

# EN-3212 Electronics

## Complex Impedance

We will talk about the impedance of elements in an AC circuit as being LIKE resistance in a DC circuit. In some ways, that is a reasonable thing to do. In others it is complete nonsense. At this point, I hope you trust that when I tell you these half-truths it's only to help you reach a complete and more useful conceptual picture of what is going on.

With that in mind, I do want you to think of impedance as being like resistance for this portion of the course. We'll clear up some of the issues with that picture later.

### 1. Resistors:

- a. Draw the schematic symbol for a resistor.
- b. Write an equation relating the resistance of a resistor to its impedance.

### 2. Capacitors:

- a. Draw the schematic symbol for a capacitor.
- b. Write the equation for the capacitive reactance of a capacitor.
- c. Write the equation for the impedance of the capacitor.

### 3. Inductors:

- a. Draw the schematic symbol for an inductor.
- b. Write the equation for the inductive reactance of an inductor.
- c. Write the equation for the impedance of an inductor.

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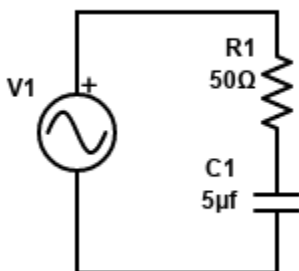
Answer the following questions given that you are using a 1kHz voltage source.

4. What is the impedance of a  $470\Omega$  resistor?

5. What is the impedance of a  $500\mu\text{f}$  capacitor?

6. What is the impedance of a  $20\text{mH}$  inductor?

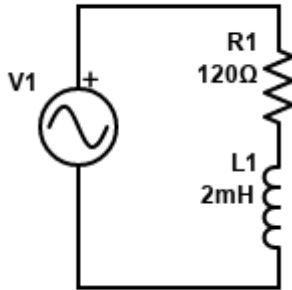
7. Given a  $1200\text{ Hz}$  source, find the total impedance of the circuit shown below.



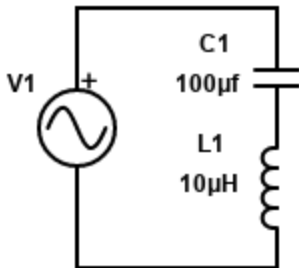
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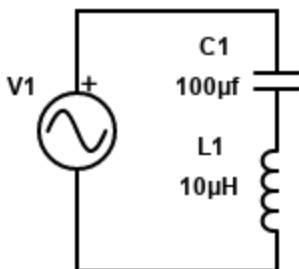
8. Given a 4.1 kHz source, find the total impedance of the circuit shown below.



9. Given a 100 Hz source, find the total impedance of the circuit shown below.



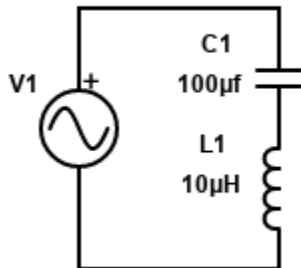
10. Given a 10 kHz source, find the total impedance of the circuit shown below.



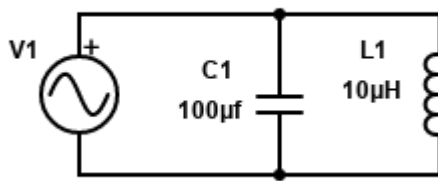
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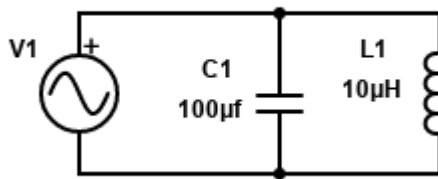
11. Given a 5 kHz source, find the total impedance of the circuit shown below.



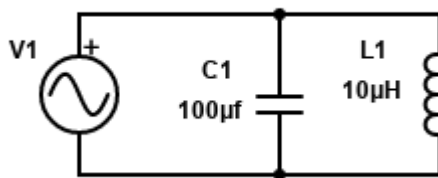
12. Given a 100 Hz source, find the total impedance of the circuit shown below.



13. Given a 10 kHz source, find the total impedance of the circuit shown below.



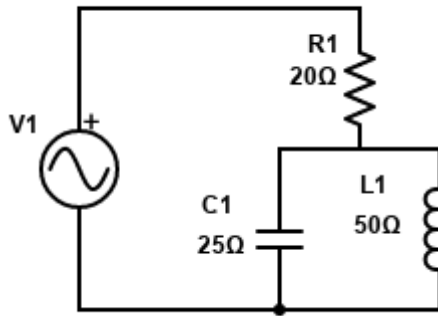
14. Given a 5 kHz source, find the total impedance of the circuit shown below.



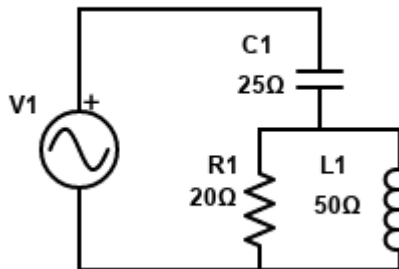
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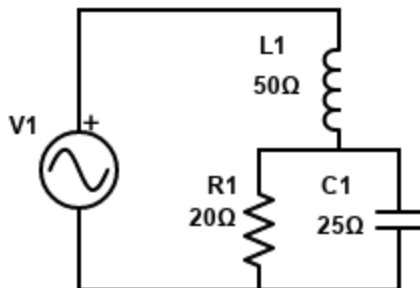
15. Find the total impedance of the circuit shown below.



16. Find the total impedance of the circuit shown below.



17. Find the total impedance of the circuit shown below.



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18. Find the total impedance of the circuit shown below.

