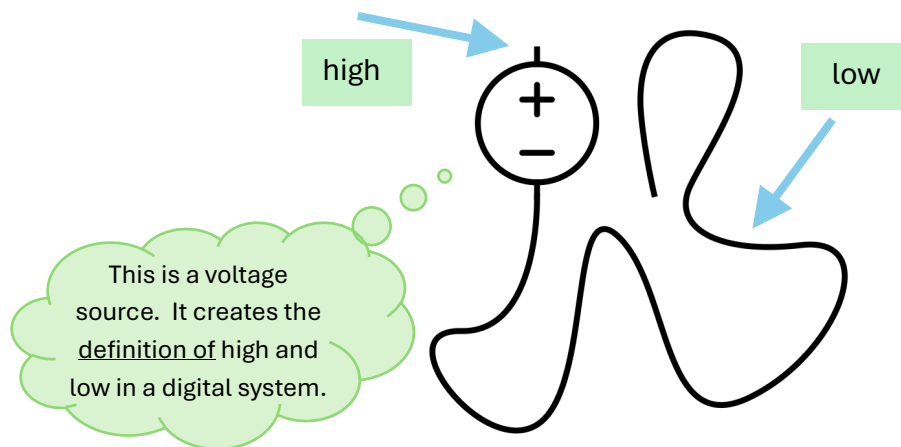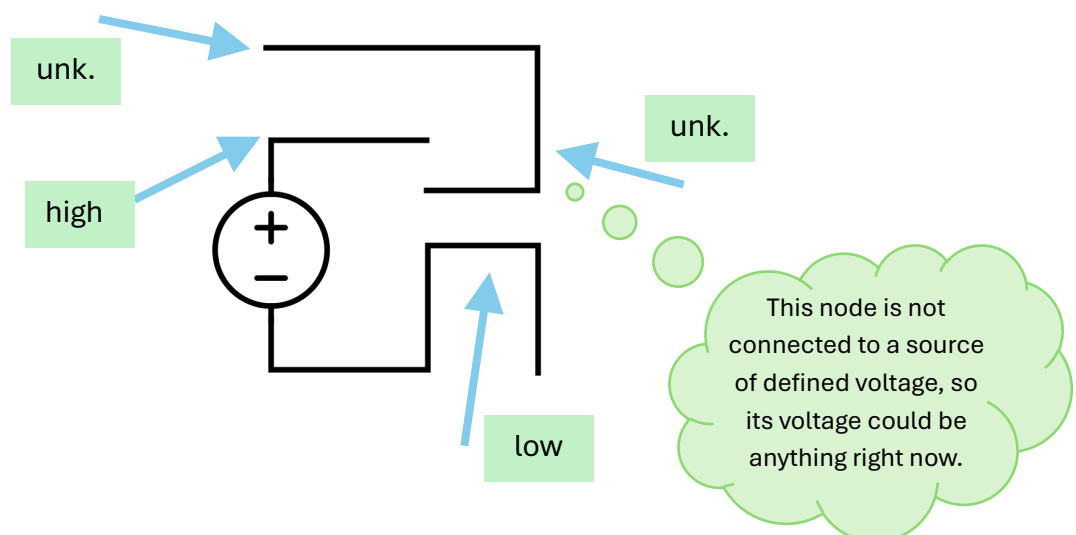For all of these questions, do not abstract voltage into symbols such as "0" and "1." All voltages should be expressed as "logic low voltage" or "logic high voltage" (but you can just write "low" and "high" for simplicity). If it is impossible to determine the voltage based on the schematic (i.e., without doing something like measuring the voltage in real life), you can express that fact with the word "unknown."
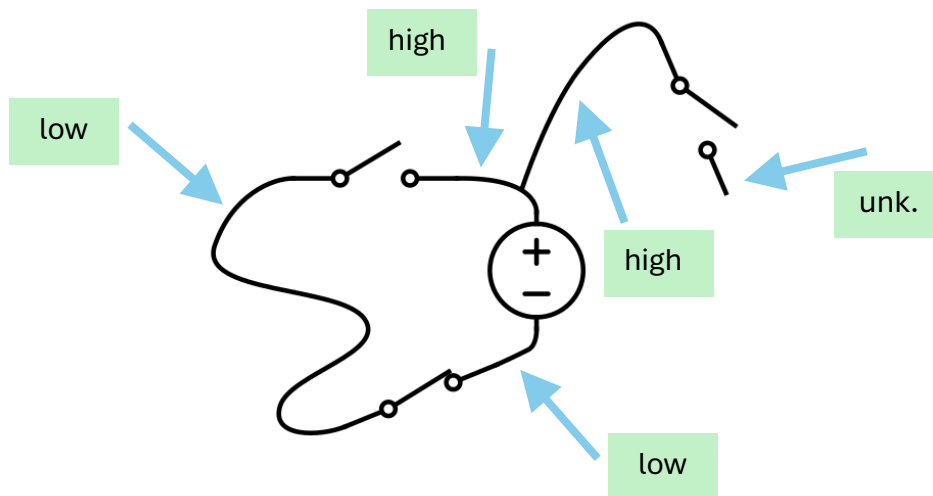
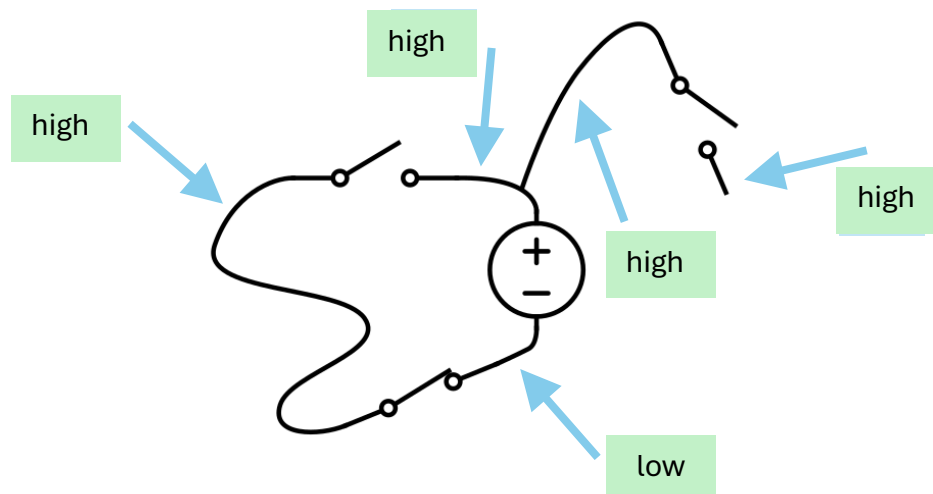a) What is the voltage at each of the indicated locations in the circuit?

