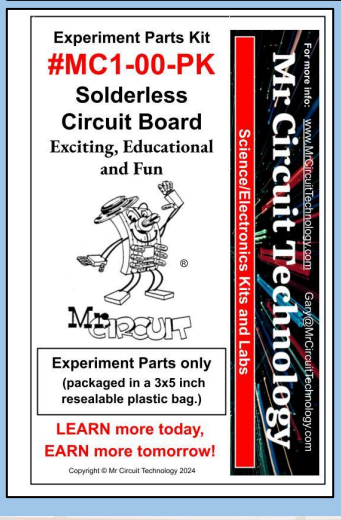
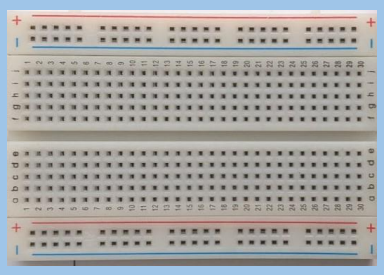
For more info: www.MrCircuitTechnology.com Gary@MrCircuitTechnology.com

Mr Circuit Technology

Science/Electronics Experiment Kits and Labs

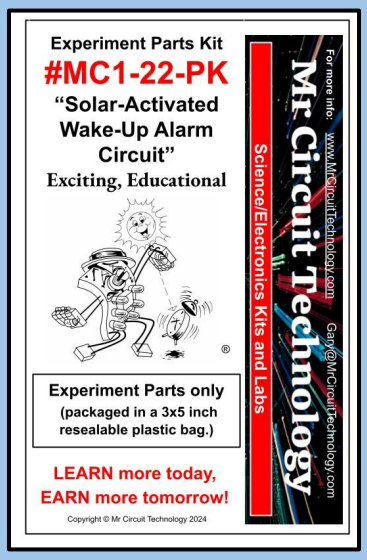
Exp. 22 - "SOLAR-ACTIVATED WAKE-UP ALARM CIRCUIT"

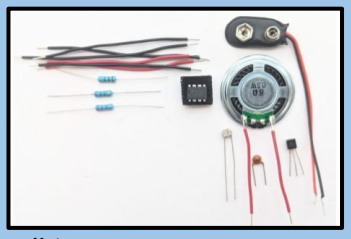




LESSON PLAN

Table of Contents

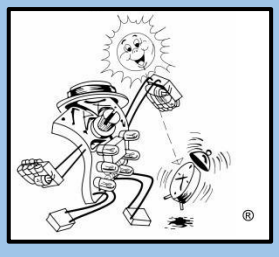




PREPARATION: You can put the Page 12 poster up on your classroom wall to announce the fact that you are going to do the Science-Electronics Experiment.

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 #MC1-22-PK (that has the experiment parts) with a 9-Volt battery. Give these items to each student along with the 8 pages.



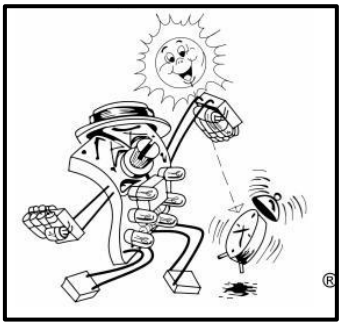
Step 3 - When your students have completed the experiment, collect all the Parts Kits and batteries for later use.

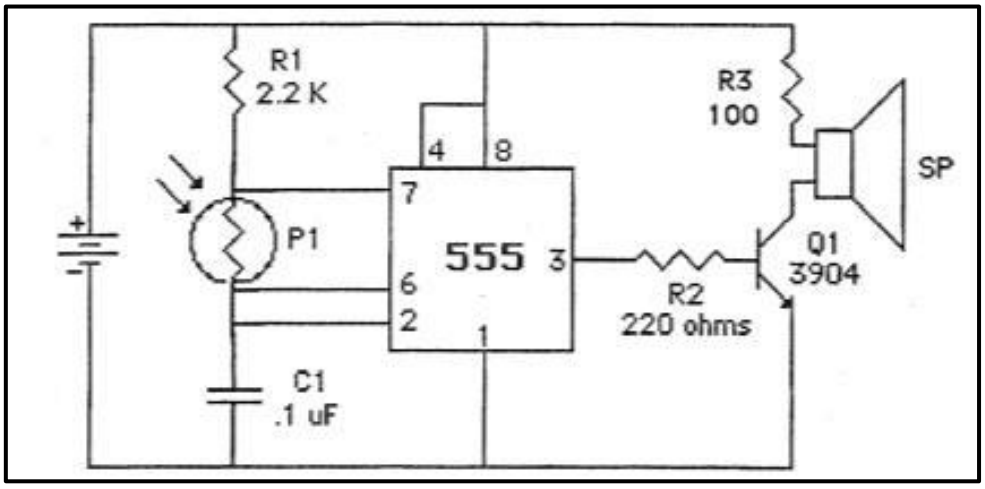
Step 4 - Collect all the Written Quizzes for grading and use the Answer Key to grade them.

