PHYSICS IN MOTION
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# Unit 5I
# Parallel and Complex Circuits
## *Practice Problems TEACHER*

**Work each of the following problems. SHOW ALL WORK.**

1. **A microwave oven has a power rating of 1,200 W. If it receives 120 V of potential difference, what is the current in the microwave?**

$$P = IV$$
$$1200\ W = I(120\ V)$$
$$I = 10\ A$$

2. **Using the information from the previous question, what is the resistance of the microwave?**

$$V = IR$$
$$120\ V = (10\ A)R$$
$$R = 12\ \Omega$$

3. **What is the resistance in the filament of a 60 W light bulb that receives 120 V of potential difference?**

$$P = \frac{V^2}{R}$$
$$60\ W = \frac{(120\ V)^2}{R}$$
$$60\ W = \frac{14400\ V^2}{R}$$
$$R = \frac{14400\ V^2}{60\ W}$$
$$R = 240\ \Omega$$

4. **The current running through a toaster oven is 7.5 A when it is connected to 120 V of potential difference. What is the power rating of the toaster?**

$$P = IV$$
$$P = (7.5\ A)(120\ V)$$
$$P = 900\ W$$

**questions continued on next page**

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**Work each of the following problems. SHOW ALL WORK.**

5. **Two resistors, one with 6 Ω of resistance and the other with 8 Ω of resistance, are connected in series to a 9 V battery. How much power is dissipated by these two resistors?**

$$R_{eq} = R_1 + R_2$$
$$R_{eq} = 6\,\Omega + 8\,\Omega$$
$$R_{eq} = 14\,\Omega$$

$$P = \frac{V^2}{R}$$
$$P = \frac{(9\,V)^2}{14\,\Omega}$$
$$P = \frac{81\,V^2}{14\,\Omega}$$
$$P = 5.8\,W$$

6. **If the two resistors from the previous question were arranged in parallel, how much power would they dissipate?**

$$\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2}$$
$$\frac{1}{R_{eq}} = \frac{1}{6\,\Omega} + \frac{1}{8\,\Omega}$$
$$\frac{1}{R_{eq}} = \frac{4}{24\,\Omega} + \frac{3}{24\,\Omega}$$
$$\frac{1}{R_{eq}} = \frac{7}{24\,\Omega}$$
$$\frac{R_{eq}}{1} = \frac{24\,\Omega}{7}$$
$$R_{eq} = 3.43\,\Omega$$

$$P = \frac{V^2}{R}$$
$$P = \frac{(9\,V)^2}{3.43\,\Omega}$$
$$P = \frac{81\,V^2}{3.43\,\Omega}$$
$$P = 23.62\,W$$

**questions continued on next page**

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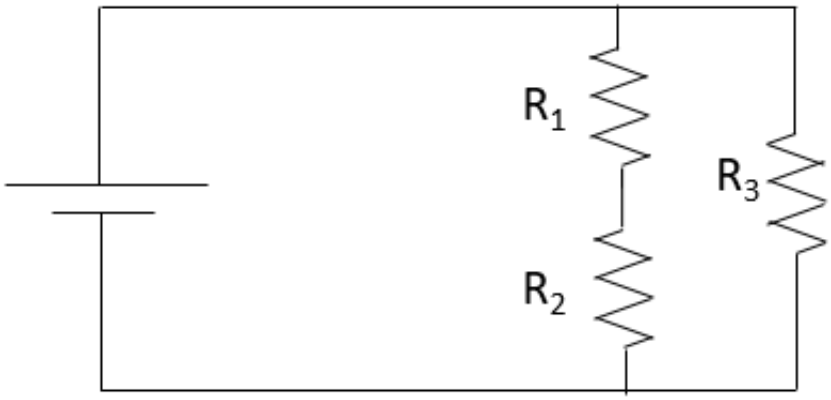
**Work each of the following problems. SHOW ALL WORK.**

**7. Each resistor in the circuit diagram below has a resistance of 2 Ω. If the potential difference supplied by the batteries in the circuit is 6 V, how much power is dissipated?**




$$R_{1+2} = R_1 + R_2$$
$$R_{1+2} = 2\,\Omega + 2\,\Omega$$
$$R_{1+2} = 4\,\Omega$$

$$\frac{1}{R_{eq}} = \frac{1}{R_{1+2}} + \frac{1}{R_3}$$
$$\frac{1}{R_{eq}} = \frac{1}{4\,\Omega} + \frac{1}{2\,\Omega}$$
$$\frac{1}{R_{eq}} = \frac{1}{4\,\Omega} + \frac{2}{4\,\Omega}$$
$$\frac{1}{R_{eq}} = \frac{3}{4\,\Omega}$$
$$\frac{R_{eq}}{1} = \frac{4\,\Omega}{3}$$
$$R_{eq} = 1.33\,\Omega$$

$$P = \frac{V^2}{R}$$
$$P = \frac{(6\,V)^2}{1.33\,\Omega}$$
$$P = \frac{36\,V^2}{1.33\,\Omega}$$
$$P = 27\,W$$

**questions continued on next page**

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**Work each of the following problems. SHOW ALL WORK.**

**8. How many joules of energy are needed to keep a 45 W ceiling fan working for 6 hours?**

$$6\ hours = 360\ minutes = 21600\ seconds$$

$$P = \frac{\Delta E}{t}$$

$$45\ W = \frac{\Delta E}{21600\ s}$$

$$\Delta E = 972000\ J$$

**9. How much does it cost to power a refrigerator for 30 days if it is rated at 200 W and the power company charges $0.07 per kWh?**

$$30\ days = 720\ hours$$

$$200\ W = 0.2\ kW$$

$$P = \frac{\Delta E}{t}$$

$$0.2\ kW = \frac{\Delta E}{720\ h}$$

$$\Delta E = 144\ kWh$$

$$\frac{144\ kWh}{1} \times \frac{\$0.07}{1\ kWh} = \$10.08$$