Cross-reference of subjects within the Quantum Entanglement course.

Prof. Leonard Susskind; videos on [Stanford on iTunes U]
[Susskind's Blog: Physics for Everyone]

The Introductory lecture is primarily a basic definition of what constitutes a physical system, a classical system and a quantum system. There is also a review of some basic linear algebra and calculus. No notes were taken.

Quantum Entanglement Lecture 02 notes 2006-10-02

measuring electron spin:
<bra & ket> Dirac notation;
probability of a vector
Hermitian matrix (a matrix of observables)

Quantum Entanglement Lecture 3 2006-10-09

Quantum Mechanics is calculation of probabilities
sigma matrices
observables, eigenvalues and eigenvectors are orthogonal
can measure component of electron spin in any x,y,z
example, unit pointer in any arbitrary direction

Quantum Entanglement Lecture 4 2006-10-16

Review: completion of single bit system
probability of finding an electron in a particular state
calculate eigenvectors of σ.n
notes on preparing and measuring a system (not in video)
simultaneous measurement
entanglement – simple definition
entangled state, prepared together

Quantum Entanglement Lecture 5 2006-10-23

review action on sigma matrices
the expectation value for all sigma observable directions is zero (50% up, 50% down)
which + or – is an eigenvector of the entangled state – the singlet state
Bell's Theorem (a classical probability theorem)
Bell's Theorem not true in entangled state
Calculate sigma projection operators
alternate definition of probability using projection operators
proof you cannot clone a quantum system

Quantum Entanglement Lecture 6 2006-10-30

review of entangled states, sub-spaces
review of projection operators, probabilities
review: classical probability (Bell's)

the 2 slit experiment, one hole, two hole

Destructive interference of a reording device

Entanglement of the experiment with an apparatus

Quantum Entanglement Lecture 7 2006-11-06

review 2 slit experiment

formal calculation of probability that electron found at m

destroying the interference pattern

shrodinger's cat is not in a superposition of alive and dead

classical entropy

Trace of a matrix

quantum density matrix

Quantum mechanical entropy of a density matrix

Quantum Entanglement Lecture 8 2006-11-12

Density matrix: a more general way to make probability statements about a system

classical definition of entropy, probabilities

entanglement and unentangled probabilities

how states change with time

H is called the Hamiltonian, it is Hermitian, and an observable, the energy of the system.

$\frac{\partial|\psi\rangle}{\partial t} = \frac{-i\,H}{\hbar}|\psi\rangle$ **governs how every quantum state evolves in time**

entropy is the measure of entanglement?

Quantum Entanglement Lecture 9 2006-11-27

review – how things change with time

$\frac{d|\psi\rangle}{dx} = \frac{-i\,H}{\hbar}\,|\psi(0)\rangle$ *The Schrodinger equation*

Einstein's photon equation

vector that is the sum of eigenvectors of the Hamiltonian

what is the time derivative of the average of the Hamiltonian itself? zero

Spin in a magnetic field

energy states with 2 electrons