

# Fundamentals of Quantum Computation

## Using Qiskit

### Understanding Quantum Computation

**Quantum computation** is a revolutionary field that harnesses the strange properties of *quantum mechanics*. Unlike classical computing, which relies on **bits** as the smallest unit of data (0s and 1s), quantum computing uses **quantum bits**, or **qubits**. This allows quantum computers to process a vast amount of possibilities simultaneously. Understanding these principles is essential for anyone looking to dive into this exciting technology.

### A Beginner's Guide to Qiskit Tutorial

If you're eager to learn *quantum programming*, the Qiskit tutorial is a fantastic starting point. Qiskit is an open-source **quantum software** development framework aimed at building and executing quantum programs. The tutorial will guide you through the installation process, basic functions, and how to run your first quantum program on real quantum devices. You can explore further details in this [Qiskit training resource](#).

### Exploring the IBM Quantum Experience

The **IBM Quantum Experience** provides a platform where learners can use real quantum computers over the cloud. This unique environment allows you to explore quantum algorithms, run experiments, and visualize results. By signing up, you can access a variety of educational resources that can accelerate your understanding of quantum mechanics and computation.

### Diving into Quantum Programming

Quantum programming is an intriguing aspect of quantum computation that focuses on writing software for quantum computers. Unlike traditional programming languages, quantum programming languages like Qiskit require a different mindset. You'll learn to think about problems in a unique way, leveraging concepts like **superposition** and **entanglement** to solve complex issues that classical computers struggle with.

# Uncovering Quantum Algorithms

Quantum algorithms are specialized methods designed to run on quantum computers. Popular algorithms, like **Grover's search algorithm** and **Shor's algorithm**, demonstrate the potential speedups of quantum computation. Understanding these algorithms is crucial as they showcase how quantum computers can solve problems that are currently infeasible for classical ones.

## Practical Qiskit Applications

Qiskit applications extend beyond just theoretical concepts. They can be used in various fields such as **finance**, **medicine**, and **logistics**. By applying quantum algorithms to real-world problems, researchers are beginning to unlock new capabilities and efficiencies that could transform industries. Exploring these applications will help you see the potential impact of quantum computing, and you can find relevant courses [here] (<https://www.certkillers.net/Exam/C1000-112>).

## Getting Started with Qiskit

To get started with Qiskit, you'll need to install the software and familiarize yourself with its documentation. Several coding examples are available to help you quickly learn the syntax and functionalities of Qiskit. The community is also active, providing support through forums and discussions. Joining this community can significantly enhance your learning experience.

## Join Online Courses and Webinars

Numerous online courses and webinars are available that cover various aspects of quantum computing and Qiskit. These resources are beneficial for those who prefer a structured learning approach. By attending these sessions, not only will you gain knowledge, but you will also connect with other learners and experts in the field.

## Final Thoughts on Quantum Computation

**Quantum computation** is a frontier of technology that holds immense promise. As we continue to develop better tools and frameworks like Qiskit, more people will have the opportunity to explore this exciting field. Whether you're a student, a researcher, or a tech enthusiast, engaging with quantum computing will undoubtedly open new doors of opportunity.



# Real Exam Questions 2025

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# Latest Version: 6.0

## Question: 1

Which of the following bloch\_multivector plot options given below is the correct one for the given bell quantum circuit?

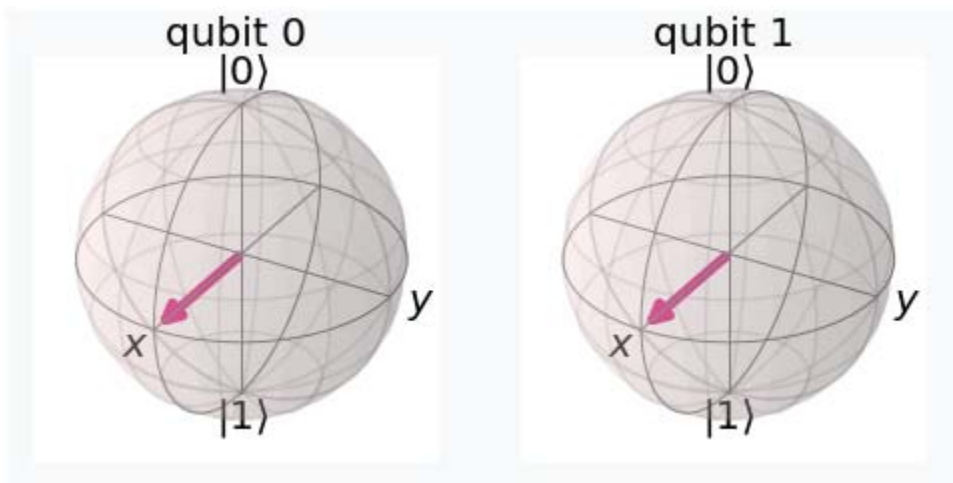
```
bell = QuantumCircuit(2)
```

```
bell.h(0)
```

