Chapter C5: Applying Momentum Conservation

Physics I

College of the Atlantic

C5.1: Momentum Conservation Without Interactions

C5.2 Different Types of Isolation

The momentum of a system is conserved when the system is isolated. Strictly, speaking, isolated means that no external interactions affect the system. However, there are some systems we can treat as isolated, even though they really aren't.

1. Floating in Space
2. Functional Isolation
3. Momentary Isolation

C5.3 Problem Solving Advice

I think this is a great a set of advice for how to solve problems.

- Always draw a picture. Clearly indicate your choice of coordinates, including which direction(s) you're taking as positive.
- **Units units units!** Answers need to have units. Also, you should keep units on the numbers during all stages of a calculation. Keeping units can help you catch lots of errors.
- I strongly recommend working symbolically and not substituting numbers until the end of the problem.
- Minus signs often require thought.
- Yes, I want you to use the framework for problem solving introduced in Chapter C5. Don't worry about writing perfect prose, but you should give some verbal clues as to what your strategy is for the problem. If you use some physics formula, say why that formula is applicable. If you conserve momentum, say why you think momentum is conserved.
- I'm most interested in that you develop and refine a personal semi-structured approach to solving problem. I'm not particularly concerned about the details of your approach. The details vary from person to person. But what I've found doesn't vary is that almost every good problem solver I've ever known has some sort of approach.

C5.4 Constructing Model Diagrams

- Consider the seven steps in the text as guidelines, not rules.
- Regarding rule 5: Don't go through all the circling if you don't want to. But it is a very good habit to list all the variables, indicate which you know and which you need to find, and then check and see if you have enough equations to solve for what you need.

C5.5 Solving Conservation of Momentum Problems

An Example that I'm going to do on the board in almost painful detail:

You are in a spaceship floating in deep space. Nearby is a 1000kg asteroid moving to the right at 10 m/s. The asteroid explodes into two fragments. One fragment is 750 kg and is observed moving 37 degrees below horizontal at 50 m/s. What is the velocity of the other fragment?