电子科技大学
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Physics Experiment I

Prelab Report

Experiment Title:	Measurement of resistance by ammeter-voltmeter method
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Date Performed:	2018.5.9
Final Mark:	

Score

Answers to Questions (20 points)

（1）From the diagram，it can be seen that the range is 50mA and the accuracy is 1 which means 30 on the ammeter presents 30mA. Thus, the magnitude of the current is 30mA.

（2）Since the resistance and the voltmeter are in parallel branch, $\mathbf{R}' = \frac{RR_V}{R+R_V}$ **. Thus,** $\mathbf{R} = \mathbf{R}'\frac{R+R_V}{R_V} = R'(1+\frac{R'}{R_V})$ **. The true resistance is larger than the apparent resistance, which is caused by the measured current. Because the measured current consists of two parts (one is the current which goes through the voltmeter, the other is the current which goes through the resistance), so the measured current is larger than the true current which goes through the resistance and it is as a denominator in** $\mathbf{R}' = \frac{V}{I}$ **.**

（3）$\mathbf{U} = \mathbf{I}(R_A + \mathbf{R})$ **. So we can get** $\mathbf{R} = \mathbf{R}' - R_A = R'(1-\frac{R_A}{R'})$**. The true resistance is smaller than the apparent resistance, which is caused by the measured voltage. Because the measured current consists of two parts (one is the voltage on the ammeter, the other is the voltage on the resistance), so the measured voltage is larger than the true voltage on the resistance and it is as a numerator in** $\mathbf{R}' = \frac{V}{I}$ **.**

（4）**R** $= \frac{V}{I} = \frac{1.002V}{23.1mA} = 43.377\Omega$ **, and the uncertainty is** $\sigma_R = R\sqrt{(\frac{\sigma_U}{U})^2 + (\frac{\sigma_I}{I})^2} = 0.287\Omega$**. Thus, the final measurement result for R is** $43.337\Omega \pm 0.287\Omega$ **.**