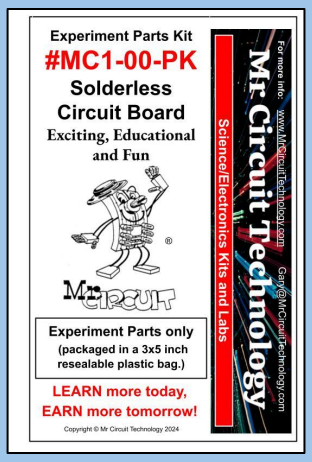
For more info: www.MrCircuitTechnology.com Gary@MrCircuitTechnology.com

Mr Circuit Technology

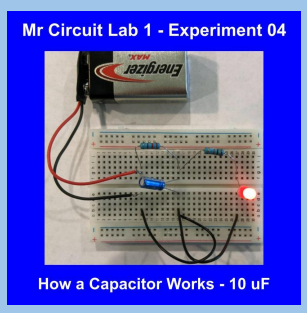
Science/Electronics Experiment Kits and Labs

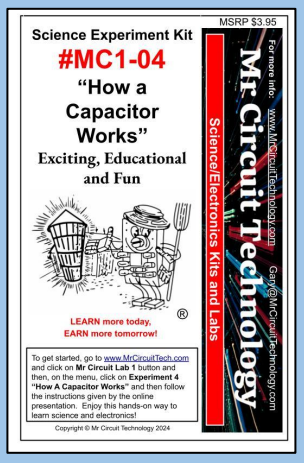
"HOW A CAPACITOR WORKS"

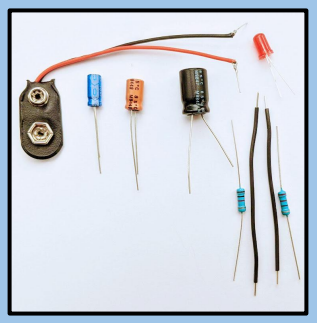


LESSON PLAN

Table of Contents







PREPARATION: You can put the Page 12 poster up on your classroom wall to announce the fact that you are going to do the Science-Electronics Experiment.

Step 1 - Make a copy of pages 1 through 8 for each student. The students can read and do these pages on their own or you can guide them.

Step 2 - Hand out Parts Kit #MC1-00-PK (that has the Solderless Circuit Board) and Parts Kit #MC1-04-PK (that has the experiment parts) with a 9-Volt battery. Give these items to each student along with the 8 pages.

Step 3 - When your students have completed the experiment, collect all the Parts Kits and batteries for later use.

Step 4 - Collect all the Written Quizzes for grading and use the Answer Key to grade them.

For Tech Support or any questions, you can email us or call 805-295-1642

How A CAPACITOR Works (Page 1)

MC1-04-R-1

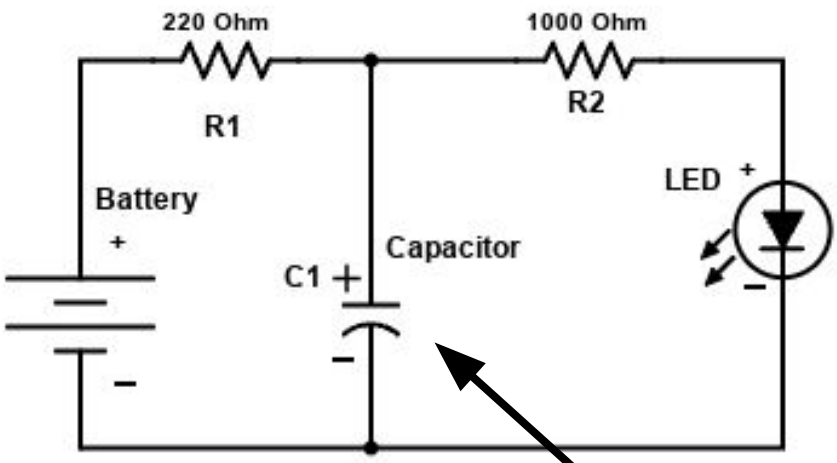
EXPLANATION OF EXPERIMENT

*** You are going to build a circuit to observe a CAPACITOR storing an electrical charge.

Here is the SCHEMATIC DIAGRAM of the circuit you will build.

1 The symbol (with a squiggly line) represents a RESISTOR.

2 The LED symbol (a circle with an arrow in it) represents a light-emitting diode that lights up when electric current is flowing through it.



3 This curved line and straight line with a plus and minus is an ELECTROLYTIC CAPACITOR.

The electron current in this circuit flows out of the negative side of the battery to the LED and to the CAPACITOR, then through the RESISTORS back to the positive side of the battery.

