Object-Oriented Programming in C++

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PHYS3072 Assignment 1

Semester 2 2023-24

Assignment 1

The Bohr Atom

- The Bohr model allows the photon energies of electron transition to be calculated as :

$$E_{ij} = 13.6Z^2\left[\frac{1}{n_j^2} - \frac{1}{n_i^2}\right]\text{eV},$$

where Z is the atomic number, n_i and n_j are the principal quantum numbers (integers) for the initial and final energy states of the electron, respectively. Write a C++ program to calculate the energy for a transition. It should

- Ask the user to enter the atomic number, and initial and final quantum numbers, and then ask the user whether to print out the energy of the transition in J or eV
- Make use of C++-specific features described in the prelecture and lecture.
- The code should ask whether to repeat (“y/n”), and stop if the answer is “n”.
- Check at each stage for incorrect inputs (either in format or violating some physical conditions).

Deadline: Friday 9th February 2024, 19.00.

Assignment 1

- Some more information for you to test your code
  - It also shows the response expected from your code
  - The error message should reflect your code.

```
1 2 1 J                                    number on output in J

y                                          repeat

1 1 2                                      error n_in<n_fin

3 5 1 e                                    number on output in eV

n                                          stop
```

Instructions

- You may use the skeleton code provided on the webpage, but you are encouraged to write the program from scratch.
- You will need to compile and run your program on lab computers.

Marking Criteria

Marks will be awarded for a program that:

- Compiles and runs successfully with requested input and output (1.25 mark).
- Makes use of at least two C++-specific features not in skeleton code (1.25 mark).
- Checks (and corrects) for bad input and formats precision of output (1.25 mark).
- Contains a separate function to return the energy of level (0.625 mark).
- The submission includes a screenshot of the code with the debugger running and a breakpoint set (0.625 marks).

You will loose marks:

- For not following the house style (-0.5 mark).
- Not submitting .cpp file(s) and .h files if used (-1 mark).
- A further penalty for late submission (after 7 pm on 9th February 2024).

Rubric

Grid View | List View

	Not at all	Partially	Completely
Programme compliles and runs	**0** (0.00%)	**0.625** (12.50%)	**1.25** (25.00%)
Makes use of 2 C++ specific features not in skeleton code	**0** (0.00%)	**0.625** (12.50%) Only 1	**1.25** (25.00%) Two
Tests for and recovers from bad input	**0** (0.00%)	**0.625** (12.50%) Reasonable job, with some omissions	**1.25** (25.00%) Completeky
Separate funtion to return energy	**0** (0.00%)	**0.3125** (6.25%) An attempt, but some mistakes.	**0.625** (12.50%)
Uses house style appropriately	**-0.5** (-10.00%)	**-0.25** (-5.00%) Tried, but missed a few important points	**0** (0.00%) Adheres to the spirit in good detail--at this stage some small mistakes are allowed.
Able to demonstrate debugging by attached image	**0** (0.00%)	**0.3125** (6.25%)	**0.625** (12.50%)

Assignment Submission

- Your code must be your own (although you are free to discuss issues with the demonstrators) - plagiarism will not be tolerated and will be checked for.
- Your code must run successfully in the PC Lab using Visual Studio Code and g++ 11 compiler by the deadline for each assignment. You are responsible for this, and if the code doesn't compile with this setup you will be marked down.
- Your code must be uploaded through Blackboard.
- **You can submit multiple times, last submission will be marked.**

Feedback

- Marks and feedback will be released 5 working days after the submission deadline.
  - If anything is unclear, please talk to us in the lab.