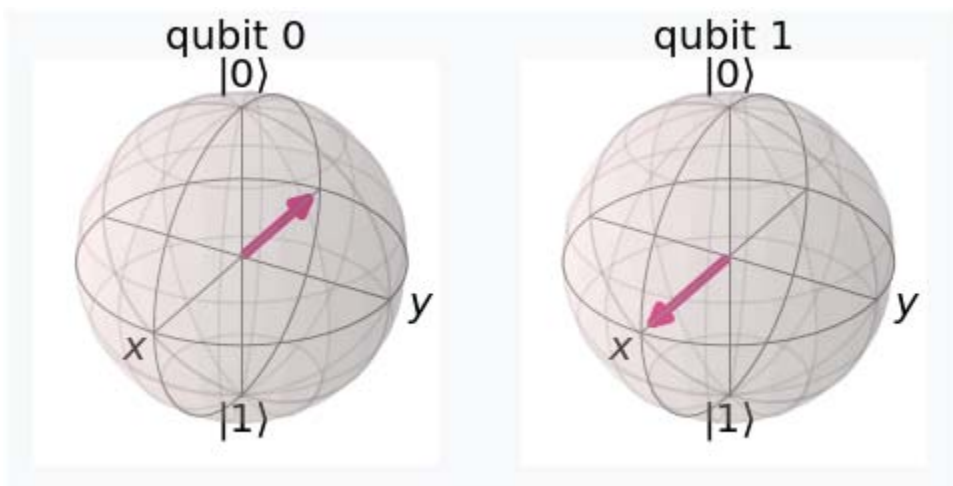
```
bell.cx(0,1)
```

Response:

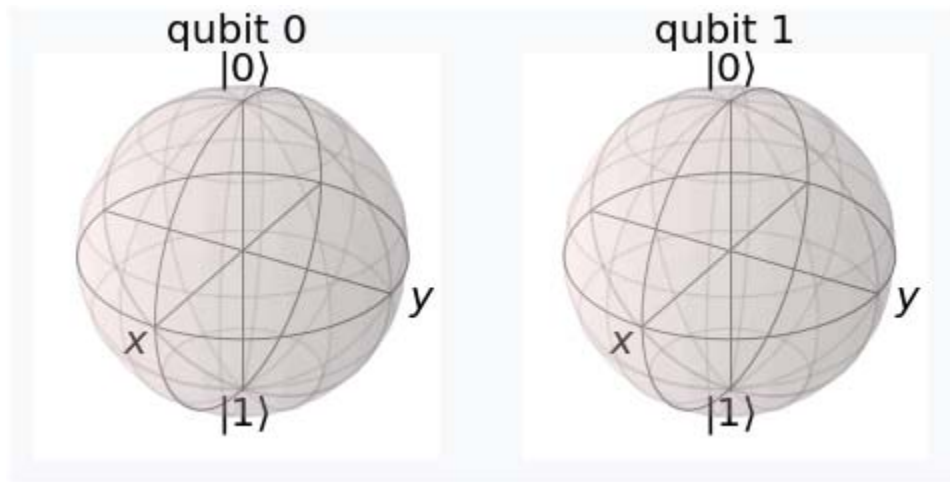
A.



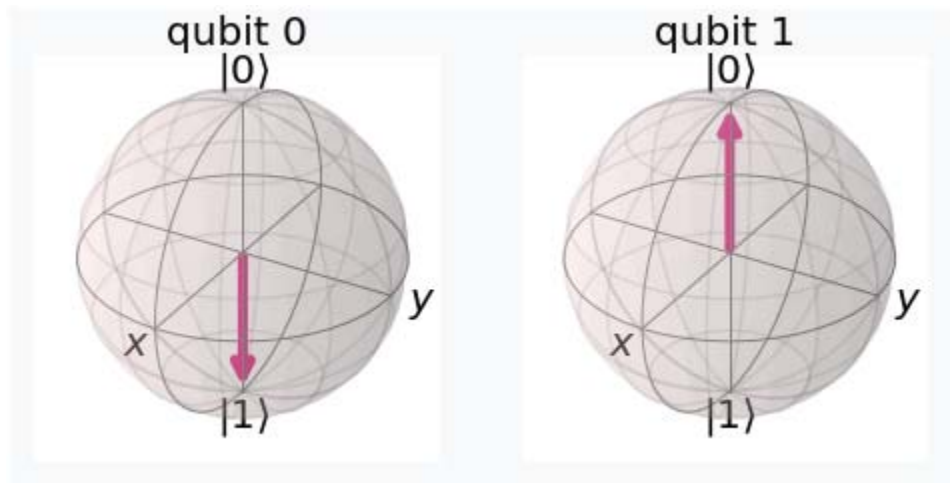
B.



C.



D.



**Answer: C**

## Question: 2

Gates X, Y, and Z perform rotations on a Bloch sphere around the  $x$ -,  $y$ - and  $z$ -axis, respectively. By which angle are these rotations performed?