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 SOLAR-ACTIVATED WAKE-UP ALARM 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 wake you up when the sun came up. **It uses a photocell to sense light intensity.**

The speaker in this circuit emits a tone when light hits it. So this circuit can also be used as a "screaming drawer alarm" Just put the active circuit in a dark drawer and when someone opens the drawer, the "alarm" will sound.

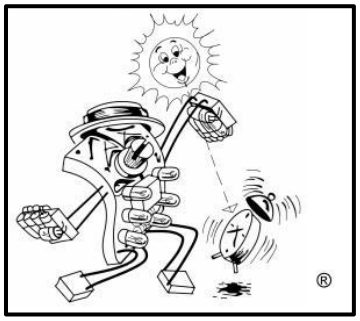
You can also use it as a Refrigerator Alarm. When it is dark inside the fridge, the alarm will be silent. But, when someone opens the fridge, the alarm will sound.

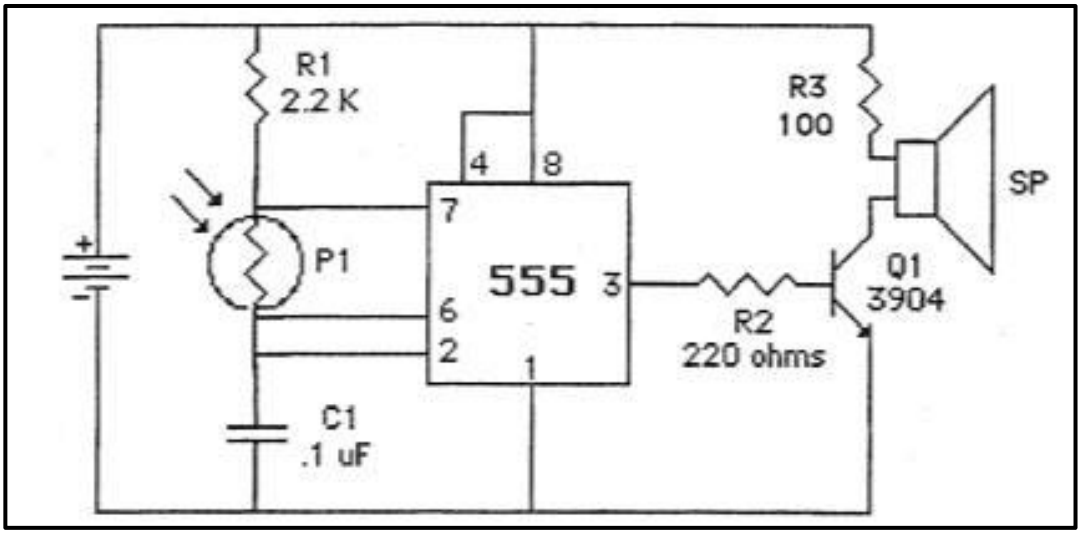
This circuit can be lots of fun to use with your friends.

(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 **SOLAR-ACTIVATED WAKE-UP ALARM** circuit that you will build.





When light hits the photocell, the speaker will emit a tone. The frequency or pitch of the tone depends on the intensity of the light hitting the photocell.

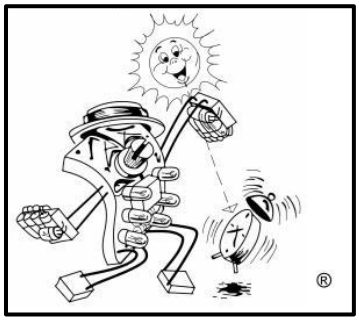
This means this circuit will also act like a **Theremin** circuit. As you shield the photocell from the light, the tone will change.

By shadowing the photocell with your hand, you can produce interesting sound effects by shielding the light with your hand.

The 555 integrated circuit is working as a CLOCK in this circuit. The strength of the audio signal is amplified by the transistor in the circuit.

(Continue to Page 3)

MC1-22-R-3



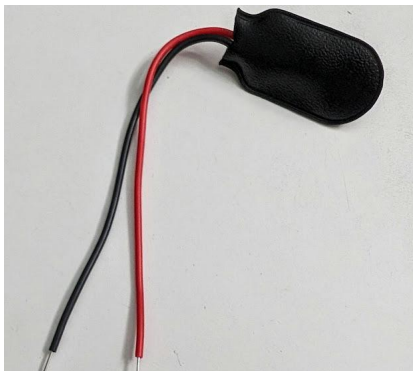
PURPOSE OF THIS EXPERIMENT

*** To build an SOLAR-ACTIVATED WAKE-UP ALARM circuit using a 555 Integrated circuit.

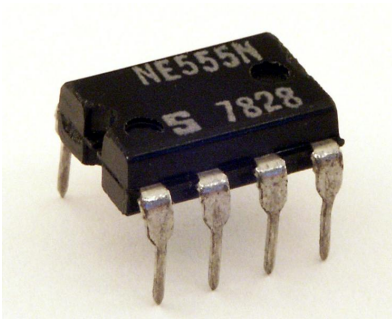
PARTS NEEDED FOR EXPERIMENT

In this experiment, you will use the following:

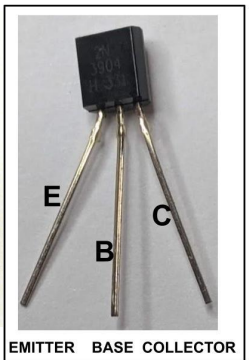
9-Volt Snap



555 IC



NPN



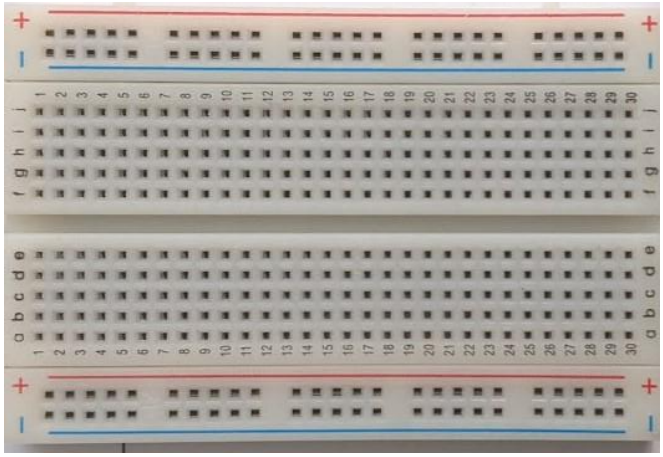
Speaker

3 fixed Resistors

6 Jumper Wires

Disc Capacitor

Solderless Circuit Board



9-V Battery

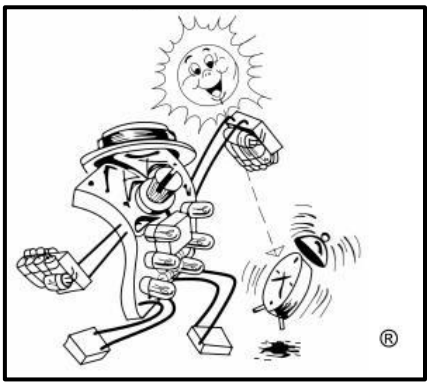
Photocell

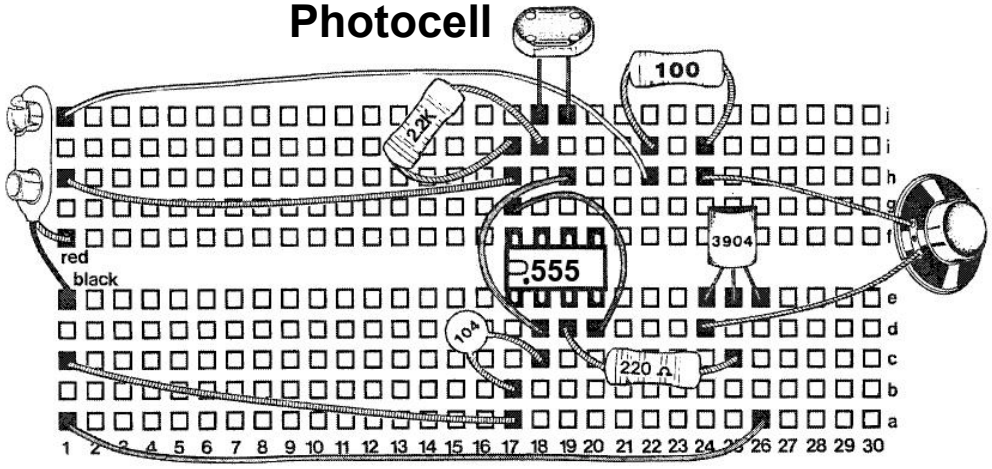
(Continue to Page 4)

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.



