INTRODUCTION TO RESISTORS
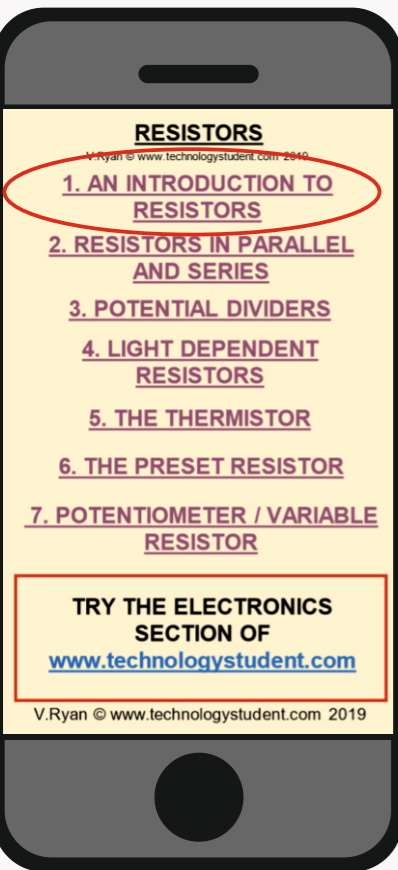
RESISTORS
V.Ryan © www.technologystudent.com 2019

1. AN INTRODUCTION TO RESISTORS

2. RESISTORS IN PARALLEL AND SERIES

3. POTENTIAL DIVIDERS

4. LIGHT DEPENDENT RESISTORS

5. THE THERMISTOR

6. THE PRESET RESISTOR

7. POTENTIOMETER / VARIABLE RESISTOR

TRY THE ELECTRONICS SECTION OF
www.technologystudent.com

V.Ryan © www.technologystudent.com 2019

TO ANSWER ALL THE QUESTIONS YOU WILL NEED TO DOWNLOAD THE 'RESISTORS' APP, FROM THE INTERACTIVE MOBILE APP SECTION OF www.technologystudent.com

LINK

http://www.technologystudent.com/mobapps/resistors1.pdf

Once you have downloaded the App, you can use it to navigate the website. You may need to follow the links on each page of the App, to research / complete answers to all the questions.
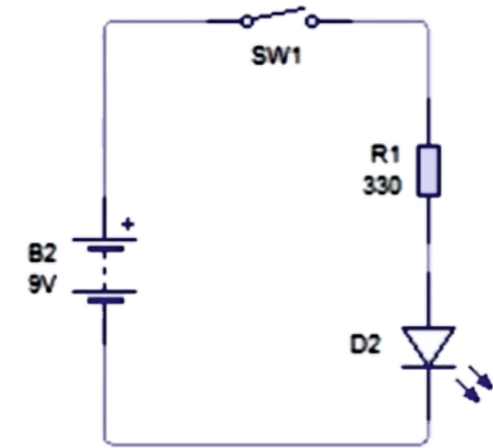
ARE YOU READY? USE THE MOBILE App!!

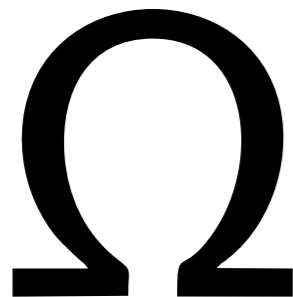**1. WHAT IS THE FUNCTION OF A RESISTOR, SUCH AS THE FIXED RESISTOR SHOWN BELOW?**

_____

_____

_____

_____

_____

_____

---

2. WHAT IS THE PURPOSE OF PLACING A FIXED RESISTOR IN THIS CIRCUIT?

SW1 — B2 9V — R1 330 — D2

_____

_____

_____

_____

---

3. REGARDING RESISTORS, WHAT DOES THIS SYMBOL MEAN?

$$\Omega$$

_____

_____

---

4. ADD THE MISSING RESISTOR VALUES TO THE STATEMENTS BELOW.

R = value up to 100 ohms
e.g. 50 ohms = ____R

K = value up to 1000 ohms and over
e.g. 10 000 ohms = ____K

M = value of 1000 000 ohms and over
e.g 1000 000 ohms = ___M

---

5. WHAT IS THE PURPOSE OF THE COLOURED BANDS, FOUND ON THE SURFACE OF A FIXED RESISTOR?

_____

_____

_____

HELPFUL LINK: http://www.technologystudent.com/mobapps/resistors1.pdf

B

2

INTRODUCTION TO RESISTORS

RESISTORS
V.Ryan © www.technologystudent.com 2010

1. AN INTRODUCTION TO RESISTORS

2. RESISTORS IN PARALLEL AND SERIES

3. POTENTIAL DIVIDERS

4. LIGHT DEPENDENT RESISTORS

5. THE THERMISTOR

6. THE PRESET RESISTOR

7. POTENTIOMETER / VARIABLE RESISTOR

TRY THE ELECTRONICS SECTION OF
www.technologystudent.com

V.Ryan © www.technologystudent.com 2019

TO ANSWER ALL THE QUESTIONS YOU WILL NEED TO DOWNLOAD THE 'RESISTORS' APP, FROM THE INTERACTIVE MOBILE APP SECTION OF www.technologystudent.com

LINK

http://www.technologystudent.com/mobapps/resistors1.pdf

Once you have downloaded the App, you can use it to navigate the website. You may need to follow the links on each page of the App, to research / complete answers to all the questions.

ARE YOU READY?
USE THE MOBILE App!!

1

COMPLETE THE FOLLOWING STATEMENTS BY FILLING IN THE 'OHMS'.

47R means ___ ohms

5R6 means ___ ohms

6k8 means ____ ohms

1M2 means _____ ohms

1a. Write the values of the following resistors:

Yellow 4	violet 7	red 00	red +/- 2%	4K7 +/-2%
green 5	blue 6	black none	gold +/- 5%	56R+/-5%
brown 1	grey 8	green 00000	silver +/- 10%	1M8+/-10%
orange 3	orange 3	orange 000	none +/- 20%	33K+/-20%

1st BAND	2nd BAND	3rd BAND	VALUE
YELLOW	BLUE	RED	
BROWN	GREY	ORANGE	
GREEN	ORANGE	BLACK	

1b. Explain why there is a fourth band _____

_____

2a. Complete the following table:

50K means	
5K7 means	
30R means	
5R8 means	
2M2 means	
1R5 means	150 ohms

Ohm's Law
Provides us with a very important formula for working out current, resistance and voltage (Potential Difference). In order to use this formula properly you must understand SI Units.

