

Unit 5: Momentum

Text:

Chapter 9

Problems (p. 229-240)

#1: 18, 20, 27, 31, 37

(momentum & impulse)

#2: 40, 42, 45, 46, 100

(conservation of momentum)

#3: 49, 103*, 123, 129

*(collisions)***assume it is an elastic collision***Vocabulary:**

momentum, impulse, center of mass, conservation of momentum, elastic collision, inelastic collision

Math:

definitions:

$$\vec{p} = m\vec{v} \qquad r = \frac{\sum m_i x_i}{M} = \frac{1}{M} \int x \, dm$$

derived formulas:

$$J = \int \vec{F} dt = (\vec{F}_{ave} t)$$

$$v_{1f} = \frac{m_1 - m_2}{(m_2 + m_1)} v_{1i} + \frac{2m_2}{(m_2 + m_1)} v_{2i} \qquad v_{2f} = \frac{2m_1}{(m_2 + m_1)} v_{1i} + \frac{(m_2 - m_1)}{(m_2 + m_1)} v_{2i}$$

skills:

no new math skills

Objectives:

You should be able to do the following:

- Explain what is meant by the center of mass and why it is important - especially in regards to Newton's Laws and momentum.
- Calculate the center of mass for a collection of masses.
- Explain the concept of conservation of momentum. Use examples to support your explanation.
- Explain what is meant by the term “impulse” and how it relates to momentum. Use examples to support your explanation.
- Compare and contrast the phrases “elastic collision” and “inelastic collision.” Use examples to support your explanation.
- Calculate impulse (or change in momentum) given an appropriate graph and information.
- Do problems involving the following ideas:
 - ♦ an object (or objects stuck together), perhaps moving, explodes into two or more pieces with different masses and velocities.
 - ♦ an object bouncing off an object experiences an impulse (and change in momentum)
 - ♦ two objects collide (either elastically or inelastically) in one dimension and have new velocities after the collision.
 - ♦ two objects collide (either elastically or inelastically) in two dimensions, and have new velocities after the collision.