

Non-Ideal Meters

IB PHYSICS | ELECTRICITY

The Observer Effect

When taking any scientific measurement, there is always the possibility that the act of taking the measurement will change what is being measured

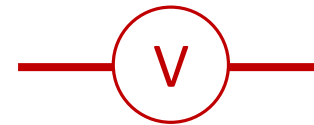


The Observer Effect

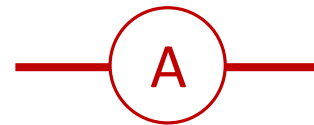
When we measure **voltage** or **current** in a circuit, we want to make sure to minimize an effect that our tool has on the circuit so that we get the most accurate results



Voltmeter

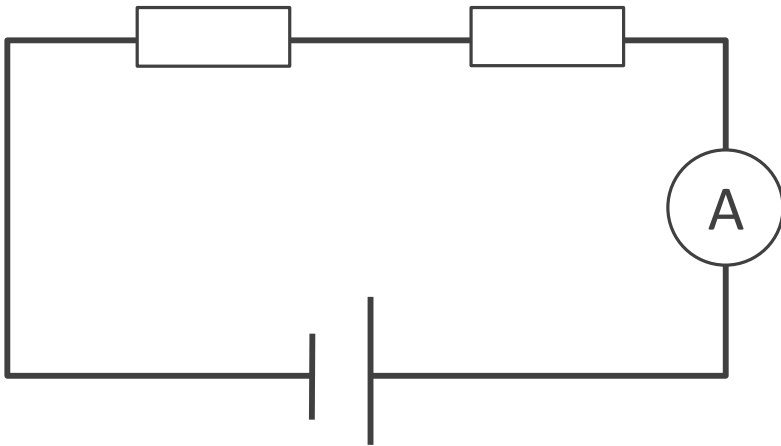


Ammeter



Ammeter

Hooked up in series with the component being measured

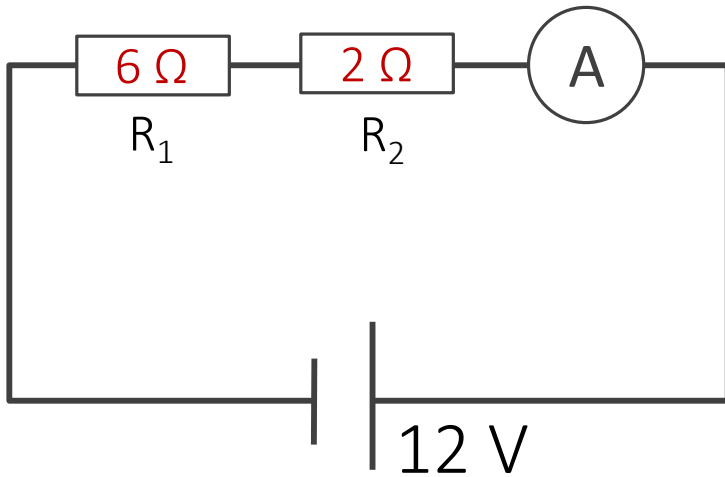


Ideal Ammeter:

$$[R =]$$

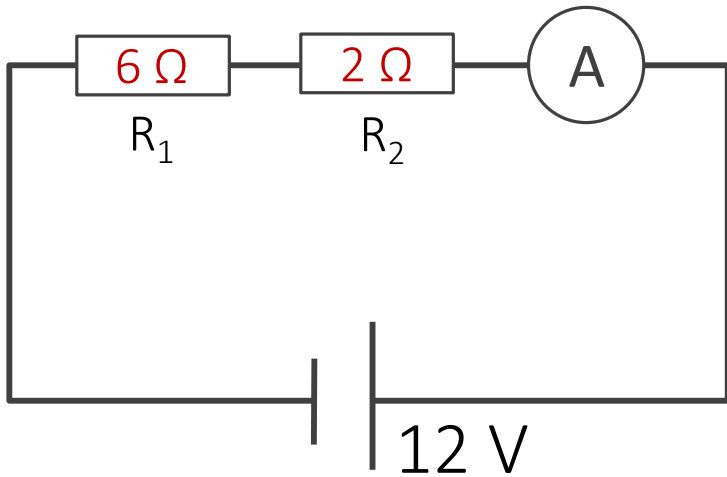
Measuring the Current

What is the reading for the current flowing through this ideal ammeter?