Voltage = V   Resistance = R   Current = I

OHMs LAW:
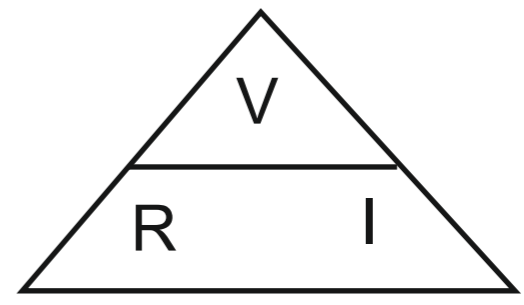
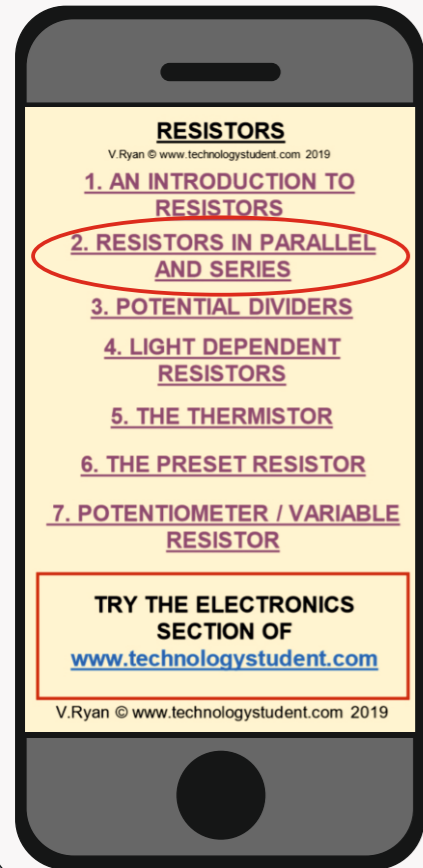1. If the current through a resistor is 1A and the voltage is 10v what is the resistance ?

$$R = \frac{V}{I} = \frac{\quad}{\quad} = \qquad ohms$$

2. If the current through a resistor is 0.6A and the voltage is 12v what is the resistance ?

$$R = \frac{V}{I} = \frac{\quad}{\quad} = \qquad ohms$$

3. A coil has a current of 50mA flowing through it when the voltage is 12v. What is the resistance of the coil ?

$$R = \frac{V}{I} = \frac{\quad}{\quad} = \frac{\quad}{\quad}$$

$$= \qquad ohms$$

RESISTORS IN PARALLEL AND SERIES

TRY THE ELECTRONICS SECTION OF
www.technologystudent.com

V.Ryan © www.technologystudent.com 2019

TO ANSWER ALL THE QUESTIONS YOU WILL NEED TO DOWNLOAD THE 'RESISTORS' APP, FROM THE INTERACTIVE MOBILE APP SECTION OF www.technologystudent.com

LINK

http://www.technologystudent.com/mobapps/resistors1.pdf

Once you have downloaded the App, you can use it to navigate the website. You may need to follow the links on each page of the App, to research / complete answers to all the questions.
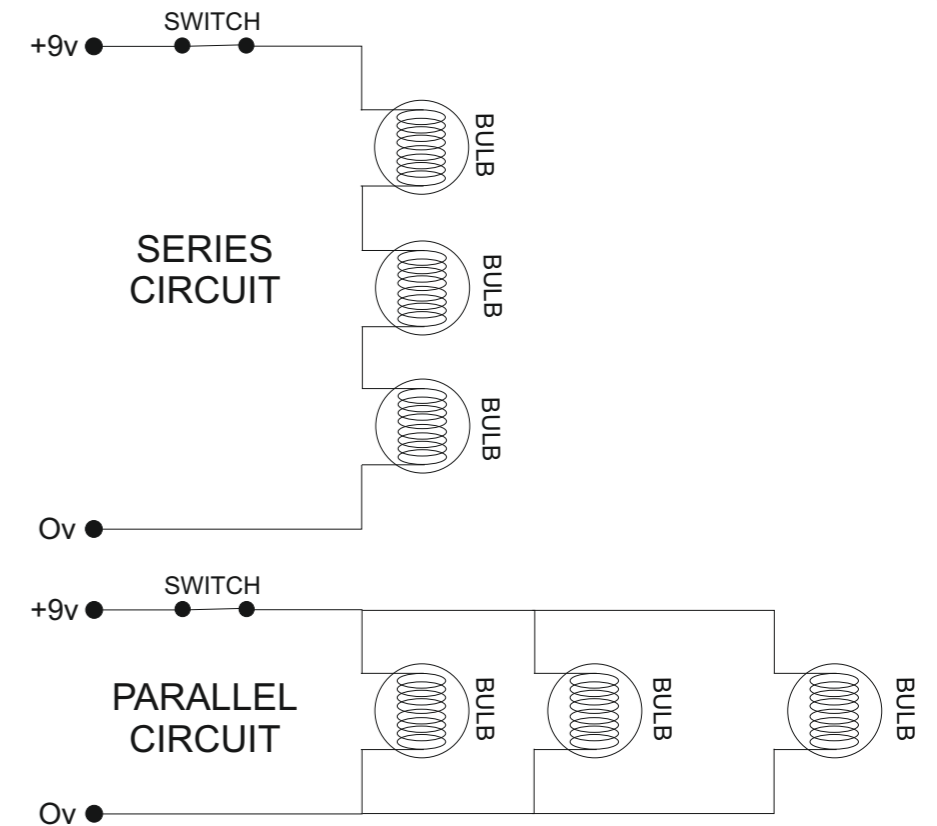
**ARE YOU READY?
USE THE MOBILE App!!**

1 WHAT ARE THE DIFFERENCES BETWEEN EACH CIRCUIT?
(Explain the arrangements of the components)

WHAT WILL HAPPEN IF A 'BULB' FAILS IN EACH CIRCUIT?

_____

_____

_____

_____

_____

_____

+9v — SWITCH

BULB
BULB
BULB

SERIES CIRCUIT

0v

+9v — SWITCH

PARALLEL CIRCUIT

BULB   BULB   BULB

0v

2 WHEN RESISTORS ARE CONNECTED IN 'SERIES', THEIR VALUES ARE ADDED TOGETHER:

$$R\ total = R1 + R2 + R3$$

R1   R2   R3

WHAT IS THE TOTAL RESISTANCE OF THE RESISTORS BELOW?

1K   1K   3K9

_____

_____

SAMPLE ANSWER - RESISTORS IN PARALLEL
You will need to read through this, before attempting the questions on the next sheet.

