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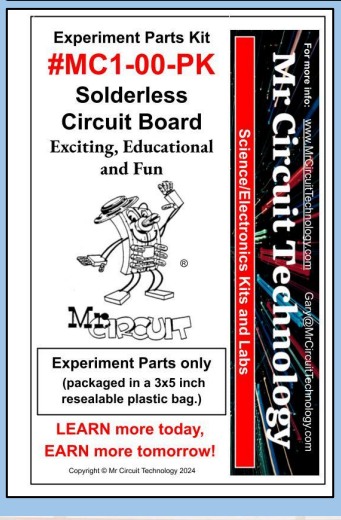
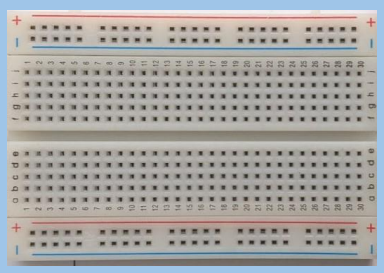
Mr Circuit Technology

Science/Electronics Experiment Kits and Labs

Exp. 30 - "ULTRASONIC PEST REPELLER"





LESSON PLAN

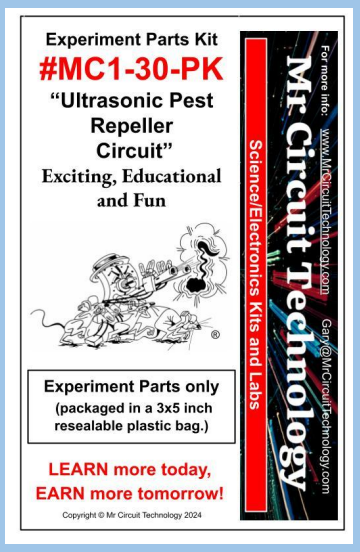
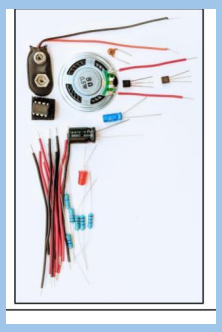


Table of Contents



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 #MC1-30-PK (that has the experiment parts) with a 9-Volt battery. Give these items to each student along with the 8 pages.

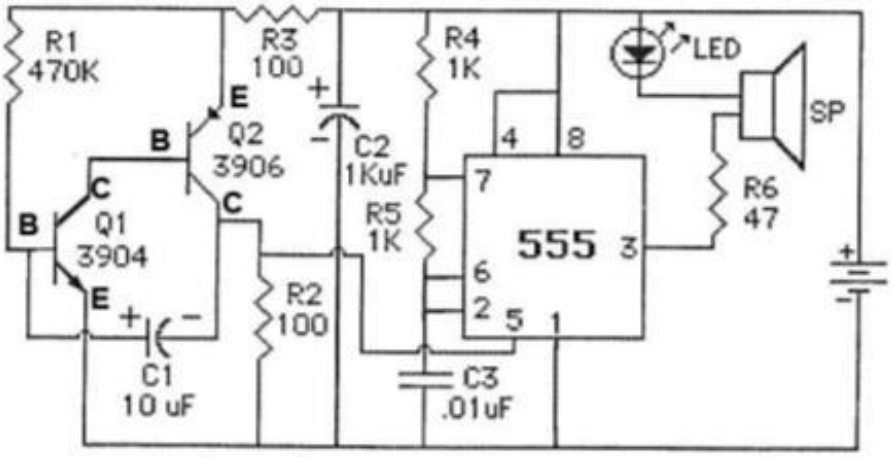
Step 3 - When your students have completed the experiment, collect all the Parts Kits and batteries for later use.

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 an ULTRASONIC PEST REPELLER 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 emit ultrasonic sounds that would 'repel' certain pests like rats and mice, etc. Ultrasonic sounds are sounds above the range that the human ear can hear.,

This circuit emits an ultrasonic sound which is a signal in the **range of 13.5 cycles per second, (13.5 kHz) and 80 thousand cycles per second (80 kHz).** This is a good circuit to experiment with. You can use it to try to get rid of pests in your home and yard.