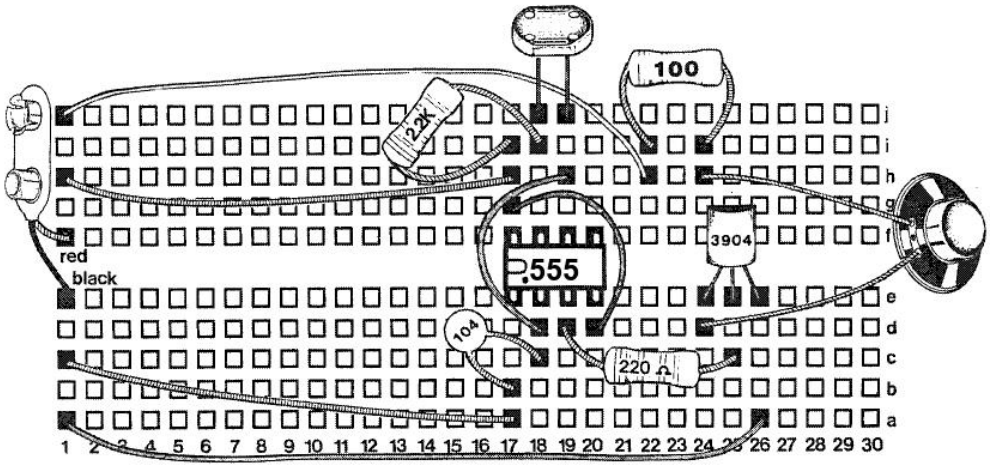


Step 2 - Install all the parts on the SCB as shown above.

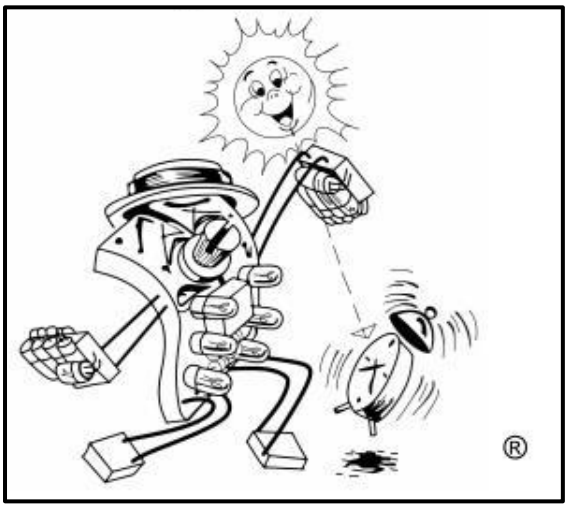
- ❑ Install the 100 Ohm resistor (brown, black, brown, gold) in holes 22i to 24i
- ❑ Install the 220 Ohm resistor (red, red, brown, gold) in holes 19d to 25c
- ❑ Install the 2200 (2.2k) Ohm resistor (red, red, red, gold) in holes 17i to 18i
- ❑ Install the 555 Timer IC with Pin 1 in hole 17e as shown in pictorial
- ❑ Install one 0.01uF (103) disc Capacitor in holes 17b to 18c
- ❑ Install one NPN 3904 Transistor -Collector in 24e, Base in 25e, Emitter in 26e
- ❑ Install the Photocell in holes 18j and 19j
- ❑ Install the Speaker in holes 24d to 24h
- ❑ Install Jumper Wire #1 in holes 1a to 26a
- ❑ Install Jumper Wire #2 in holes 1c to 17a
- ❑ Install Jumper Wire #3 in holes 1j to 22h
- ❑ Install Jumper Wire #4 in holes 1h to 17h
- ❑ Install Jumper Wire #5 in holes 18d to 19h
- ❑ Install Jumper Wire #6 in holes 17g to 20d
- ❑ Install the Battery Snap, Black lead in hole 1e and Red Lead in hole 1f

(Continue to Page 5)

DO THE EXPERIMENT (part 2 of 2)



Step 3 - Connect the battery to the Battery Snap. <u>A tone should be emitted from the speaker. As you shield the light from the photocell, the pitch of the tone should change.</u>



CONCLUSION

You should have observed that you can build an **SOLAR-ACTIVATED WAKE-UP ALARM** circuit with a 555 Integrated Circuit.

