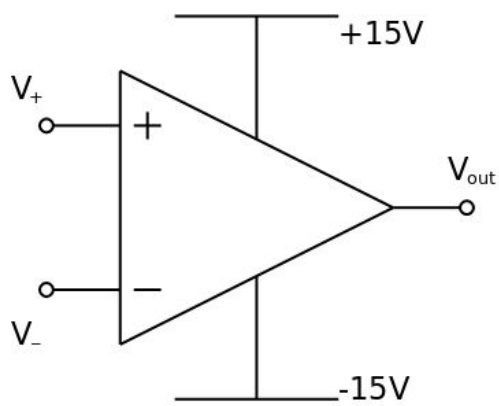


Comparator Questions

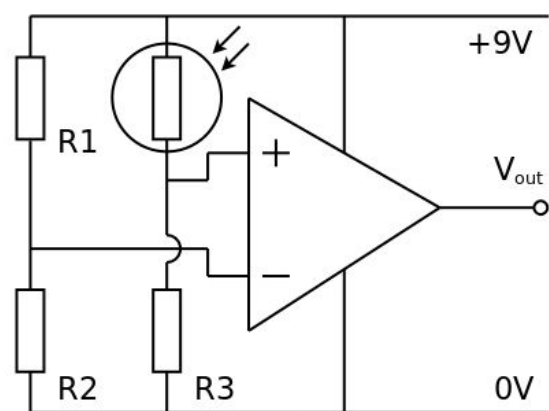
Consider the circuit diagrams of four different comparator circuits. To answer the questions you will also need to know about the characteristics of an LDR and how potential dividers work.

When the power supply voltages are $\pm 15\text{V}$ the output voltage V_{out} is $\pm 13\text{V}$.

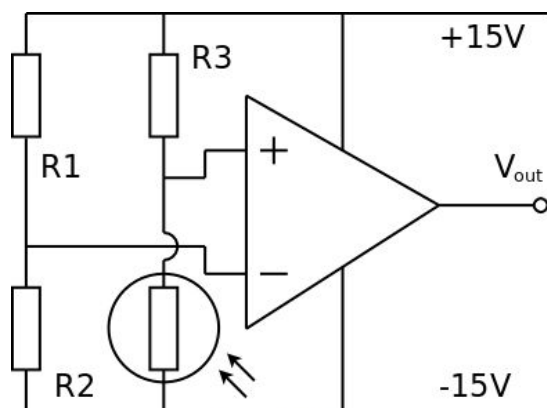
When the power supply voltages are $+9\text{V}$ and 0V the output voltage V_{out} is $+7\text{V}$ or $+2\text{V}$.



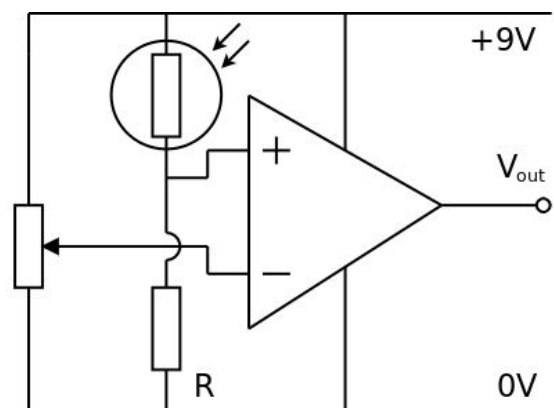
Circuit 1



Circuit 2



Circuit 3



Circuit 4

Question 1

In Circuit 1, $V_+ = +6\text{V}$ and $V_- = -4\text{V}$. What is V_{out} ?

- A. +15V
- B. +13V
- C. +10V
- D. -13V

Question 2

In Circuit 1, $V_+ = -3\text{V}$ and $V_- = +3\text{V}$. What is V_{out} ?

- A. +13V
- B. +6V
- C. 0V
- D. -13V

Question 3

In Circuit 1, $V_+ = +9\text{V}$ and $V_- = +2\text{V}$. What is V_{out} ?

- A. +13V
- B. +11V
- C. +7V
- D. -13V

Question 4

In Circuit 1, $V_+ = -6\text{V}$ and $V_- = -3\text{V}$. What is V_{out} ?

- A. +15V
- B. +13V
- C. -13V
- D. -15V

Question 5

In Circuit 1, $V_+ = +1\text{V}$ and $V_- = +1\text{V}$. What is V_{out} ?

