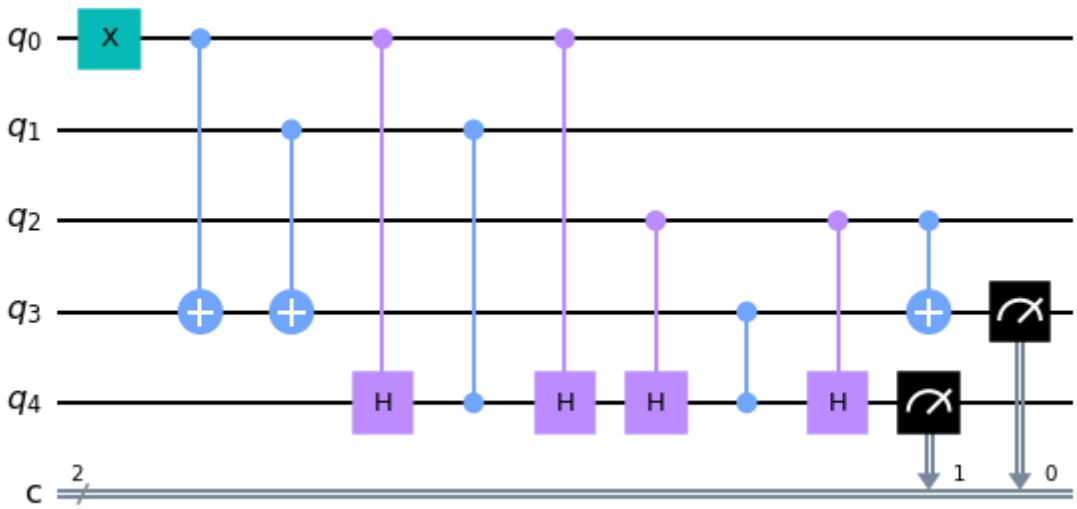
In [1]:
```
from qiskit import QuantumRegister,ClassicalRegister,QuantumCircuit
from qiskit import IBMQ,Aer,execute
from qiskit.visualization import plot_histogram
```

In [2]:
```
def build_state(circuit,b,a,carry):
    if a == 1:
        circuit.x(0)
    if b == 1:
        circuit.x(1)
    if carry == 1:
        circuit.x(2)
    return circuit
```

In [3]:
```
#### build your quantum circuit here
qc = QuantumCircuit(5,2)
qc = build_state(qc,0,1,0)
qc.cx(0,3)
qc.cx(1,3)

qc.ch(0,4)
qc.cz(1,4)
qc.ch(0,4)
qc.ch(2,4)
qc.cz(3,4)
qc.ch(2,4)
qc.cx(2,3)
qc.measure(3,0)
qc.measure(4,1)
qc.draw('mpl')
```

Out[3]:

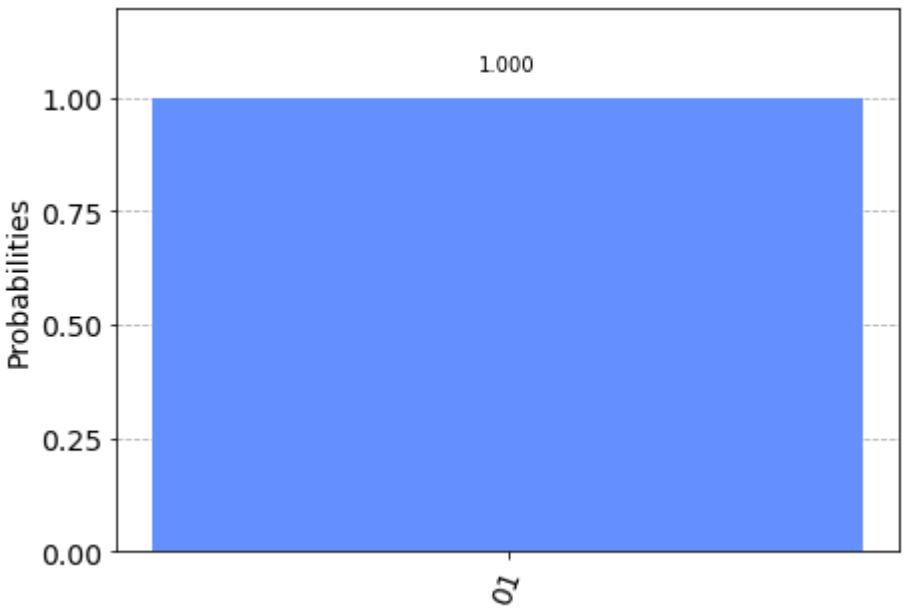


In [4]:

```
# execute the circuit by qasm_simulator
backend = Aer.get_backend('qasm_simulator')
job = execute(qc,backend,shots=1000)
result = job.result()
count = result.get_counts()
print(count)
plot_histogram(count)
```