WHEN RESISTORS ARE CONNECTED IN PARALLEL, THEIR VALUES ARE CALCULATED IN THIS WAY:

R1   60Ω

R2   20Ω

R3   10Ω
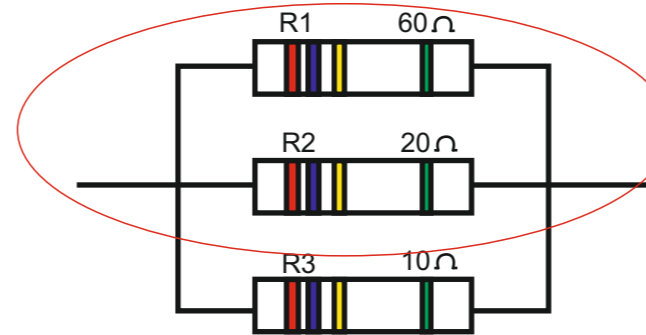
Begin by calculating the total resistance of the first two resistors.

$$\frac{1}{R_{(total)}} = \frac{1}{R1} + \frac{1}{R2}$$

$$\Rightarrow \frac{R1 \times R2}{R1 + R2} = \frac{60 \times 20}{60 + 20} = \frac{1200}{80}$$

$$\Rightarrow 15\,\Omega \ R_{(total)}$$

Then, take the total of the first two resistors and perform the same calculation with the third resistor.

$$\frac{R_{(total)} \times R3}{R_{(total)} \times R3} = \frac{15 \times 10}{15 + 10} = \frac{150}{25} = 6\,\Omega$$

HELPFUL LINK: http://www.technologystudent.com/mobapps/resistors1.pdf
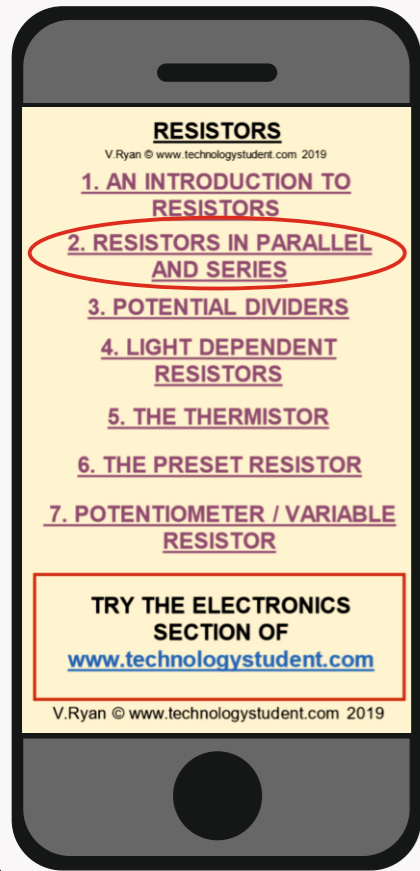
D

RESISTORS IN PARALLEL

TO ANSWER ALL THE QUESTIONS YOU WILL NEED TO DOWNLOAD THE 'RESISTORS' APP, FROM THE INTERACTIVE MOBILE APP SECTION OF www.technologystudent.com

LINK

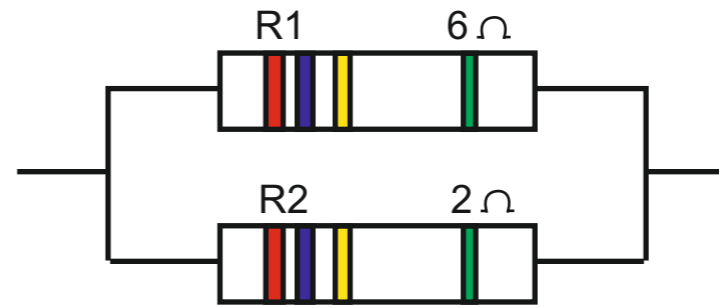http://www.technologystudent.com/mobapps/resistors1.pdf

Once you have downloaded the App, you can use it to navigate the website. You may need to follow the links on each page of the App, to research / complete answers to all the questions.

ARE YOU READY?
USE THE MOBILE App!!

1 COMPLETE THE CALCULATIONS SHOWN OPPOSITE. THE FIRST QUESTION HAS BEEN COMPLETED FOR YOU.

$$\frac{R1 \times R2}{R1 + R2} = \text{TOTAL RESISTANCE}$$
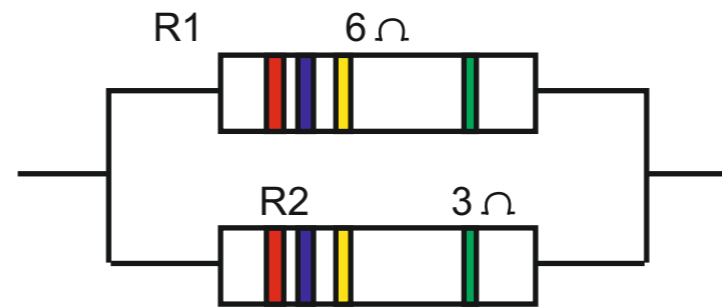
SAMPLE ANSWER

QUESTION 1

R1   6 Ω

R2   2 Ω

1. Calculate the total resistance for the two resistors in parallel

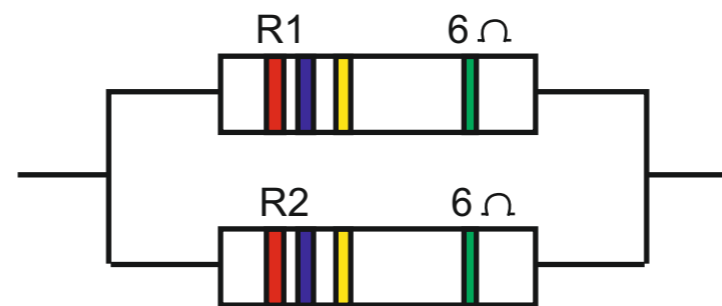$$\frac{R1 \times R2}{R1 + R2} = \frac{6 \times 2}{6 + 2} = \frac{12}{8} = 1.5 \, \Omega$$

RESISTORS IN PARALLEL - QUESTION 2

R1   6 Ω

R2   3 Ω

2. Calculate the total resistance for the two resistors in parallel

$$\frac{R1 \times R2}{R1 + R2} = \underline{\quad\quad} = \underline{\quad} = \quad \Omega$$

RESISTORS IN PARALLEL - QUESTION 2

R1   6 Ω

R2   6 Ω

3. Calculate the total resistance for the two resistors in parallel

$$\frac{R1 \times R2}{R1 + R2} = \underline{\quad\quad} = \underline{\quad} = \quad \Omega$$

