

MULTIPLE CHOICE. Choose the one alternative that BEST completes the statement or answers the question, and mark your scan sheet (only the scan sheet will be graded).

- 1) A potter's wheel, with rotational inertia $46 \text{ kg}\cdot\text{m}^2$, is spinning freely at 40.0 rpm. The potter drops a lump of clay onto the wheel, where it sticks a distance 1.2 m from the rotational axis. If the subsequent angular speed of the wheel and clay is 32 rpm, what is the mass of the clay?
A) 8.8 kg B) 5.4 kg C) 7.0 kg D) 8.0 kg
- 2) An irregularly shaped object 10 m long is placed with each end on a scale. If the scale on the right reads 74 N and the scale on the left reads 93 N, how far from the left is the center of gravity?
A) 13 m B) 5.6 m C) 4.4 m D) 8.0 m
- 3) A solid, uniform sphere of mass 2.0 kg and radius 1.7 m rolls without slipping down an inclined plane of height 7.0 m. What is the angular velocity of the sphere at the bottom of the inclined plane?
A) 7.0 rad/s B) 5.8 rad/s C) 9.9 rad/s D) 11.0 rad/s
SPHERE: $I = \frac{2}{5}MR^2$
- 4) Use energy conservation to find the mass of planet Π where it is observed that a meteor is approaching in a collision course. At 7514 km from the center of the planet, the meteor has a speed of 136.0 m/s and later at 2823 km a speed of 392.0 m/s.
A) $6.112 \times 10^{28} \text{ kg}$ B) $4.582 \times 10^{20} \text{ kg}$ C) $9.164 \times 10^{27} \text{ kg}$ D) $4.582 \times 10^{21} \text{ kg}$
- 5) You are the science officer on a visit to a distant solar system. Prior to landing on a planet you measure its diameter to be $1.8 \times 10^7 \text{ m}$ and its rotation period to be 22.3 hours. You have previously determined that the planet orbits $1.8 \times 10^{11} \text{ m}$ from its star with a period of 402 earth days. Once on the surface you find that the acceleration due to gravity is 59.7 m/s^2 . What are the mass of (a) the planet and (b) the star?
A) (a) $1.3 \text{ kg} \times 10^{26} \text{ kg}$, (b) $1.7 \text{ kg} \times 10^{30} \text{ kg}$ B) (a) $1.3 \text{ kg} \times 10^{26} \text{ kg}$, (b) $2.9 \text{ kg} \times 10^{30} \text{ kg}$
C) (a) $7.2 \text{ kg} \times 10^{25} \text{ kg}$, (b) $1.7 \text{ kg} \times 10^{30} \text{ kg}$ D) (a) $7.2 \text{ kg} \times 10^{25}$, (b) $2.9 \text{ kg} \times 10^{30} \text{ kg}$
- 6) A mass on a spring has an angular oscillation frequency of 2.56 rad/s. The spring constant is 27.2 N/m, and the system's kinetic energy is 2.92 J when $t = 1.56 \text{ s}$. What is the oscillation amplitude? Assume that $\phi = 0.00$.
A) 61.5 cm B) 40.0 cm C) 70.1 cm D) 52.9 cm
- 7) A 2.15 kg damped harmonic oscillator has an angular oscillation frequency of 0.261 rad/s. If the maximum displacement of 2.0 m occurs when $t = 0.0 \text{ s}$, and the damping constant is 0.74 kg/s, what is the object's displacement when $t = 4.01 \text{ s}$?
A) 0.65 m B) 0.43 m C) 0.50 m D) 0.57 m
- 8) Find the speed of an ocean wave whose displacement is given by $y = 3.7 \cos(2.2x - 5.6t)$ where x and y are in meters and t is in seconds.
A) 4.5 m/s B) 2.5 m/s C) 3.5 m/s D) 1.9 m/s

CORRECT ANSWERS:

D, C, B, D, D, A, C, B