AP Physics 2

Description of Average Weekly Outside Requirements

Main Topics
(What main ideas/concepts are covered):
- Fluids
- Thermodynamics
- Electric Force, Field, Potential
- Magnetism and Electromagnetic Induction
- Geometric and Physical Optics
- Quantum, Atomic, and Nuclear Physics

Rationale
(Why a student should take this course):
The main reasons to take AP Physics 2 are: Earn college credit, get exposed to a college level course, and learn the study skills that are needed to be successful in all college level classes.

Reading
(Text, document, etc.):
- Textbook
- Notes

Average of 1 hour per week of reading. May be more depending on level of understanding.

Written
(Terms, questions, outlines, free response, etc.):
- AP Classroom Progress Checks
- AP Classroom guided notes/videos
- Free Response practice
- Multiple Choice Practice

Average of 2 ½ hours per week of problem solving. May be more depending on level of understanding.

Grade Composition
(How grades are determined):
- Quiz
- Lab reports
- Tests
- Assignments

Skill Development
(Skills developed in this course and how):
- Modeling
- Mathematical Routines
- Scientific Questioning
- Experimental Methods
- Data analysis
- Argumentation
- Making Connections

Required Skills
(Skills necessary to be successful in this course):
- Strong math and reading skills
- Students should have completed AP Physics 1 or a comparable introductory physics course and should have taken or be concurrently taking pre-calculus or an equivalent course.

Sample Textbook Excerpt: Openstax.org AP edition

Calculating buoyant force: dependency on shape

(a) Calculate the buoyant force on 10,000 metric tons $(1.00 \times 10^7\ \text{kg})$ of solid steel completely submerged in water, and compare this with the steel's weight. (b) What is the maximum buoyant force that water could exert on this same steel if it were shaped into a boat that could displace $1.00 \times 10^5\ \text{m}^3$ of water?

Strategy for (a)

To find the buoyant force, we must find the weight of water displaced. We can do this by using the densities of water and steel given in Table 11.1. We note that, since the steel is completely submerged, its volume and the water's volume are the same. Once we know the volume of water, we can find its mass and weight.

Solution for (a)

First, we use the definition of density $\rho = \frac{m}{V}$ to find the steel's volume, and then we substitute values for mass and density. This gives

$$V_{\text{st}} = \frac{m_{\text{st}}}{\rho_{\text{st}}} = \frac{1.00 \times 10^7\ \text{kg}}{7.8 \times 10^3\ \text{kg/m}^3} = 1.28 \times 10^3\ \text{m}^3. \quad \boxed{11.32}$$

Because the steel is completely submerged, this is also the volume of water displaced, V_{w}. We can now find the mass of water displaced from the relationship between its volume and density, both of which are known. This gives

$$\begin{aligned} m_{\text{w}} &= \rho_{\text{w}} V_{\text{w}} = (1.000 \times 10^3\ \text{kg/m}^3)(1.28 \times 10^3\ \text{m}^3) \\ &= 1.28 \times 10^6\ \text{kg}. \end{aligned} \quad \boxed{11.33}$$