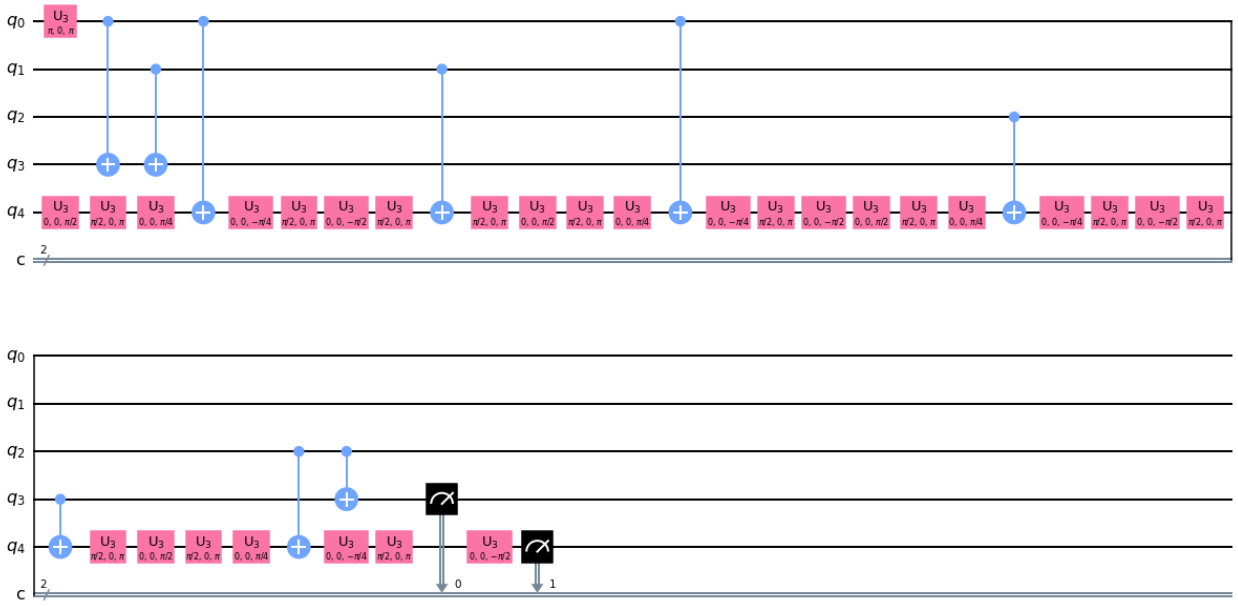
```
{'01': 1000}
```

Out[4]:



In [5]:
```
from qiskit.transpiler import PassManager
from qiskit.transpiler.passes import Unroller
pass_ = Unroller(['u3', 'cx'])
pm = PassManager(pass_)
new_circuit = pm.run(qc)
new_circuit.draw(output='mpl')
```

Out[5]:



In [6]:
```
new_circuit.count_ops()
```

Out[6]:
```
OrderedDict([('u3', 29), ('cx', 9), ('measure', 2)])
```

CIRCUIT COST 229

qc = QuantumCircuit(4,2)
qc = build_state(qc,0,1,1)
qc.ccx(0,1,3)
qc.ccx(0,2,3)
qc.ccx(1,2,3)
qc.cx(0,1)
qc.cx(2,1)
qc.measure(1,0)
qc.measure(3,1)
qc.draw('mpl')

CIRCUIT COST 154 (HZH of above)

qc = QuantumCircuit(4,2)
qc = build_state(qc,0,1,1)
qc.ch(0,3)
qc.cz(1,3)
qc.ch(0,3)
qc.ch(0,3)
qc.cz(2,3)
qc.ch(0,3)
qc.ch(1,3)
qc.cz(2,3)

```
qc.ch(1,3)
qc.cx(0,1)
qc.cx(2,1)
qc.measure(1,0)
qc.measure(3,1)
qc.draw('mpl')
```

CIRCUIT COST 110

```
qc = QuantumCircuit(4,2)
qc = build_state(qc,0,1,1)
qc.ch(0,3)
qc.cz(1,3)
qc.ch(0,3)
qc.cx(0,1)
qc.ch(2,3)
qc.cz(1,3)
qc.ch(2,3)
qc.cx(2,1)
qc.measure(1,0)
qc.measure(3,1)
qc.draw('mpl')
```

In [ ]: