

Name: _____

Physics 203 Quiz 1

Jun 26, 2013

Word Problems

Show all your work and circle your final answer. (Ten points each.)

1. An evil genius wants to shrink the Moon in order to steal it. He accidentally shrinks it below its Schwarzschild radius and the Moon is lost forever in a mini-black hole. What is this radius?



Answer: 0.109 millimeters

We simply use the definition of the Schwarzschild radius:

$$r_s = \frac{2GM}{c^2}$$

The GM value for the moon is

$$GM = (6.673 \times 10^{-11})(7.36 \times 10^{22}) = 4.9113 \times 10^{12}$$

So...

$$r_s = \frac{(2)(4.9113 \times 10^{12})}{(2.998 \times 10^8)^2} = 1.0929 \times 10^{-4}$$

2. A certain mass spectrometer is designed with a radius of 0.40 meters using a magnetic field of 2.0 tesla. What electric voltage is required to accelerate a doubly ionized ozone molecule to travel through the spectrometer?

Answer: TBD

No solution available.