



Course > Section 10: $E = mc^2$: Taylor Approximation and the Energy Equation (OPTIONAL) >
 1.4 Higher Terms and Faster Speeds > 1.4.2 Exploratory Quiz: Catching an Error in Computation

1.4.2 Exploratory Quiz: Catching an Error in Computation

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Question 1

1/1 point (graded)

Mboyo made an error when he wrote the approximation

$$E \approx m_0 c^2 + \frac{1}{2} m_0 v^2 + \frac{3}{8} m_0 \left(\frac{v}{c}\right)^4$$

It should be

$$E \approx m_0 c^2 + \frac{1}{2} m_0 v^2 + \frac{3}{8} m_0 c^2 \left(\frac{v}{c}\right)^4 = m_0 c^2 + \frac{1}{2} m_0 v^2 + \frac{3}{8} m_0 \frac{v^4}{c^2}$$

Why doesn't this change the following comment by Mboyo about when higher order terms matter?

Mboyo: So as you said, the first term is very familiar, the second term is very familiar from classical physics, the next term is a term that involve the fourth power of $\frac{v}{c}$. [...] So this term is extremely small. So it will be relevant for people only who basically go so fast that this expression should not be considered to be very small compared to one. So to give you an example, if you do an experiment in physics in which you are colliding particles that move at say 50% the speed of light, you definitely need to take this into account. But only at very high speeds this third term will be relevant to anyone.

since c^2 is so large that it often is much larger than v^4



Thank you for your response.


Explanation

What Mboyo said about when higher order terms matter is still accurate. The fourth degree term will be small, and thus less important, if v^4/c^2 is very small compared to one. This implies that v^4 should be small compared to c^2 , or in other words, that v^2 is small compared to c .

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Answers are displayed within the problem



 English ▼

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