(Continue to Page 2)

How a CAPACITOR Works (Page 2)

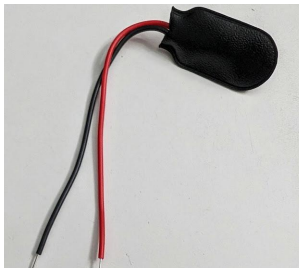
MC1-04-R-2

PURPOSE OF THIS EXPERIMENT

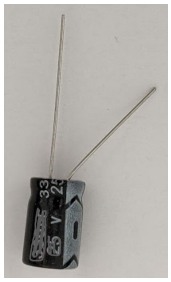
*** To observe CAPACITORS storing and discharging electrical charge..

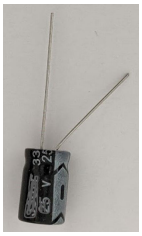
PARTS NEEDED FOR EXPERIMENT

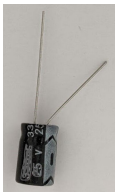
In this experiment, you will use a BATTERY SNAP



three ELECTROLYTIC CAPACITORS

1000 uF 

100 uF 

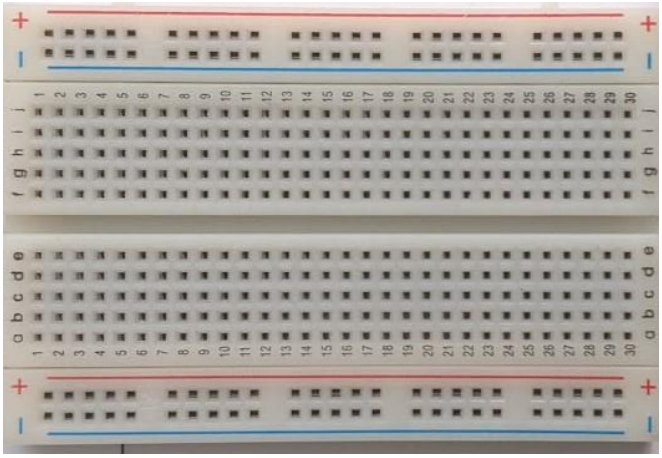
10 uF 

uF = MicroFarad is a measurement of capacitance.

an LED 

two Jumper Wires

and a SOLDERLESS CIRCUIT BOARD.



You will also need a good 9 Volt battery

(Continue to Page 3)

How a CAPACITOR Works (Page 3)

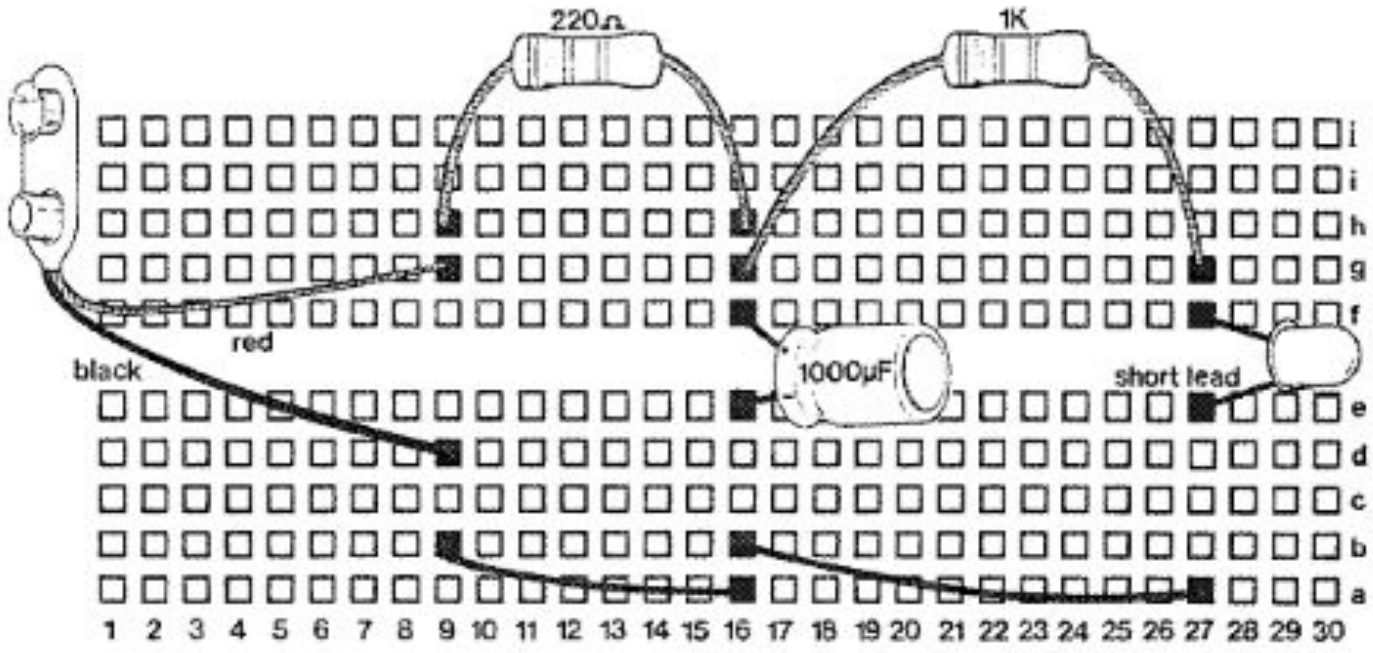
MC1-04-R-3

DO THE EXPERIMENT (part 1 of 3)

***** You are going to build a circuit to demonstrate CAPACITORS storing and discharging an electrical charge.**

Step 1 - Take out a **Battery Snap** and install it with its Red lead in hole **9g** and its Black lead in hole **9d** as shown in the pictorial diagram. **(Note: If you reverse the leads, the circuit will NOT work.)**

PICTORIAL DIAGRAM



Step 2 - Install an **LED** with its short lead into hole **27e** and its long lead into hole **27f.**

Step 3 - Install a 220 Ohm resistor (color bands Red, Red, Brown, Gold) as shown on the pictorial into holes **9h** and **16h.**

(Continue to Page 4)

How a CAPACITOR Works (Page 4)

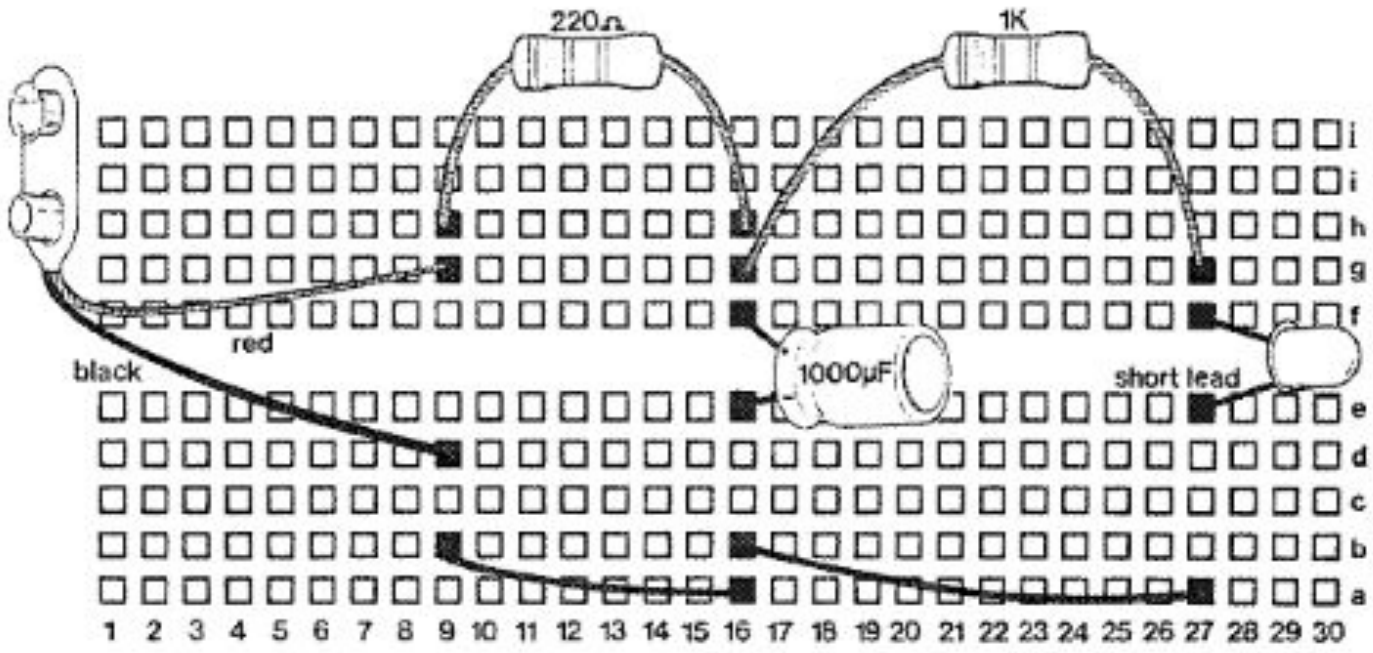
MC1-04-R-4

DO THE EXPERIMENT (part 2 of 3)

Step 4 - Install a 1000 Ohm (1k) **RESISTOR** (color bands Brown, Black, Red, Gold) as shown on the pictorial into holes **16g** and **27g**.

Step 5 - Install a **Jumper Wire** into holes **9b** to **16a** and another **Jumper Wire** into holes **16b** to **27a**.

PICTORIAL DIAGRAM



Step 6 - Now touch the 9V battery to the battery snap and observe that the LED lights up. Then, when you disconnect the battery, the LED remains lit for short time while the CAPACITOR is discharging. The LED shuts off when the CAPACITOR is discharged. Try it again and notice how long the LED remains lit after you disconnect the battery.

(Continue to Page 5)

How a CAPACITOR Works (Page 5)

MC1-04-R-5

DO THE EXPERIMENT (part 3 of 3)

Step 7 - Now remove the **1000uF CAPACITOR** and put a 100uF CAPACITOR in its place in the circuit.

Step 8 - Now touch the 9V battery to the battery snap and observe that the LED lights up. Then, when you disconnect the battery, the LED remains lit for **very short time** while the CAPACITOR is discharging.

Step 8 -Now remove the **100uF CAPACITOR** and put a 10uF CAPACITOR in its place in the circuit.

Step 9 - Now touch the 9V battery to the battery snap and observe that the LED lights up. Then, when you disconnect the battery, the LED remains lit for **SUPER short time** while the CAPACITOR is discharging. You may not even see the LED remain lit at all because the time is so short.

CONCLUSION

*** You should have observed that a **CAPACITOR** can store an electrical charge which can be used to keep an LED lit for a short time after the 9 Volt power is removed from the circuit. Capacitors are used in all kinds of timing circuits in electronics.

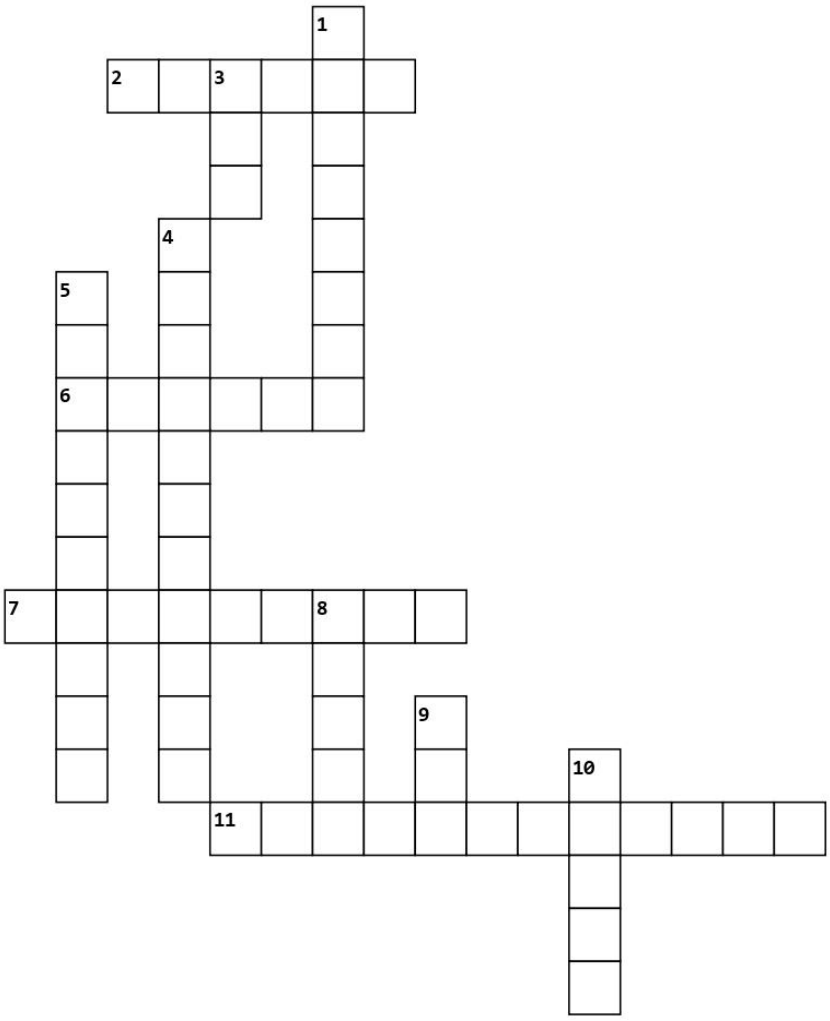
(End of Experiment 4)

Mr. CIRCUIT®

MC1-04-CW

CROSSWORD

Experiment 4 - "How a CAPACITOR Works"



