Quiz 3

Name: _____ Date: _____ I participated today: _____

1. How many vector components are required to represent the state of a system of n qubits? In other words, what is the dimensionality of an n-qubit state vector?

2. What is the complete state vector for two $|i\rangle$ qubits? (Recall that $|i\rangle = \frac{1}{\sqrt{2}}(|0\rangle + i|1\rangle)$.) Give your answer in Dirac notation.

3. What is the meaning of the n-qubit state below? (Hint: Plug in small values for n and write out the resulting superposition.)

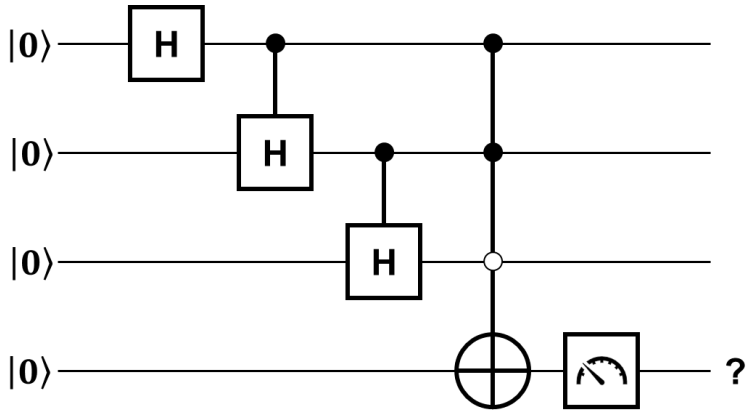
$$\frac{1}{\sqrt{2^{n-1}}} \sum_{i=0}^{2^{n-1}-1} |2i\rangle$$

4. Suppose a register of n qubits is in a uniform superposition $\frac{1}{\sqrt{2^n}} \sum_{i=0}^{2^n-1} |i\rangle$, and then a Z gate is applied to each qubit. Which terms of the superposition have their sign flipped? (Hint: Again, try small values for n and see what happens.)

5. What does it mean for the states of two qubits to become “entangled”?

6. True or False: The state $\frac{1}{2}(|00\rangle + |01\rangle + |10\rangle - |11\rangle)$ is an example of entanglement.

7. What is the probability of measuring a $|1\rangle$ in the circuit below?



8. Referring to the circuit above, suppose a $|1\rangle$ is actually measured. What is the state of the four-qubit system then?