

Brett Robbins Academic Consulting

Physics 30 Practice Test

Unit A: Momentum & Impulse

25 Questions

Original practice questions written to the Alberta curriculum, in the style of past diploma examinations. Work through each question, then check your answers with the key at the end.

This practice test was made by AI and there may be mistakes. If a question or answer looks wrong, contact Brett for clarification.

Question 1

A hockey puck with a mass of 0.16 kg is sliding across the ice at 25 m/s.

The magnitude of the momentum of the puck is

- A) 0.16 kg · m/s
- B) 25 kg · m/s
- C) 4.0 kg · m/s
- D) 1.6×10^2 kg · m/s

Question 2

A 0.40 kg ball moving at 12 m/s is caught and brought to rest by a player.

The magnitude of the impulse delivered to the ball is

- A) 4.8 N · s
- B) 3.0 N · s
- C) 0.40 N · s
- D) 30 N · s

Question 3

On a force – versus – time graph for an object, the area under the curve represents the

- A) work done on the object
- B) impulse experienced by the object
- C) power delivered to the object
- D) acceleration of the object

Question 4

A constant net force of 250 N acts on a crate for 0.80 s.

The magnitude of the impulse delivered to the crate is

- A) 31 N · s
- B) 3.1×10^2 N · s
- C) 20 N · s
- D) 2.0×10^2 N · s

Question 5

A 1.2 kg ball moving east at 5.0 m/s strikes a wall and rebounds directly west at 3.0 m/s.

The magnitude of the change in momentum of the ball is

- | | |
|-----------------|-----------------|
| A) 2.4 kg · m/s | B) 9.6 kg · m/s |
| C) 6.0 kg · m/s | D) 3.6 kg · m/s |

Question 6

A 0.50 kg ball moving at 12 m/s toward a wall rebounds directly away from the wall at 8.0 m/s.

If the ball is in contact with the wall for 0.010 s, the magnitude of the average force exerted on the ball by the wall is

- | | |
|------------------------|------------------------|
| A) 2.0×10^2 N | B) 4.0×10^2 N |
| C) 1.0×10^3 N | D) 1.0×10^4 N |

Question 7

A 1 200 kg car travelling at 8.0 m/s rear – ends a stationary 900 kg car.

The two cars lock together. Their common speed immediately after the collision is

- | | |
|------------|------------|
| A) 4.6 m/s | B) 3.4 m/s |
| C) 6.2 m/s | D) 8.0 m/s |

Question 8

Two carts rest on a frictionless track with a compressed spring between them.

When the spring is released, the 1.2 kg cart moves away at 2.0 m/s.

The speed of the 0.80 kg cart, in metres per second, to the nearest tenth, is ____

Question 9

A 1.0 kg ball moving at 6.0 m/s undergoes an elastic collision with a stationary 3.0 kg ball.

The speed of the 3.0 kg ball immediately after the collision is

- | | |
|------------|------------|
| A) 1.5 m/s | B) 6.0 m/s |
| C) 4.5 m/s | D) 3.0 m/s |

Question 10

A 5.0 kg cart moving at 6.0 m/s collides with a stationary 5.0 kg cart and sticks to it.

The kinetic energy lost in the collision is

- | | |
|---------|---------|
| A) 0 J | B) 45 J |
| C) 90 J | D) 22 J |

Question 11

A 3.0 kg lump of clay moving north at 5.0 m/s collides with a 4.0 kg lump of clay moving east at 5.0 m/s. The two lumps stick together. The speed of the combined lump immediately after the collision is

- | | |
|------------|------------|
| A) 2.9 m/s | B) 5.0 m/s |
| C) 7.1 m/s | D) 3.6 m/s |

Question 12

The total momentum of a system has an eastward component of $30 \text{ kg} \cdot \text{m/s}$ and a northward component of $40 \text{ kg} \cdot \text{m/s}$. The magnitude and direction of the total momentum are

- A) $50 \text{ kg} \cdot \text{m/s}$, 53° north of east
- B) $50 \text{ kg} \cdot \text{m/s}$, 37° north of east
- C) $70 \text{ kg} \cdot \text{m/s}$, 53° north of east
- D) $35 \text{ kg} \cdot \text{m/s}$, 37° north of east

Question 13

A net force acting on an object increases uniformly from 0 to 60 N during the first 0.10 s and then remains constant at 60 N until 0.30 s. The impulse delivered to the object, in newton seconds, is ____

Question 14

A 60 kg astronaut floating at rest in space throws a 3.0 kg tool at 8.0 m/s. The speed of the astronaut after throwing the tool, in metres per second, to the nearest hundredth, is ____

Question 15

A 0.20 kg ball moving at 5.0 m/s strikes a stationary ball of the same mass.