Across

2. If we want the LED to remain lit longer, we have to use a _____ capacitor.

6. A capacitor can store a _____ .

7. What keeps the LED lit for a short time when you remove power from the circuit?

11. What kind of capacitor are we using in this experiment?

Down

1. The short lead on the LED is connected toward the _____ of the battery.

3. What is the second color band on a 220 Ohm resistor?

4. The larger the _____ the longer the LED will remain lit?

5. What does this stand for uF ?

8. How many sizes of capacitor did we use in this experiment?

9. If we reverse the battery leads, the LED will _____ light up.

10. What is the second color band on a 1000 Ohm resistor?

WORD SEARCH

Experiment 4 - "How a CAPACITOR Works"

J R D F H H L H Q X G F A P W U A D D H
U E O Z L S M J B L W T I K N M O A P Q
M D C R K L O Z E X M R M R T V C Y N T
S P N T T T B X W U I X P E Z I L L T W
D X V Q D B R V O Y C T E G V H L V K M
V D Y Y Z S G C T Q R C L R L D H Z R S
G F M U W P K N V M O A E A Q H N X P X
K C C Y Y N J B V M F P C L B E R T B A
I D N A T J E N B S A A T J G F A H X K
W T O T P U N U N U R C R E D G S R J A
V N T F U A Y W E X A I O P O N I E P C
C L H J I O C S G Q D T L N R H Q E S A
F L G X E D S I A O T O Y C V Q L N S M
A D B R P B X U T I E R T Q H B B E M W
Z U R L T R N D I A X M I O E X G G G J
G T S W A D R T V Q N M C F B L T F W K
J T N Q V C D Z E R C C O Y L Q N E O L
H B A S F P K H Y I Q P E E E R T F C O
Q P L O P F D I U R S Z I X Z D G S X R
R G W X F V C H A R G E B E E Q L W C P

1. What does uF this stand? **2.** What is the second color band on a 220 Ohm resistor?

3. What is the second color band on a 1000 Ohm resistor?

4. What keeps the LED lit for a short time when you remove power from the circuit?

5. The larger the _____ the longer the LED will remain lit?

6. What kind of capacitor are we using in this experiment?

7. If we reverse the battery leads, the LED will _____ light up.

8. If we want the LED to remain lit longer, we have to use a _____ capacitor.

9. A capacitor can store a _____ .

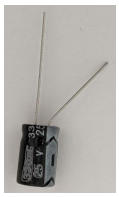
10. The short lead on the LED is connected toward the _____ of the battery.

11. How many sizes of capacitor did we use in this experiment?

(Student Name) (Period/Student Number) (Date)

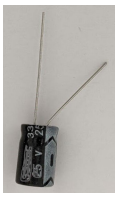
QUIZ for Exp 04 or STEM KIT #04
in the Mr Circuit Electronics Training Lab 1

(Page 8)



This Quiz covers the training learned by completing

"How a Capacitor Works" Experiment 4



Circle the letter for your answer to each question and then hand this quiz in to your teacher.

#1 In Experiment #4, what is the component that you learned about?

A **A.** a capacitor
B **B.** a resistor
C **C.** an LED
D **D.** a battery snap

#2 In Exp. #4, how many resistors do we use?

A **A.** 1
B **B.** 2
C **C.** 3
D **D.** 4

#3 In Exp. #4, when you disconnect the battery, the LED remains lit for a time because _____.

A **A.** the two resistors keep it lit
B **B.** the energy stored in the capacitor keeps it lit
C **C.** LEDs store electrons
D **D.** your eyes are playing tricks on you.

#4 What happens to the LED when we reduce the value of the capacitor in the circuit and then disconnect the battery?

A **A.** The LED remains lit for a longer time.
B **B.** The LED will burn out.
C **C.** The LED remains lit for shorter time.
D **D.** It will have no effect on the LED.

#5 In Exp. #4, what type of capacitor are we using?

A **A.** an electrolytic capacitor
B **B.** a ceramic disc capacitor
C **C.** a polyester film capacitor
D **D.** a variable capacitor

#6 What happens to the LED if we reverse the polarity on the battery?

A **A.** it lights up just fine
B **B.** it burns out the LED
C **C.** the LED will not light up
D **D.** the LED will get hot

#7 The more capacitance a capacitor has, the _____ electrical charge it will hold.

A **A.** less
B **B.** fuzzier
C **C.** worse
D **D.** more

#8 Which value of capacitor will hold more electrical charge?

A **A.** 1000uF
B **B.** 100uF
C **C.** 10uF
D **D.** 1uF

#9 What is the purpose of a capacitor in a circuit?

A **A.** to vary the resistance
B **B.** to store inductance
C **C.** to store an electrical charge
D **D.** to increase the wattage

#10 Does the capacitor in this circuit have polarity?

