

Momentum and Impulse introduction

1. Velocity is how fast an object is traveling and in what direction.
2. Velocity is a vector because it has both magnitude and direction.
3. The fundamental SI unit for velocity is m/s.
4. The measurement of how much matter is in an object is the object's mass and the fundamental SI unit is Kg.
5. When an object moves with a velocity and it has mass, it has momentum.
6. An object's momentum is a product of the object's mass and velocity.
7. The SI unit for momentum is kgm/s.
8. If an object is not moving, its momentum is zero no matter how much mass the object has.
9. To change an object's momentum, a force is applied over time.
This is called impulse.
10. The fundamental SI unit for impulse is Ns.

Practice problems:

11. A 2000 kg elephant is moving at 5.0 m/s. What is the elephant's momentum?

Formula: $p = mv$	Plug in numbers: $p = (2000 \text{ kg})(5.0 \text{ m/s})$	Answer: $10,000 \text{ kgm/s}$
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12. If a 0.1kg mouse is moving at the same speed of the elephant, what is the mouse's momentum?

Formula: $p = mv$	Plug in numbers: $p = (0.1 \text{ kg})(5.0 \text{ m/s})$	Answer: 0.5 kgm/s
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13. What is the mass of a runner that has a momentum of 360 kgm/s and is moving with a velocity of 6m/s?

Formula: $p = mv$	Plug in numbers: $\frac{360 \text{ kgm}}{6} = m \left(\frac{6 \text{ m/s}}{6} \right)$	Answer: 60 kg
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14. A baseball bat hits a baseball and applies a 20 N force for 0.50 seconds. What is the impulse on the ball?

Formula: $J = Ft$	Plug in numbers: $J = (20\text{ N})(.50\text{ s})$	Answer: 10 N s
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15. When hit with a bat, 17,500 Ns of impulse acts on a baseball. If the impulse acts on the baseball for 0.53 seconds, what is the magnitude of force acting on the baseball?

Formula: $J = Ft$	Plug in numbers: $17,500\text{ Ns} = F(.53\text{ s})$	Answer: 33018.9 N
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