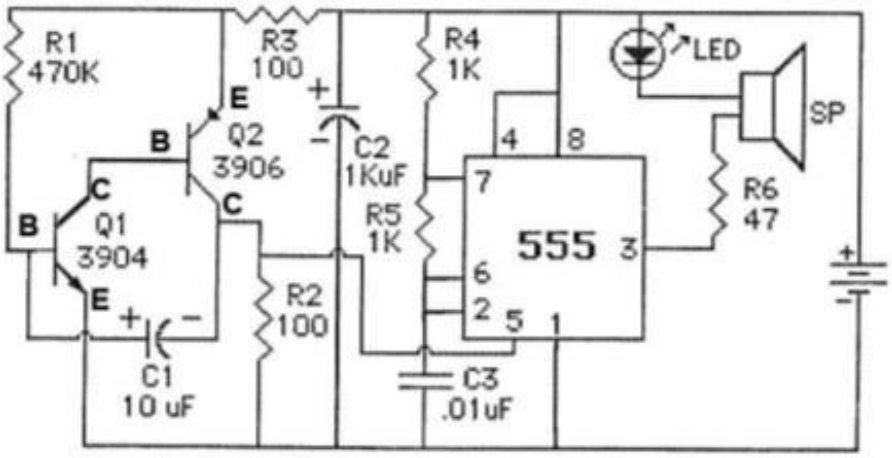
Mr Circuit is shown **dressed like the Pied Piper** attracting pests to follow him away from others.

It is amazing how many circuits can be made with a few well chosen electronic components.

(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 **ULTRASONIC PEST REPELLER** circuit that you will build.



This circuit has two oscillators. Transistors Q1 and Q2 form one oscillator. The 555 IC is the other oscillator. These two oscillators are **connected in series**.

Potentiometer R7 is adjusted to vary the frequency of the first oscillator and this frequency is fed into Pin 5 of the second oscillator made with the 555 Integrated circuit.

The frequency of the first oscillator is **"injected"** into the second oscillator through Pin 5. The signal coming out of the speaker is a mixture of these two oscillator frequencies..

When you connect the 9-Volt battery, the circuit will emit **ultrasonic signals** which will hopefully rid your environment of certain rodents.

(Continue to Page 3)

MC1-30-R-3

PURPOSE OF THIS EXPERIMENT

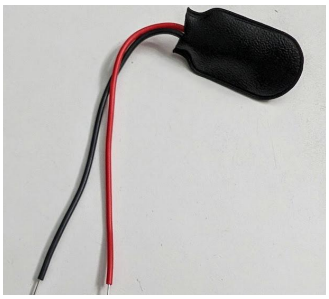
*** To build an ULTRASONIC PEST REPELLER Using a 555 Integrated Circuit.

PARTS NEEDED FOR EXPERIMENT

In this experiment, you will use the following:

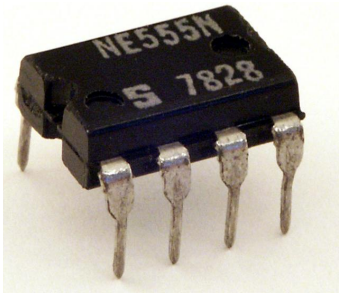
Speaker

9V Battery Snap0



0.01uF Cap

555 IC



LED

47 Ohm resistor

100 Ohm resistor

100 Ohm resistor

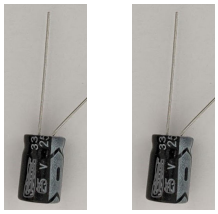
1k Ohm resistor

1k Ohm resistor

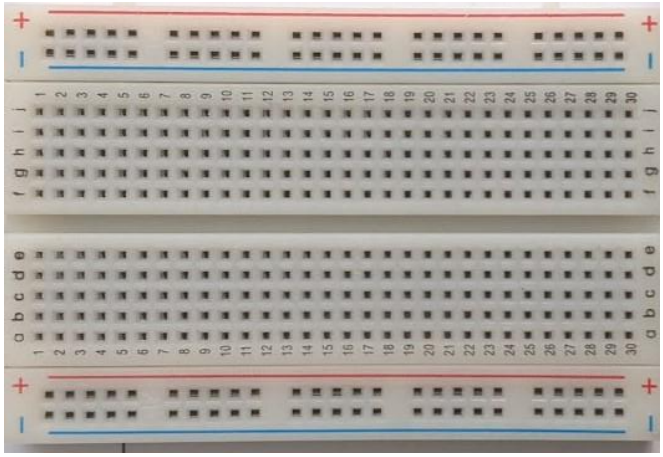
470k Ohm resistor

11 Jumper Wires

10uF & 1000uF Capacitors

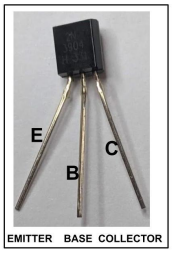


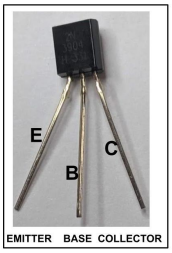
Solderless Circuit Board



You will also need a good 9 Volt battery

NPN & PNP Transistors



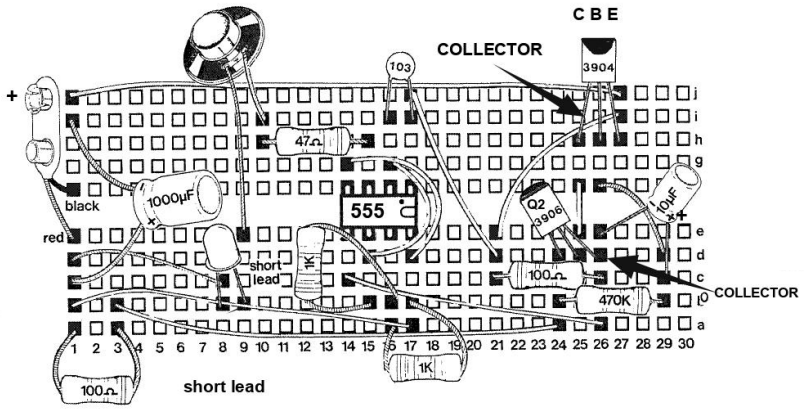


(Continue to Page 4)

MC1-30-R-4

DO THE EXPERIMENT (part 1 of 2)

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

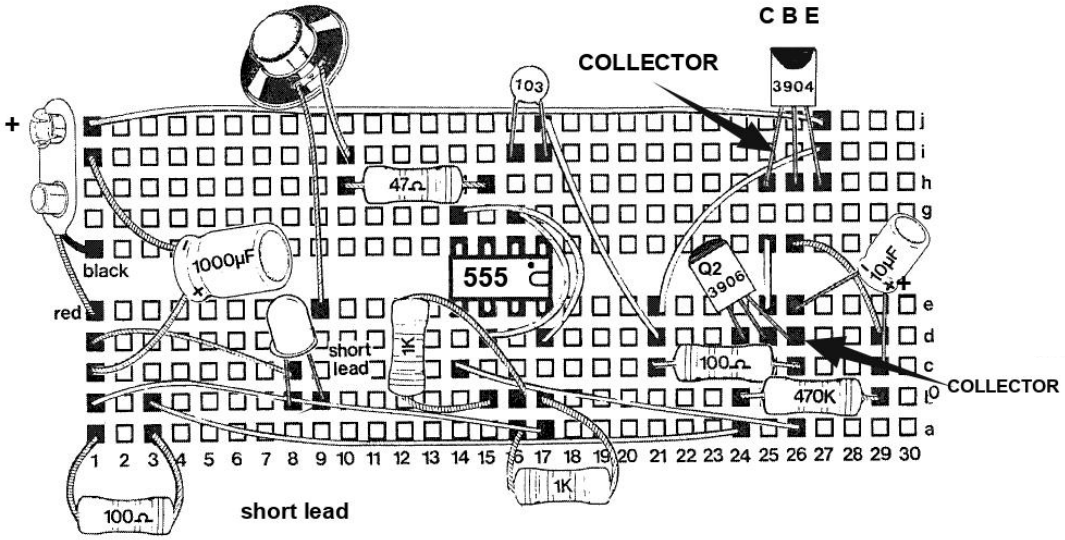


Step 2 - Install all the parts on the SCB as shown above.

