# Multiple choice

There will be 13 different choices and You will choose only one question

Question 1 :

A Qubit is a \_\_\_\_\_\_\_\_\_ quantum mechanical system.

a) 2-state

b) 3-state

c) 4-state

Question 2 :

Which of the following shape can be used to the pure state space of a 2-level quantum system?

a) Rectangle

b) Cylinder

c) Bloch-Sphere

d) Cube

Question 3 :

Does a quantum computer perform Boolean logic (AND, OR, NOT with true and false — not to be confused with binary digits of 0 and 1),

such as evaluating complex conditions, comparable to a traditional digital computer?

a) Yes

b) No

c) Yes and No

Question 4 :

How is Quantum bit stored when measured by Quantum Operators?

a) In a Classical memory

b) In a Quantum memory

Question 5 :

Is room temperature quantum computing theoretically practical?

a) No

b) Yes

Question 6 :

What is the main difference between a classical bit and a qubit?

a) Qubits can be in two states at the same time

b) Qubits are able to store more data than bits

c) Qubits cannot be run in parallel

d)There is no difference, a qubit simply represents a bit

Question 7 :

What is the quantum equivalent of the classical NOT gate?

a) Hadamard Gate

b) Pauli-X Gate

c) SWAP Gate

d) CNOT Gate

Question 8 :

How long does it take for communication to travel between a quantum entangled pair?

a) speed of light time between the entangled pair

b) Instantaneously

c) They don’t communicate with each other

Question 9 :

How can interference be used in a quantum computation like Shor's algorithm?

a) We make sure all the wrong answer interferes with each other and cancels out

b) It proves that the superposition is compromised, and we need to restart the computation

c) It serves no purpose

d) The interference will amplify the correct result and drown out the wrong

Question 10 :

How many qubits does CNOT-gate take as input?

a) 1

b) 2

c) 3

d) Any number of qubits

Question 11 :

What is a tensor product of two qubits?

a) The tension between two qubits

b) The state of the combined system of two qubits

c) The angle between two qubits

d) The inner product of two qubits

Question 12 :

What does Heisenbergs Uncertainty Principle state?

a) The entanglement is uncertain until you measure it

b) The velocity is uncertain unless you also measure position

c) It is possible to measure both a particle's velocity and position

d) It is not possible to measure both a particle's velocity and position

Question 13 :

What happens if you execute two Hadamard gates to |0>?

a) 1 / 2

b) -1 / 2

c) |0>

d) |1>

# Optional Supplementary questions and answers to fill out the 30 minutes

|  |  |
| --- | --- |
| 1. what stands EPR for | Einsten,Podolsky and Rosen |
| 1. Show us an example of a KET | l0> or l1> |
| 1. What do we call the experiment where You prove whether the theory behind the EPR is right or wrong | CHSH game (your exercise at DTU) |
| 1. What is the idea about a unitary tranformation | Pauli gates times each other results in a unitary matrix. If a Gate is unitary it’s a genuine Quantum Gate |
| 1. Show us an example of a unitary transformation | Ex Pauli like: Not\*Not, |
| 1. Show us how a Hadamard works with at KET zero | Zero to a 45 degree angle of the vector |
| 1. How can You prove that the Hadamard is a true Quantum Gate - Show us | H\*H = a unitary matrix |
| 1. Show us an example of an entangled wavefunction | lψ> = αl00> + βl11> |
| 1. What is a Bell state, show us an example | lψ> = αl00> + βl11> |
| 1. How many Bell states are there | 4 |
| 1. How do You create an entangled state with Quantum Gates | a Hadamard and a CNOT |
| 1. which gate du You use to set a qubit in a superpositioned state | The hadamard gate |
| 1. What happens when You sense on a qubit | It collapses to a classical 0 or 1 |