Basic Circuit:

6. 5 A
6a. No, the current is not sufficient
6b. By trying to draw more current than the RPI can provide, the circuit would probably break in some way.
7. This is enough resistance because it will make the current through the circuit less than 2A (.05A). 100 Ohm resistor
7a. We weren't able to get any major reading from the multimeter.

LED Circuit:
1ai. The longer side of the diode needs to be connected to the positive side.
1b. The voltage drop across the resistor was 2.289V
1c. The voltage drop across the LED is 2.842
2a. The LED will become much brighter without any resistor.
3. The much stronger resistor results in a much dimmer LED.
3a. The voltage drop across the resistor is 2.940V, and the voltage drop across the LED is 2.219V
4a. The LED brightness will be dimmer with less voltage and current.
5b. The LED becomes brighter than it did before with the stronger resistor.
6. As resistance within the circuit increases, the brightness of the light produced by the LED is reduced
7. White 2.5V
Red 1.7V
Blue: 0.57V
Yellow: 1.8V
Green: 2.22V
The voltage drops are wildly different between different colored LEDS. Blue is barely visible, but white is brightest.

Photo-Diode:

2. 0.25V
3a. When you cover the photo-diode the voltage across the resistor basically goes to 0. So the dark current is 0A.
3b. You can definitely see the signal with 5V. It's very difficult to see any change with only 3.3V.
3c. Voltage across the photo diode decreases when using the step-up amplifier.
4. The dark current is 0A, and the saturated current is ~.00003A