GRADES
100
97
94
88
85
80

PHYS 223 University Physics III
Exam 3

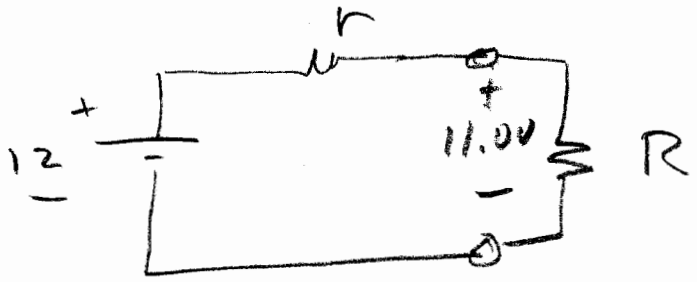
February 26, 2020

Name J. C. Daly

1. A battery has an emf of 12.0 V. The terminal voltage of the battery is 11.0 V when it is delivering 10.0 W of power to an external load resistor R.

   a. What is the value of R? 12.1 Ω

   b. What is the internal resistance of the battery? 1.1 Ω



$P = \frac{U^2}{R}$ $\quad R = \frac{V^2}{P} = \frac{(11)^2}{10} = \frac{121}{10} = 12.1\ \Omega$

$12 = (r + R)I$

$P = I^2 R \quad I = \sqrt{\frac{P}{R}} = \sqrt{\frac{10}{12.1}} = 0.909$

$r + R = \frac{12}{I}$

$r = \frac{12}{I} - R = \frac{12}{0.909} - 12.1$

$r = 1.1\ \Omega$

2. Determine the equivalent resistance between the points ***A*** and ***B*** for the group of resistors shown in Figure 2.

R_{AB} = 8 Ω

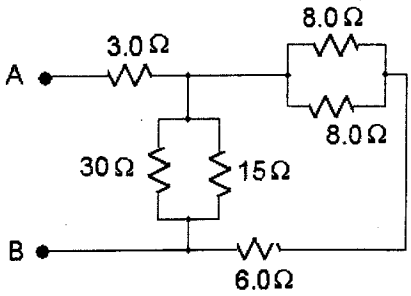
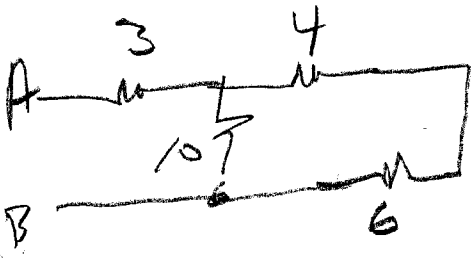
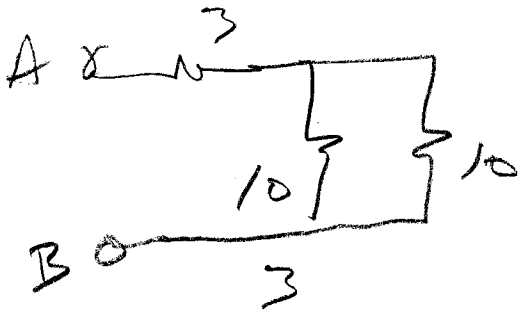
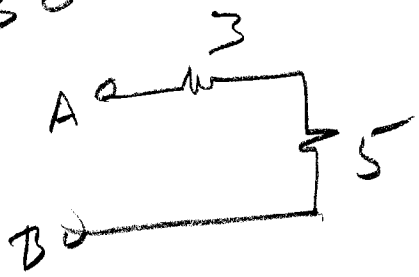


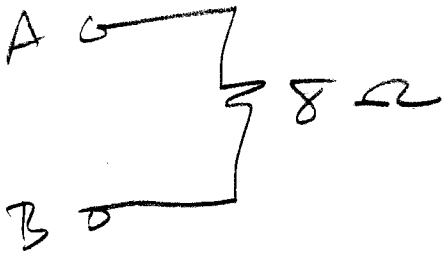
Figure 2



$\frac{1}{30} + \frac{1}{15} = \frac{1}{10}$







3. Using Kirchhoff's rules, find the voltage across the resistors,

a. R_1 2.67 V

b. R_2 1.33 V

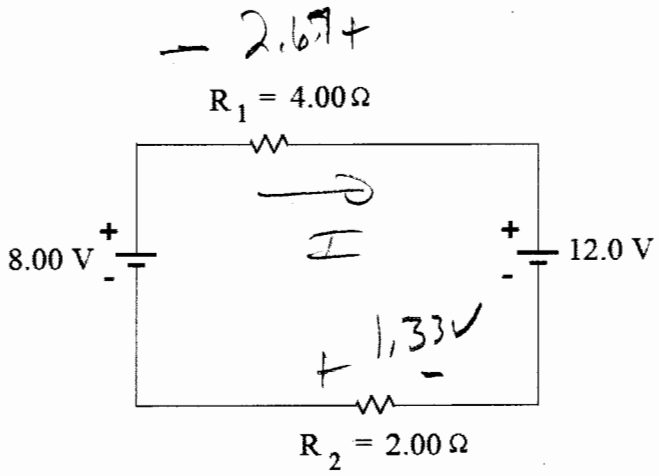


Figure 3

Loop Rule

$$8 - 4I - 12 - 2I = 0$$

$$-6I - 4 = 0$$

$$I = -\frac{4}{6} = -\frac{2}{3}\ A$$

$$V_1 = R_1 I = -4 \times \frac{2}{3} = -\frac{8}{3} = -2.67\ V$$

$$V_2 = R_2 I = -2 \times \frac{2}{3} = -\frac{4}{3} = -1.33\ V$$

Current flow is COUNTER CLOCKWISE

$$8 + 2.67 - 12 + 1.33 = 8 = 0$$