

PRP Lab Test Session 1 — 12th November, 2013

Do not log in using your usual username and password. Instead, use the username **examuser1** and password **LU75kgLc** and log in to **the local machine**.

This test counts for 15% of your total mark for the module. Time allowed is 1 hour. Answer as many questions as you can.

Please read and follow these instructions carefully: failure to do so could result in loss of your submission. Create a directory whose name is your firstname and surname (eg Derek.Long). Put your java source files in this directory. You may create and work in this directory at the start, or create it for submission. You can include class files in the directory, but only java source files are *required*. Once you are ready to submit, zip up the entire directory and submit it through Keats, at the lab test assignment.

1. Write a program that prints *all* 2-digit numbers whose digits sum to an odd number. Recall that $a \% b$ is an expression that gives the remainder when a is divided by b .

[20 marks]

2. The lowest common multiple of two integers, a and b , is the smallest integer that is a multiple of both a and b . For example, 18 is the lowest common multiple of 6 and 9. Write a program that finds the lowest common multiple of two integers entered by the user. Note that the lowest common multiple of a and b is always less than or equal to $a \times b$.

[30 marks]

3. An *ionic compound* is a chemical compound made up of two elements: a metal, such as aluminium, and a non-metal, such as oxygen. It is named by the metal followed by the non-metal element root with its end replaced by 'ide'. For example, aluminium oxide ('oxygen' has its ending replaced with 'ide' to form 'oxide').

- (a) Create a class `Element` that records the name of the element as a `String` and has a public method, `toString` that returns the `String` name. Define a constructor for the class (that should receive a `String` to initialise the name).

[10 marks]

- (b) Create a method in the class, `boolean isMetal()`, that returns true if the element is one of the following metals: iron, aluminium, sodium or zinc (this is not an exhaustive list, of course, but it is all that is required for this question).

[10 marks]

- (c) Create a method in the class, `boolean isNonMetal()`, that returns true if the element is one of the following non-metals: oxygen, nitrogen, chlorine or bromine.

[5 marks]

- (d) Now create a class `IonicCompound` that contains two elements (provided to the constructor) and has a method `boolean isValid()` that returns true if the first element is a metal and the second is a non-metal.

[10 marks]

- (e) Finally, write a method `String toString()` for `IonicCompound` that returns the name of the compound. You might find it helpful to create a method in `Element` that returns the modified name for a non-metal (ie 'oxide' for oxygen, 'nitride' for nitrogen, 'chloride' for chlorine, and 'bromide' for bromine).

[10 marks]

4. Now write a simple program that illustrates the use of your classes by prompting the user for the names of two elements, which it attempts to use to build an ionic compound and prints the name of that compound.

[5 marks]