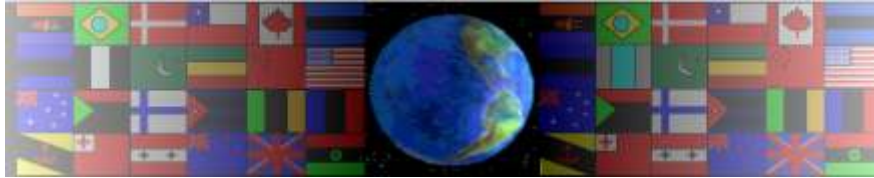


THE 741 OPERATIONAL AMPLIFIER

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On behalf of The World Association of Technology Teachers

W.A.T.T.



World Association of Technology Teachers

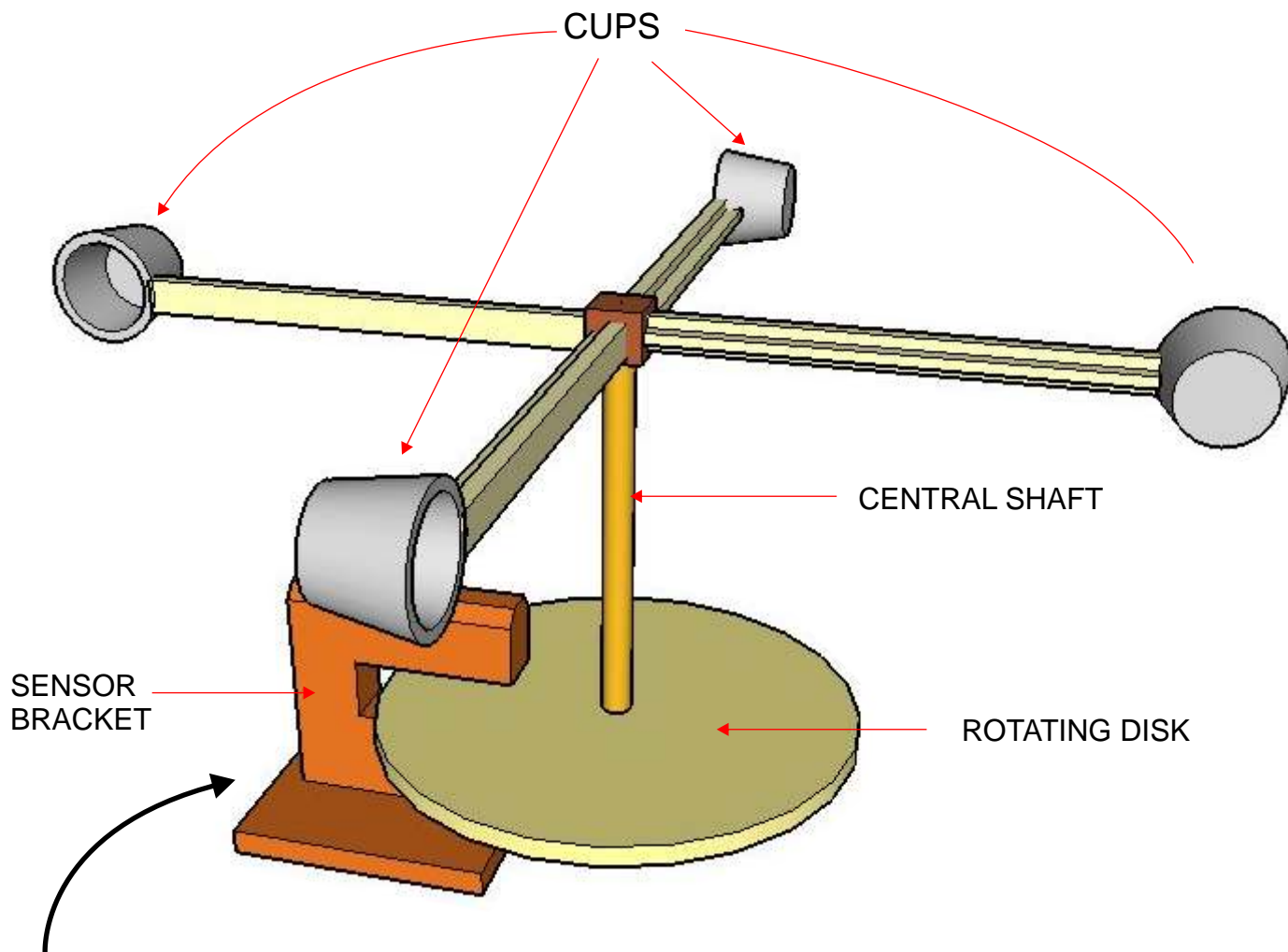
This exercise can be printed and used by teachers and students. It is recommended that you view the website (www.technologystudent.com) before attempting the design sheet .