- ❑ Install an LED - Long lead in hole 8b - Short lead in hole 9b
- ❑ Install a 47 Ohm resistor (yellow, violet, black, gold) in holes 10h to 15h
- ❑ Install a 100 Ohm resistor (brown, black, brown, gold) in holes 1a to 3a
- ❑ Install a 100 Ohm resistor (brown, black, brown, gold) in holes 21c to 26c
- ❑ Install a 1000 (1k) Ohm resistor (brown, black, red, gold) in holes 15b to 16b
- ❑ Install a 1000 (1k) Ohm resistor (brown, black, red, gold) in holes 16a to 17b
- ❑ Install a 470k Ohm resistor (yellow, violet, yellow, gold) in holes 24b to 29b
- ❑ Install the 555 Timer IC with Pin 1 in hole 17f as shown in pictorial (careful!)
- ❑ Install a NPN 3904 Transistor - Collector in 25h, Base in 26h, Emitter in 27h
- ❑ Install a PNP 3906 Transistor - Emitter in 24d, Base in 25d,Collector in 26d
- ❑ Install a 0.01uF Capacitor in holes 16i to 17i
- ❑ Install a 10uF Electrolytic Capacitor - Long lead in hole 29c Short lead in hole 26e
- ❑ Install a 1000uF Electrolytic Capacitor - Long lead in hole 1c Short lead in hole 1i
- ❑ Install Speaker from hole 9e to 10i
- ❑ Install Jumper Wire #1 in holes 3b to 24a **AND** Install Jumper Wire #2 in holes 1b to 17a
- ❑ Install Jumper Wire #3 in holes 1d to 8c **AND** Install Jumper Wire #4 in holes 1j to 27j
- ❑ Install Jumper Wire #5 in 14g to 17d **AND** Install Jumper Wire #6 in holes 15d to 16g
- ❑ Install Jumper Wire #7 in 17j to 21d **AND** Install Jumper Wire #8 in holes 21e to 27i
- ❑ Install Jumper Wire #9 in 26f to 29d **AND** Install Jumper Wire #10 in holes 25e to 25f
- ❑ Install Jumper Wire #11 in holes 14c to 26a
- ❑ Install the Battery Snap, **Black lead in hole 1f** and **Red Lead in hole 1e** (careful to put in right holes))
- ❑

(Continue to Page 5)

DO THE EXPERIMENT (part 2 of 2)



Step 3 - Connect the battery to the Battery Snap and this circuit will emit signals that your ears cannot hear but insects and rodents may. It should make the insects and rodents want to flee the area and go somewhere else.

Since your ears cannot hear the signal emitted by the speaker, you can tell the circuit is working if the LED lights up.

You can experiment with certain insects too like cockroaches, etc. and see if it works on them too.

CONCLUSION: You should have observed that you can build an **ULTRASONIC PEST REPELLER** circuit with a 555 Integrated Circuit and two transistors.

