The nonlinear optical properties of nematic liquid crystal material have been studied at different concentrations using Z-Scan technique. Experiments are performed using continuous wave (CW) diode solid state laser at 473 nm wavelength and 20 mW power. In this work, six concentrations were prepared for (Di-Cinnamylidene Benzidine), these concentrations were (9\times10^{-5}, 8\times10^{-5}, 7\times10^{-5}, 6\times10^{-5}, 5\times10^{-5} and 4\times10^{-5})M. The optical absorption and transmission spectra for these concentrations were measured by using UV-VIS spectrophotometer. The physical parameters of nematic liquid crystal materials that are relevant to the operation and optimization of nematic display modes will be presented in this entry. These parameters include the anisotropic refractive indices, dielectric permittivities, elastic constants and viscosities. The a.c. voltage Fréedericksz transition in a planar nematic layer is presented as a case study to illustrate the roles that these different physical parameters perform in the operation of an electro-optical device. Keywords: Threshold Voltage, Applied Electric Field, Nematic Liquid Crystal, Molecules, Phase Transition, Pe

An apolar nematic liquid crystal is formed if the interaction has an apolar symmetry. Different cell types like human melanocytes (=pigment cells of the skin), human fibroblasts (=connective tissue cells), human osteoblasts (=bone cells), human adipocytes (=fat cells) etc., form an apolar nematic liquid crystal. The orientational elastic energy is derived and the orientational defects (disclination) of nematic liquid crystals are investigated. The existence of half-numbered disclinations show that the nematic phase has an apolar symmetry. The density-, order parameter dependence of the orientational defects is investigated. The physical properties of nematic liquid crystals are a key part of this underlying knowledge and determine the detailed operation of the various modes. A knowledge of the physical properties of nematic liquid crystals, and understanding of the way in which they are related to the chemical composition and how they influence the device performance has been, and will remain, absolutely crucial to the success of LCD technology. 

DEDICATION
This book is dedicated to the late Frank M Leslie FRS FRSE in recognition of his major contributions to the field of liquid crystals. Foreword I am delighted to have been asked to write the foreword to the Datareview volume on the physical properties of nematic liquid crystals.