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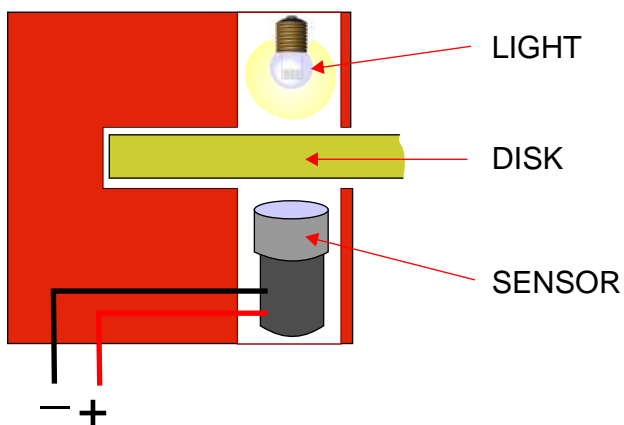
741 OPERATIONAL AMPLIFIER COMPARATOR EXAMINATION QUESTION

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A home-made anemometer can be seen below. It is part of a system that calculates the wind speed. It is composed of four cups that rotate on a central shaft. As it rotates a light / dark sensor, housed in the 'sensor bracket' detects light from the light bulb found inside the sensor bracket. The sensor is connected to a circuit that counts each time the disk rotates (light from the bulb is detected).

