# Quantum Information to be Brief

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This brief note intends to list the minimal, however incomplete, references for beginners.

The note [1] is a good start for reading. Although not up to date, it gives newcomers, including physicists, a *friendly* introduction to quantum computing. This article is worth quick browsing to catch what quantum computing is like, but not for the detailed or complete exposition. Two volumes, Gruska [2] and Nielsen & Chuang [3], are recommended. The one by Gruska, a theoretical computer scientist in Czech, is not as comprehensive as the latter, and yet is an excellent text particularly from the perspective of computer science. The volume by Nielsen and Chuang is considered so far the best text of the field of quantum computing and quantum information. This text has provided among-the best introduction on several topics, such as physical realization of quantum computing, quantum error correcting codes, and quantum information theory. Parts of contents are altered from the dissertation of Nielsen [4]. Isaac Chaung, the world leading expert of applying NMR techniques to quantum computing, has recently made a milestone progress – performing Shor's algorithm to factorize the integer 15 [5].

For Grover's, quantum searching, algorithm, perhaps Lomonaco [6] has given the most simplified and clarified exposition, where one can find references for further reading. For the extended Grover's algorithm, multiobject search, the article by Chen *et al.* [7] and the references therein are suggested. Lomonaco [8] gives a pretty good description for the celebrated Shor's algorithm as well, but it is not complete. The review [9] is the earliest re-introduction to a wider readership. However, the original paper by Shor [10] is quite readable and already among the best to present the algorithm. The review by Cleve *et al.* [11] for various computing algorithms is recommended.

The CSS (Calderbank-Shor-Steane) codes [12], a class of effective quantum error correcting codes, are developed from the concept of classical error correcting codes. The beautiful scheme of *stabilizer codes* [13] invented by Gottesman [14] is intrinsically quantum mechanical, and is interpreted as *the Heisenberg picture* of the codes. Quantum cryptography is comprehensively reviewed in the recent article [15]. The website [16] and the review [17] give a snapshot at quantum information (QI). The classification and quantification of entanglement is the current focus of QI research. This study is actively developing and any article attempted to review it soon becomes incomplete. Finally a very recent partial review on both computation and information [18] should be of interest to read.

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