

Applied Science Study Guide - By Patton and Zahen

1. Relationships between Science and Technology

- a. Circuits are a relationship between Science and technology because the power within a current comes from science. Many different science-based findings occur in circuits.
- b. Technology requires science in order to advance

2. Current Electricity

a. Ohms Law

- i. $\Delta V = I \cdot R$
- ii. Ohms law states that The change in voltage (ΔV) is equal to the product of the current between the current (I) and the total resistance (R)
- iii. This equation is a powerful predictor of the relationship between potential difference, current and resistance.

3. Circuits

a. Series Circuits

- i. One path for current to flow
- ii. Total resistance in the circuit
 - 1. $R_t = R_1 + R_2 + R_3 \dots$
- iii. Current is the same at each load and is equal to the current of the power source
- iv. The sum of the voltage drops across the individual resistor is equal to the voltage rating of the battery.
- v. The overall resistance of the collection of resistors is equal to the sum of the individual resistance values

b. Parallel Circuits

- i. In a parallel circuit, there are multiple pathways for charge flow
- ii. The voltage drop is the same across each parallel branch
- iii. The total resistance is always less than the smallest resistor in the circuit
- iv. The current at each resistor/ pathway is the same
- v. The overall resistance can be determined with the equation:
 - 1. $1/R_{eq} = 1/R_1 = 1/R_2 = 1/R_3$

c. Combination Circuits

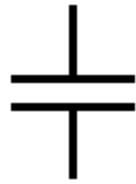
- i. Contains series and parallel parts.
- ii. Both equations can be used to determine the resistance of the Combination Circuit

4. Electrical Components

a. Power Source

- i. Voltage Source
 - 1. Pushes electrons through the conductor
 - 2. Measured in volts (v)
- ii. Current

1. Measured in amps (I)
- iii. Power
 1. Measured in watts (w)
- iv. AC - Alternating Current
 1. It flows in negative and positive zones
 2. Ex. Battery
- v. DC - Direct Current
 1. It flows consistently
 2. Electrons move steadily in one direction
 3. ex. outlet
- b. Conductor
 - i. Wire
 1. Gauge
 - a. Diameter (cross section)
 - b. Inverse number/diameter
- c. Load
 - i. Measures resistance
 - ii. Measured in ohms (R, Ω)
- d. Control Device
 - i. Switch
 - ii. Sensor
- e. Transistor
 - i. Monumental technology
 - ii. Related to diodes
 1. semiconductor device
 2. One way valve for electrical current
 3. Allow current to flow in ONLY one direction
 4. Looks like a resistor
 5. Can convert AC to DC
 - iii. 3 Layers
 1. -N-P-
 2. -NPN-
 3. -PNP-
 - iv. Switch or amplifies
- f. Capacitor
 - i. Capacitance is measured in micro/pico farads
 - ii. Filters frequencies
 - iii. Stores electrical energy