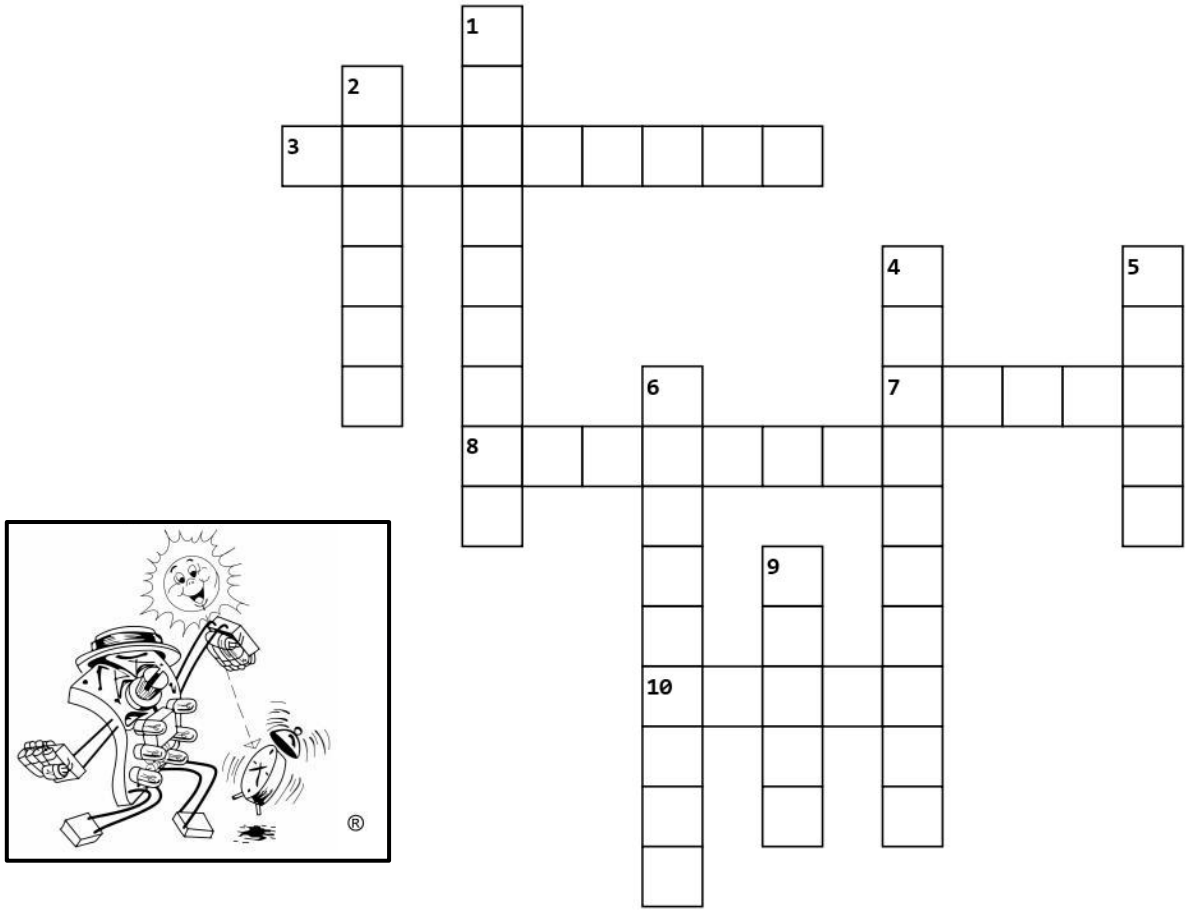
(End of Experiment 11)

Mr. CIRCUIT®

MC1-22-CW

CROSSWORD

Exp. 22 - "SOLAR-ACTIVATED WAKE-UP ALARM CIRCUIT"



Across

3. The component that senses light in this circuit is called a _____ .

7. The tone emitted by this circuit is called an _____ signal.

8. This circuit acts like a _____ circuit.

10. The 555 Timer IC has _____ pins.

Down

1. The pitch of the tone emitted by this circuit is controlled by the _____ of the light.

2. You can control the pitch of the sound by using a _____ from your hand.

4. The _____ in this circuit amplifies the sound.

5. The 555 Timer IC in this circuit is used as a _____ .

6. The _____ of the tone is controlled by the intensity of the light.

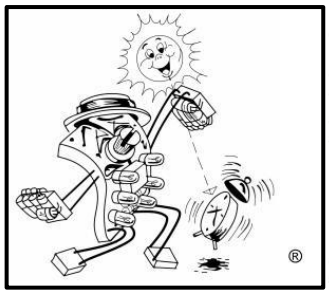
9. The photocell in this circuit senses the _____ intensity.

Mr. CIRCUIT®

MC1-22-WS

WORD SEARCH

Exp. 22 - "SOLAR-ACTIVATED WAKE-UP ALARM CIRCUIT"



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

1. The diagram that shows the symbols and how the parts are connected together is called a _____ .

2. This circuit generates a sound when _____ hits the photocell.

3. The pitch of the tone of this circuit can be changed by _____ the light.

4. The component that emits the sound in this circuit is called a _____ .

5. The diagram that shows a drawing of the components of this circuit is called a _____ diagram.

6. The component in this circuit that senses light intensity is called a _____ .

7. The 555 Timer IC in this circuit is used as a _____ .

8. A _____ is used to amplify the sound emitted by the speaker.

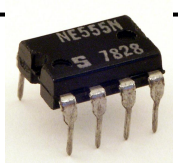
9. What is the color of the first color band on a 2200 Ohm resistor used in this circuit.

10. Pins 4 and 8 of the 555 Timer used in this circuit are _____ together.

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

QUIZ for Exp 22 or STEM KIT #22
in the Mr Circuit Electronics Training Lab 1

(Page 8)



This Quiz covers the training learned by completing

"Build a Solar-Activated Wake-Up Alarm Circuit" Experiment 22

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

#1 This circuit uses a _____ to sense light intensity?

A
B
C
D

A. an SCR
B. a 555 Timer IC
C. a transistor
D. a Photocell

#2 What pin on the 555 Timer is connected to a 220 Ohm resistor?