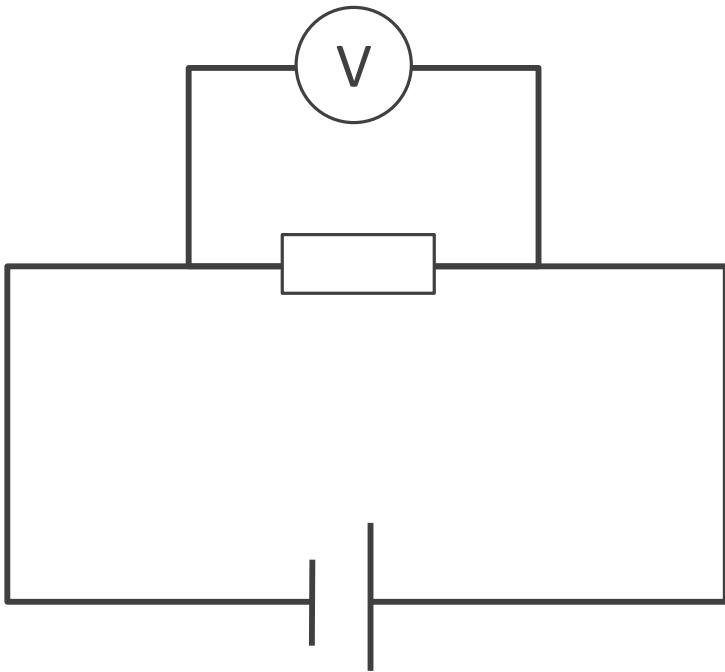
What if Ammeter isn't ideal?

What is the reading for the current flowing through this $2\ \Omega$ ammeter?



Voltmeter

Hooked up in parallel with the component being measured

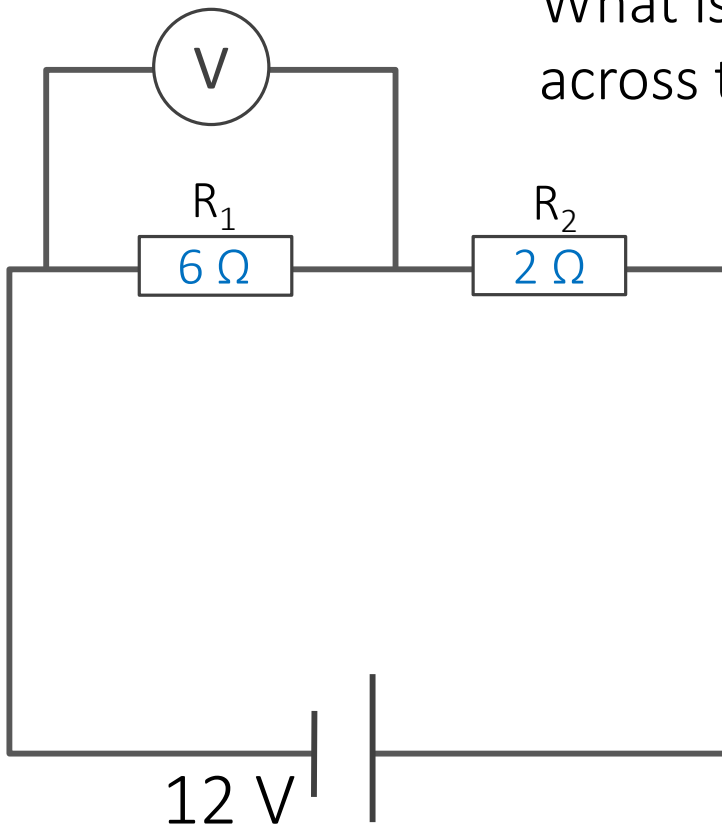


Ideal Voltmeter:

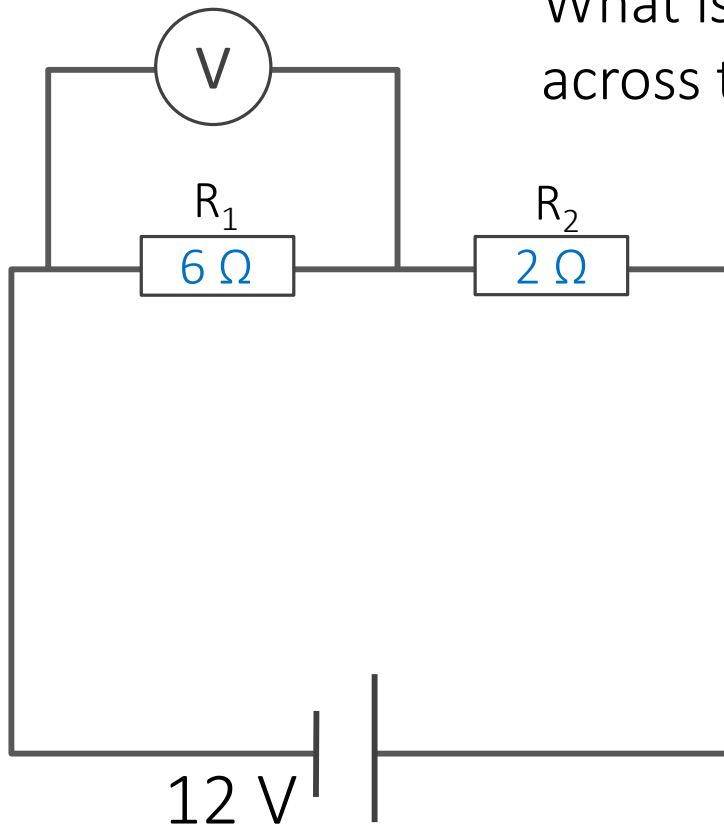
$$[R = \quad]$$

Measuring the Voltage

What is the reading for the ideal voltmeter across the resistor R_1 ?



Measuring the Voltage



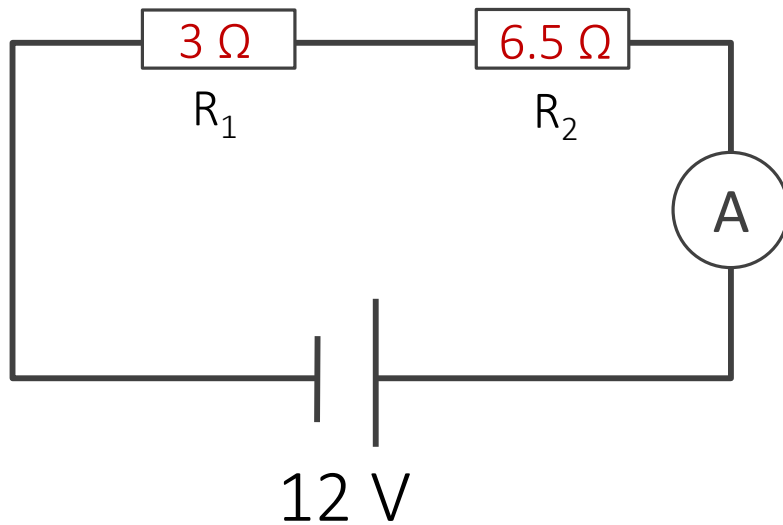
What is the reading for the 12 Ω voltmeter across the resistor R_1 ?

Try This

Calculate the resistance of this non-ideal meter:

Ammeter
Reading

1.2 A

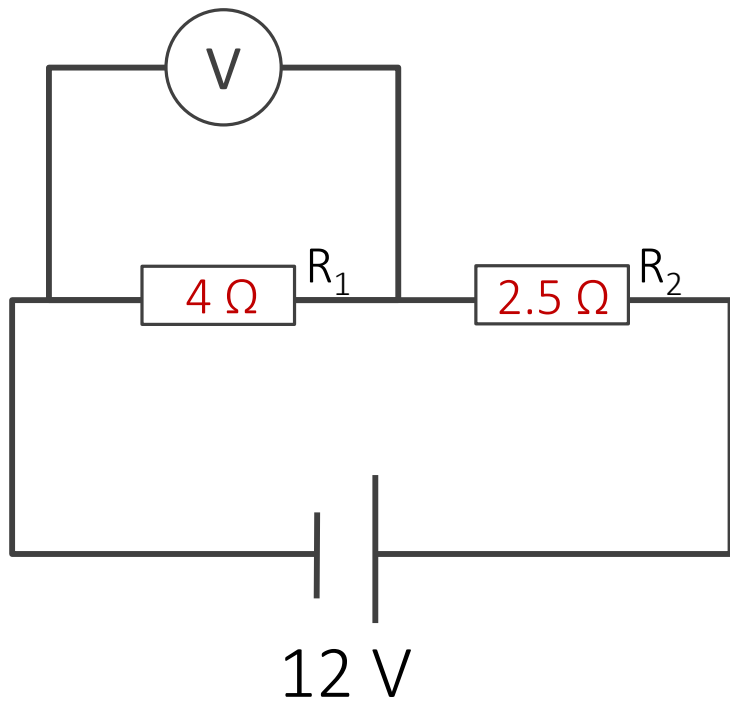


Try This

Calculate the resistance of this non-ideal meter:

Voltmeter
Reading

7 V



Lesson Takeaways

- ☐ I can connect a meter to measure current or voltage
- ☐ I can describe the conditions required for an ideal ammeter or voltmeter
- ☐ I can calculate for a situation when the meter isn't ideal