After the collision, the first ball moves at 1.0 m/s and the second ball moves at 4.0 m/s, both in the original direction. This collision is best classified as

- A) elastic, because both momentum and kinetic energy are conserved
- B) inelastic, because momentum is conserved but kinetic energy is not
- C) perfectly inelastic, because the two balls stick together
- D) impossible, because momentum is not conserved

Question 16

A bullet with a mass of 0.020 kg travelling at 400 m/s embeds itself in a stationary 4.0 kg wooden block. The speed of the block and bullet immediately after the impact is

- | | |
|------------|------------|
| A) 1.0 m/s | B) 4.0 m/s |
| C) 2.0 m/s | D) 8.0 m/s |

Question 17

Two 0.50 kg balls collide and stick together. One ball moves east at 4.0 m/s and the other moves north at 3.0 m/s. The direction of the combined mass immediately after the collision, in degrees north of east, to the nearest degree, is ____

Question 18

A 0.058 kg tennis ball approaches a racket at 30 m/s and leaves the racket at 25 m/s in the opposite direction. If the ball is in contact with the racket for 5.0×10^{-3} s, the magnitude of the average force exerted on the ball is

- A) 58 N
B) 2.9×10^2 N
C) 3.5×10^2 N
D) 6.4×10^2 N

Question 19

A 5.0 kg object at rest explodes into two pieces. A 2.0 kg piece flies off at 6.0 m/s. The speed of the remaining 3.0 kg piece, in metres per second, to the nearest tenth, is ____

Question 20

A 1 500 kg vehicle travelling east at 20 m/s collides head – on with a 1 000 kg vehicle travelling west at 15 m/s. The vehicles lock together. The velocity of the combined vehicles immediately after the collision is

- A) 6.0 m/s east
B) 6.0 m/s west
C) 18 m/s east
D) 2.0 m/s east

Question 21

A 65 kg driver is brought to rest from a speed of 14 m/s in 0.25 s by an airbag and seatbelt. The magnitude of the average net force exerted on the driver, in newtons, is ____

Question 22

A 0.30 kg puck sliding east at 6.0 m/s collides with an identical stationary puck.

After the collision, the first puck moves at 3.0 m/s in a direction 60° north of east.

The speed of the second puck after the collision is

- A) 5.2 m/s
- B) 4.5 m/s
- C) 3.0 m/s
- D) 6.0 m/s

Question 23

Crumple zones in a car reduce the force exerted on the passengers during a collision primarily by

- A) increasing the impulse delivered to the passengers
- B) decreasing the change in momentum of the passengers
- C) increasing the time over which the momentum of the passengers changes
- D) decreasing the mass of the car

Question 24

A 2.0 kg object moving at 8.0 m/s collides with and sticks to a stationary 6.0 kg object.

The kinetic energy lost in the collision, in joules, is ____

Question 25

A firecracker at rest explodes into three pieces of equal mass. Two of the pieces fly off at 20 m/s, one toward the north and one toward the east. The speed of the third piece is

- A) 20 m/s
- B) 28 m/s
- C) 35 m/s
- D) 40 m/s

Answer Key

- | | | |
|--------|----------|----------|
| 1. C | 10. B | 19. 4.0 |
| 2. A | 11. D | 20. A |
| 3. B | 12. A | 21. 3640 |
| 4. D | 13. 15 | 22. A |
| 5. B | 14. 0.40 | 23. C |
| 6. C | 15. B | 24. 48 |
| 7. A | 16. C | 25. B |
| 8. 3.0 | 17. 37 | |
| 9. D | 18. D | |

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