Normal



Normal



Electrolytic

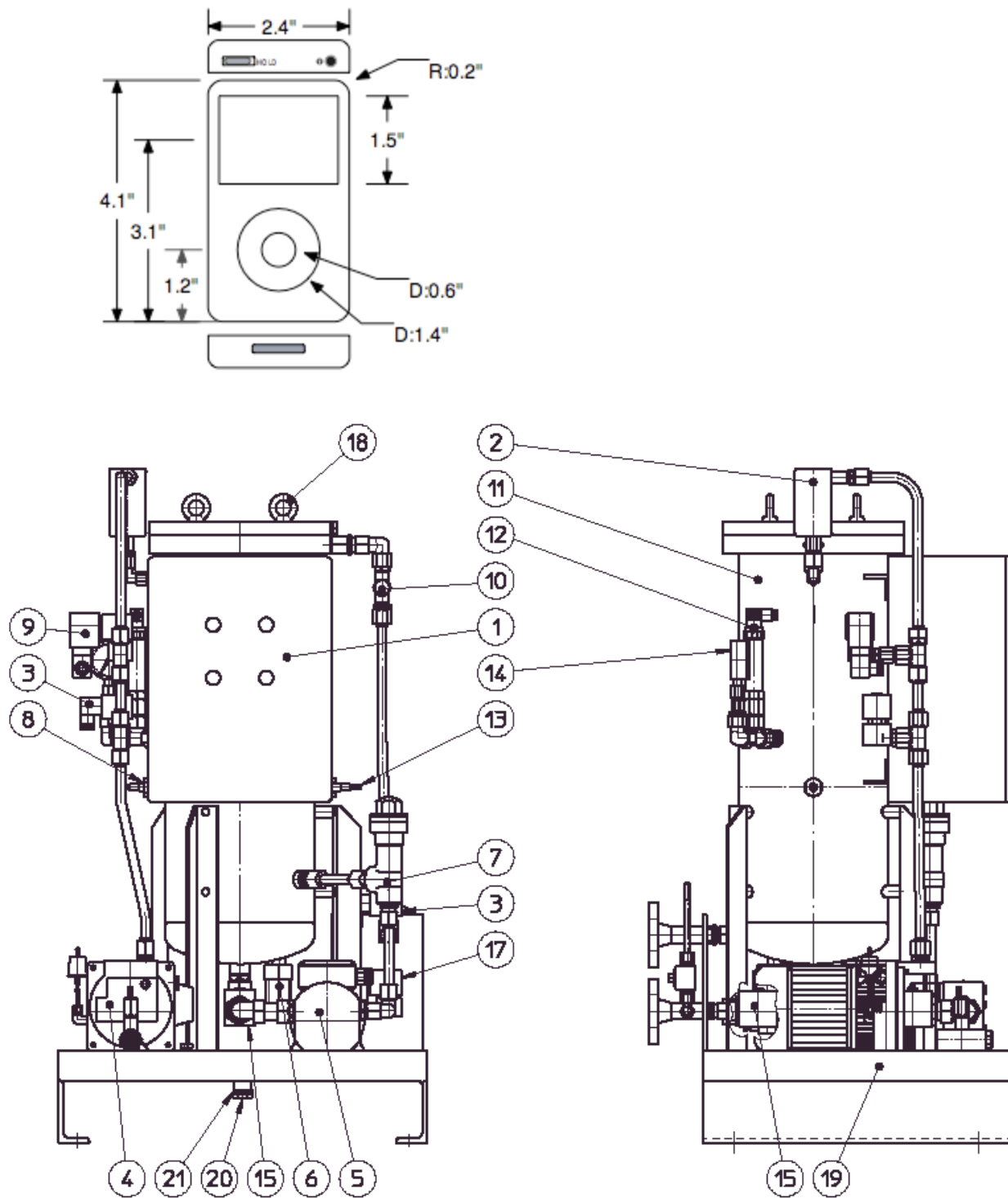


Variable

iv.

- g. Transformer
 - i. Increases or decreases voltage
 - h. Active Devices
 - i. Any type of component with the ability to control electrical current
5. Binary Numbers
- a. Pattern of 1 of 0 to store information
6. Technical Drawings
- a. Electrical
 - b. Mechanical
 - c. Architectural
 - d. Topography
 - e. Aeronautics
 - f. Industrial Design
 - g. Interior Design
 - h. Orthographic
 - i. Pictorial
 - j. Section
 - k. Assembly
 - l. Developments
 - m. Elevations
 - n. Floor pl

7. Models



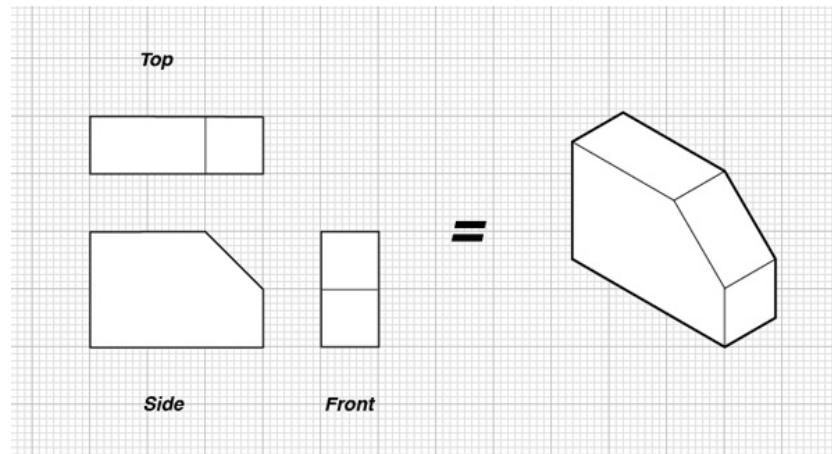
8. Autocad

- a. Offset
- b. Array
- c. Osnap

- d. Trim
- e. Grid
- 9. Industrial Design
 - a. Involved with:
 - i. Aesthetics
 - ii. Ergonomics
 - iii. Functionality
 - iv. Usability of a product
 - v. Used to improve marketability and production
 - b. What do they do:
 - i. The objective of this area is to study both function and form
 - ii. Doesn't design mechanism
 - iii. Concern how it looks
 - c. What do they study
 - i. Art and design
 - ii. Applied science
 - iii. Technology
 - iv. Material science
 - v. Material processing
 - vi. Manufacturing processing

10. Drawings

- a. Isometric Drawings - 3D
- b. Orthographic Drawings - 2D
- c. Comparison



11. Formulas

- a. Resistance
 - i. Series
 1. $R_t = R_1 + R_2 + R_3 \dots$

ii. Parallel

$$1. R_t = \frac{1}{\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}}$$

b. Amps/ Ohms Law

i. Series

$$1. I_t = \frac{V_t}{R_t}$$

ii. Parallel

$$1. I_{R1} = \frac{V_{R1}}{R_1} \dots$$

c. Watts

i. Series and Parallel

$$1. P = V \times I$$

d. Kirchhoff's Voltage Law

i. Series and Parallel

$$1. V_S = V_{DR1} + V_{DR2} + V_{DR3}$$

$$2. V_{DRn} = I_{Rn} \times R_n$$

e. Kirchhoff's Current Law

i. Series and Parallel

$$1. I_{DT} - I_{D1} - I_{D2} - I_{D3}$$