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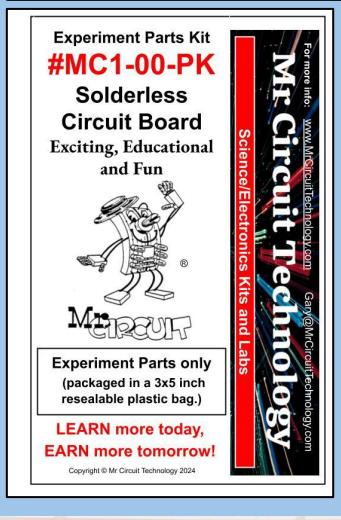
Mr Circuit Technology

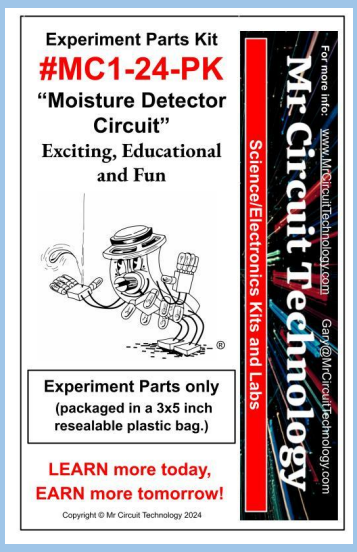
Science/Electronics Experiment Kits and Labs

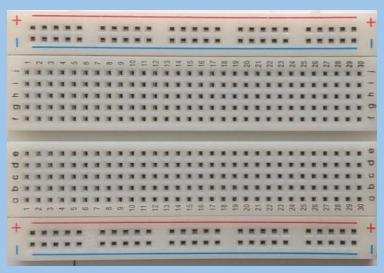
Exp. 24 - "MOISTURE DETECTOR CIRCUIT"

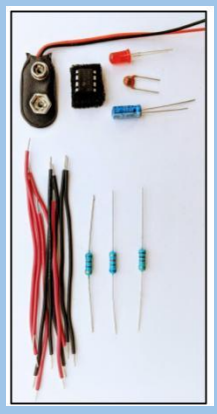


LESSON PLAN

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 #MC1-24-PK (that has the experiment parts) with a 9-Volt battery. Give these items to each student along with the 8 pages.

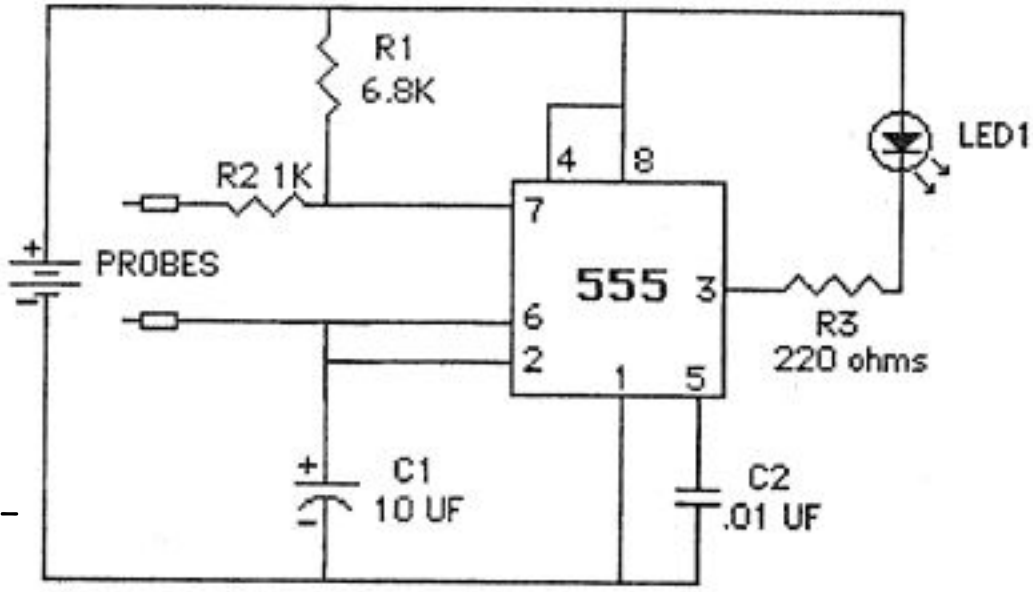
Step 3 - When your students have completed the experiment, collect all the Parts Kits and batteries for later use.

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

EXPLANATION OF EXPERIMENT part 1 of 2

*** You are going to build a MOISTURE DETECTOR circuit. Here is the SCHEMATIC DIAGRAM of the circuit you will build.



This interesting circuit was invented by engineers who wanted a circuit that would sense MOISTURE and set off an alarm or turn on a light.

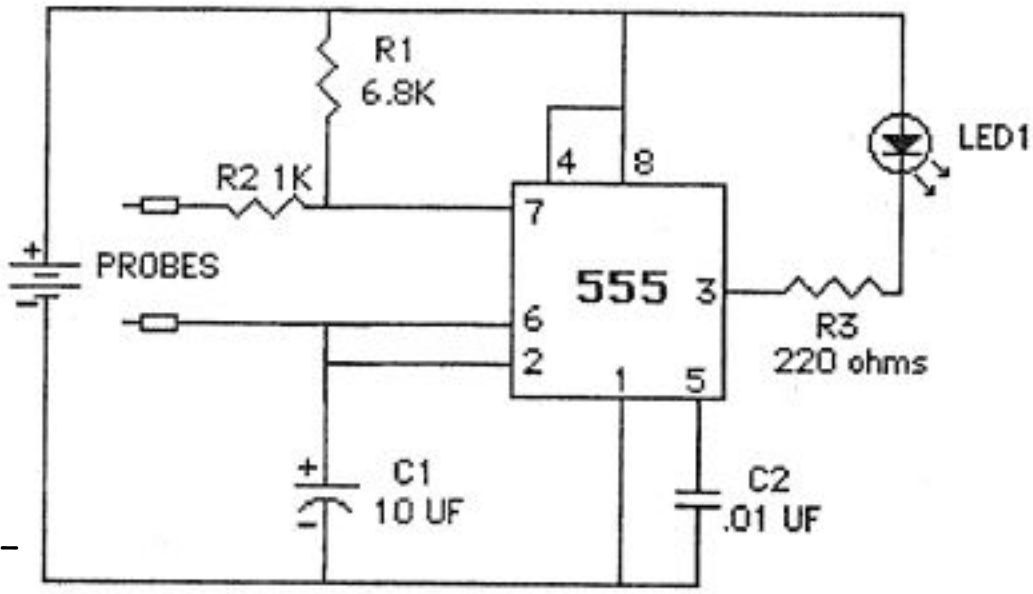
An electronic moisture detector can be used in a home basement to sense a leaky water heater and set off an alarm or turn on a light.

It can also be used to sense moisture in soil to be sure the plants are getting enough water.

(Continue to Page 2)

EXPLANATION OF EXPERIMENT part 2 of 2

Let's talk about how the circuit works. Here is the schematic of the **MOISTURE DETECTOR** circuit that you will build.



This circuit uses a 555 Integrated Circuit as **CLOCK**.

The frequency of the CLOCK pulses depends on the resistance between the PROBES.

If there is lots of moisture, the resistance between the probes will be lower than when the soil is dry. The lower the resistance between the probes, the faster the blinks of the LED.

You can experiment with different soils and water levels to tell the approximate amount of moisture that you are detecting.

If the soil is dry, the LED should not blink at all. The LED may remain ON or may remain OFF to indicate dry soil.