high

low

This is a voltage source. It creates the definition of high and low in a digital system.

b) What is the voltage at each of the indicated locations in the circuit?

unk.

unk.

high

low

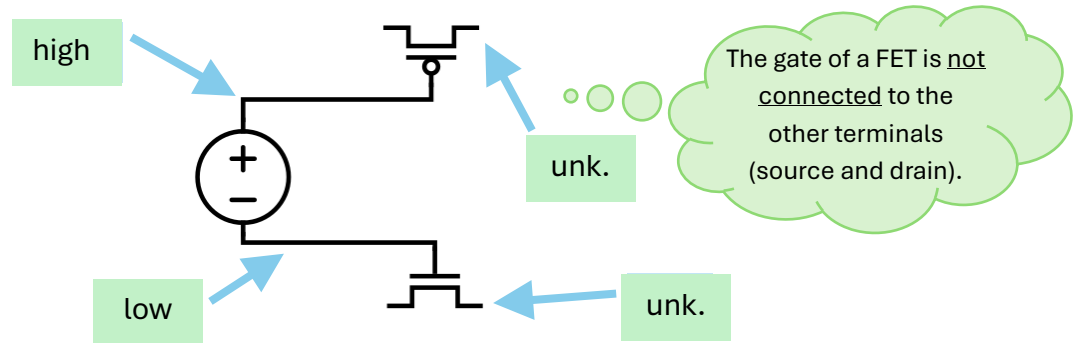This node is not connected to a source of defined voltage, so its voltage could be anything right now.

c) What is the voltage at each of the indicated locations in the circuit if every switch is in its normal position?

high

low

unk.