E

RESISTORS IN PARALLEL

RESISTORS
V.Ryan © www.technologystudent.com 2019

1. AN INTRODUCTION TO RESISTORS

2. RESISTORS IN PARALLEL AND SERIES

3. POTENTIAL DIVIDERS

4. LIGHT DEPENDENT RESISTORS

5. THE THERMISTOR

6. THE PRESET RESISTOR

7. POTENTIOMETER / VARIABLE RESISTOR

TRY THE ELECTRONICS SECTION OF
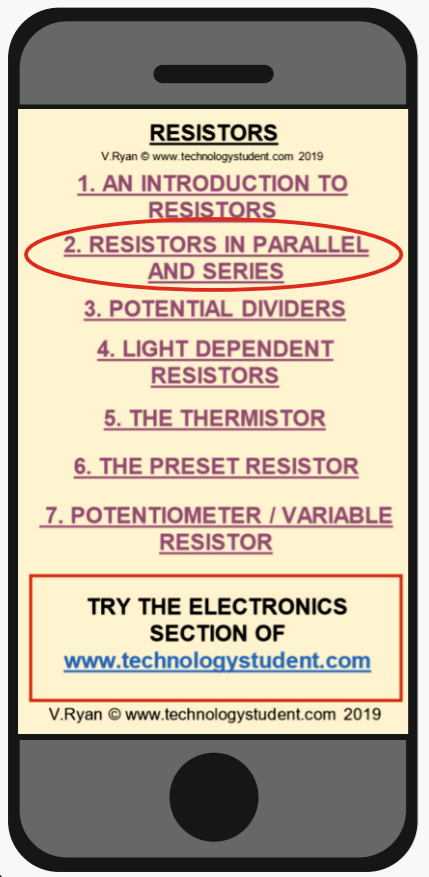**www.technologystudent.com**

V.Ryan © www.technologystudent.com 2019

TO ANSWER ALL THE QUESTIONS YOU WILL NEED TO DOWNLOAD THE 'RESISTORS' APP, FROM THE INTERACTIVE MOBILE APP SECTION OF www.technologystudent.com

LINK

http://www.technologystudent.com/mobapps/resistors1.pdf

Once you have downloaded the App, you can use it to navigate the website. You may need to follow the links on each page of the App, to research / complete answers to all the questions.
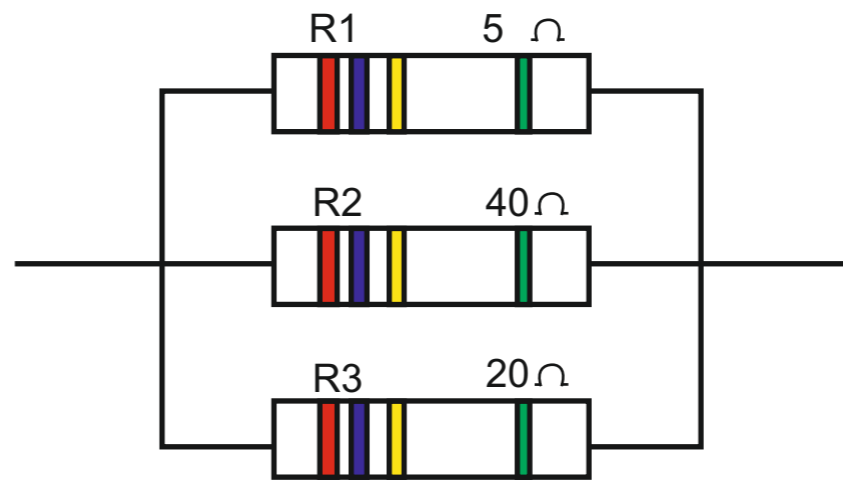
ARE YOU READY?
USE THE MOBILE App!!

1 **COMPLETE THE CALCULATION SHOWN OPPOSITE. THE SAMPLE CALCULATION ON SHEET 'C', WILL HELP YOU WORK OUT THE ANSWER.**

$$\frac{1}{R_{(total)}} = \frac{1}{R1} + \frac{1}{R2} + \frac{1}{R3}$$

R1   5 Ω

R2   40 Ω

R3   20 Ω

1. Calculate the total resistance for the three resistors in parallel

The usual formula is seen opposite although it is easier to break down the calculation into two separate ones. These are similar to calculations you have attempted earlier.

$$\frac{1}{R_{(total)}} = \frac{1}{R1} + \frac{1}{R2} + \frac{1}{R3}$$

To make the calculation easier calculate the total of the first two resistors.

....

$$\frac{1}{R_{(total)}} = \frac{1}{R1} + \frac{1}{R2}$$

First calculate the total resistance of the first two resistors.

$$=\triangleright \frac{R1 \times R2}{R1 + R2} = \underline{\hspace{2cm}} = \underline{\hspace{1.5cm}}$$

$$=\triangleright \quad \Omega \; R_{(total)}$$

Then, take the total of the first two resistors and perform the same calculation with the third resistor.

$$\frac{R_{(total)} \times R3}{R_{(total)} \times R3} = \underline{\hspace{2cm}} = \underline{\hspace{1.5cm}} = \underline{\hspace{1cm}} \Omega$$
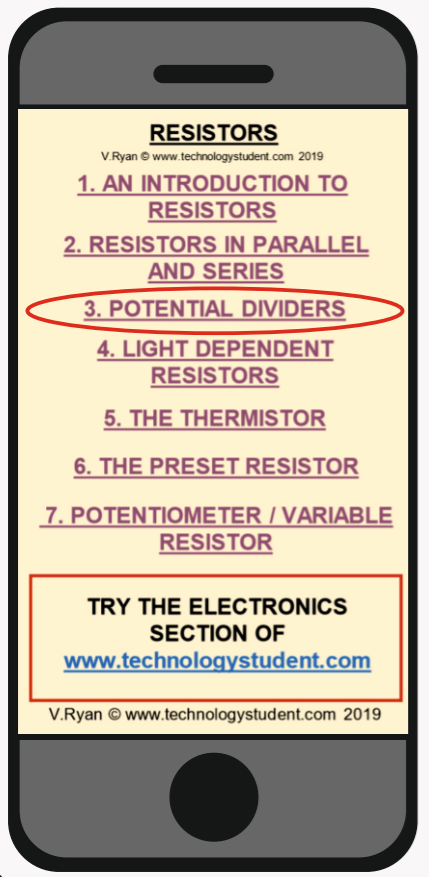
F

POTENTIAL DIVIDERS

TO ANSWER ALL THE QUESTIONS YOU WILL NEED TO DOWNLOAD THE 'RESISTORS' APP, FROM THE INTERACTIVE MOBILE APP SECTION OF www.technologystudent.com

RESISTORS
V.Ryan © www.technologystudent.com 2019

1. AN INTRODUCTION TO RESISTORS

2. RESISTORS IN PARALLEL AND SERIES

3. POTENTIAL DIVIDERS

4. LIGHT DEPENDENT RESISTORS

5. THE THERMISTOR

6. THE PRESET RESISTOR

7. POTENTIOMETER / VARIABLE RESISTOR

**TRY THE ELECTRONICS SECTION OF
www.technologystudent.com**

V.Ryan © www.technologystudent.com 2019

LINK

http://www.technologystudent.com/mobapps/resistors1.pdf

Once you have downloaded the App, you can use it to navigate the website. You may need to follow the links on each page of the App, to research / complete answers to all the questions.