(Continue to Page 3)

MC1-24-R-3

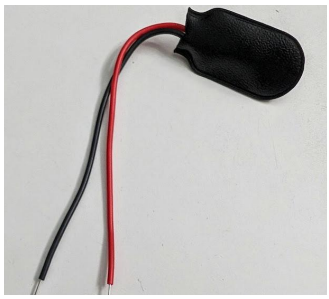
PURPOSE OF THIS EXPERIMENT

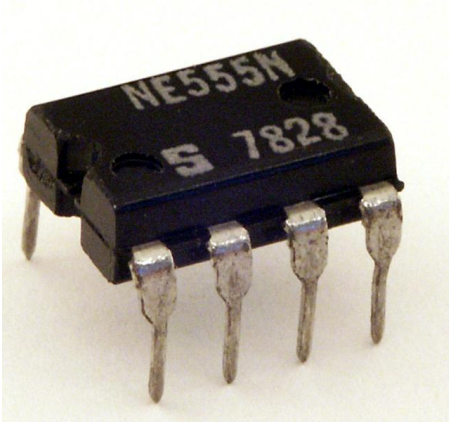
*** To build an MOISTURE DETECTOR using a 555 Integrated Circuit.

PARTS NEEDED FOR EXPERIMENT

In this experiment, you will use the following items:

a BATTERY SNAP a DISC CAPACITOR 555 IC LED





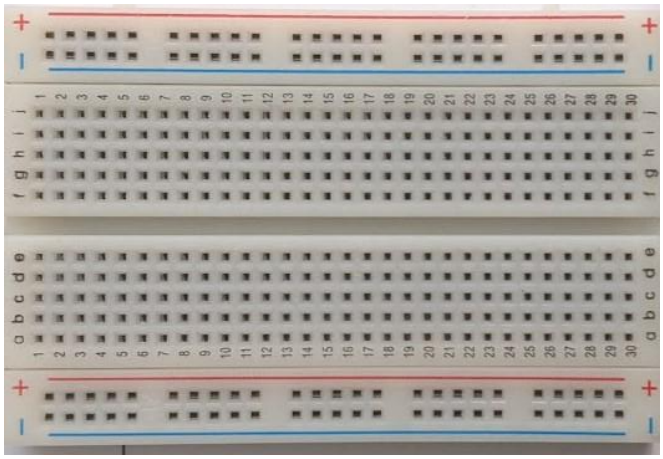
220 Ohm resistor

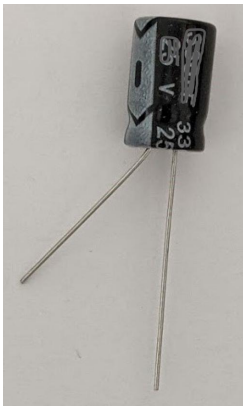
1000 Ohm resistor

6800 Ohm resistor

9 Jumper Wires

a SOLDERLESS CIRCUIT BOARD a Radial Cap P/B Sw





You will also need a good 9 Volt battery

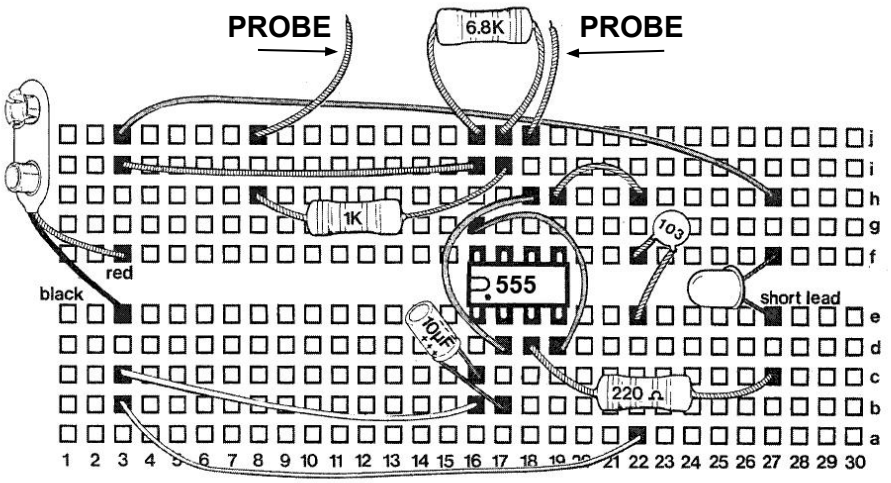
(Continue to Page 4)

MC1-24-R-4

DO THE EXPERIMENT (part 1 of 2)

Now you are going to build the circuit on a Solderless CB.