A
B
C
D

A. 8
B. 3
C. 6
D. 12

#3 With this circuit, you can generate a variety of interesting _____ by shadowing the surface of the Photocell with your hand.

A
B
C
D

A. weather conditions
B. electronic displays
C. light displays
D. sound effects

#4 What is the value of the capacitor connected to Pin 2 and Pin 6 of the 555 Timer IC in this circuit?

A
B
C
D

A. 0.01uF
B. 10uF
C. 0.1uF
D. 470uF

#5 How many pins on the 555 Timer IC do we use in this circuit?

A
B
C
D

A. 7
B. 3
C. 8
D. 1

#6 Pins 4 and 8 of the 555 Timer IC are _____ .

A
B
C
D

A. connected
B. are not connected
C. are isolated from each other
D. are not important

#7 When the Photocell receives a lot of light, the alarm will _____.

A
B
C
D

A. go silent
B. make noise
C. burn up
D. give off moisture

#8 To increase the amplitude of the pulses coming from the output Pin 3 of the 555 Timer IC we use _____ .

A
B
C
D

A. an SCR
B. a PNP transistor
C. an NPN Transistor
D. variable capacitor

#9 The Photocell is connected to Pins 7, 6, and _____ .

A
B
C
D

A. 8
B. 4
C. 1
D. 2

#10 Pin 1 of the 555 Timer IC is connected to the negative of the battery, to the 0.1uF capacitor and to _____ .

A
B
C
D

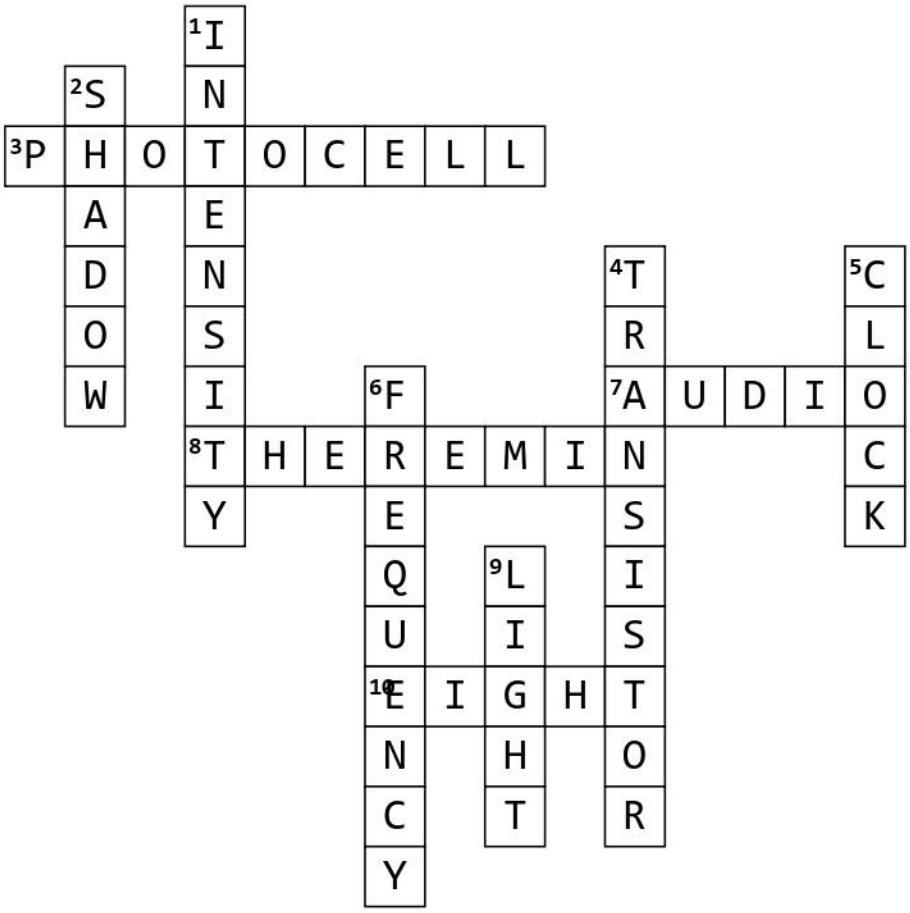
A. the Emitter of the NPN Transistor
B. the Collector of the PNP Transistor
C. the 100 Ohm resistor
D. the speaker

(Form SQ22)

Score

ANSWERS FOR CROSSWORD

Exp. 22 - "SOLAR-ACTIVATED WAKE-UP ALARM CIRCUIT"