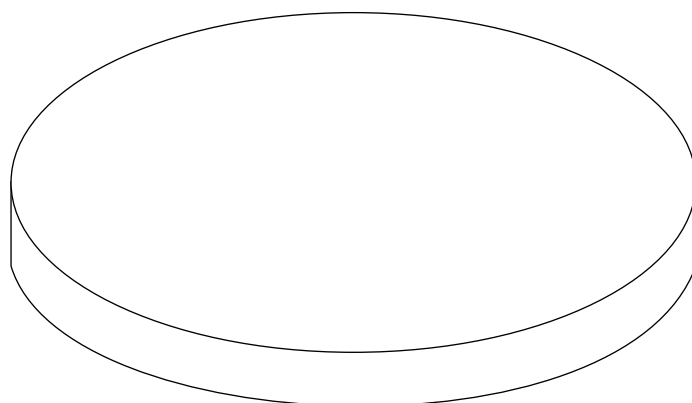


SENSOR BRACKET

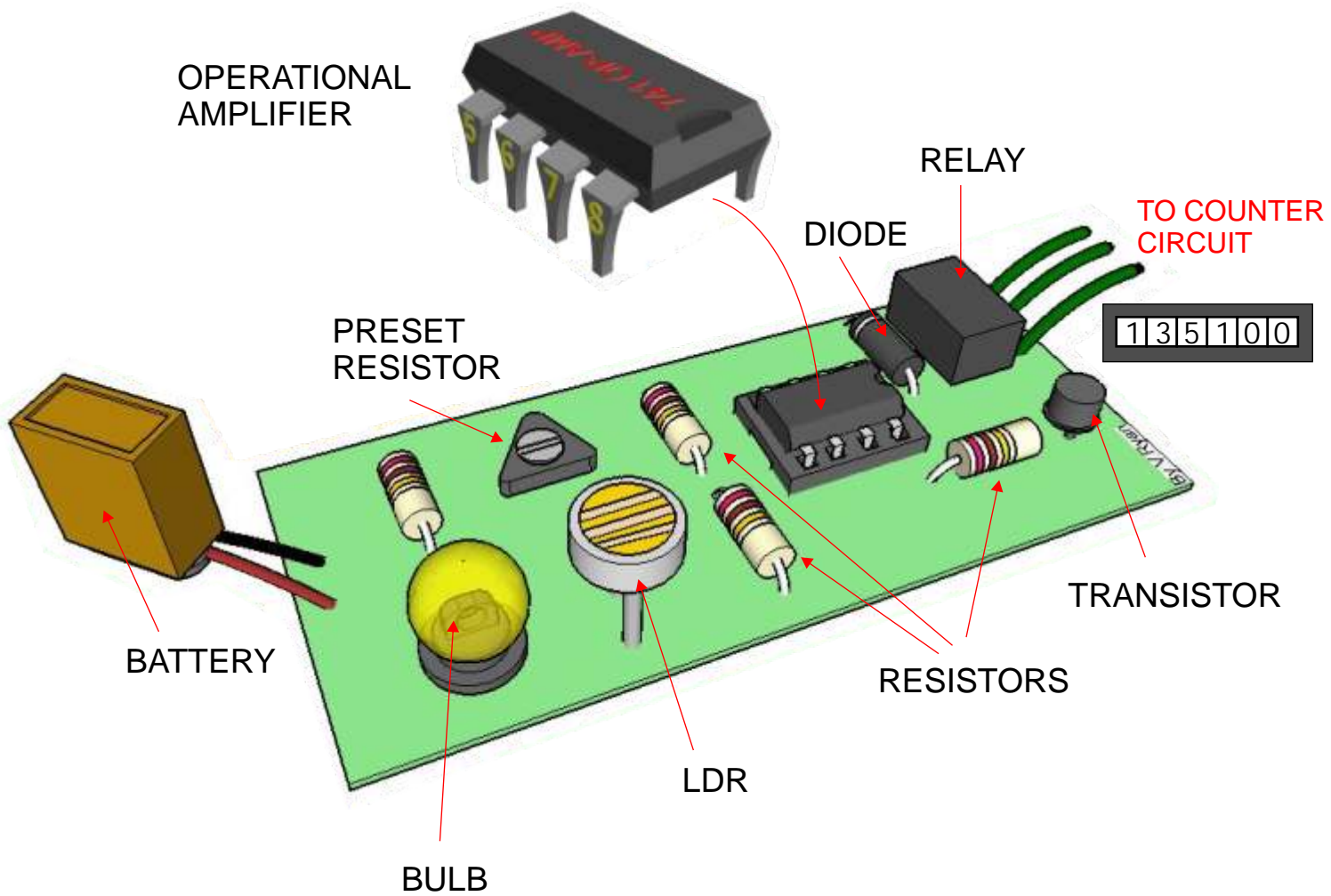


1. The diagram below represents the rotating disk. Draw on the disk any modifications you feel need to be made to allow the sensor to be exposed to the light from the bulb. The sensor must be exposed to the light twice for every rotation. Add notes explaining your answer.

