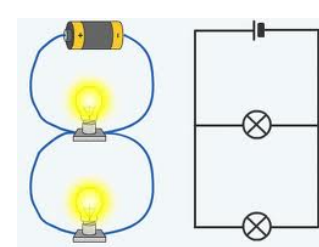
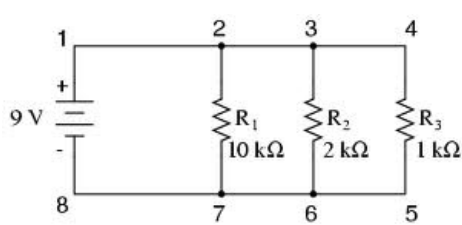


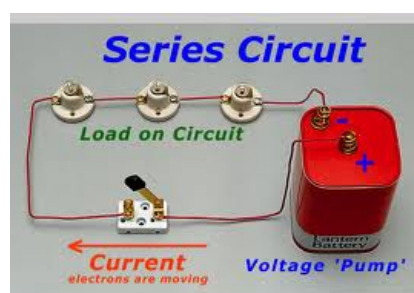
Simple circuit with light

Unit 7

Simple, Series & Parallel Circuits












Jan 29-10:29 AM

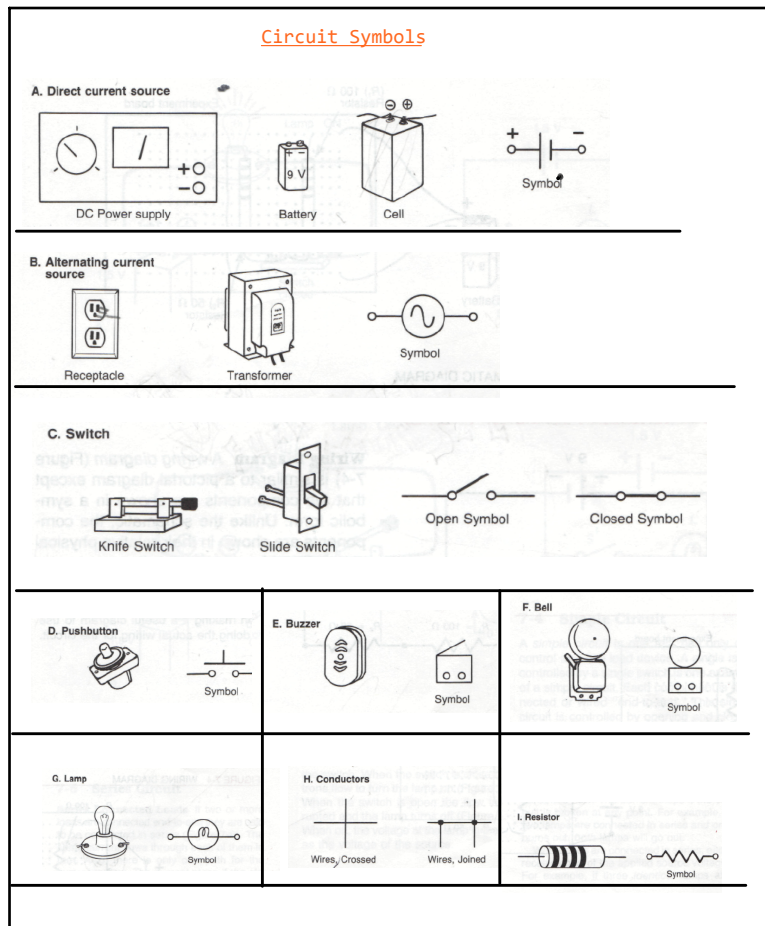
Circuit Components

- Every circuit contains voltage, current and resistance
- Component parts are used to produce desired functions of a circuit
- Component parts in any circuit are:
 - energy source
 - protective device
 - conductors
 - control device
 - load device

Feb 9-7:44 PM

- **Energy source**
 - supplies voltage to move free electrons (power supply)
 - 2 types:
 - * Direct Current (DC)
 - * Alternating Current (AC)
- **Protective device**
 - used to protect circuit wiring and equipment
 - (Only allows currents within safe limits to flow. When higher currents are detected the device will automatically open the circuit, shutting off current.)
 - Examples) Fuses and Circuit breakers
 - assumed to be part of voltage device (so won't include in diagrams)
- **Conductors**
 - wires used to complete path from component to component
 - most common is plastic-insulated copper wire
 - low resistance
- **Control device**
 - used to start or stop flow of electrons
 - Examples) Switches and Push buttons

- **Load device**
 - is the device that converts electrical energy to produce the desired function of the circuit.
 - Example) Lamps, Motors, Heaters and Resistors
 - Resistance will be contained in the load device (for this course)

Feb 9-11:07 PM



Feb 9-11:29 PM

Circuit Diagrams

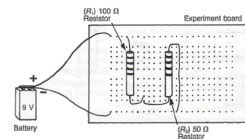
3 types

1) Pictorial

- show physical details seen by eye
- advantage take group of parts and compare them to pictures in diagram
- DISADVANTAGE circuits are so complex

THIS METHOD IS IMPRACTICAL

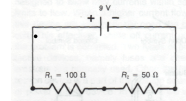
FIGURE 7-2 PICTORIAL DIAGRAM



2) Schematic

- uses symbols to represent components
- not cluttered
- easier to read and understand
- "Ladder" type schematic diagram is most often used in industry
- *vertical lines are connected to power source (known as power rails)
- they are connected to various circuits (the rungs)

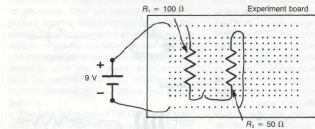
FIGURE 7-3 SCHEMATIC DIAGRAM (LADDER TYPE)



3) Wiring

- similar to pictorial but components are shown in symbols
- shows relative position
- useful to use when doing wiring

FIGURE 7-4 WIRING DIAGRAM

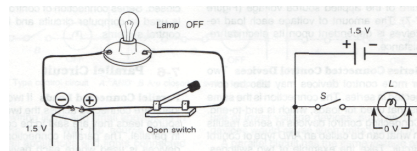


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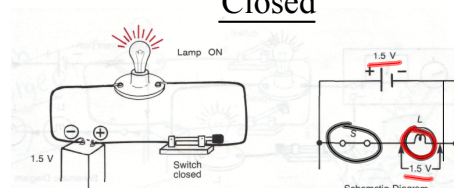
Simple Circuits

- A simple circuit **ONLY** has **one load device** and **one control**
 - Example) A single lamp controlled by a single switch
- Each is wired "end-to-end"
- Switch controls the opening and closing, which controls flow of electrons
 - Switched closed - electrons flow to turn on lamp
 - Switch open - flow is interrupted and lamp turns off
- When lamp is on the voltage at lamp equals voltage at source

Open



Closed



Feb 10-12:06 AM

http://www.bing.com/videos/search?q=series+circuit+bill
 +nye&view=detail&mid=8F635F611470F6126B688F635F611470F6126B68&first=0&F
 RM=NVPFVR&adlt=strict



Bill Nye

23 min

Mar 19-3:01 PM

Series Circuits

2 lamps

- A Series Connected Loads has 2 or more load devices connected "end-to-end" FIGURE 7-6. TWO LAMPS CONNECTED IN SERIES

- **ONE CURRENT PATH**
 - same current flows through each in turn
 - there is only one path for the current so if one light bulb burns out then the current STOPS and both lamps will go out.
- When LOADS are connected in series, EACH receives PART of the voltage source
 - Example) If 3 identical lamps are connected in a series each will receive one third of the applied source of voltage.
 - If battery is 12V then each load will receive 4V

FIGURE 7-7 VOLTAGE DROP ACROSS IDENTICAL SERIES CONNECTED LAMPS

$\frac{12}{3} = 4V$

Feb 10-12:26 AM

Series Circuits continued

- A Series Connected CONTROL DEVICES has 2 or more control devices. (Still connected end-to-end) 2 switches
- Both must be closed in order to turn on the lamp
- Known as "AND" type control
- used in computer circuits