- A. +13V
- B. +2V
- C. 0V
- D. -13V

Question 6

In Circuit 2, V_{out} changes when the light intensity is 1000Lux. What is V_{out} when the light intensity falls to 700Lux?

- A. 9V
- B. 7V
- C. 2V
- D. 0V

Question 7

In Circuit 2, V_{out} just changes when the light intensity is 1000Lux. At 1000Lux the resistance of the LDR is 36k Ω . If $R_1 = 120\text{k}\Omega$ and $R_2 = 240\text{k}\Omega$ what is the value of R_3 ?

- A. 18k Ω
- B. 36k Ω
- C. 72k Ω
- D. 156k Ω

Question 8

In Circuit 2, V_{out} just changes when the light intensity is 1000Lux. At 1000Lux the resistance of the LDR is 36k Ω . If $R_3 = 12\text{k}\Omega$ and $R_1 = 150\text{k}\Omega$ what is the value of R_2 ?

- A. 36k Ω
- B. 50k Ω
- C. 150k Ω
- D. 450k Ω

Question 9

In Circuit 2, V_{out} just changes when the light intensity is 1000Lux. At 1000Lux the resistance of the LDR is 36k Ω . If $R_2 = 10\text{k}\Omega$ and $R_3 = 10\text{k}\Omega$ what is the value of R_1 ?

- A. 72k Ω
- B. 36k Ω
- C. 18k Ω
- D. 10k Ω

Question 10

In Circuit 3, V_{out} changes when the light intensity is 300Lux. What is V_{out} when the light intensity changes to 200Lux?

- A. +13V
- B. +7V
- C. 0V
- D. -13V

Question 11

In Circuit 3, V_{out} just changes when the light intensity is 300Lux. At 300Lux the resistance of the LDR is 6k Ω . If $R_1 = 240\text{k}\Omega$ and $R_2 = 360\text{k}\Omega$ what is the value of R_3 ?

- A. 3k Ω
- B. 4k Ω
- C. 5k Ω
- D. 6k Ω

Question 12

In Circuit 3, V_{out} just changes when the light intensity is 800Lux. At 800Lux the resistance of the LDR is 2k Ω . If $R_3 = 12\text{k}\Omega$ and $R_1 = 180\text{k}\Omega$ what is the value of R_2 ?

- A. 15k Ω
- B. 20k Ω
- C. 30k Ω
- D. 60k Ω

Question 13

In Circuit 3, V_{out} just changes when the light intensity is 200Lux. At 200Lux the resistance of the LDR is 7.5k Ω . If $R_2 = 10\text{k}\Omega$ and $R_3 = 15\text{k}\Omega$ what is the value of R_1 ?

- A. 7.5k Ω
- B. 10k Ω
- C. 15k Ω
- D. 20k Ω

Question 14

In Circuit 4, V_{out} needs to change when the light intensity is 100 Lux. At a light intensity of 100 Lux the resistance of the LDR being used in this circuit is $10\text{ k}\Omega$. What is the most appropriate value for the resistor labelled R?

- A. $120\ \Omega$
- B. $1\text{ k}\Omega$
- C. $12\text{ k}\Omega$
- D. $120\text{ k}\Omega$

Question 15

In Circuit 4, what is the main advantage of using a potentiometer instead of a pair of fixed resistors to provide the voltage at the Inverting input?

- A. The light level at which the output changes can be adjusted
- B. There are less components used in the circuit
- C. The circuit is easier to build
- D. The circuit works more reliably

Question 16

In Circuit 4, the components are changed and the potentiometer is set so that the output just changes when the light intensity is 500 Lux. At this light intensity the voltage at the Inverting input is measured to be 4.5 V. What can be determined about the resistance of the LDR and the value of resistor R?

- A. The value of R does not matter when using a potentiometer
- B. The value of R is slightly less than the resistance of the LDR
- C. The value of R is slightly more than the resistance of the LDR
- D. The value of R is exactly equal to the resistance of the LDR

Answers

1. B
2. D
3. A
4. C
5. C
6. C
7. C
8. B
9. B
10. A
11. B
12. C
13. D
14. C
15. A
16. D

Website

http://www.pfnicholls.com/Electronics_Resources/QuestionIndex.html

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