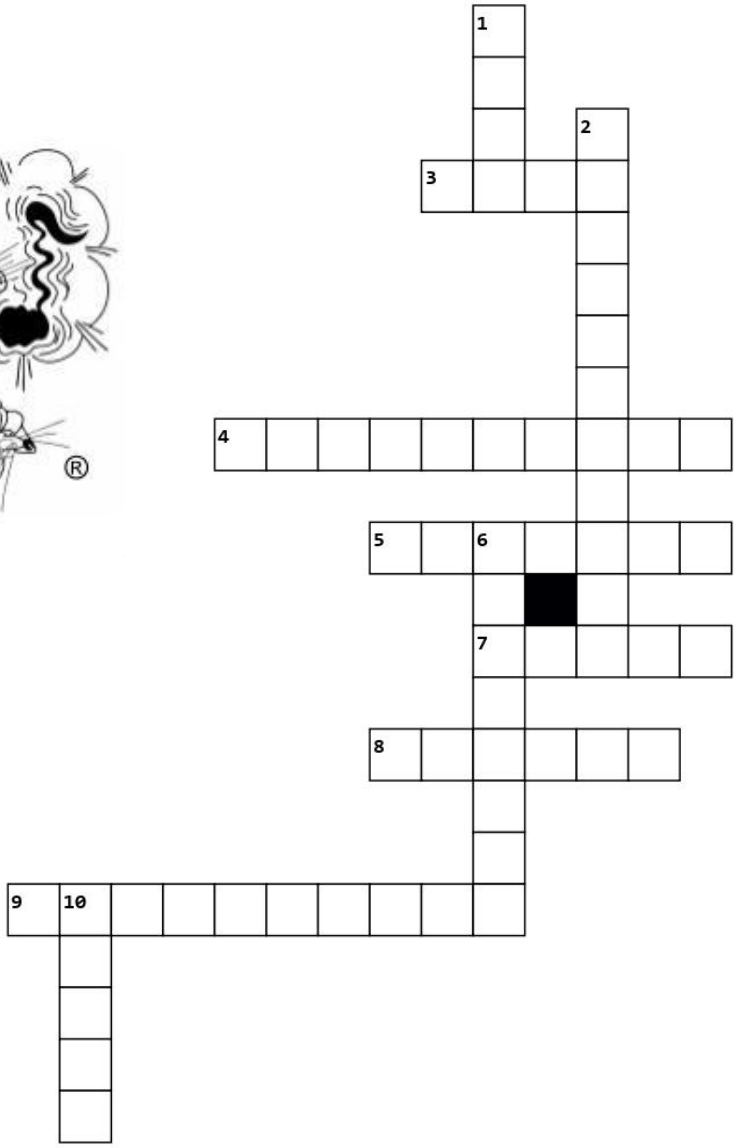
(End of Experiment 30)

Mr. CIRCUIT®

MC1-30-CW

CROSSWORD

Exp. 30 - "ULTRASONIC PEST REPELLER"



Across

3. This circuit emits a sound that the human ear cannot _____ .

4. Sounds that are just above the human hearing are called _____ frequencies.

5. You can tell the circuit is _____ when the LED is lit up.

7. The sounds emitted by this circuit may repel many types of _____ .

8. The color of the first color band on a 470k Ohm fixed resistor is the color _____ .

9. The 3904 is an NPN _____ .

Down

1. This circuit may cause certain insects and rodents to _____.

2. Certain _____ irritate pests.

6. This circuit is an Ultrasonic _____ Repeller.

10. Sound frequencies between the _____ 13.5 cps (13.5 kHz) and 80 cps (80 kHz) are called _____ frequencies.

Mr. CIRCUIT®

MC1-30-WS

WORD SEARCH

Exp. 30 - "ULTRASONIC PEST REPELLER"

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

1. This circuit emits sounds up to 80 _____ cycles per second.

2. Mr Circuit is _____ like the Pied Piper.

3. This circuit has two oscillators connected in _____ .

4. This circuit emits ultrasonic _____ .

5. This circuit is made up of two _____ .

6. The signal from oscillator number 1 is _____ into Pin 5 of the 555 IC.

7. This circuit is powered by a 9 Volt _____ .

8. How many jumper wires do we use in this circuit?

9. What are the frequencies between 13.5 cycles per second and 80k cycles per second called?

10. The sounds emitted by this circuit will make certain insects and pests want to _____ .

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

QUIZ for Exp 30 or STEM KIT #30 in the Mr Circuit Electronics Training Lab 1

This Quiz covers the training learned by completing

"Build an Ultrasonic Pest Repeller Circuit" Experiment 30

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 and _____ .