Step 1 - Take out all the parts needed for this experiment.



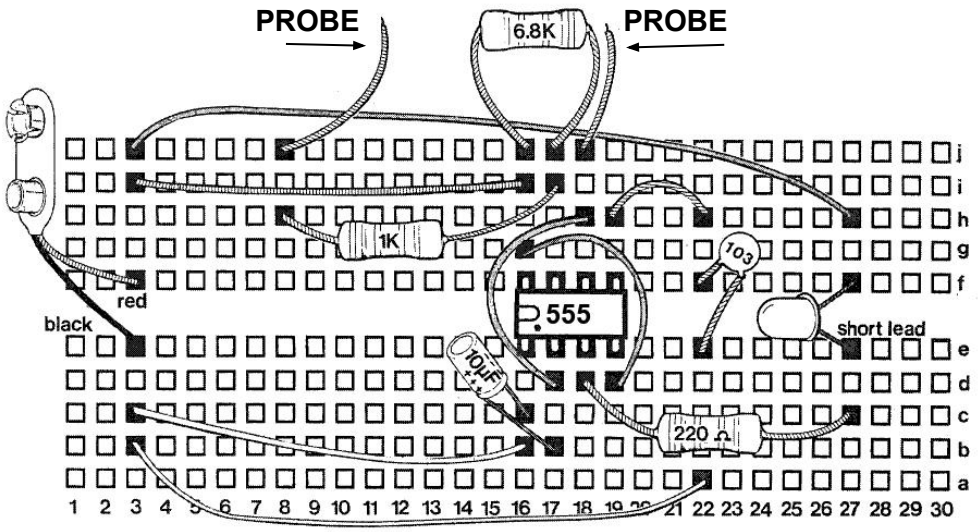
Step 2 - Install all the parts on the SCB as shown above.

- ❑ Install an LED with the Short Lead in hole 27e and the Long Lead in hole 27f
- ❑ Install the 220 Ohm resistor (red, red, brown, gold) in holes 18d to 27c
- ❑ Install the 1000 (1k) Ohm resistor (brown, black, red, gold) in holes 8h to 17i
- ❑ Install the 6800 (6.8k) Ohm resistor (blue, gray, red, gold) in holes 16j to 17j
- ❑ Install the 555 Timer IC with Pin 1 in hole 16e as shown in pictorial
- ❑ Install a 0.01uF (103) Capacitor in holes 22e to 22f
- ❑ Install a 10uF Capacitor - Long lead in hole 17b, Short lead in 16c
- ❑ Install Jumper Wire #1 in holes 3b to 22a
- ❑ Install Jumper Wire #2 in holes 3c to 16b
- ❑ Install Jumper Wire #3 in holes 3i to 16i
- ❑ Install Jumper Wire #4 in holes 3j to 27h
- ❑ Install Jumper Wire #5 in holes 8j and loose end
- ❑ Install Jumper Wire #6 in holes 18j and loose end
- ❑ Install Jumper Wire #7 in holes 19h to 22h
- ❑ Install Jumper Wire #8 in holes 17d to 18h
- ❑ Install Jumper Wire #9 in holes 16g to 19d
- ❑ Install the Battery Snap, Black lead in hole 3e and Red Lead in hole 3f

(Continue to Page 5)

MC1-24-R-5

DO THE EXPERIMENT (part 2 of 2)



Step 3 - Connect the battery to the Battery Snap. Insert the PROBES into different soils to test for moisture. The faster the LED blinks, the more moisture in the soil.

CONCLUSION

You should have observed that you can build an **MOISTURE DETECTOR** circuit with a 555 Integrated Circuit.

