

- 1 A pion decays in 1.8×10^{-8} sec when at rest. We detected a pion traveled a distance of 37.9m before it decays. Explain this. (10 points)
- 2 Discuss the energy levels of a harmonic oscillator. Why S.H.O. is so important in physics? (15 points)
- 3 Why an atom or molecule can not have permanent electric dipole moment if it is in a definite parity eigen state? (10 points)
- 4 Discuss the possible energy levels of an atom with two 3d valence electrons. Assuming LS coupling. (Draw diagrams and indicate the levels with J,L,S, values. Explain the ordering too.) (15points)
- 5 Why the existence of a meta stable state is important in making Lasers? (10 points)
- 6 What is nuclear shell model? What are the successful predications? Give two examples. (10, points)
- 7 Why a gamma ray can not decay into electron-positron pair in vacuum even if its energy is well above the required energy. (10 points)
- 8 Discuss the covalent binding and ionic binding of solids. (10 points)
- 9 How many kinds of fundamental forces are there in nature? Discuss. (10 points)