A. a two-transistor oscillator
B. a variable capacitor
C. a Photocell
D. an SCR

A
B
C
D

#2 R6 is connected to _____ .

A. Pin 7
B. R7
C. C1
D. Pin 3

A
B
C
D

#3 On the 555 Timer _____ .

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

A
B
C
D

#4 The purpose of this circuit is to _____ .

A. emit a siren sound
B. emit ultrasonic sounds
C. emit phasor machine gun sounds
D. emit crunching sounds

A
B
C
D

#5 What are the signals from this circuit supposed to do?

A. repel pests
B. chirp like a birds
C. varies the heat in the room
D. vibrate like a snake

A
B
C
D

#6 The frequencies that may repel pests are from 13.5 thousand cycles per second to _____ .

A. 1 Megacycle (1Mhz)
B. 80 thousand cycles per second (80kHz)
C. 25 Giga Hz
D. 10 milli Hz

A
B
C
D

#7 How can you tell if the circuit is working?

A. you can feel the speaker vibrate
B. resistor R6 will be smoking
C. the LED will light up
D. the battery will be hot

A
B
C
D

#8 One side of the speaker is connected directly to _____ .

A. the positive of the battery
B. Pin 3 on the 555 Timer IC
C. Pin 7 on the 555 Timer IC
D. an LED

A
B
C
D

#9 C1 is 10uF and it is part of the _____ .

A. two-transistor oscillator
B. power supply circuit
C. output circuit
D. heat sensing circuit

A
B
C
D

#10 What capacitor is connected to R3 and R4?

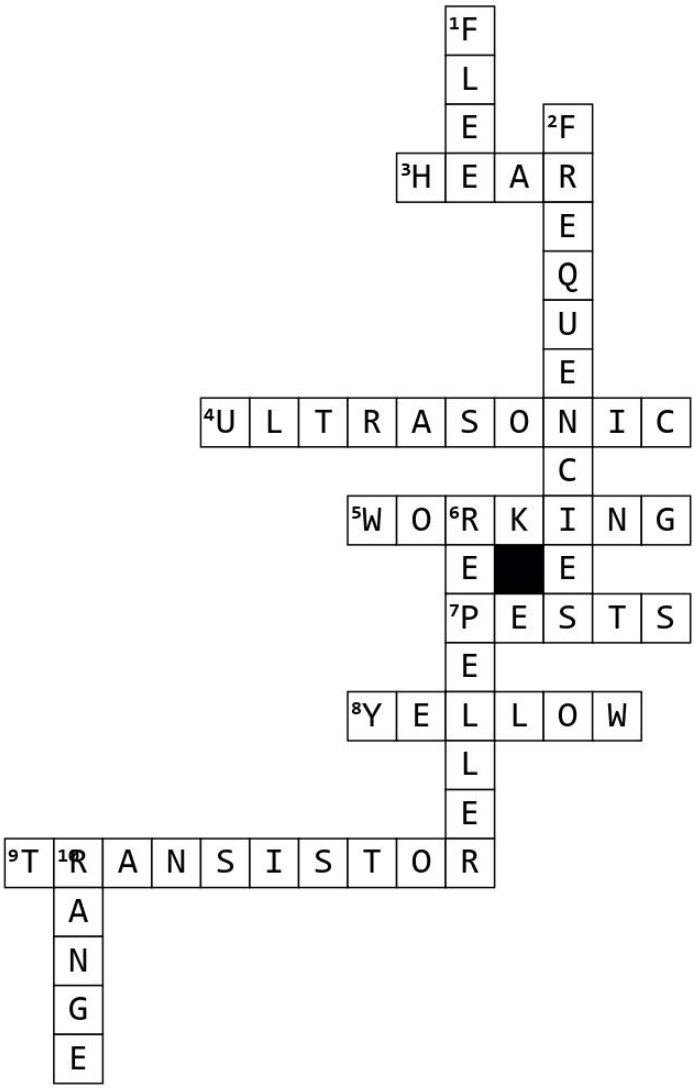
A. C1
B. C2
C. C3
D. Q2

(Form SQ30)

