SERIES
$$I_{total} = I_1 = I_2 = I_3$$

$$R_{total} = R_1 + R_2 + R_3$$

 $V_{total} = V_1 + V_2 + V_3$

PARALLEL
$$I_{total} = I_1 + I_2 + I_3$$

 $1 = 1 + 1 + 1$

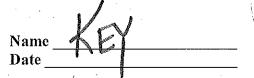
$$\frac{1}{R} = \frac{1}{R_{total}} + \frac{1}{R_{2}} + \frac{1}{R_{3}}$$
 $V_{total} = V_{1} = V_{2} = V_{3}$

POWER
$$P = IV = I^2R = \frac{V^2}{R}$$

ENERGY
$$E = Pt = IVt = I^2Rt = \frac{V^2}{R}t$$

Physics

Power & Energy with Series & Parallel Circuits



1. Suppose you have a 15 A circuit breaker in series with the following parallel combinations all across 120-V: Television – 10 Ω , Alarm Clock – 60 Ω , Lamp – 40 Ω . Can you have all 3 things on at the same time?





no ble it exceeds amount of 15 A allowed

A curling iron of resistance 80-0 Ω is plugged into a 120-V outlet. How much thermal energy is produced in 60 2. seconds?

A 13.0- Ω resistors and a 52.0- Ω resistors are connected in series and placed across (135-V generator. 3.

a) What is the equivalent resistance of the circuit?

* changed to 130 V

b) What is the value of the current in the circuit?

c) What is the potential drop (voltage) across each resistor?

$$V = 2.08 \, \text{A} \cdot 13.0 = 27.04 \, \text{V}$$

 $V = 2.08 \cdot 52.0 = 10.8.16$

d) Calculate the power of each resistor.

$$p = (2.08)^{L} (52) = 225 \text{ W}$$

e) What is the total power of the circuit?

| $\frac{1}{R_1} = \frac{1}{3} + \frac{1}{6} + \frac{1}{12} + \frac{1}{12} = \frac{4}{12} + \frac{2}{12} + \frac{1}{12} + \frac{1}{12} = \frac{8}{12} = \frac{12}{8}$ b) What is the value of the current in each branch of the circuit? | - | | supp nat is | | uiv | alent r | esista | nce of | the c | ircuit? | , | | | | | | |
|--|--------|-------------------------------------|----------------|--------|-----|---------|--------|-------------|--------|-------------|----------|----------|--------------|-----|-----|-----|-------------------------|
| b) What is the value of the current in each branch of the circuit? | L R | C [®] G ₁ C® | 3 | * L | 4. | 2 | 12. | €7# €00# | 4 12 | r 2. 12. | - 2 | . 12 | ton Contr | 8 | 6 m | 12. | (R _r = 1.5.0 |
| | b) | W. | hat is | the va | lue | of the | curre | ent in e | each b | ranch | of the | circuit' | ? | • • | | U | |

c) What is the value of the total current through the circuit?

3.2: 9 = 1.3 = 3.0

d) Calculate the power of each resistor.

e) What is the total power of the circuit?

5. A blow dryer rated at 1500 W is plugged into an outlet of 120-V. What is the resistance of the blow dryer?

$$P = 1500W$$
 $P = \frac{\sqrt{2}}{R}$ $1500W = 120^2$ $1500R = 14,400$ $R = 120V$ $R = 9.6.2$

7. A digital clock has a resistance of 12,000 Ω and is plugged into a 115-V outlet.

a) How much current does it draw?

b) How much power does it use?

c) If the clock is constantly on (in use 24 hours) a day), how much energy in kWh does the clock use in one day?

c) If the owner of the clock pays \$0.10 per kWh, how much does it cost to operate the clock for 30 days?

Tim left for school at 6:45 a.m. and forgot to turn off her TV, which is rated at 300 W when plugged into a 8. 120-V source. After he came home from school, he left the TV on until leaving for work at 4pm 3:45 pm a) How much energy (in kWh) did the TV use?

b) At \$0.13 per kWh, how much did it cost to run the TV?