What is Impulse?

Worksheet

Impulse equals the average force applied multiplied by the time interval: J = Ft, measured in Ns. Impulse also equals the change in momentum, p.

$$J = F \cdot \Delta t = m \cdot \Delta v$$

Questions

1. A force of 20 N acts for 3 s. What is the impulse?

A) 6.67 Ns
B) 23 Ns
C) 60 Ns
D) 17 Ns

2. Impulse is equal to the change in

A) Velocity
B) Momentum
C) Force
D) Acceleration

3. Why does bending your knees when landing a jump reduce injury?

A) It reduces force by increasing landing time
B) It reduces the impulse to zero
C) It reduces your mass
D) It reduces gravity

4. What is the SI unit of impulse?

A) Joule
B) Watt
C) Ns
D) N/s

5. A force of 500 N is applied for 0.2 s. Find the impulse.

6. A 0.45 kg ball speeds up from 0 to 20 m/s when kicked over 0.05 s. Find the average force.

7. A bat hits a ball with a force of 8000 N for 0.001 s. Find the impulse.

8. Define: What is impulse?

9. Define: How does impulse relate to momentum?

10. Define: Why do airbags reduce injury?

Answer Key

1. C) 60 Ns - J = Ft = 20 3 = 60 Ns.

2. B) Momentum - The impulse-momentum theorem: J = p.

3. A) It reduces force by increasing landing time - For the same impulse, a longer t means a smaller average force F.

4. C) Ns - Impulse = force time = Ns (equivalent to kgm/s).

5. J = Ft J = 500 0.2 J = 100 Ns

6. J = p = mv m0 = 0.45 20 = 9 kgm/s F = J/t = 9/0.05 F = 180 N

7. J = Ft J = 8000 0.001 J = 8 Ns

8. The product of average force and the time it acts: J = Ft, in Ns.

9. Impulse equals the change in momentum: J = p (the impulse-momentum theorem).

10. They increase the collision time, lowering the average force for the same impulse.