high

low
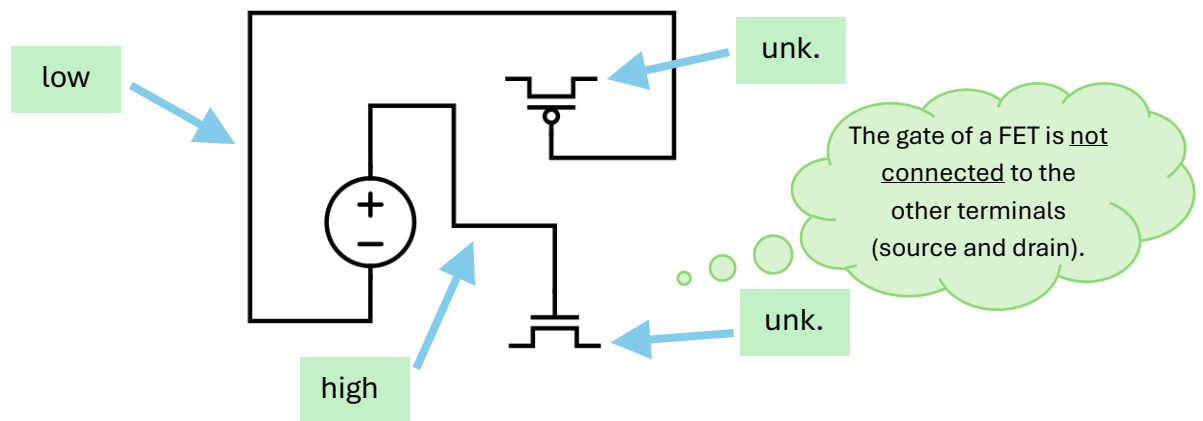
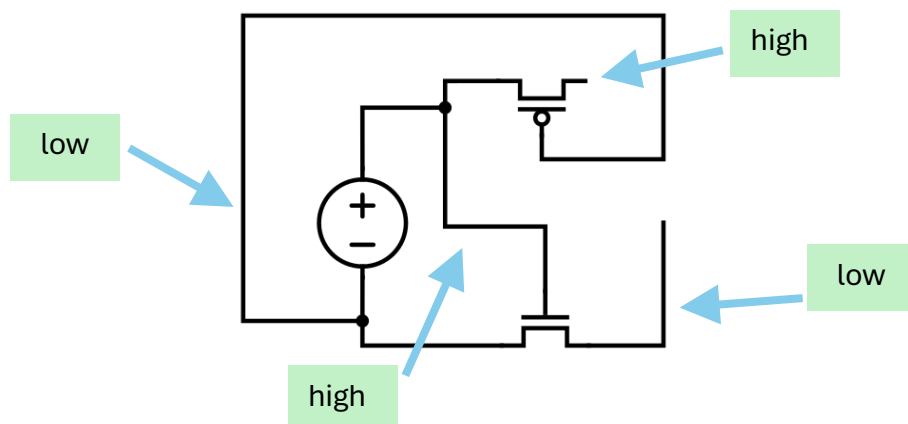d) What is the voltage at each of the indicated locations in the circuit if every switch is in its active position?

high

high

high

high

high

low

e) What is the voltage at each of the indicated locations in the circuit?

high

unk.

low

unk.

The gate of a FET is not connected to the other terminals (source and drain).

f) What is the voltage at each of the indicated locations in the circuit?

low

unk.

unk.

high

The gate of a FET is not connected to the other terminals (source and drain).
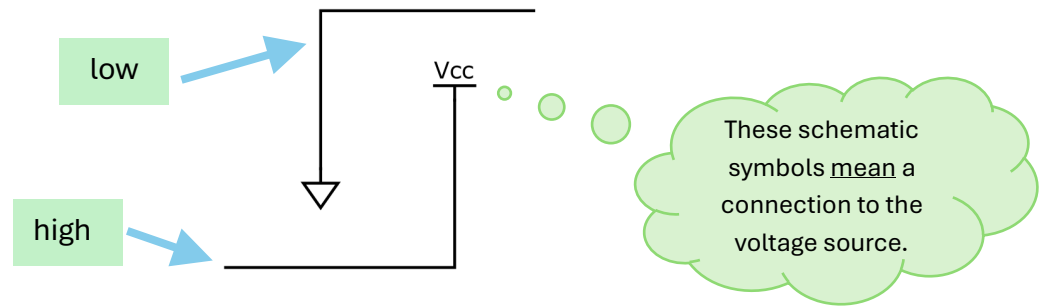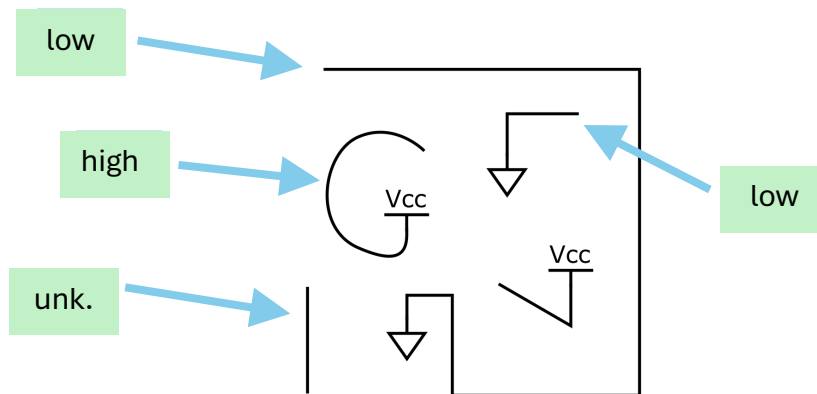
g) What is the voltage at each of the indicated locations in the circuit?

low

high

high

low

h) What is the voltage at each of the indicated locations in the circuit?

low

Vcc

high

These schematic symbols <u>mean</u> a connection to the voltage source.

i) What is the voltage at each of the indicated locations in the circuit?

low

high

Vcc

low

unk.

Vcc

j) What is the voltage at each of the indicated locations in the circuit?