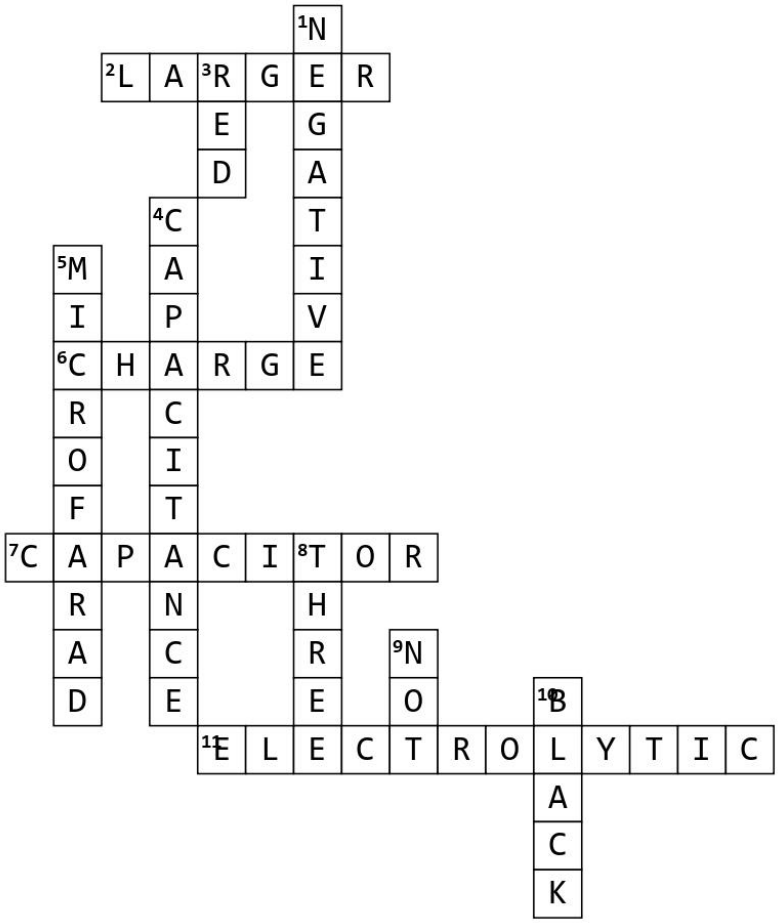
A **A.** NO
B **B.** can't tell
C **C.** YES
D **D.** its an inductor

(Form SQ04)

Score

ANSWERS FOR CROSSWORD

Experiment 4 - “How a CAPACITOR Works”



Across

2. If we want the LED to remain lit longer, we have to use a _____ capacitor.

6. A capacitor can store a _____ .

7. What keeps the LED lit for a short time when you remove power from the circuit?

11. What kind of capacitor are we using in this experiment?

Down

1. The short lead on the LED is connected toward the _____ of the battery.

3. What is the second color band on a 220 Ohm resistor?

4. The larger the _____ the longer the LED will remain lit?

5. What does this stand for uF ?

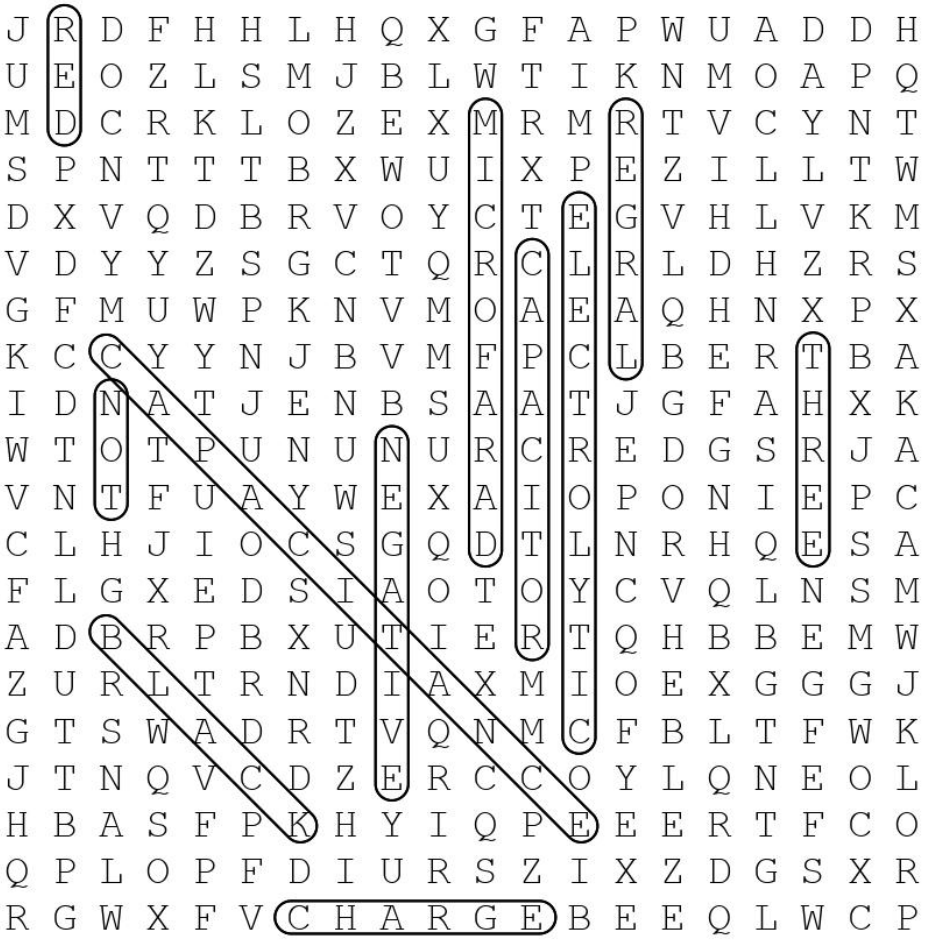
8. How many sizes of capacitor did we use in this experiment?