NOTES

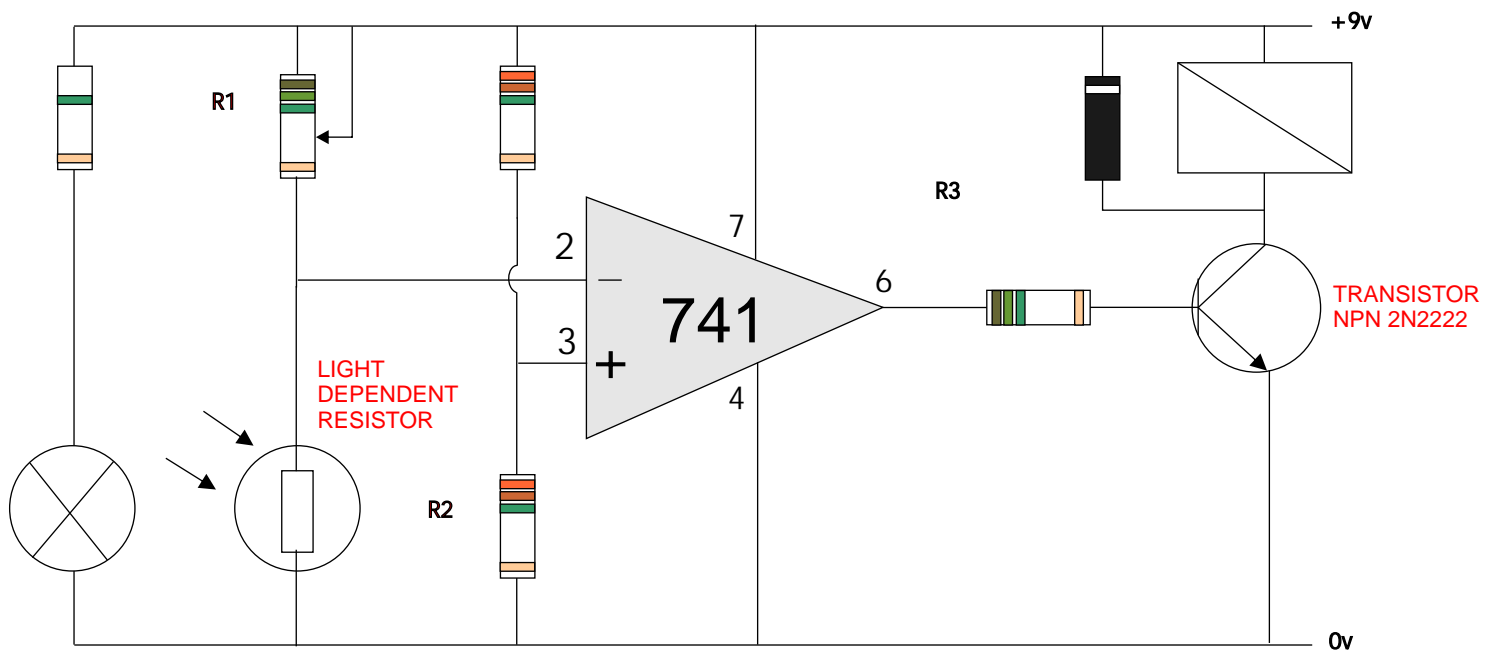


2. Below is a 3D version of the sensor / counter circuit.



The circuit diagram of the 3d circuit is seen below. When the light from the bulb shines on the light / dark sensor the resistance of the LDR decreases. This allows current to flow into pin 2. The 741 compares the current of pin 2 and pin 3. When a change in current occurs in either pin 2 or 3 the 741 outputs current at pins 6. This energises the relay. The energised relay activates the counter circuit. Each time the counter circuit is activated it adds a number.

When a 741 Op Amp is used in a circuit like this it is called a 'comparator'.



However, there is a fault with the circuit due to the position of the light bulb and LDR. Sometimes the LDR does not detect the light from the bulb. Explain why this may happen and how it could be corrected.