Across

3. The component that senses light in this circuit is called a _____ .

7. The tone emitted by this circuit is called an _____ signal.

8. This circuit acts like a _____ circuit.

10. The 555 Timer IC has _____ pins.

Down

1. The pitch of the tone emitted by this circuit is controlled by the _____ of the light.

2. You can control the pitch of the sound by using a _____ from your hand.

4. The _____ in this circuit amplifies the sound.

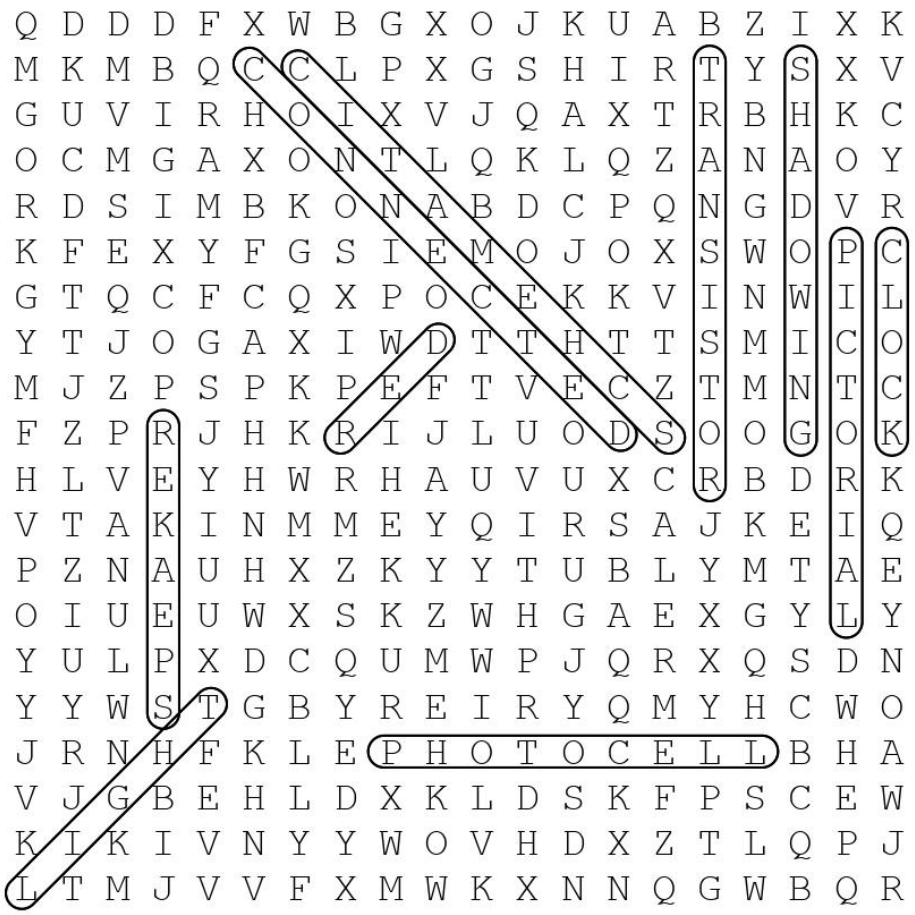
5. The 555 Timer IC in this circuit is used as a _____ .

6. The _____ of the tone is controlled by the intensity of the light.

9. The photocell in this circuit senses the _____ intensity.

ANSWERS FOR WORD SEARCH

Exp. 22 - "SOLAR-ACTIVATED WAKE-UP ALARM CIRCUIT"



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5. The diagram that shows a drawing of the components of this circuit is called a _____ diagram.

6. The component in this circuit that senses light intensity is called a _____ .

7. The 555 Timer IC in this circuit is used as a _____ .

8. A _____ is used to amplify the sound emitted by the speaker.

9. What is the color of the first color band on a 2200 Ohm resistor used in this circuit.

10. Pins 4 and 8 of the 555 Timer used in this circuit are _____ together.

QUICK-CHECK ANSWER KEY for Experiment 22 QUIZ
for Mr Circuit Electronics Training ("Solar-Activated Wake-Up Alarm")

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 _____ to sense light intensity?

A. an SCR
B. a 555 Timer IC
C. a transistor
D. a Photocell

A **(B)** C D

#2 What pin on the 555 Timer is connected to a 220 Ohm resistor?

A. 8
B. 3
C. 6
D. 12

A B **(C)** D

#3 With this circuit, you can generate a variety of interesting _____ by shadowing the surface of the Photocell with your hand.

A. weather conditions
B. electronic displays
C. light displays
D. sound effects

A B **(C)** D

#4 What is the value of the capacitor connected to Pin 2 and Pin 6 of the 555 Timer IC in this circuit?

A. 0.01uF
B. 10uF
C. 0.1uF
D. 470uF

(A) B C D

#5 How many pins on the 555 Timer IC do we use in this circuit?

A. 7
B. 3
C. 8
D. 1

#6 Pins 4 and 8 of the 555 Timer IC are _____ .

A. connected
B. are not connected
C. are isolated from each other
D. are not important

(A) B C D

#7 When the Photocell receives a lot of light, the alarm will _____.

A. go silent
B. make noise
C. burn up
D. give off moisture

A **(B)** C D

#8 To increase the amplitude of the pulses coming from the output Pin 3 of the 555 Timer IC we use _____ .