Score	

ANSWERS FOR CROSSWORD

Exp. 30 - "ULTRASONIC PEST REPELLER"



Across

3. This circuit emits a sound that the human ear cannot _____ .

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ANSWERS FOR WORD SEARCH

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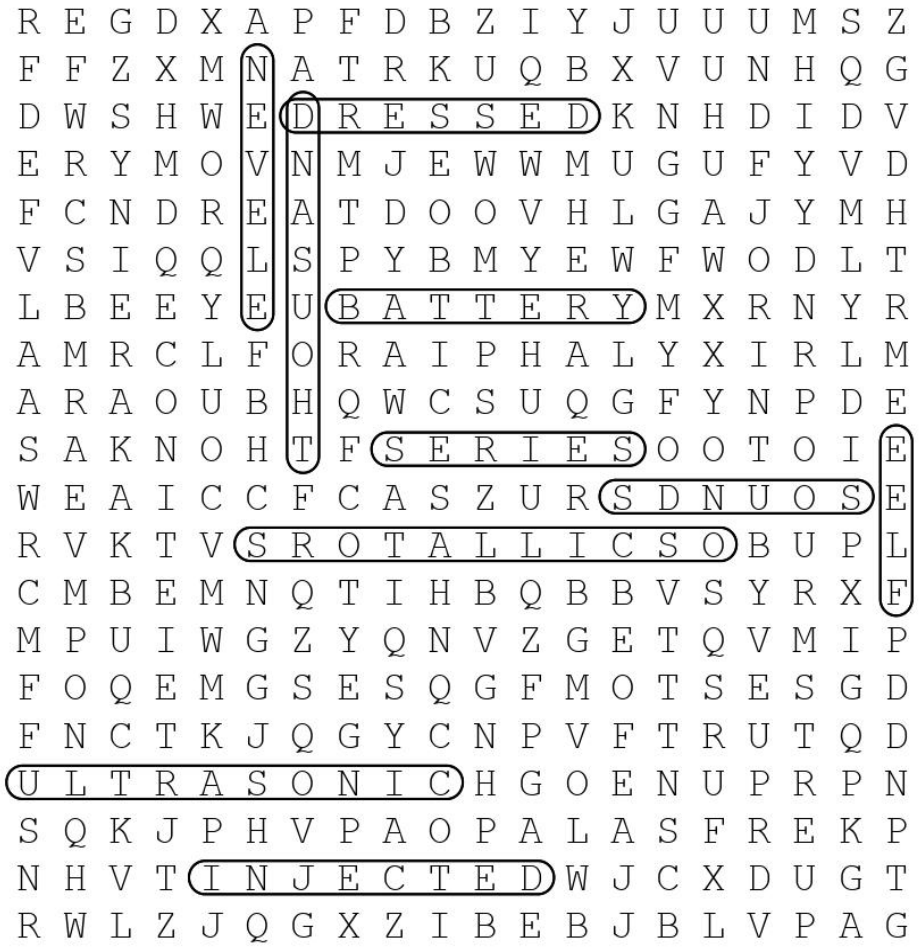

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5. This circuit is made up of two _____ .

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7. This circuit is powered by a 9 Volt _____ .

8. How many jumper wires do we use in this circuit?

9. What are the frequencies between 13.5 cycles per second and 80k cycles per second called?

10. The sounds emitted by this circuit will make certain insects and pests want to _____ .

QUICK-CHECK ANSWER KEY for Experiment 30 QUIZ
for Mr Circuit Electronics Training ("Ultrasonic Pest Repeller")

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 and _____ .

