?

- A) 1.50 m
- B) 1.26 m
- C) 1.05 m
- D) 4.56 m

6) A 1.8 kg solid disk pulley of radius 0.11 m rotates about an axis through its center. Starting from rest, a torque of 0.22 m·N will produce what angular acceleration? [$I_{\text{disk}} = \frac{1}{2}MR^2$]

- A) $15 \text{ rad} \cdot \text{sec}^{-2}$
- B) $20 \text{ rad} \cdot \text{sec}^{-2}$
- C) $25 \text{ rad} \cdot \text{sec}^{-2}$
- D) $30 \text{ rad} \cdot \text{sec}^{-2}$

7) An astronaut drops a marble on the surface of Mars and observes that it takes 1.02 s for the marble to fall 2.00 m. She also knows that the radius of Mars is 3.39×10^6 m and that $G = 6.67 \times 10^{-11} \text{ N} \cdot \text{m}^2/\text{kg}^2$. From this information, she can conclude that the mass of Mars is

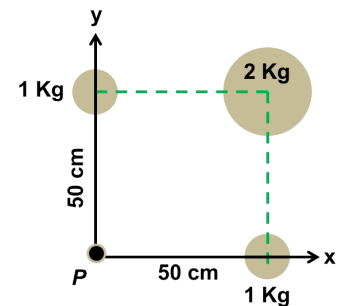
- A) $3.30 \times 10^{23} \text{ kg}$.
- B) $6.62 \times 10^{23} \text{ kg}$.
- C) $4.62 \times 10^{23} \text{ kg}$.
- D) $8.09 \times 10^{23} \text{ kg}$.

8) Asteroid 433 Eros is one of the largest near-Earth asteroids. For purposes of this problem, assume it is spherical. The value of g at its surface is 0.00600 m/s^2 and the escape velocity is only 9.95 m/s . What is the radius of Eros?

- A) 8250 m
- B) 16,000 m
- C) 1600 m
- D) 800 m

9) Three uniform spheres are fixed at the position, as shown in the adjoining figure. What is the magnitude and direction of the gravitational force on a 0.015 kg particle placed at P ?

- A) $9.67 \times 10^{-12} \text{ N}$, 45°
- B) $9.67 \times 10^{-16} \text{ N}$, 30°
- C) $4.84 \times 10^{-12} \text{ N}$, 45°
- D) $9.67 \times 10^{-16} \text{ N}$, 45°



10) A mass of 500 g is resting on a vertical spring with a force constant of 55.0 N/m . A mass of 250 g is dropped from a height of 12.0 cm onto the larger mass and sticks to it. What is the amplitude of the resulting oscillations?

- A) 4.71 cm
- B) 6.34 cm
- C) 5.97 cm
- D) 9.90 cm

Key: 1 D, 2 C, 3 A, 4 A, 5 D, 6 B, 7 B, 8 A, 9 A, 10 C