**ARE YOU READY?
USE THE MOBILE App!!**

1

WHAT IS A POTENTIAL DIVIDER?
Refer to the diagram, to support your answer.

9v
IK R1
→ **4.5V**
1K R2
0v

_____

_____

_____

_____

_____

_____

_____

2

SAMPLE CALCULATION

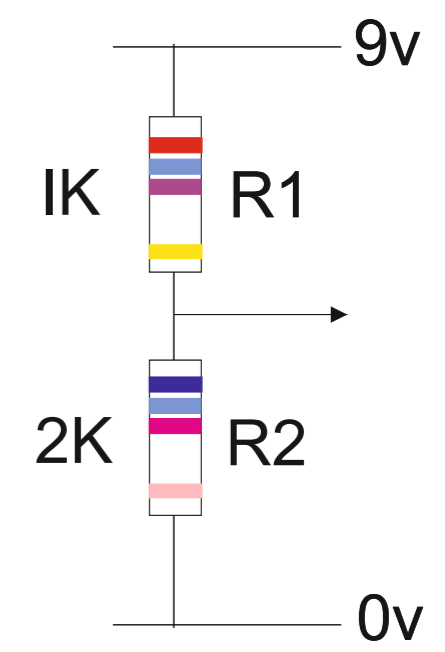**If R1 is 250K and R2 is 500K what is the voltage at 'A'.**

9v
R1
A
R2
0v
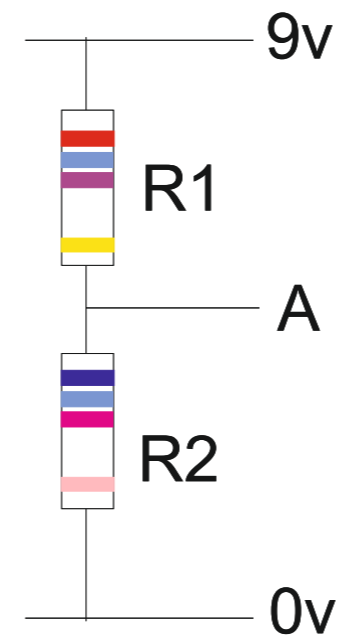
$$V = \text{supply voltage} \times R_2/R_1 + R_2$$

$$V = 9v \times \frac{500}{250+500} = 9v \times \frac{500}{750}$$

$$V = 9v \times 0.6$$

$$V = 6v$$

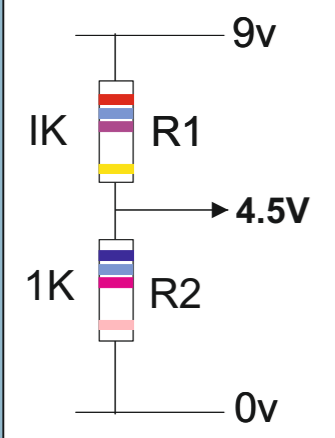**Calculate the output voltage, given that R1 = 1K and R2 = 2K**
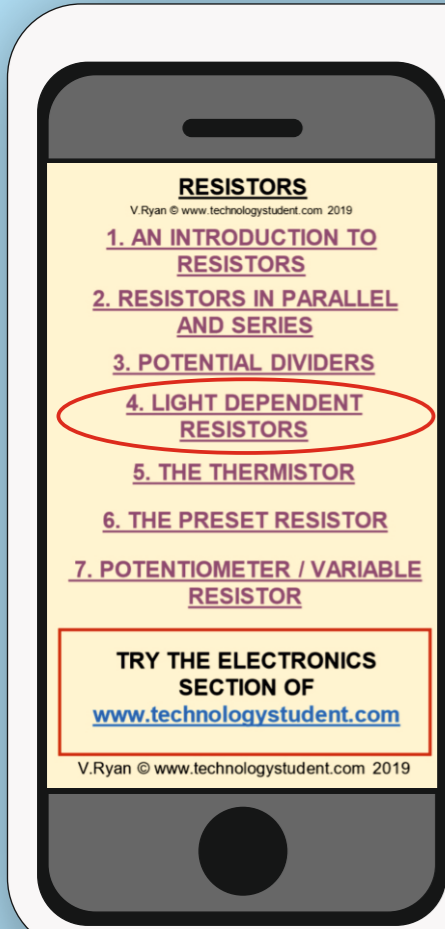

9v
IK R1
2K R2
0v

EXTENSION WORK

1. If R1 is 600K and R2 is 300K what is the voltage at 'A'.

2. If R1 is 50R and R2 is 250R what is the voltage at 'A'.

3. If R1 is 100R and R2 is 300K what is the voltage at 'A'.

4. If R1 is 10K and R2 is 80K what is the voltage at 'A'.

LIGHT DEPENDENT RESISTORS

RESISTORS
V.Ryan © www.technologystudent.com 2019

1. AN INTRODUCTION TO RESISTORS

2. RESISTORS IN PARALLEL AND SERIES

3. POTENTIAL DIVIDERS

4. LIGHT DEPENDENT RESISTORS

5. THE THERMISTOR

6. THE PRESET RESISTOR

7. POTENTIOMETER / VARIABLE RESISTOR

TRY THE ELECTRONICS SECTION OF www.technologystudent.com

V.Ryan © www.technologystudent.com 2019

TO ANSWER ALL THE QUESTIONS YOU WILL NEED TO DOWNLOAD THE 'RESISTORS' APP, FROM THE INTERACTIVE MOBILE APP SECTION OF www.technologystudent.com

LINK

http://www.technologystudent.com/mobapps/resistors1.pdf

Once you have downloaded the App, you can use it to navigate the website. You may need to follow the links on each page of the App, to research / complete answers to all the questions.