Vcc

high

Vcc

unk.

low

Neither FET is creating a connection between this node and a source of defined voltage.

k) What is the voltage at each of the indicated locations in the circuit?

l) What is the voltage at each of the indicated locations in the circuit?

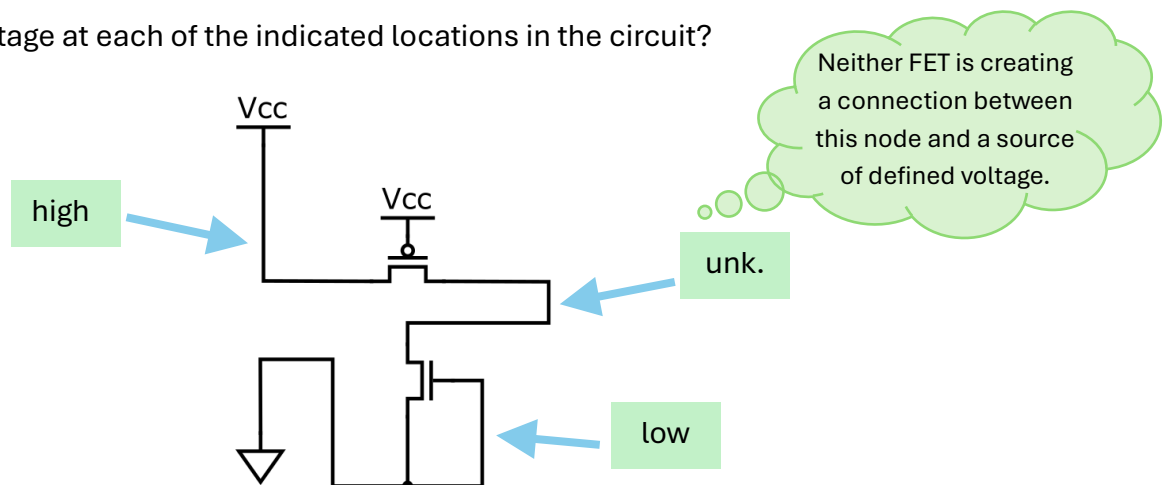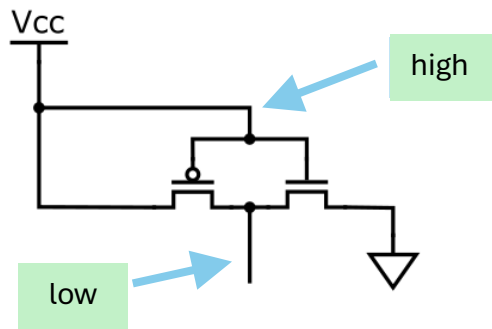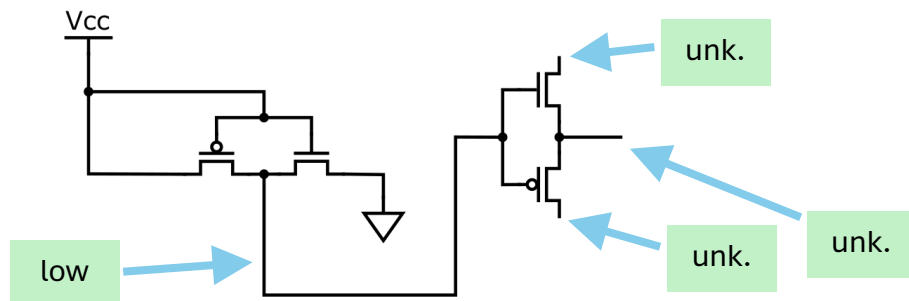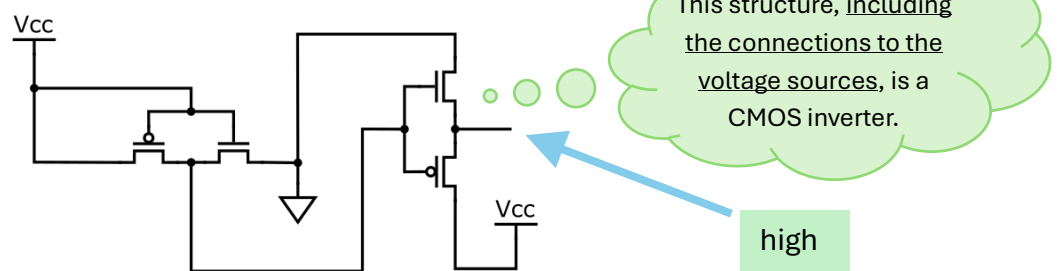m) What is the voltage at each of the indicated locations in the circuit?

This structure, including the connections to the voltage sources, is a CMOS inverter.

n) What is the voltage at each of the indicated locations in the circuit?

high

This is more obviously a CMOS inverter now.