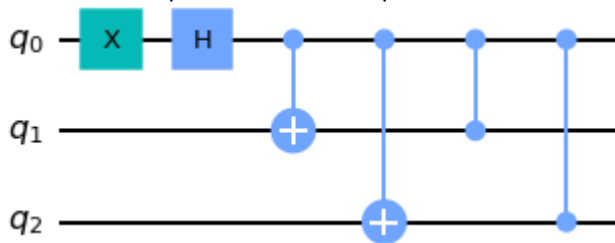
Response:

- A.  $\pi$
- B.  $\pi/4$
- C.  $3\pi/4$
- D.  $\pi/8$

**Answer: A**

### Question: 3

What is the depth of the below quantum circuit?



Response:

- A. 4
- B. 5
- C. 6
- D. 3

**Answer: C**

### Question: 4

which of the following simulator can be as good as real IBM Quantum computer?

Response:

- A. qasm\_simulator
- B. real\_quantum\_simulator
- C. statevector\_simulator
- D. unitary\_simulator

**Answer: A**

### Question: 5

What is the output of the given state in qiskit after applying CNOT to it?

$\frac{1}{\sqrt{2}}|00\rangle + \frac{1}{\sqrt{2}}|10\rangle - \frac{1}{\sqrt{2}}|11\rangle$

Response:

- A.  $\frac{1}{\sqrt{2}}|00\rangle + \frac{1}{\sqrt{2}}|11\rangle - \frac{1}{\sqrt{2}}|10\rangle$
- B.  $\frac{1}{\sqrt{2}}|00\rangle + \frac{1}{\sqrt{2}}|10\rangle - \frac{1}{\sqrt{2}}|11\rangle$
- C.  $\frac{1}{\sqrt{2}}|01\rangle + \frac{1}{\sqrt{2}}|01\rangle - \frac{1}{\sqrt{2}}|11\rangle$

D.  $1/\sqrt{2}|00\rangle$

**Answer: A**

## Question: 6

which of the following quantum circuits will produce a bell state (maximum entangled state)?  
(select any 3)

Response:

A.

```
bell= QuantumCircuit(2)
bell.h(0)
bell.cx(0,1)
```

B.

```
bell= QuantumCircuit(2)
bell.h(0)
bell.x(1)
bell.cx(0,1)
```

C.

```
bell= QuantumCircuit(2)
bell.h(0)
bell.x(1)
bell.cx(0,1)
bell.z(1)
```

D.

```
bell= QuantumCircuit(2)
bell.h(0)
bell.h(1)
bell.cx(0,1)
```

E.

```
bell= QuantumCircuit(2)
bell.h(0)
bell.x(1)
bell.h(1)
bell.cx(0,1)
```

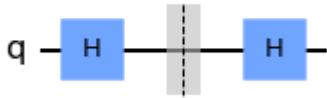
F.

```
bell= QuantumCircuit(2)
bell.x(0)
bell.cx(0,1)
```

**Answer: ABC**

## Question: 7

What is barrier instruction between the H-gates in the below quantum circuit do?



Response:

- A. It joins both H-gates and executes them.
- B. It won't simplify the circuit between the two H-gates
- C. It is used for better circuit visualization
- D. It is used for circuit optimization

**Answer: B**

## Question: 8

Given the following code, what is the depth of the circuit?

```
qc = QuantumCircuit(2, 2)
qc.h(0)
qc.barrier(0)
qc.cx(0,1)
qc.barrier([0,1])
```

Response:

- A. 2
- B. 3
- C. 4
- D. 5

**Answer: A**

## Question: 9

Which statement continues parsing filename as if the contents of the file were inserted at the location of the statement?

Response:

- A. statement: begin "filename";

- B. statement: include "filename";
- C. statement: qasm\_parser "filename";
- D. statement: compile "filename";

**Answer: B**

## Question: 10

Which two options would place a barrier across all qubits to the QuantumCircuit below?

qc = QuantumCircuit(3,3)

Response:

- A. qc.barrier(qc)
- B. qc.barrier([0,1,2])
- C. qc.barrier()
- D. qc.barrier(3)
- E. qc.barrier\_all()

**Answer: BC**

## Question: 11

Which of the following statement prints the qiskit version?

Response:

A.

```
import qiskit
print(qiskit.__version__)
```

B.

```
import qiskit
print(qiskit.__qiskit_version__)
```

C.

```
import qiskit
print(qiskit.version())
```

D.

```
import qiskit
print(qiskit_version_display())
```

**Answer: B**

### Question: 12

What is the output of the below snippet?

```
a = 1/np.sqrt(2)
desired_state = [a,np.sqrt(1-a**2)]
qc = QuantumCircuit(1)
qc.initialize(desired_state,0)
back_sv = BasicAer.get_backend('statevector_simulator')
result = execute(qc, back_sv).result()
qc_sv = result.get_statevector(qc)
state_fidelity(desired_state, qc_sv)
```

Response:

- A. 0.5
- B. Error in executing state\_fidelity
- C. 0
- D. 1.0

**Answer: D**