A. an SCR
B. a PNP transistor
C. an NPN Transistor
D. variable capacitor

A B **(C)** D

#9 The Photocell is connected to Pins 7, 6, and _____ .

A. 8
B. 4
C. 1
D. 2

A B C **(D)**

#10 Pin 1 of the 555 Timer IC is connected to the negative of the battery, to the 0.1uF capacitor and to _____ .

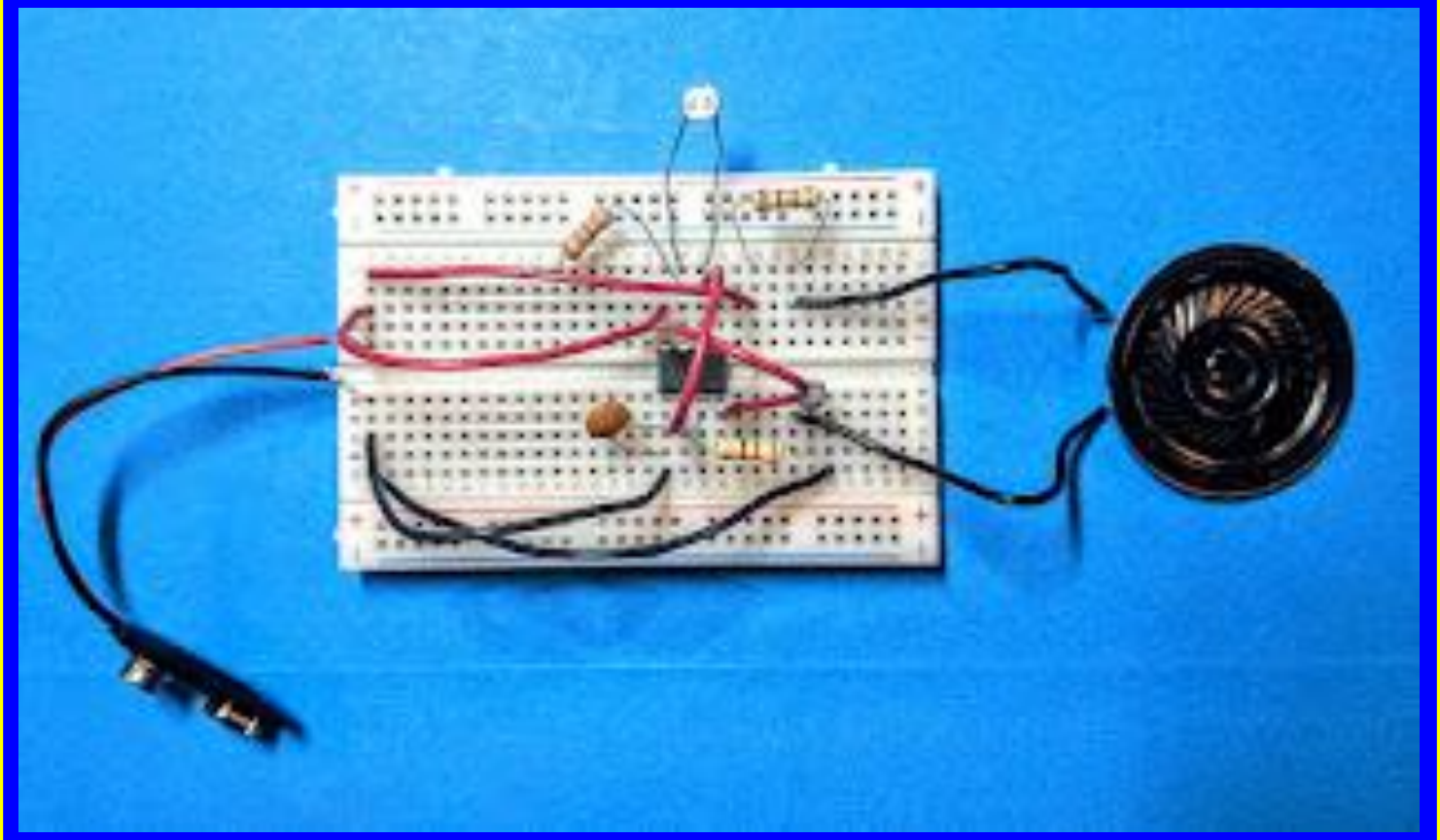
A. the Emitter of the NPN Transistor
B. the Collector of the PNP Transistor
C. the 100 Ohm resistor
D. the speaker

(A) B C D

(Form SQAK22)

BUILD A BETTER FUTURE by UNDERSTANDING SCIENCE-ELECTRONICS

SOLAR-ACTIVATED WAKE-UP ALARM



BASIC ELECTRONICS LAB 1

"SOLAR-ACTIVATED WAKE-UP ALARM CIRCUIT"

(Poster MC1-22-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**