3.1

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1 Specification

Write a program that reads a temperature value and the letter C for Celsius or F for Fahrenheit. Print whether water is liquid, solid, or gaseous at the given temperature at sea level.

2 Analysis/Design

obtain user input for temperature in celsius or farenheit
below 0 degrees Celsius or 32 degrees Fahrenheit, water changes into a solid
above 100 degrees Celsius or 212 degrees Fahrenheit, water changes its a gas
print state of water at input temperature to screen

- Get temperature from user at celsius or farenheit
- Determine physical state of water at given temperature
- Display result

3 Implementation

⟨ *get input* 1 ⟩ ≡

```
cout << "Enter temperature and scale of the water: ";
cin >> degrees >> scale;
```

◇

Fragment referenced in 2d.

⟨ *convert* 2a ⟩ ≡

```
        degrees_celsius = degrees;
        if( scale == 'F' ) degrees = 5.0/9.0 * (degrees-32); cout << degrees << endl;
```

◇

Fragment referenced in 2d.

Assume we are using only celcius. If $0 degrees$, water is solid; If $degreesis > 100$, water is gaseous; otherwise it is liquid. Store the information in a variable named *state*.

⟨ *decide state* 2b ⟩ ≡

```
        if( degrees <= 0) state = "solid";
        else if( degrees >= 100 ) state = "gas";
        else state = "liquid";
```

◇

Fragment referenced in 2d.

⟨ *display result* 2c ⟩ ≡

```
        cout << "At " << degrees_celsius << 'C' << ", water is " << state << endl;
```

◇

Fragment referenced in 2d.

"p3_1.cpp" 2d≡

⟨ *Include* 3a ⟩

⟨ *Constants* 3b ⟩

```
int main()
{
        double degrees, degrees_celsius;
        char scale;
        string state;
        ⟨ get input 1 ⟩
        ⟨ convert 2a ⟩
        ⟨ decide state 2b ⟩
        ⟨ display result 2c ⟩

}
```

◇

These are the include files needed for library function calls

⟨ *Include* 3a ⟩ ≡

```
#include <iostream>
using namespace std;
```

◇

Fragment referenced in 2d.

These are the values that will not change during program execution

⟨ *Constants* 3b ⟩ ≡

◇

Fragment referenced in 2d.

4 Test

If specified temperature is between $0Cand100C*$ or $32For212F$ then water is in liquid phase. Temperatures below that result in water being in a solid phase, and above that it will be in a gaseous phase.