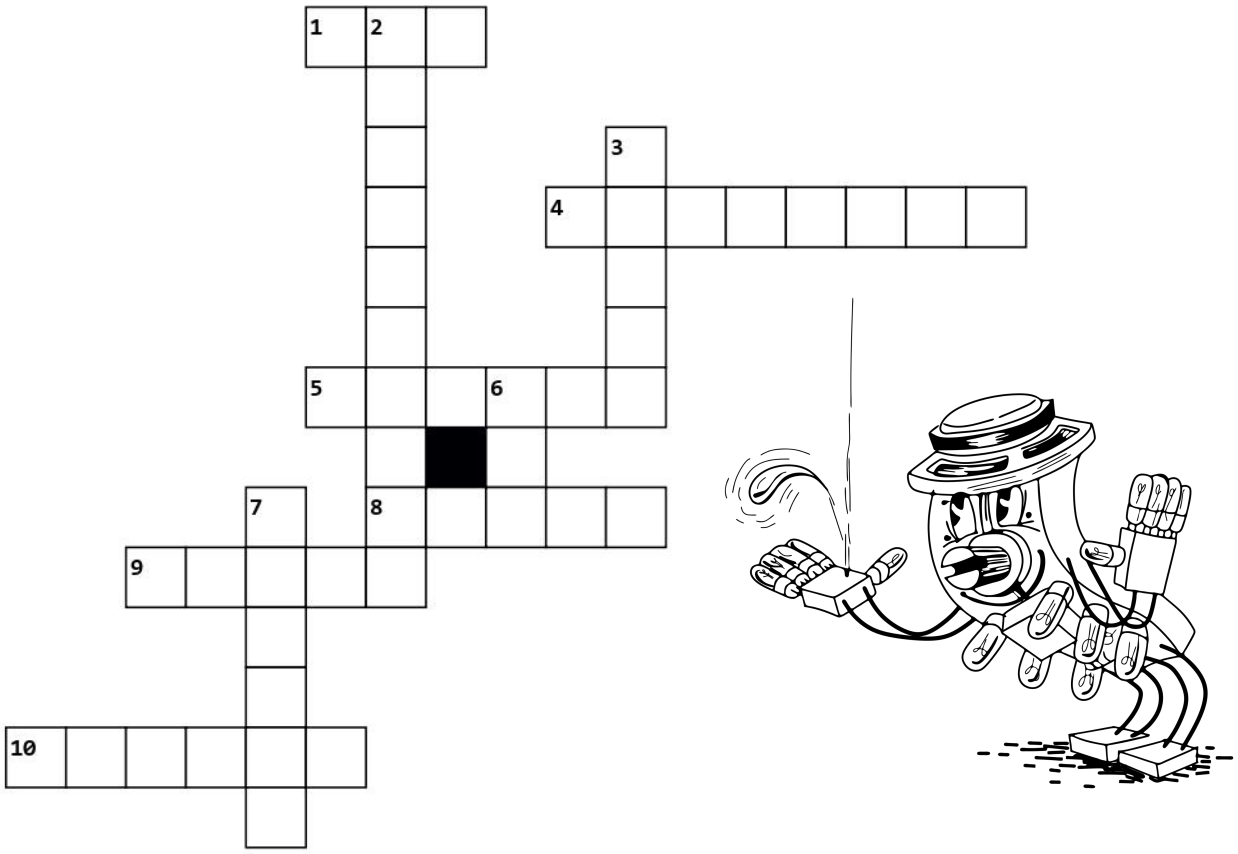
(End of Experiment 24)

Mr. CIRCUIT®

MC1-24-CW

CROSSWORD

Exp. 24 - "MOISTURE DETECTOR CIRCUIT"



Across

1. If the soil you are testing is _____, there should be no blinks.

4. This circuit was invented to sense _____ in soil.

5. The _____ the blinks, the more moisture in the soil.

8. This circuit uses a 555 integrated circuit as a _____ .

9. How many fixed resistors are used in this circuit?

10. This circuit can also sense a leaky water _____ .

Down

2. The more _____ between the probes, the fewer the blinks of the LED.

3. The lower the resistance between the probes, the more moisture.

6. How many capacitors are used in this circuit?

7. This circuit senses resistance between the _____ .

Mr. CIRCUIT®

MC1-24-WS

WORD SEARCH

Exp. 24 - "MOISTURE DETECTOR CIRCUIT"