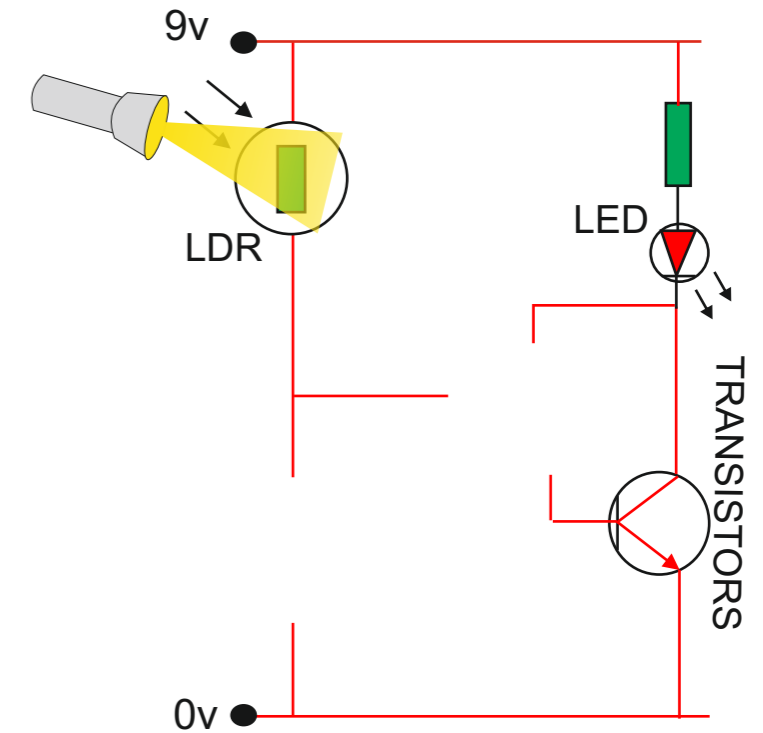**ARE YOU READY? USE THE MOBILE App!!**

1 IN SIMPLE TERMS, WHAT ARE THE FUNCTIONS OF A LIGHT DEPENDENT RESISTOR?
Include reference to the rise and fall of resistance

_____

_____

_____

_____

2 COMPLETE THE LIGHT / DARK SENSOR CIRCUIT DRAWN BELOW.

9v

LDR

LED

TRANSISTORS

0v

3 HOW DOES THE CIRCUIT YOU COMPLETED IN Q2, WORK?

_____

_____

_____

_____

4 WHAT IS THE ROLE OF A PRESET RESISTOR, IN A LIGHT / DARK SENSOR CIRCUIT.

_____

_____

_____

_____

5 HOW COULD A LIGHT / DARK SENSOR BE USED? Write some ideas / suggestions.
E.G. AS A SENSOR IN AN ALARM

_____

_____

_____

_____

HELPFUL LINK: http://www.technologystudent.com/mobapps/resistors1.pdf

LDR EXAMINATION QUESTION

A pupil has designed and manufactured a model based on the automatic control of street lights. When the light level drops the street light comes on automatically .The systems diagram below shows how the pupil's circuit works. The sensor detects when the day light fades and a relay circuit turns on the street lights.

| SENSE LIGHT FADING | → | CIRCUIT ACTIVATED | → | TURN ON STREET LIGHT |
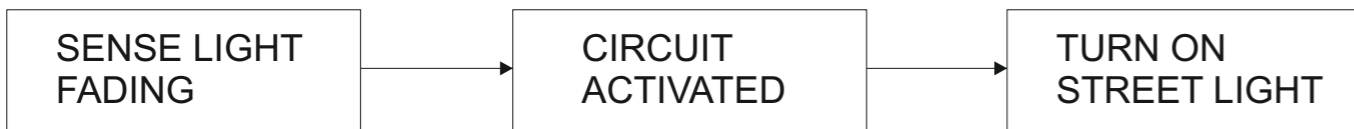
The circuit below has been manufactured as a sensor. It has been developed to sense a drop in the light level.
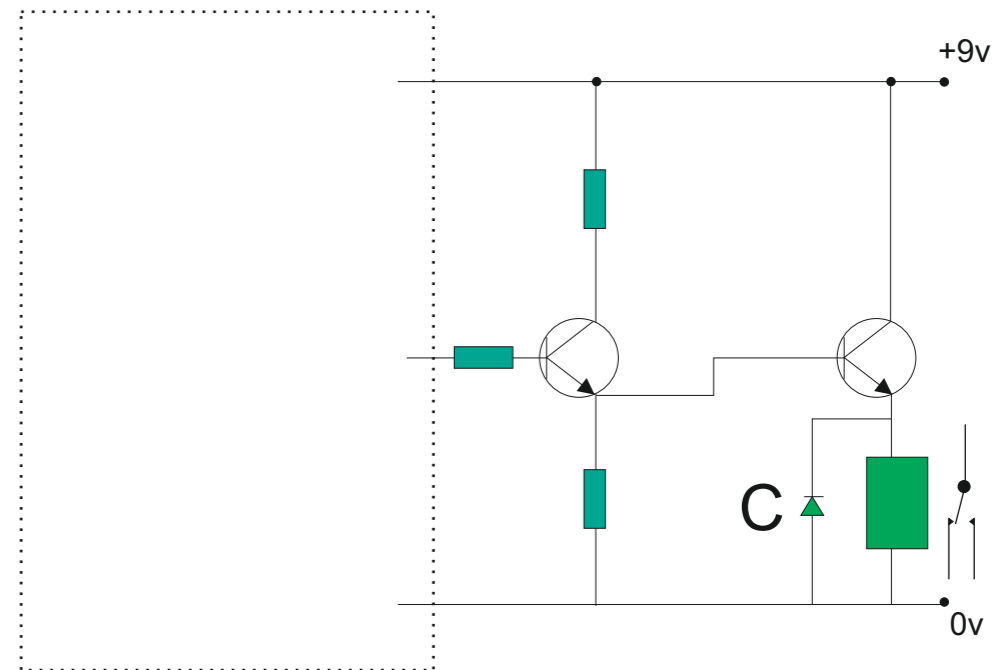
A