FIGURE 7-8 TWO SWITCHES CONNECTED IN SERIES

FIGURE 7-9 "AND" TYPE CONTROL CIRCUIT

"AND" Type control circuit. A "AND" B Are closed to switch lamp ON

+ - open

closed

Feb 10-12:26 AM

Parallel Circuits

Parallel Connected Loads

- Two or more loads are connected across the voltage sources leads (+ and -) post not end to end
- The main difference between a series circuit and a parallel circuit is in the way the components are connected. In a parallel circuit the electricity has several paths that it can travel.
- each load device operates at same voltage as power supply
- used in wiring lights and small appliances in the home

Example: If 3 identical lamps are connected in a parallel circuit each will receive the same voltage as the battery if battery is 12V then each load will receive 12V

FIGURE 7-9 THREE LAMPS CONNECTED IN PARALLEL

- each load operates independently (because of many paths to take)
- *if one burns out the others will still light

FIGURE 7-10 CURRENT PATHS FOR TWO LAMPS CONNECTED IN PARALLEL

Parallel Circuit

3 lamps 12V Battery (DC)

1 Switch

Feb 10-12:41 AM

Parallel Circuits
continued

Parallel Connected Control Devices. ($+$ and $-$) post

-Two or more control devices are connected across each other
2 lamps

The main difference between a series circuit and a parallel circuit is in the way the components are connected. In a parallel circuit the electricity has several paths that it can travel.

-"OR" type control
-only one need to be closed to light the load
but all can

Example) If 2 push buttons are connected in a parallel circuit in order for the lamp to light one can be closed OR both

FIGURE 7-11 TWO PUSHBUTTONS CONNECTED IN PARALLEL.

Parallel Circuit
2 switches 12V
1 Lamp

Feb 10-12:41 AM

Using Schematic Diagrams

Example) Draw a circuit consisting of 2 lamps connected in parallel controlled by a single push button. Assume a 12 V DC source

Step 1) Draw the schematic diagram (Use proper symbols) Your thinking
draw DC end to end for push button has to be connected to (-) since controls lamps lamps on top of each other (parallel)

FIGURE 7-12 CIRCUIT SCHEMATIC DIAGRAM

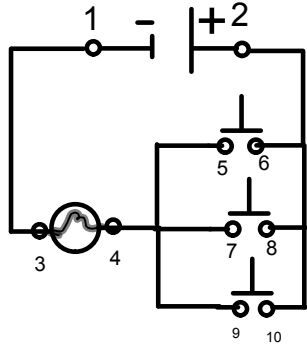
Step 2) Make wiring number sequence charts
-this helps you make right wire connections
*start with numbering each component part (1 goes with negative post, 2 with positive)
(Then 3 and 4 on each side of button) and so on

Step 3) Group all common terminals
-common points in the circuit

FIGURE 7-13 HOW TO USE A WIRING NUMBER SEQUENCE CHART

Feb 10-1:36 AM

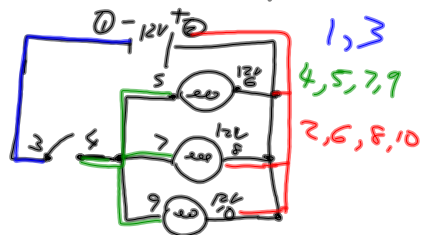
Do the wiring number sequence chart:



Mar 18-3:24 PM

1) 12 V Battery (DC)
1 switch

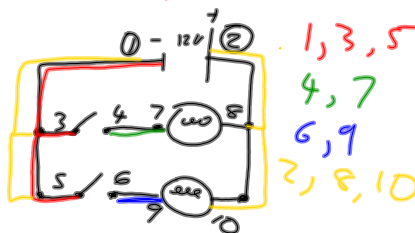
3 lamps connected in parallel



2) 12V DC

2 switches wired parallel

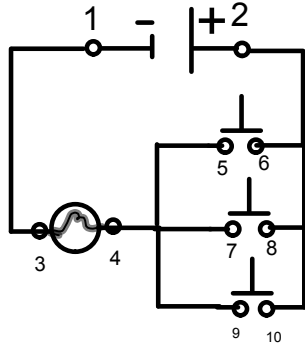
2 lamp parallel



Mar 25-2:05 PM

Do the wiring number sequence chart:

Solution:



2, 6, 8, 10

4, 5, 7, 9

1, 3

Mar 18-3:24 PM

Page 67

#2 Do the wiring number sequence chart for all diagrams (i), (ii), (iii), (iv), (v), & (vi)



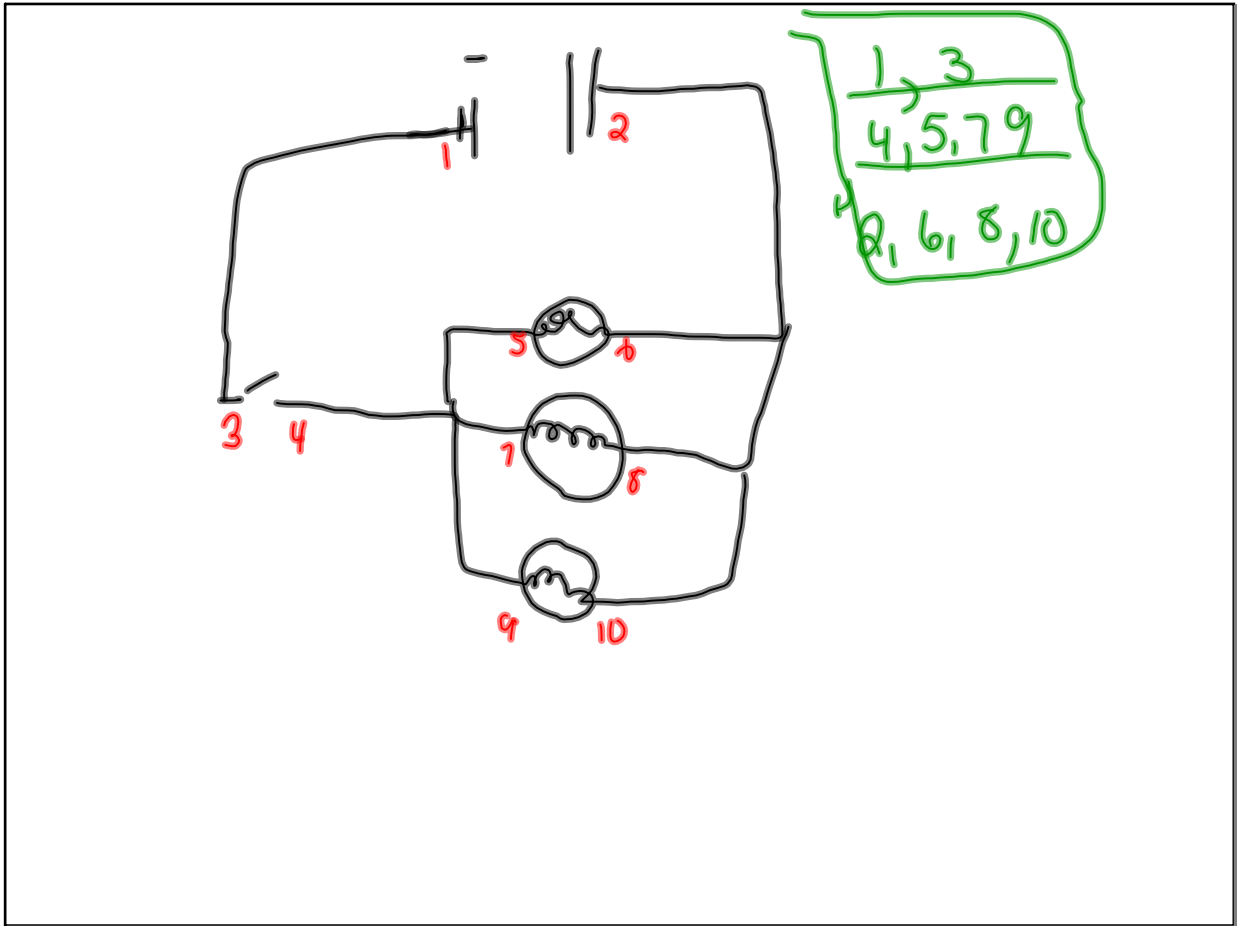
Page 68

All Question Page 68 - 69

1 to 12

↘
except #12d

Mar 18-3:35 PM

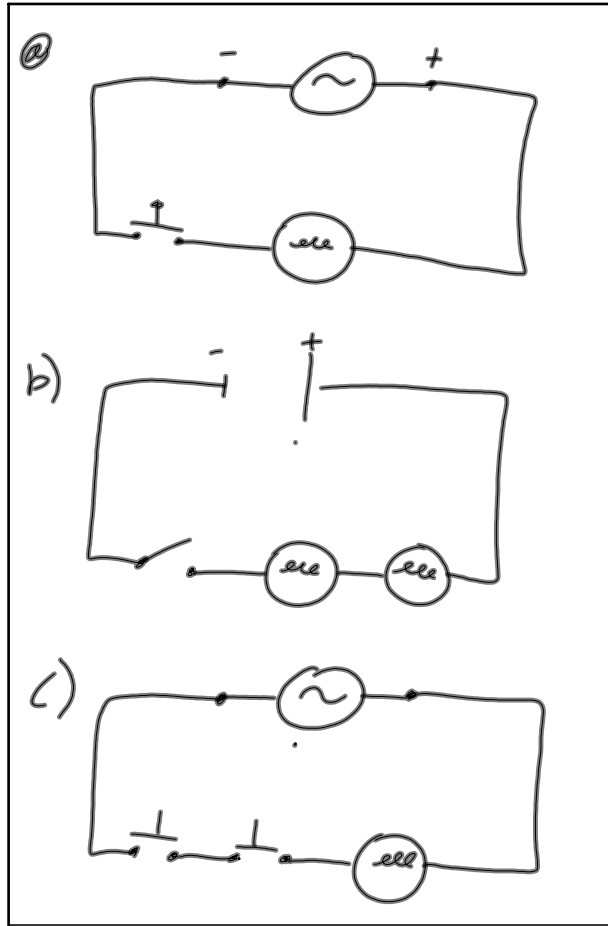


Mar 22-2:04 PM

Test

White binder all questions PG 14-16
Textbook 68-69

Feb 10-1:06 AM



Mar 28-2:12 PM

Test Unit 7

Part 1 Match the symbols

Part 2 Multiple Choice (open Book)?

Mar 25-7:56 PM

Circuit Symbols

DC
A. Direct current source

DC Power supply Battery Cell Symbol

B. Alternating current source

Receptacle Transformer Symbol

C. Switch

Knife Switch Slide Switch Open Symbol Closed Symbol

<p>D. Pushbutton</p> <p>Symbol</p>	<p>E. Buzzer</p> <p>Symbol</p>	<p>F. Bell</p> <p>Symbol</p>
<p>G. Lamp</p> <p>Symbol</p>	<p>H. Conductors</p> <p>Wires, Crossed Wires, Joined</p>	

<p>Resistor</p>	<p>Symbol</p>	<p>Symbol</p>
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Mar 25-7:58 PM

Test Review

Examples & PURPOSE of load, energy source, protective device

In the circuit where is the resistance contained?

Definition of a circuit conductor

Which electrical diagrams are :

- Easiest to read
- Complex
- Impractical
- Best for Wiring
- Use Symbols

Ladder type Schematic Diagram

Voltage Across each load in a **Series** Circuit

Voltage Across each load in a **Parallel** Circuit

Parallel (How many paths?)

Series (How many paths?)

