Physics

Name_____

Date_____Period____#_____

Ingrum 12/97

Topic 21 Review Worksheet

1. For Questions 1-10, write the letter of the correct answer to the left of the question.

b 1. As resistors are added to a circuit in series, the current in the circuit.
(a) increases (b) decreases (c) remains the same

a 2. As you plug in more appliances in your house, the total current in the circuit
(a) increases (b) decreases (c) remains the same

b 3. As you plug in more appliances in your house, the total resistance
(a) increases (b) decreases (c) remains the same

d 4. An ammeter connected in parallel with a battery and resistor will
(a) give the current in the circuit (b) read zero (c) measure the resistance of the battery (d) burn out

a 5. A voltmeter has an internal resistance that is
(a) high (b) low

b 6. An ammeter has an internal resistance that is
(a) high (b) low

a 7. Current is the same throughout in a
(a) series circuit (b) parallel circuit

b 8. The sum of the resistors is less than the smallest resistor in a
(a) series circuit (b) parallel circuit

c 9. If you have three identical resistors in parallel and one is removed, the current through the remaining resistors
(a) increases (b) decreases (c) remains the same

b 10. If one resistor in a parallel circuit is removed, the total current
(a) increases (b) decreases (c) remains the same

2. A 10 Ω resistor, a 20 Ω resistor, and a 30 Ω resistor are connected in series with a 120 V source. What is the current in the circuit?

$R_T = 10 + 20 + 30 = 60\,\Omega$

$I = \frac{V}{R} = \frac{120\,V}{60\,\Omega}$

2. 2A

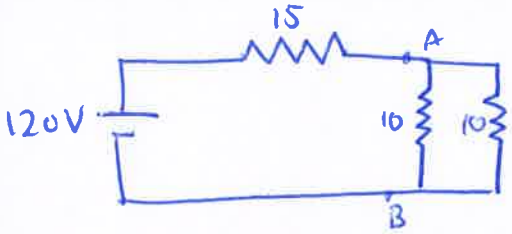
3. A 10.0 Ω resistor, a 20.0 Ω resistor, and a 30.0 Ω resistor are connected in parallel across a potential difference of 120 V. What is the current through the 20.0 ohm resistor?

$\frac{1}{R_T} = \frac{1}{10} + \frac{1}{20} + \frac{1}{30} = \frac{6+3+2}{60}$

$I = \frac{V}{R} = \frac{120}{20} = 6$

3. 6A

4. A 15.0 Ω resistor is connected in series with two 10.0 Ω resistors in parallel and a 120 V generator. What is the voltage drop across the 15.0 ohm resistor?



$\frac{1}{R_{AB}} = \frac{1}{10} + \frac{1}{10} = \frac{2}{10} = \frac{1}{5}$ $R_{AB} = 5$

$R_T = 15 + 5 = 20$

$I_T = \frac{120}{20} = 6A$

$V_{15} = 6 \times 15 = 90$

4. 90V

5. The following appliances are all connected in parallel in one of the lines in the electrical system of a house: a 15 Ω electric fry pan, a 25 Ω refrigerator, a 20.0 Ω heater, and a 12 Ω toaster. The fuse in this line melts at 28 A. Will this arrangement of appliances cause the fuse to melt? Explain.

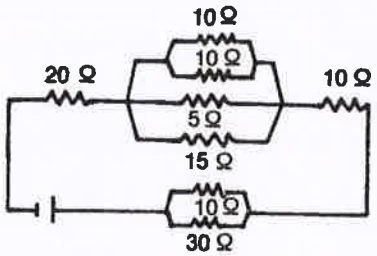
$\frac{1}{R_T} = \frac{1}{15} + \frac{1}{25} + \frac{1}{20} + \frac{1}{12} =$

$R_T = 4.167\ \Omega$

$I = \frac{120}{4.167} = 28.798$

5. YES, Total current exceeds loading

6. Find the effective resistance of the circuit in the diagram.



$20 + 2.143 + 10 + 7.5$

6. 39.643 Ω

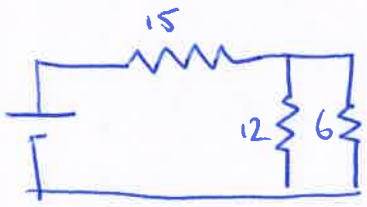
7. A 6 Ω resistor,a 54 Ω resistor, and a 32 Ω resistor are connected in series. Calculate their total resistance.

7. 92 Ω

8. Calculate the total resistance of four 8 Ω resistors connected in parallel.

8. 2 Ω

9. Two 12 Ω resistors and a 6 Ω resistor are each connected in parallel. A 15 Ω resistor is added to the parallel group in series. Calculate the voltage needed to drive a 2.0 A current through the total resistance.



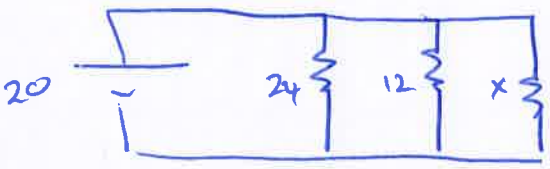
$R_T = 15 + 4$
$= 19\ \Omega$

Since $I = 2$

$V = 2 \times 19 = 38V$

9. 38V

10. Three resistors are connected in parallel across 20.0 V. The resistors draw a total of 5.0 A. Two of the resistors have values of 24 Ω and 12 Ω. What is the value of the third resistor?