9. If we reverse the battery leads, the LED will _____ light up.

10. What is the second color band on a 1000 Ohm resistor?

ANSWERS FOR WORD SEARCH

Experiment 4 - "How a CAPACITOR Works"



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10. The short lead on the LED is connected toward the _____ of the battery.

11. How many sizes of capacitor did we use in this experiment?

QUICK-CHECK ANSWER KEY for Experiment 04 QUIZ
for Mr Circuit Electronics Training ("How a Capacitor Works")

Place this sheet over top of the STUDENT QUIZ (offset a little to the left and then offset to the right) to compare the answers on this sheet to the answers that the student marked. Put an 'X' for each wrong answer.

Count the right answers and record the score of right answers in your grade book.

A (B) C D

#1 In Experiment #4, what is the component that you learned about?

A. a capacitor
B. a resistor
C. an LED
D. a battery snap

A B C (D)

#2 In Exp. #4, how many resistors do we use?

A. 1
B. 2
C. 3
D. 4

A (B) C D

#3 In Exp. #4, when you disconnect the battery, the LED remains lit for a time because _____.

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D. your eyes are playing tricks on you.

A B (C) D

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(A) B C D

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D. a variable capacitor

A B (C) D

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A B C (D)

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D. more

(A) B C D

#8 Which value of capacitor will hold more electrical charge?

A. 1000uF
B. 100uF
C. 10uF
D. 1uF

A B C (D)

#9 What is the purpose of a capacitor in a circuit?

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D. to increase the wattage

A B (C) D

#10 Does the capacitor in this circuit have polarity?

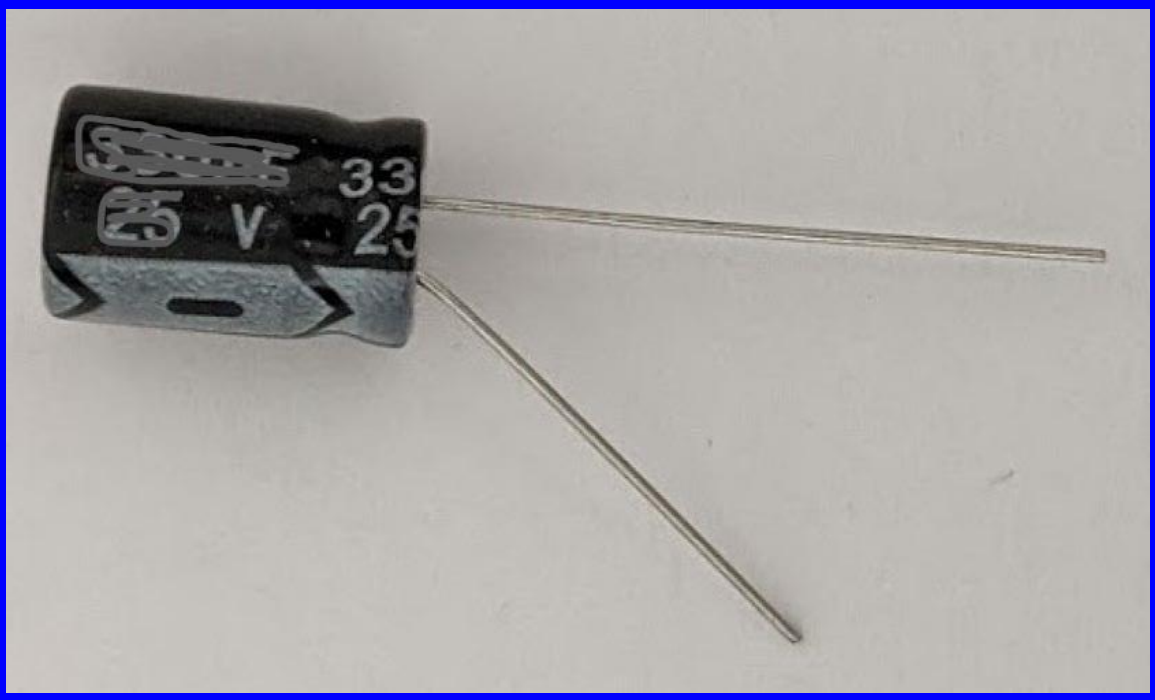
A. NO
B. can't tell
C. YES
D. its an inductor