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A
B
C
D

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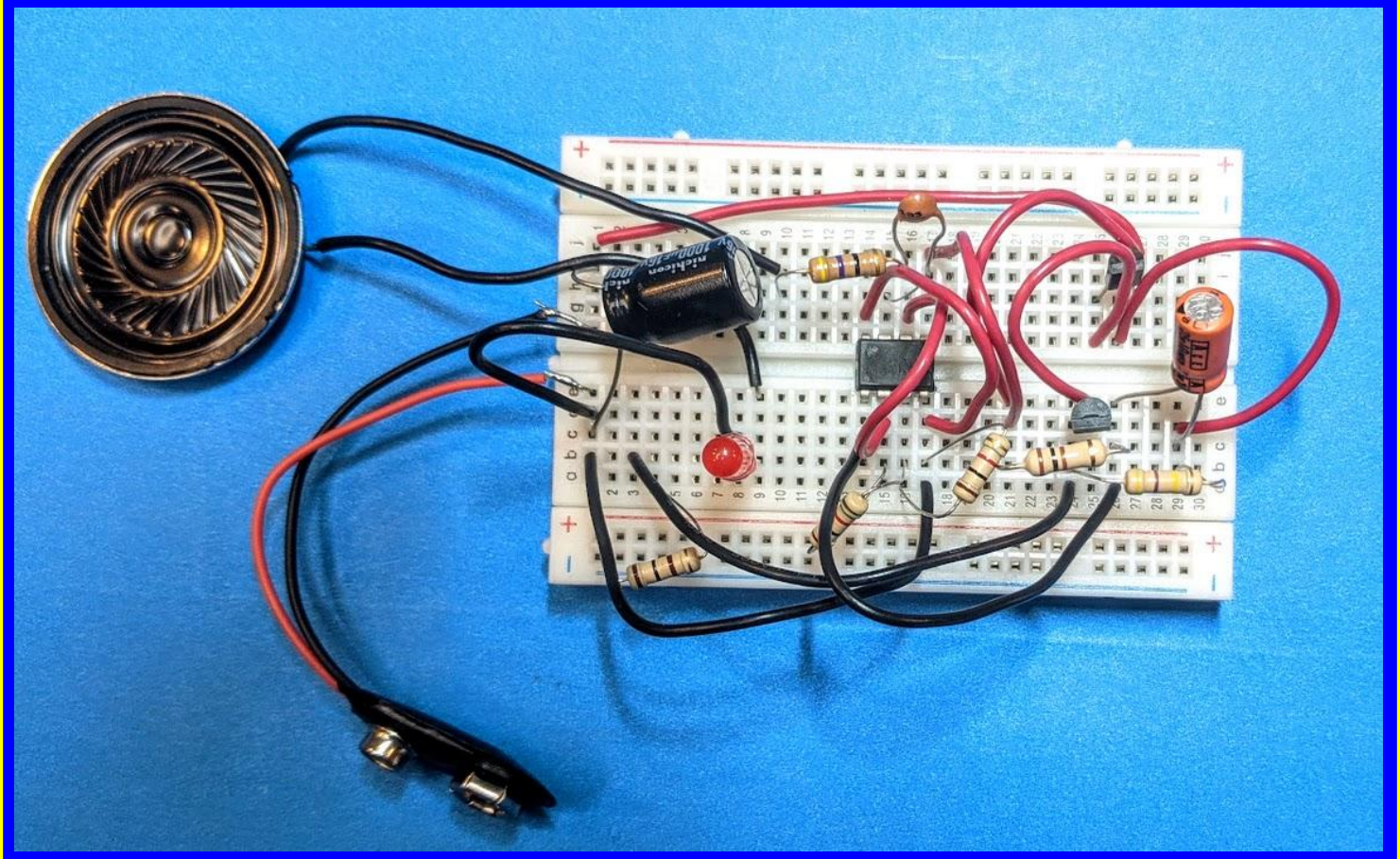
A. C1
B. C2
C. C3
D. Q2

(Form SQAK30)

BUILD A BETTER FUTURE by UNDERSTANDING SCIENCE-ELECTRONICS

ULTRASONIC PEST REPELLER



BASIC ELECTRONICS LAB 1

"ULTRASONIC PEST REPELLER CIRCUIT"

(Poster MC1-30-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
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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**