Common Problems

Design a Night Light
The Op Amp in PSpice

- The LM324 part will not work unless you have wired two Vdc parts to the V+ and V- pins on the part.
  - If you have done this and the simulation still doesn’t work, make sure that:
    - The negative side of one Vdc is connected to V- and the positive side of the other Vdc is connected to V- if you have made the value of both Vdc parts equal to 9V.
    - The positive side of the Vdc should be connected to V- if you gave it a value of -9V.
    - The other side of the Vdc parts should be connected to ground.
    - You typed a space between the number and unit for the value of Vdc.
      - PSpice only recognizes 9V and -9V, not 9 V or -9V. It does, however, recognize 9 as +9V and -9 as -9V. (I.e., you don’t have to include the units when assigning the value to Vdc).
The Op Amp in PSpice

- The output voltage is +9 V when you expect it to be -9 V and visa versa.
  - It should be +9 V when the voltage on the negative input terminal is smaller than the voltage on the positive input terminal.
  - Review your schematic. Make sure that the input terminals of the op amp are connected to the appropriate components.
    - You can rotate the part by clicking on the symbol and then Ctrl-R (the Ctrl key and r key at the same time)
    - You can flip the part around a vertical axis (also known as mirroring) using Crtl-F.
The Op Amp on the ANDY board

- GND on the LM 324 (pin 11) can be connected to -9 V, which is what you are supposed to do in this experiment.
- V+ (Pin 4) should be connected to +9 V.
  - If the op amp isn’t working, check to make sure that you have connected these pins to the ANDY board power supplies and have plugged the ANDY board into a wall socket.
  - If you accidentally wire GND to +9 V and V+ to -9 V, the op amp will not function properly.
    - In fact, it will become extremely hot!
      - Hot enough to melt the plastic on your breadboard.
      - Hot enough to give you a blister, should you try to remove it while it is still hot.
        - DON’T! If this happens to you, pull the plug on your ANDY board and let the dip package cool down before you remove it from the board.
        - THEN, throw it away as you have probably damaged the silicon integrated circuit.
LED turns on at the wrong time

- in PSpice
  - Check the following:
    - That you have changed the attribute SET from 0.5 to 1 in the part R_var.
    - That Dbreak is facing the correct direction (arrow headed towards ground).
    - That the input terminals of the part LM324 are wired correctly.
LED turns on at the wrong time

- in the circuit built on the ANDY board.
  - Check the following:
    - That the negative and positive input terminals of the op amp are wired correctly.
    - That the LED cathode is headed towards ground (it is either connected directly to ground or to the current-limiting resistor $R_{limit}$, which is then connected to ground).
    - That the value of $R$ is correct.
      - Measure it with your DMM to be sure.
LED doesn’t turn on at all

- in the circuit built on the ANDY board.
  - Check the following:
    - That your ANDY board is plugged in and you have +9 V, +5 V, and -9 V available on the board.
    - That the value of $R_{\text{limit}}$ is correct. Measure the resistor with your DMM just to make sure.
      - If it is too large, the amount of light emitted by the LED may be insufficient for you to see.
      - If it is too small, the LED may have been damaged if the current allowed to flow through it is much greater than 30 mA.
        - Swap out the LED.
    - That about 9V is the node voltage on the output pin of the op amp that you chose to use when the CdS is in the dark.
      - Your op amp may be dead, pick a different op amp on the quad dip package.