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

1. This circuit uses a 9-volt _____ .

2. This circuit uses _____ fixed resistors.

3. The purpose of this circuit is to _____ moisture.

4. The LED _____ when there is moisture in the soil.

5. The 555 integrated circuit has _____ pins.

6. Pin _____ in the output of the 555 integrated circuit.

7. How many probes are in this circuit to sense moisture?

8. The _____ of the clock pulses depends on how much moisture is in the soil being tested.

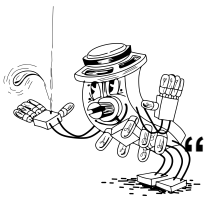
9. If the soil is low on _____ the LED may remain ON or it may remain OFF.

10. What is the color of the first band on the 222 Ohm fixed resistor?

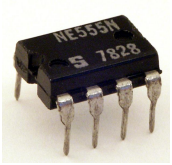
(Student Name) (Period/Student Number) (Date)

QUIZ for Exp 24 or STEM KIT #24
in the Mr Circuit Electronics Training Lab 1

(Page 8)



This Quiz covers the training learned by completing



"Build a Moisture Detector Circuit" Experiment 24

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

A B C D

#1 This circuit uses a 555 Timer IC as a _____ .

A. a clock
B. variable capacitor
C. a timer
D. variable resistor

A B C D

#2 What is connected to pin 3 on the 555 Timer IC?

A. an LED
B. a 220 Ohm resistor
C. a 10uF capacitor
D. a Photocell

A B C D

#3 On the 555 Timer _____ .

A. only 6 pins are used
B. all but pin 5 are used
C. all 8 pins are used
D. all but pin 4 are used

A B C D

#4 The purpose of this circuit is to _____ in soil.

A. sense moisture
B. sense vibrations
C. sense heat
D. sense light

A B C D

#5 What controls the frequency of the output tone?

A. humidity in the air
B. the air temperature
C. resistance between the probes
D. the brightness of the sun

A B C D

#6 The more moisture in the soil, the _____ .

A. the slower the blinks of the LED
B. the hotter the LED gets
C. the faster the blinks of the LED
D. the higher the input voltage

A B C D

#7 Pin 1 of the 555 Timer IC is connected is connected to _____ .

A. the negative of the battery.
B. Pin 5
C. the positive of the battery
D. the positive of C1

A B C D

#8 To make sure the circuit is working, you _____ .

A. touch the probes together
B. short capacitor C1
C. remove the LED
D. disconnect the battery

A B C D

#9 Pins 6 and 2 are _____ .

A. not connected
B. connected
C. not important
D. determine the brightness of the LED.

A B C D

#10 If the soil is dry, the LED will _____ .

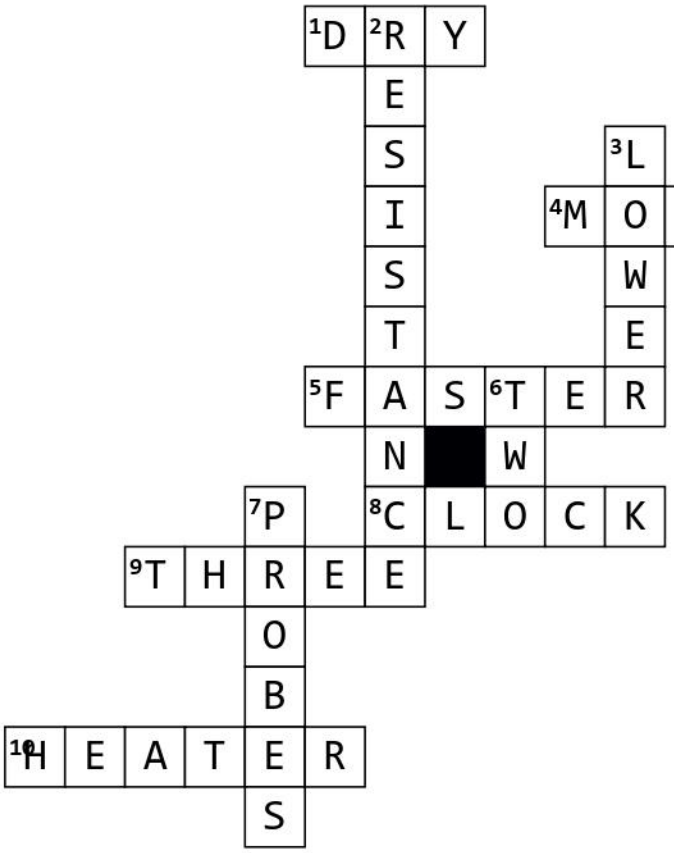
A. blink
B. remain either ON or OFF
C. get hot
D. the LED will self-destruct