A B (C) D

(Form SQAK04)

BUILD A BETTER FUTURE by UNDERSTANDING SCIENCE-ELECTRONICS

CAPACITORS STORE ELECTRICAL CHARGE

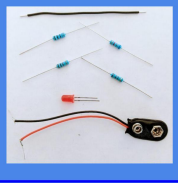


BASIC ELECTRONICS LAB 1

"HOW A CAPACITOR WORKS"

(Poster MC1-04-P01)

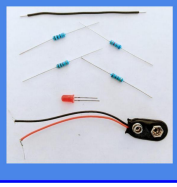
MC1-01
Electronic Parts



For more info: www.MrCircuitTechnology.com MrCircuit23@gmail.com

Mr Circuit Technology

MC1-01
Electronic Parts



PRICE LIST May 2024

PRICE LIST

PARTS KIT Number	Mr Circuit Series 1 SCIENCE / ELECTRONICS "PARTS KITS"	Price Each
MC1-00-PK	Solderless Circuit Board to build kits	$3.95
MC1-01-PK	Parts Kit for "How a Resistor Works	$1.95
MC1-02-PK	Parts Kit for "How a Potentiometer Works	$2.95
MC1-03-PK	Parts Kit for "How a Photocell Works	$1.95
MC1-04-PK	Parts Kit for "How a Capacitor Works	$2.95
MC1-05-PK	Parts Kit for "How a Speaker Works	$2.95
MC1-06-PK	Parts Kit for "How a Diode Works	$1.95
MC1-07-PK	Parts Kit for "How an SCR Works	$3.95
MC1-08-PK	Parts Kit for "How an NPN Transistor Works	$2.95
MC1-09-PK	Parts Kit for "How a PNP Transistor Works	$2.95
MC1-10-PK	Parts Kit for "How a Transistor Oscillator Works	$3.95
MC1-11-PK	Parts Kit for "How a 555 Timer IC Works	$2.95
MC1-12-PK	Parts Kit for "Burglar Alarm circuit	$3.95
MC1-13-PK	Parts Kit for "Solar-Activated Night Light circuit	$3.95
MC1-14-PK	Parts Kit for "DC to DC Power Supply circuit	$2.95
MC1-15-PK	Parts Kit for "Electronic Metronome circuit	$4.95
MC1-16-PK	Parts Kit for "Electronic Motorcycle circuit	$3.95
MC1-17-PK	Parts Kit for "Railroad Lights circuit	$2.95
MC1-18-PK	Parts Kit for "Variable Speed Lights circuit	$3.95
MC1-19-PK	Parts Kit for "Continuity Tester circuit	$4.95
MC1-20-PK	Parts Kit for "Audio Generator circuit	$5.95
MC1-21-PK	Parts Kit for "Electronic Police Siren circuit	$4.95
MC1-22-PK	Parts Kit for "Solar-Activated Wake-Up Alarm circuit	$3.95
MC1-23-PK	Parts Kit for "Variable Timer circuit	$3.95
MC1-24-PK	Parts Kit for "Moisture Detector circuit	$2.95
MC1-25-PK	Parts Kit for "Code Oscillator circuit	$4.95
MC1-26-PK	Parts Kit for "Audible Water Detector circuit	$4.95
MC1-27-PK	Parts Kit for "English Police Siren circuit	$4.95
MC1-28-PK	Parts Kit for "Electronic Canary circuit	$7.95
MC1-29-PK	Parts Kit for "fantasy Space Machine Gun circuit	$5.95
MC1-30-PK	Parts Kit for "Ultrasonic Pest Repeller circuit	$5.95
Set-MC1-PK	**Complete Set of All Series 1 Parts Kits (31 total)**	**$120.00**