

國立中央大學八十六學年度碩士班研究生入學試題卷

所別: 大氣物理研究所 不分組 科目:

近代物理學

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1. A proton moves at a speed of $v = 0.6c$.

(a) Find the momentum of this proton in units of MeV/c .

(b) Find the kinetic energy of this proton in units of MeV .

(c) Find the relativistic energy of this proton in units of MeV .

(Note: the proton's rest energy is 938 MeV). (20%)

2. The wavelength of a photon is 620 nm .

(a) Find the energy of this photon in units of eV .

(b) Find the momentum of this photon in units of eV/c .

(Note: Planck's constant $h \times$ light speed $c = 1240 \text{ eV} \cdot \text{nm}$)

(c) What is the rest mass of this photon?

(d) What is the rest energy of this photon? (20%)

3. Sketch the wave function and wavelength of a particle of energy E encountering a barrier of height V_0 and width a , for the cases:

(a) $E > V_0$, (b) $E < V_0$. (30%)

4. Explain:

(a) Fermi-Dirac Statistics

(b) Families of Particles

(c) Periodic Table. (30%)