

Sample Placement Test

1. Two carts collide elastically on a frictionless track. Cart A (1.0 kg) moves at 3.0 m/s in the positive x direction, and Cart B (2.0 kg) is at rest. What is Cart A's velocity after collision?

- A) -1.0 m/s \hat{i}
- B) +1.0 m/s \hat{i}
- C) +2.0 m/s \hat{i}
- D) +0.0 m/s \hat{i}

Correct answer: A

2. A force of 10 N is applied tangentially to a 2 kg solid cylinder (radius = 0.5 m) causing it to rotate. What is the cylinder's angular acceleration?

- A) 10 rad/s²
- B) 5 rad/s²
- C) 20 rad/s²
- D) 8 rad/s²

Correct answer: C

3. A ball of mass 0.5 kg is swung in a horizontal circle on a 1.2 m long string. If the tension in the string is 18 N, what is the speed of the ball?

- A) 6.6 m/s
- B) 4.9 m/s
- C) 3.8 m/s
- D) 5.2 m/s

Correct answer: A

4. A rotating platform ($I = 2.5 \text{ kg}\cdot\text{m}^2$) slows from 8 rad/s to 4 rad/s in 5 seconds due to friction. What is the torque applied?

- A) -2.0 Nm
- B) -1.5 Nm
- C) -3.0 Nm
- D) -1.0 Nm

Correct answer: A

Sample Placement Test

5. A 0.2-kg object moving at 10 m/s strikes a wall perpendicularly and bounces back with a speed of 8 m/s. What is the magnitude of the impulse delivered by the wall?

- A) 1.6 N·s
- B) 3.6 N·s
- C) 2.0 N·s
- D) 0.4 N·s

Correct answer: B

6. A disk with moment of inertia $0.4 \text{ kg}\cdot\text{m}^2$ is spun up from rest by a constant torque of 1.2 Nm. How long does it take to reach 6 rad/s?

- A) 1.5 s
- B) 2.0 s
- C) 2.5 s
- D) 3.0 s

Correct answer: B

7. A spinning figure skater pulls in her arms, reducing her moment of inertia to half. What happens to her angular velocity?

- A) Doubles
- B) Halves
- C) Quadruples
- D) Stays the same

Correct answer: A

8. A car honks its horn while moving toward a stationary observer. Which of the following best describes the sound heard by the observer?

- *A) Higher frequency than emitted
- B) Lower frequency than emitted
- C) Same frequency as emitted
- D) Zero frequency

Correct answer: A

Sample Placement Test

9. What is the time required to charge a capacitor to 95.0% of maximum in an RC circuit with a 2.0 k Ω resistor and a 10 μ F capacitor?

- A) 0.01 s
- B) 0.02 s
- *C) 0.06 s
- D) 2.0 s

Correct answer: C

10. A proton moving at 2.0×10^6 m/s enters a zone of uniform magnetic field (0.10 T) perpendicular to its velocity. What is the radius of its circular path? (mass = 1.67×10^{-27} kg, charge = 1.6×10^{-19} C)

- *A) 0.21 m
- B) 0.33 m
- C) 0.42 m
- D) 0.52 m

Correct answer: A

END OF SAMPLE TEST