(Form SQ24)

Score	

ANSWERS FOR CROSSWORD

Exp. 24 - "MOISTURE DETECTOR CIRCUIT"



Across

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Down

2. The more _____ between the probes, the fewer the blinks of the LED.

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7. This circuit senses resistance between the _____ .

ANSWERS FOR WORD SEARCH

Exp. 24 - "MOISTURE DETECTOR CIRCUIT"

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

1. This circuit uses a 9-volt _____ .

2. This circuit uses _____ fixed resistors.

3. The purpose of this circuit is to _____ moisture.

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5. The 555 integrated circuit has _____ pins.

6. Pin _____ in the output of the 555 integrated circuit.

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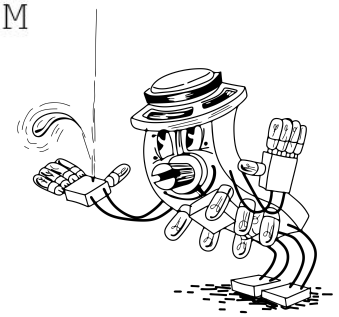

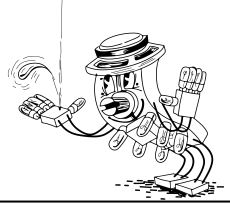

QUICK-CHECK ANSWER KEY for Experiment 24 QUIZ
for Mr Circuit Electronics Training ("Moisture Detector")

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 This circuit uses a 555 Timer IC as a _____ .

A. a clock
B. variable capacitor
C. a timer
D. variable resistor

A
B
C
D

#2 What is connected to pin 3 on the 555 Timer IC?

A. an LED
B. a 220 Ohm resistor
C. a 10uF capacitor
D. a Photocell

A
B
C
D

#3 On the 555 Timer _____ .

A. only 6 pins are used
B. all but pin 5 are used
C. all 8 pins are used
D. all but pin 4 are used

A
B
C
D

#4 The purpose of this circuit is to _____ in soil.

A. sense moisture
B. sense vibrations
C. sense heat
D. sense light

A
B
C
D

#5 What controls the frequency of the output tone?

A. humidity in the air
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C. resistance between the probes
D. the brightness of the sun

A
B
C
D

#6 The more moisture in the soil, the _____ .

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B. the hotter the LED gets
C. the faster the blinks of the LED
D. the higher the input voltage

A
B
C
D

#7 Pin 1 of the 555 Timer IC is connected is connected to _____ .

A. the negative of the battery.
B. Pin 5
C. the positive of the battery
D. the positive of C1

A
B
C
D

#8 To make sure the circuit is working, you _____ .

A. touch the probes together
B. short capacitor C1
C. remove the LED
D. disconnect the battery

A
B
C
D

#9 Pins 6 and 2 are _____ .