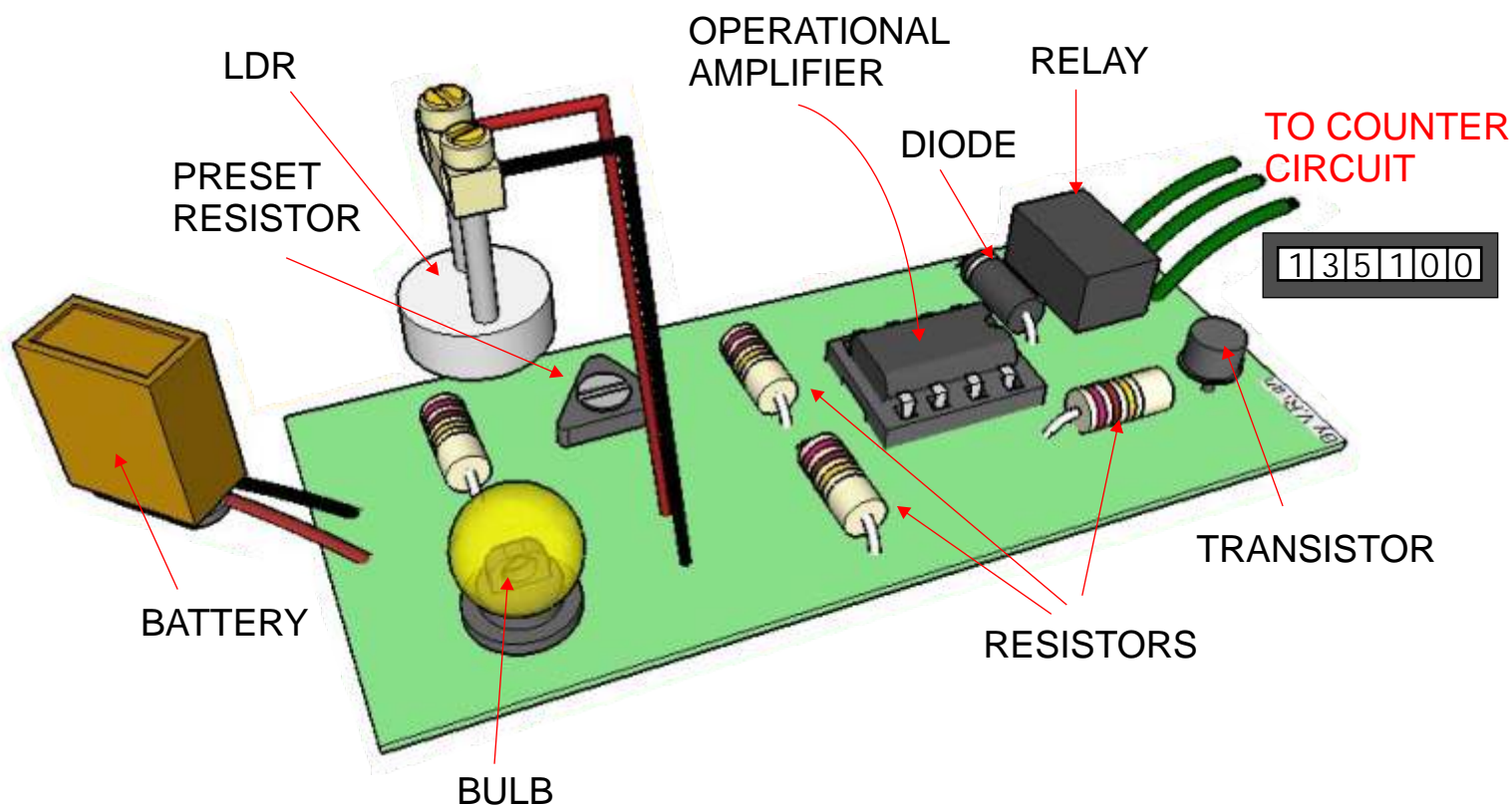
3.WHY THE LIGHT IS NOT ALWAYS DETECTED:

4. HOW THE CIRCUIT COULD BE CORRECTED SO THAT LIGHT IS ALWAYS DETECTED:

5. A 741 Operational Amplifier is represented by a distinctive symbol. Draw the symbol in the space opposite



The sensor circuit has been altered slightly and it is now suitable for use in the sensor bracket. The LDR is not soldered directly to the PCB as it is fixed in position with an electrical connector. This means that the LDR is directly above the bulb. As the bulb lights the LDR detects the light immediately.