B
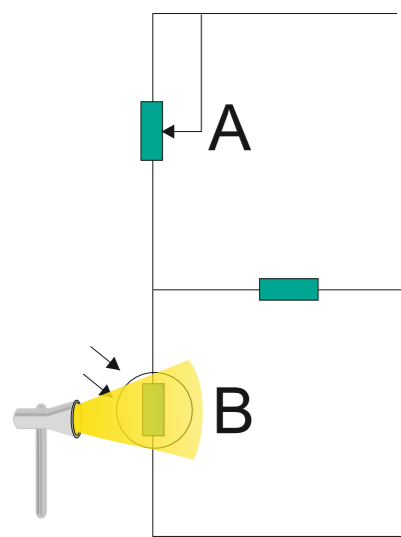
1. Name of component A: _____

2. Name of component B: _____

3. Which component is the one that behaves as a sensor.

_____

4. How does the resistance of this component change when the light fades.

_____

5. Which component is used to adjust the sensitivity of the circuit.

_____

6. The dark sensing circuit shown above can be altered to detect light. Complete the next circuit by adding the light sensor.
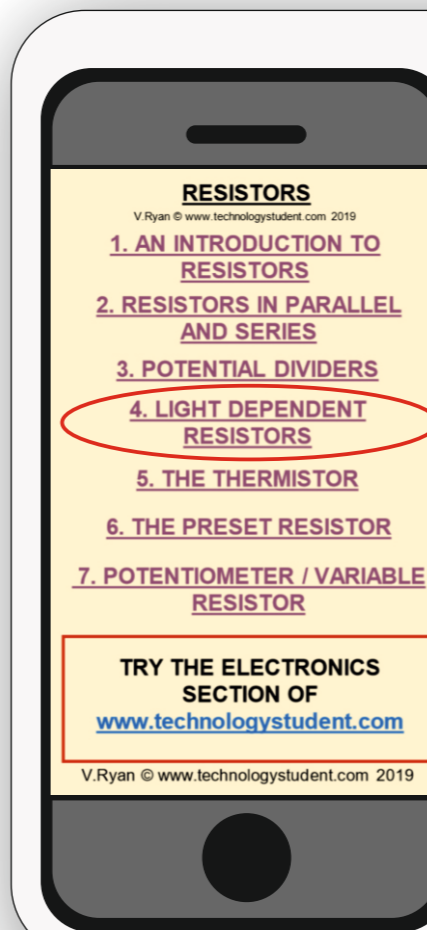
+9v

C

0v

7. What is the name of component C shown in the sensing circuit above?

Name of component C: _____

8. What is its function ?

_____

_____

LIGHT DEPENDENT RESISTORS

RESISTORS
V.Ryan © www.technologystudent.com 2019

1. AN INTRODUCTION TO RESISTORS

2. RESISTORS IN PARALLEL AND SERIES

3. POTENTIAL DIVIDERS

4. LIGHT DEPENDENT RESISTORS

5. THE THERMISTOR

6. THE PRESET RESISTOR

7. POTENTIOMETER / VARIABLE RESISTOR

TRY THE ELECTRONICS SECTION OF
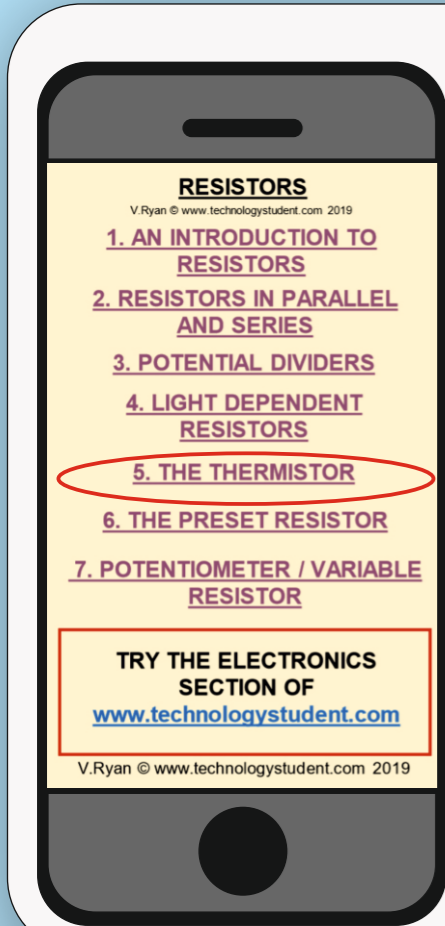www.technologystudent.com

V.Ryan © www.technologystudent.com 2019

TO ANSWER ALL THE QUESTIONS YOU WILL NEED TO DOWNLOAD THE 'RESISTORS' APP, FROM THE INTERACTIVE MOBILE APP SECTION OF www.technologystudent.com

LINK

http://www.technologystudent.com/mobapps/resistors1.pdf

Once you have downloaded the App, you can use it to navigate the website. You may need to follow the links on each page of the App, to research / complete answers to all the questions.

ARE YOU READY? USE THE MOBILE App!!

THE THERMISTOR

RESISTORS
V.Ryan © www.technologystudent.com 2019

1. AN INTRODUCTION TO RESISTORS

2. RESISTORS IN PARALLEL AND SERIES

3. POTENTIAL DIVIDERS

4. LIGHT DEPENDENT RESISTORS

5. THE THERMISTOR

6. THE PRESET RESISTOR

7. POTENTIOMETER / VARIABLE RESISTOR

TRY THE ELECTRONICS SECTION OF
www.technologystudent.com

V.Ryan © www.technologystudent.com 2019

TO ANSWER ALL THE QUESTIONS YOU WILL NEED TO DOWNLOAD THE 'RESISTORS' APP, FROM THE INTERACTIVE MOBILE APP SECTION OF www.technologystudent.com

LINK

http://www.technologystudent.com/mobapps/resistors1.pdf

Once you have downloaded the App, you can use it to navigate the website. You may need to follow the links on each page of the App, to research / complete answers to all the questions.
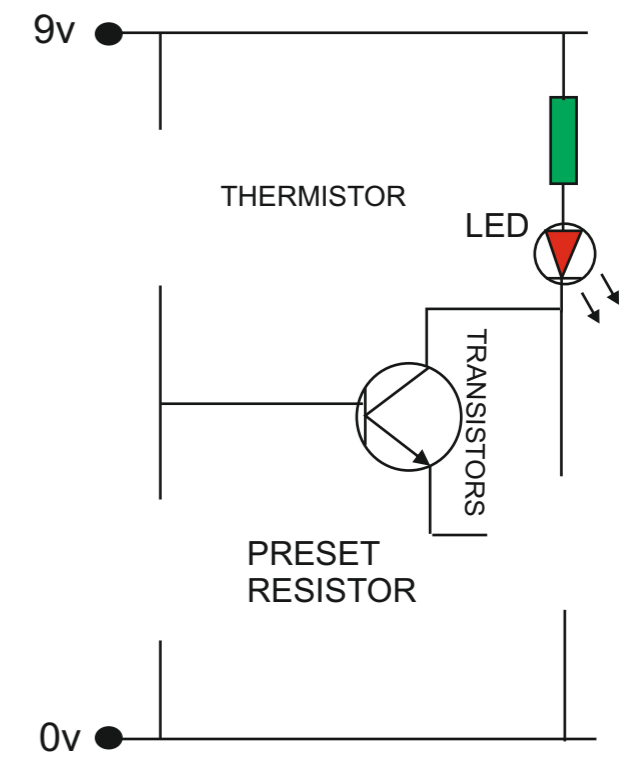
**ARE YOU READY?
USE THE MOBILE App!!**