A. not connected
B. connected
C. not important
D. determine the brightness of the LED.

A
B
C
D

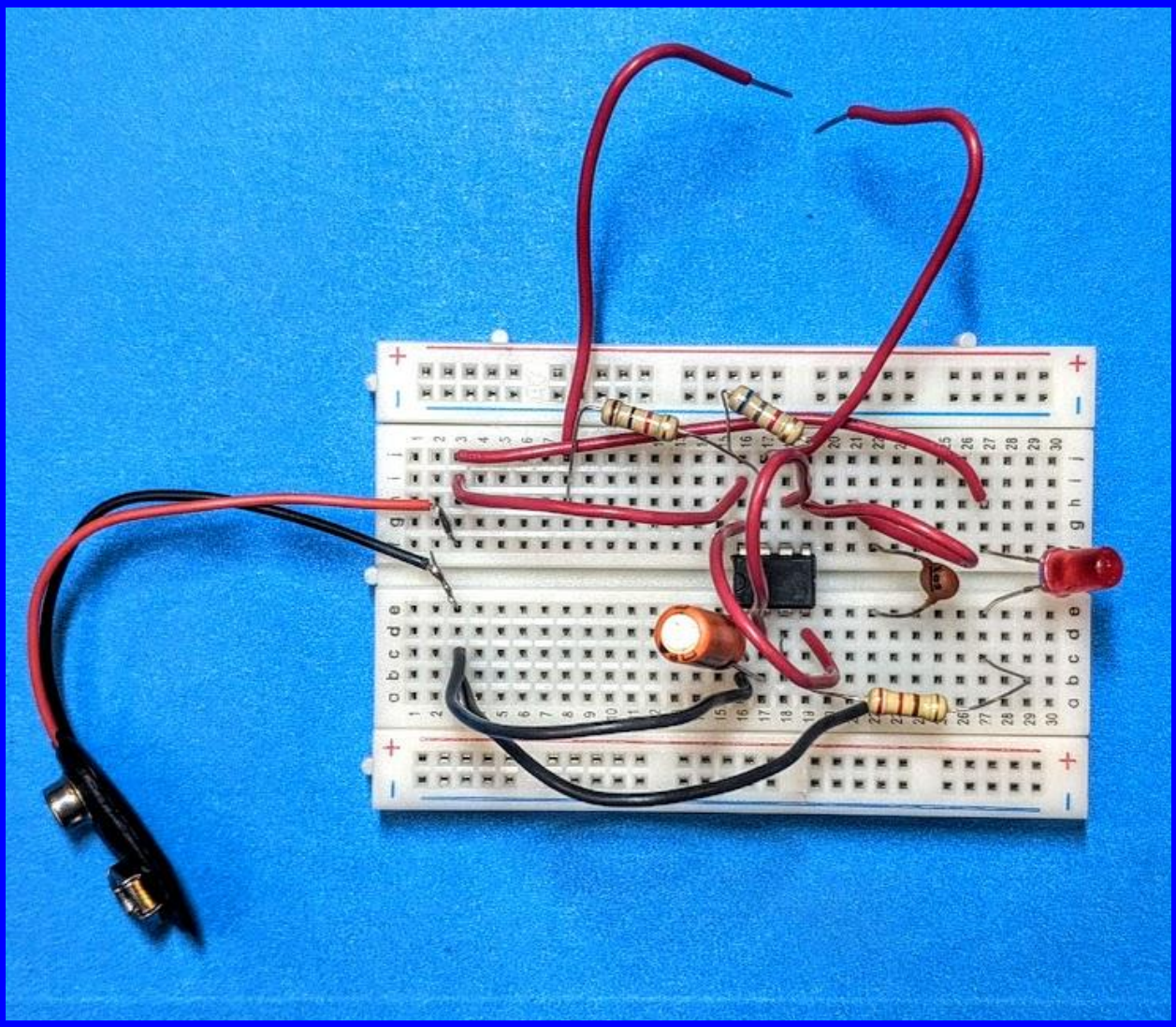
#10 If the soil is dry, the LED will _____ .

A. blink
B. remain either ON or OFF
C. get hot
D. the LED will self-destruct

(Form SQAK24)

BUILD A BETTER FUTURE by UNDERSTANDING SCIENCE-ELECTRONICS

MOISTURE DETECTOR



BASIC ELECTRONICS LAB 1

"MOISTURE DETECTOR CIRCUIT"

(Poster MC1-24-P01)

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

Mr Circuit Technology

PRICE LIST

PRICE LIST

PARTS KIT Number	Mr Circuit Series 1 PARTS KITS FOR "LESSON PLANS"	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 "0 TO 9V 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
MC1-SET-PK	**Complete Set of All Series 1 Parts Kits (31 total)**	**$120.00**