

Static Class Members

<https://csci-1301.github.io/about#authors>

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Contents

1	A Class for Chemical Elements	1
1.1	Reading	1
1.2	Modifying	1
1.3	Enhancing	2

1 A Class for Chemical Elements

In this lab you will study and modify a class for chemical elements¹. Consult https://en.wikipedia.org/wiki/List_of_chemical_elements#List for a complete list of all elements.

1.1 Reading

Download ChemElemProject² and extract the project. Open it in in your IDE, compile and execute it. Now read the code in “ChemElem.cs” and “Program.cs”.

The class definition “ChemElem.cs” contains:

- Three attributes,
- One constructor,
- One static method,
- One method that returns the melting point in Celsius,
- One `ToString` method.

The application program “Program.cs” performs one simple conversion from Kelvin to Celsius. It uses data given by the user to create and display a ChemElem object (implicitly calling the `ToString` method).

1.2 Modifying

Do the following:

1. In “ChemElem.cs”, write getters and setters for all attributes
2. In “ChemElem.cs”, write a constructor that requires no arguments.
3. In “Program.cs”, create a second object using the custom constructor that takes 3 arguments, then display the value of its attributes using the getters you previously defined.

¹https://en.wikipedia.org/wiki/Chemical_element

²ChemicalElements.zip

4. In “Program.cs”, create an object using the no-args constructor, and set its values using the setters your previously defined.
5. In “Program.cs”, display on the screen the string returned by the `ToString` method when it is called by the object you created in the previous step.
6. In “Program.cs”, try calling the `FromKelvinToCelsius` method with one of your objects, for instance using `hydrogen.FromKelvinToCelsius(34)`. What happens?
7. Still in “Program.cs”, try calling the `MeltingInCelsius` method with the class, for instance using `ChemElem.MeltingInCelsius()`. What happens?

1.3 Enhancing

We now want to significantly improve this class, by adding:

1. An attribute for the boiling point,
2. All the tools needed to display the information in Fahrenheit degrees, in addition to Celsius and Kelvin.

You may want to comment out part or all of your “Program.cs” file, before starting to change your class.

- Add an attribute for the boiling point (in Kelvin).
- Modify the constructor, so that it takes a 4th argument, and sets its value to be the value of the boiling point attribute.
- Create a *static* `FromKelvinToFahrenheit` method, taking inspiration from the `FromKelvinToCelsius` method.
- Create a `MeltingInFahrenheit` method, that returns the melting point in Fahrenheit of the calling object. This method should use your `FromKelvinToFahrenheit` method.
- Create a `BoilingInFahrenheit` method, that return the boiling point in Fahrenheit of the calling object. This method should use your `FromKelvinToFahrenheit` method.
- Modify the `ToString` method, so that the string returned includes
 - The name of the chemical element and its atomic number,
 - The *melting point* in Kelvin and in Fahrenheit,
 - The *boiling point* in Kelvin and in Fahrenheit.

You should test all of those modifications in your “Program.cs” file as you implement them. Use relevant data, test your program, and make sure the behavior is the expected behavior.