$I_{24} = \frac{20}{24}$

$I_{12} = \frac{20}{12}$

$I_x = \frac{20}{x}$

} 5

$\frac{5}{6} + \frac{10}{6} + \frac{20}{x} = 5$

$\frac{15}{6} + \frac{20}{x} = 5$

$\frac{15x + 120}{6x} = 5$

$15x + 120 = 30x$

$120 = 15x$

$x = 120/15 = 8\ \Omega$

10. 8 Ω

11. A coffee pot rated at 360 W, an iron rated at 960 W, and an oven rated at 1200 W are connected in parallel across 120 V. The 15 A fuse in the circuit immediately blows. Calculate the total current drawn.

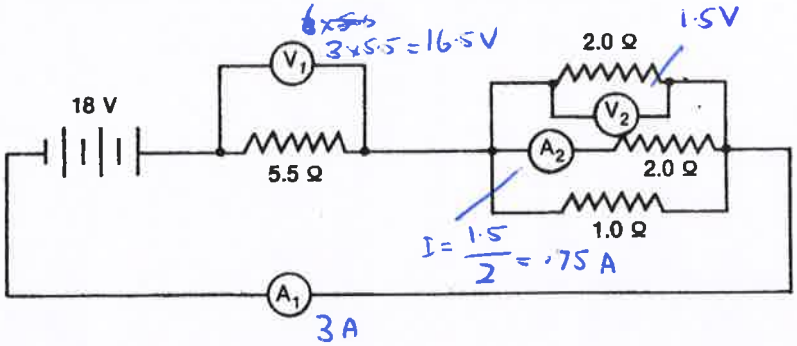
Since $P = VI$ + $V = 120$

$I_c = \frac{360}{120} = 3A$ $I_I = \frac{960}{120} = 8A$ $I_o = \frac{1200}{120} = 10A$

$I_T = 3 + 8 + 10 = 21A$

11. 21A

12. Calculate the total resistance of the circuit shown below.



$3 \times 5.5 = 16.5\ V$ ~~6 × 5.5~~ 1.5V

$I = \frac{1.5}{2} = .75\ A$

3 A

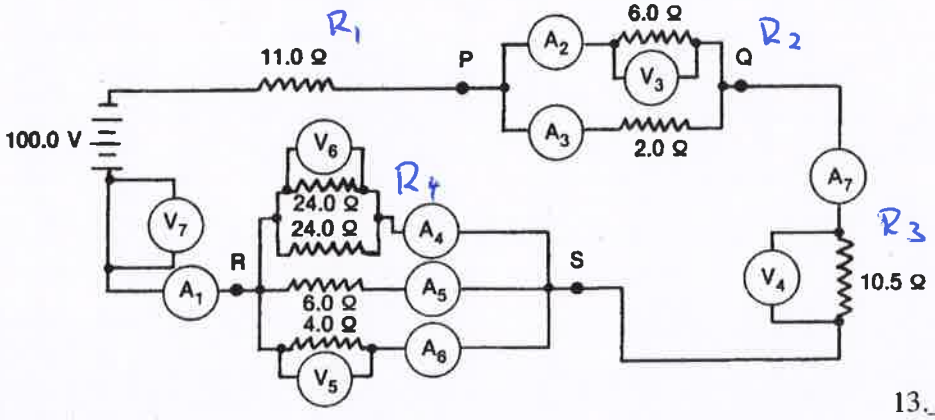
$\frac{1}{R_{//}} = \frac{1}{2} + \frac{1}{1} + \frac{1}{2} = \frac{3}{2}\Omega$

$R_{//} = \frac{2}{3}\ \frac{1}{2}$

$R_T = 5.5 + .5$

12. 6 Ω

13. What are the meter readings for the diagram in problem 12? $I_T = \frac{18}{6} = 3A$



13. _____

14. Calculate the reading for each of the 7 ammeters in the circuit diagram below.

$\frac{1}{R_2} = \frac{1}{6} + \frac{1}{2} = \frac{4}{6}$ $R_2 = \frac{3}{2}\Omega$

$\frac{1}{R_4} = \frac{1}{24} + \frac{1}{24} + \frac{1}{6} + \frac{1}{4} = \frac{1+1+4+6}{24} = \frac{12}{24} = \frac{1}{2}$ $R_4 = 2\Omega$

$\therefore R_T = 11 + \frac{3}{2} + 10.5 + 2 = 25\Omega$

$I_T = \frac{100}{25} = 4A$

$A_1 = 4\ A = A_7$

$A_2 = 1A$

$A_3 = 3A$

$A_4 = \frac{V_6}{12} = \frac{8}{12} = \frac{2}{3}\ A$

$A_5 = 8/6 = 4/3$

$A_6 = 8/4 = 2A$

$= 4A$

14. _____

15. Calculate the reading for each of the 5 voltmeters in the circuit diagram in problem 14.

$V_{RS} = 4 \times 2 = 8\ V$

$= V_6 = V_5$

$V_4 = 4 \times 10.5$

$= 42\ V$

$V_3 = 1 \times 6 = 6\ V$

$V_7 = 0$

15. _____