**Element/ArrayList Free Response**

Imagine you have an ArrayList of Element objects called *table*. Write the following methods based on that ArrayList. I’ll remind you of the Element class data fields:

|  |  |  |  |
| --- | --- | --- | --- |
| **Data Field Name** | **Type** | **Purpose** | **Default Value** |
| name | String | Name of the element | "Hydrogen" |
| natural | boolean | whether it occurs naturally (true) or is manmade (false) | true |
| valence | int | number of valence electrons in its outer shell | +1 |
| symbol | String | element symbol (from periodic table) | "H" |

There are getters and setters created for each of these private data fields: *getName*, *setName*, *isNatural*, *setNatural*, *getValence*, *setValence*, *getSymbol* and *setSymbol*. There is an additional method provided called *canCombine* and a slight tweak to the combine method mentioned in the original Element class design.

//This method receives an Element object and returns true/false based on whether it can be combined with the Element object that is calling the method. You do NOT need to implement this method, just use it where you feel necessary in your free responses.

***public boolean canCombine(Element e){***

 //not implemented

}

//This method will attempt to combine a received Element object with the Element instance calling the method. If it can combine it, it will return as a String, the resulting molecule. If it cannot, it will return an empty String ( “” ).

**public String combine(Element e){**

 //not implemented

}

**Free Reponse # 1 – removeDuplicates**

This method will receive an ArrayList of Element objects. It will remove all duplicate Element objects. You do not need to return the ArrayList since changes made to it in the method will change it outside the method (like with arrays). This method should be written as if it was created in the ElementRunner class, not the Element class.

**Free Response # 2 – findCombinables**

This method will be written from within the Element class. It will receive an ArrayList of Element objects. From this ArrayList, it will build a new ArrayList (of type Element), containing those Elements that are combinable with the Element object that calls the method. This new ArrayList should be returned from the method.

**Free Response # 3 – makeManMade**

This method will receive an ArrayList of Element objects. It will change all Element objects that end “ium” to be man made (not natural). You do not need to return the ArrayList since changes made to it in the method will change it outside the method. This method should be written as if it was created in the ElementRunner class, not the Element class.

**Free Response # 4 – addHydrogen**

This method will receive an ArrayList of Element objects. For each Element object in the ArrayList that can be combined with Hydrogen, you will combine then and add the resulting molecule (as a String) in a new ArrayList of type String. You will return the String ArrayList. This method should be written as if it was created in the ElementRunner class, not the Element class.