And Circuit

OR Circuit

Questions similar to Assignment?

what happens when PB₁ is closed? (all MC) Applying Knowledge

wiring number sequence

Describe the circuit.

What happen win S₁ is closed?

What happens when S₁ and PB is closed?

Number the wiring sequence

b)

Mar 25-8:00 PM

Test Review

Solution

Examples & PURPOSE of load, energy source, protective device

load is a lamp, its purpose is to transform electrical energy

Energy source : its purpose is to supply the voltage require to move electrons (Ex. battery is DC) (Ex. AC is an outlet)

Protective Devices are used to protect circuit wiring and equipment. Only allows currents within safe limits to flow. When higher currents are detected the device will automatically open the circuit, shutting off current (Example: Fuse)

In the circuit where is the resistance contained?
 -contained in the load

Definition of a circuit conductor
 -complete the path from component to component, Low Resistance, are insulated, have a voltage source,

Which electrical diagrams are :

- a) Easiest to read Schematic
- b) Complex Pictorial
- c) Impractical Pictorial
- d) Best for Wiring Wiring
- e) Use Symbols Schematic

Ladder type Schematic Diagram

Ladder" type schematic diagram is most often used in industry

*vertical lines are connected to power source (known as power rails)

they are connected to various circuits (the rungs)

Mar 25-8:00 PM

Test Review

Solution

Voltage Across each load in a Series Circuit

- When LOADS are connected in series, EACH receives PART of the voltage source
- Example) If 3 identical lamps are connected in a series each will receive one third of the applied source of voltage.
 If battery is 12V then each load
- Known as "AND" type control

The diagram shows a series circuit. At the top is a 12V battery with the positive terminal on the right. Below the battery is a closed switch labeled 'S'. Following the switch are three lamps labeled L1, L2, and L3. Each lamp is represented by a circle with a filament. Below each lamp, two arrows point upwards, indicating a 4V potential difference across each lamp. The total voltage of the battery is 12V, and the sum of the voltages across the three lamps (4V + 4V + 4V) equals the battery voltage.

Mar 25-8:00 PM

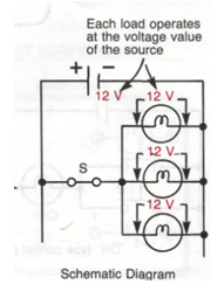
Test Review

Solution

Voltage Across each load in a **Parallel** Circuit

-each load device operates at same voltage as power supply

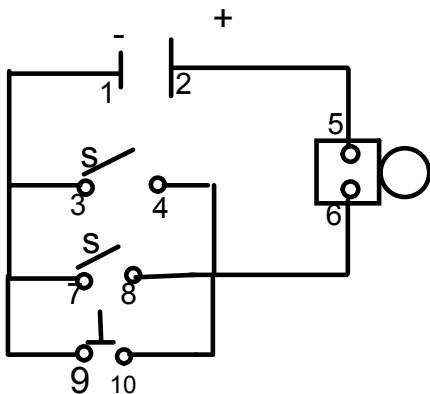
Example) If 3 identical lamps are connected in a parallel circuit each will receive the same voltage as the battery
If battery is 12V then each load will receive 12V



More than one path

- "or" type so independent of one another

Mar 25-8:00 PM



Describe the circuit.

two switches and a push button in a parallel circuit controlling a bell and operated by a DC voltage

What happen win S_1 is closed?

Bell rings

What happens when S_1 and PB is closed? Bell Rings

Number the wiring sequence

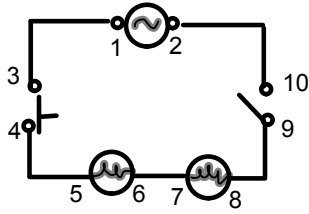
1,3,7,9

4,6,8,10

2,5

Mar 25-8:54 PM

Example 2)



2 Lamps connected in a series controlled by a push button and a switch. Voltage source is AC.

If just push button closed then no lights.

If one burns out? no lights

All have to be closed in order to light up

1,3

4,5

6,7

8,9

2,10

Mar 25-9:05 PM