

Assignment #6: QIT Part 2.

1. (2 pts.) In the protocol for distributing a secret key using non-orthogonal states of quantum systems, what is the random element associated with Alice's encoding procedure? What is the random element associated with Bob's decoding procedure? Why is this random element important?
2. (2 pts.) What is the goal of quantum dense coding, and why is it paradoxical on a literal interpretation of qubits?
3. (3 pts.) In both quantum dense coding and quantum teleportation, explain how the use of entangled states *in general* allows Bob to "receive" more information from Alice than was actually sent to him over the distance separating the two (do *not* go into all the gory details). What does this indicate about what it means fundamentally to transmit information?
4. (3 pts.) In quantum teleportation, is the unknown qubit that Bob receives *exactly* the same unknown qubit that Alice "teleported" to him? Why or why not? Would you submit yourself to a quantum teleporter (given a sufficiently complex machine were to be developed based on the same fundamental principles)? Why or why not?