# Unique Questions with Answers and Explanations

## Paper 1 Unique Questions

1. **The rest energy of an electron in MeV is approximately:** Options: (a) 0.511 (b) 5.11 (c) 0.0511 (d) 51.1

* **Answer:** (a) 0.511 MeV
* **Explanation:** Rest energy is . For an electron, kg. Substituting gives MeV.
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1. **What term correctly classifies a frame of reference that is stationary (i.e., at rest)?** Options: (a) Inertial frame (b) Non-inertial frame (c) Both (d) Neither

* **Answer:** (a) Inertial frame
* **Explanation:** An inertial frame is one where Newton’s laws hold true, including a stationary frame or one moving with constant velocity.
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1. **A body moves with speed 0.6c and has a relativistic mass of 2.5 kg. What is its rest mass?** Options: (a) 1.60 kg (b) 1.00 kg (c) 2.00 kg (d) 1.58 kg

* **Answer:** (a) 1.60 kg
* **Explanation:** , where . For , . Hence kg.
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1. **The momentum of a photon is:** Options: (a) (b) Zero (c) (d) None

* **Answer:** (c)
* **Explanation:** For a photon, rest mass is zero. Its momentum is related to energy as .
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1. **According to Lorentz–Fitzgerald contraction:** Options: (a) moving rod has longer length (b) longest length is for a rod at rest (c) moving rod has shorter length (d) either (b) or (c)

* **Answer:** (c) moving rod has shorter length
* **Explanation:** Length contraction predicts that an object moving at velocity appears shorter along its direction of motion: .
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1. **Which phenomenon related to moving clocks is predicted by the special theory of relativity?** Options: (a) Length contraction (b) Gravitational time dilation (c) Time dilation (d) Variation of mass

* **Answer:** (c) Time dilation
* **Explanation:** Moving clocks appear to tick slower compared to stationary clocks due to relativistic time dilation: .