Electronics HW 3

1.

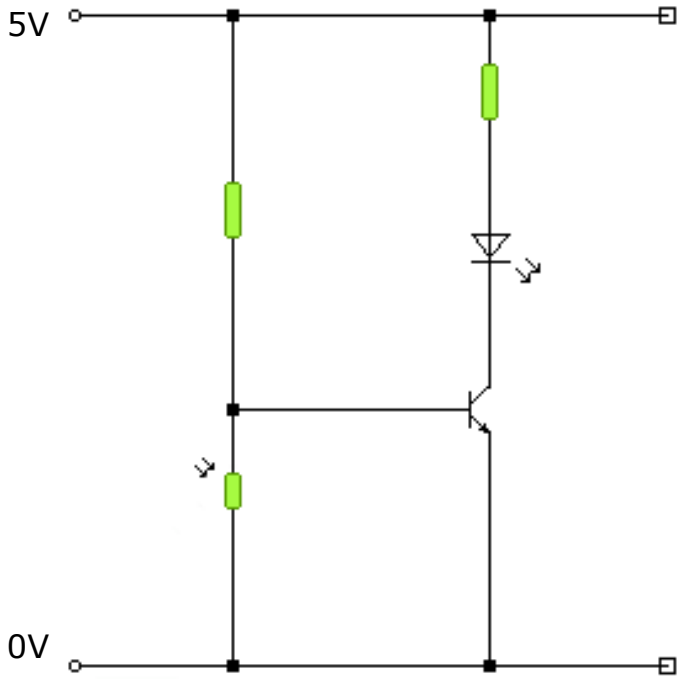
(a) As the potentiometer is turned from Y to X, the voltage at the transistor base increases. Once the potentiometer has been turned far enough, the base voltage will be large enough to turn on the transistor and allow current to flow through the collector circuit and light up the LED.

(b) The transistor is OFF when the potentiometer is at position Y.

(c) When the transistor is fully ON, the voltmeter will display a voltage of 0.7V.

2

(a)



(b) As the light level falls, the resistance of the LDR increases. When the LDR resistance increases, the voltage across the LDR also increases. When the voltage across the LDR reaches 0.7V, the transistor is switched on and the LED will light up.

3. If the engine overheats the resistance of the thermistor will decrease. This means that the voltage across the thermistor will also decrease. Since the sum of voltages across the thermistor and resistor R must add up to 5V (the supply voltage), the voltage across resistor R must increase when the engine temperature rises. If the temperature rise is large enough, the voltage across R will exceed 0.7V and the transistor will switch ON and cause the buzzer to sound.

4.

(a) 0V

(b) OFF – because the voltage at point X is not high enough to switch on the transistor.

(c) 12V

(d) The light switches on because the voltage on the base of the transistor exceeds 0.7V.

(e) When the door is closed again, switch S opens and the capacitor starts to charge up to 12 V. As the capacitor charges, the voltage at point X begins to fall. When the voltage at X goes below 0.7V, the lamp will go out.