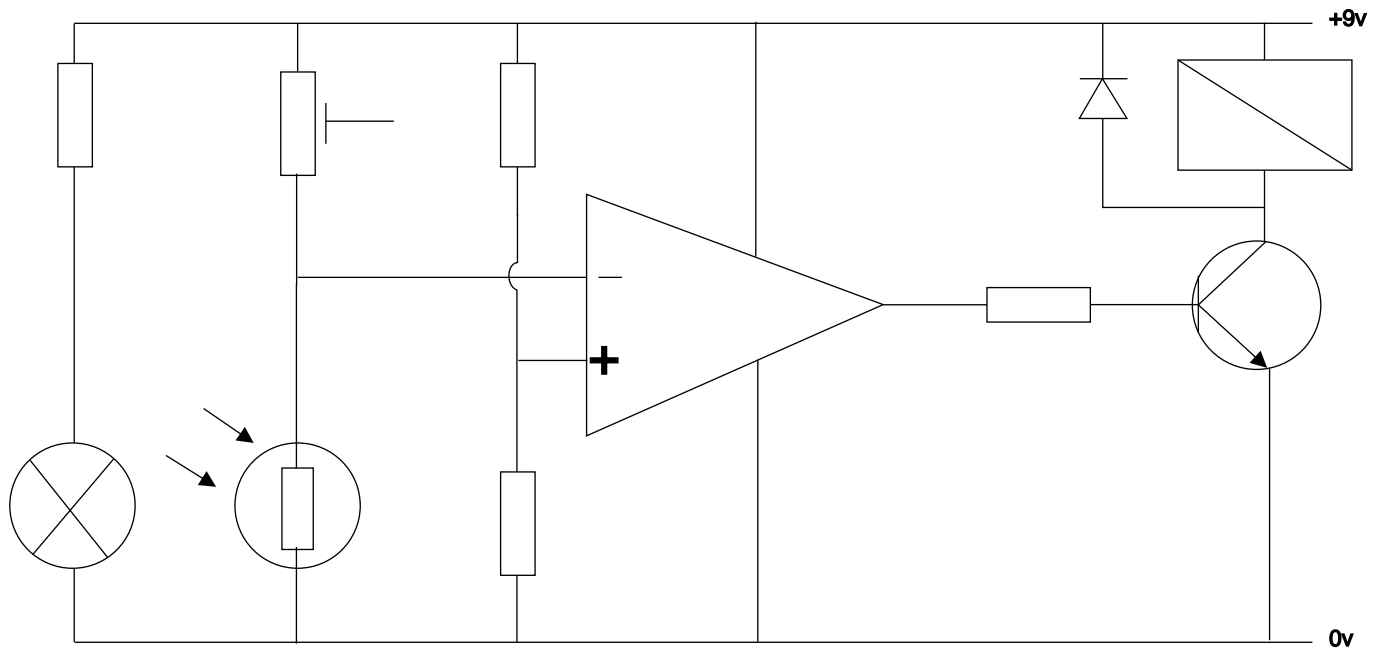


6. How does the position the LDR in relation to the bulb make the circuit more efficient ?

7. Identify the components listed below (label the components on the circuit diagram) :

Preset Resistor - Op Amp - Diode - LDR - Bulb - Relay

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8. Label the 741 Op Amp shown in the circuit above according to the Pin Table shown opposite.

Op Amp Pin Table	
1 and 5	= offset null
2	= inverting
3	= non-inverting
4	= 0v
6	= output
7	= +Vcc
8	= NC