1 IN SIMPLE TERMS, WHAT ARE THE FUNCTIONS OF A THERMISTOR?
Include reference to the rise and fall of resistance

2 COMPLETE THE TEMPERATURE SENSOR CIRCUIT DRAWN BELOW.

9v

THERMISTOR
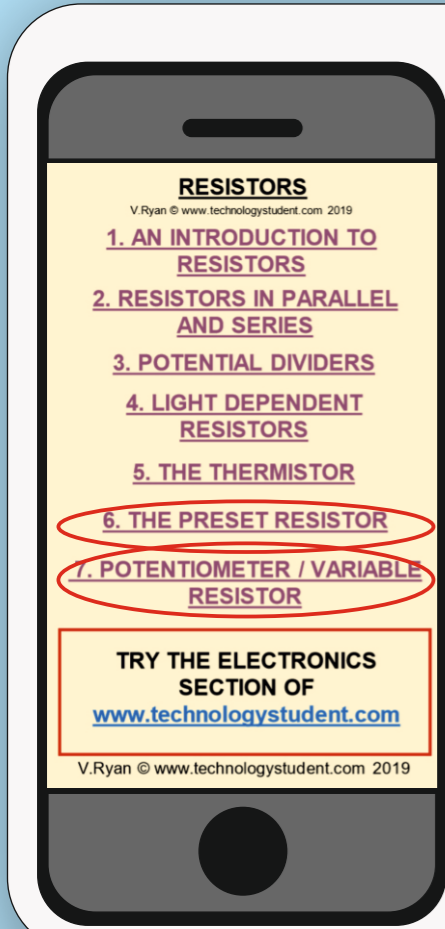
LED

TRANSISTORS

PRESET RESISTOR

0v

3 HOW DOES THE CIRCUIT YOU COMPLETED IN Q2, WORK?

4 THE CIRCUIT IN Q2 DOES NOT HAVE AN 'ON / OFF' SWITCH. DRAW A SWITCH THAT COULD BE ADDED TO THE CIRCUIT.
INCLUDE ITS SYMBOL AND NAME.

5 HOW COULD A TEMPERATURE SENSOR BE USED? Write some ideas / suggestions.
E.G. ICE WARNING CIRCUIT IN A CAR

HELPFUL LINK: http://www.technologystudent.com/mobapps/resistors1.pdf

RESISTORS
V.Ryan © www.technologystudent.com 2019

1. AN INTRODUCTION TO RESISTORS

2. RESISTORS IN PARALLEL AND SERIES

3. POTENTIAL DIVIDERS

4. LIGHT DEPENDENT RESISTORS

5. THE THERMISTOR

6. THE PRESET RESISTOR

7. POTENTIOMETER / VARIABLE RESISTOR

TRY THE ELECTRONICS SECTION OF www.technologystudent.com

V.Ryan © www.technologystudent.com 2019

THE PRESET RESISTOR AND VARIABLE RESISTOR

TO ANSWER ALL THE QUESTIONS YOU WILL NEED TO DOWNLOAD THE 'RESISTORS' APP, FROM THE INTERACTIVE MOBILE APP SECTION OF www.technologystudent.com

LINK

http://www.technologystudent.com/mobapps/resistors1.pdf

Once you have downloaded the App, you can use it to navigate the website. You may need to follow the links on each page of the App, to research / complete answers to all the questions.
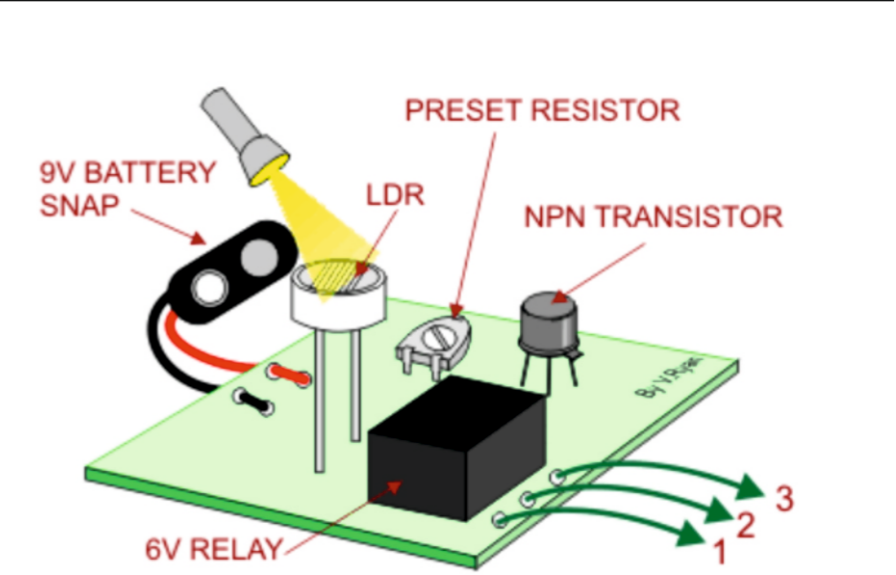
ARE YOU READY? USE THE MOBILE App!!

1 WHAT ARE PRESET RESISTORS AND WHY ARE THEY OFTEN USED IN CIRCUITS ?
Include reference to variable resistance

2 NAME THE TOOL REQUIRED TO INCREASE / DECREASE RESISTANCE OF THE PRESET, IN THIS CIRCUIT.

PRESET RESISTOR
9V BATTERY SNAP
LDR
NPN TRANSISTOR
6V RELAY
By V.Ryan
3
2
1

3 WHY ARE VARIABLE RESISTORS / POTENTIOMETERS USED, RATHER THAN PRESET RESISTORS?

SEARCH THE INTERNET FOR IMAGES OF VARIABLE RESISTORS / POTENTIOMETERS.
Paste some examples below

HELPFUL LINK: http://www.technologystudent.com/mobapps/resistors1.pdf