Spreadsheet Lab for Physics – Part I

Creating, Saving and Organizing Spreadsheets

Name _____

Purpose: Learn how to create and save an Excel Spreadsheet. Learn how to organize an Excel spreadsheet. Learn how to format cells in Excel. Learn how to create simple formulas in Excel. Learn the basics of absolute and relative addressing in Excel. Learn how to copy and paste formulas in Excel. Create a spreadsheet to calculate a column of results from a column of data and a table of given values and constants.

Equipment: A computer with MS Excel installed on it.

Introduction: When you first start Excel, it comes up with a blank spreadsheet in which you are immediately ready to create a working spreadsheet of your own. A copy of the starting spreadsheet has been loaded into your Home Directory. It is called

Lab-00-ExcelLab I (Creating, Saving and Organizing Spreadsheets).xls

You will open it to begin your computer lab session.

A spreadsheet program can save and retrieve any number of personal spreadsheets. Such spreadsheets are also known as worksheets. A spreadsheet or worksheet is a grid of cells into which you may put words, numbers, or formulas. Cells may be formatted with color, bold or italic, a variety of fonts, various numeric formats and font sizes, and in many other ways to enhance readability. A numeric value saved or calculated in a cell retains its high precision no matter what formatting is applied to the appearance of the number in that cell.

There are many built-in functions, in addition to the four familiar arithmetic functions. These can be used to perform such tasks as statistical analyses, database functions, advanced mathematical operations, such as exponentiation (10^x and e^x), logarithms, log and ln, trigonometric function, sin, cos and tan, and for creating graphs, among other things.

We are not going to learn about all of these features at once. In this computer lab you are going to uncover only a basic introduction. Each student must personally and individually complete all the steps in this lab. We are going to concentrate on formatting the spreadsheet for easy readability, introduce simple arithmetic formulas, and learn how to copy them.

This lab should be completed in one class period. If you cannot complete it in class, you will have to compete it on your own. It is essential that you read and follow instructions fully.

The spreadsheet will be organized into three sections: The heading and user area, the starting data section, and the calculations table. This general plan will work well in many different situations.

Outline of the Assignment:

Imagine that we are observing a vehicle moving at constant velocity. As part of your assignment you need to know the position of the cart at various times after a certain starting time. Here is how you might construct a table in a spreadsheet to give you that information. This is a simple task. In this introduction there may seem to be a lot of steps, but once you get used to using a spreadsheet these will come more or less automatically and this process will take only minutes. The advantages of using a spreadsheet are its speed and accuracy.

Creating the Spreadsheet: *See the example at the end of the lab handout for additional guidance.*

Follow these instructions carefully. Complete all steps. Complete each step before going on to the next step.

a) Double-click the Excel icon in your physics folder. A basic blank spreadsheet should appear. First try a few basic moves. Click on a cell with the mouse pointer. Note that a dark box appears around that cell. To make an entry in a cell simply click and start typing. When you enter formulas, begin each formula with an equal (=) sign. To edit click the cell then click the edit box. Type your changes there. Hit the enter key to stop editing the cell.
b) Note that each cell has an address consisting of a column-letter and a row-number. These look like C1, B11 and D177, for example. Use the file open feature to find the spreadsheet that has been uploaded to your home directory. It is titled

Lab-00-ExcelLab I (Creating, Saving and Organizing Spreadsheets).xls

This spreadsheet has the beginnings of the spreadsheet you will create.

c) From the main menu select **File**, **Save-as**. The first thing you should do is pick a new name for the file. Here is the name you must use:

Lab-00-Excel Lab I-P*x-username*

For "x" enter your class period. For "username" enter your TVS username. Use the File SaveAs menu option to save this file under its new name in the personal directory, H:\..

The other thing you have to do before saving is make sure your spreadsheet will be stored in you're **My Documents** folder. Find the little folder icon with the up-arrow in the first line of the dialogue box. Click on it until the **My Computer** identifier appears in the **Save in:** line. Then double click on the H: drive. That is you're personal H:\ drive. no one else's files will be stored here. Then click the save button in the lower right-hand corner. From now on, using **File Save**, or using the diskette icon on the tool bar, will automatically save the file in the same location with the same name without forcing you to go through all these steps.

d) Most of the formatting has been done for you in the spreadsheet template file uploaded to your home directory. Now you need to fill in some important key parameters.

For the time increment type 0.01 in cell B9.

For the initial velocity enter the following formula into cell B8 **=F5+F7+F8**

This is the sum of your physics period plus your birth month plus your birth day. Make sure the correct sum is displayed.

For the Mass enter this formula into cell B6 **=F9/(F7+F8)**

This is your birth year divided by the sum of your birth month and birth date. Make sure the correct result is displayed.

Save the spreadsheet again. Save it often from now on.

e) Before we start on the results table we need to make one quick check. Click on **File** menu, then **Print-Preview**, and then close it. Then save the spreadsheet again. The print preview will place dashed lines horizontally and vertically on the spreadsheet to show where the edges of the printed pages are located. Adjust your column widths now, if necessary, to make sure that columns A thru G all fit in one page width.

The results table will begin on row 11 and end at the bottom of the first page, about line 49 or 50, depending on the printer and other factors. The column labels have been added to row 11 for you. The labels beginning at cell A11 are: **Time**, **Position**, **Velocity**, **Momentum**, **Kinetic Energy**, **Potential Energy** and **Total Energy**.

Save your spreadsheet again.

f) In the first row or two of any table you need to set up the initial conditions from which the rest of the results in the table can be calculated. Sometimes the first cell in a column can be specified with a specific number. Other times it can be calculated from other data already available in the spreadsheet. In this case we will assume that out measurement conditions allow us to set the initial time to zero. Depending on how we measure time and position, in other circumstances non-zero numbers would be more appropriate.

Enter zero in the top cell of the time column in the table.

The second cell in the time column will be calculated as the time above it plus the time increment specified in the top section of the spreadsheet. That is, you should begin by entering the following formula in cell A13.

=A12+B9

Addresses like A12 are what we call relative addresses. If we copy this formula to other parts of the spreadsheet, the new copy of the formula will always refer to the cell right above it. That will work fine for us here because when we want to copy this formula down the column we want each new copy of the formula to refer to the time just above it and add the time increment to the time above.

On the other hand, the time increment is available only from cell B9. We need to find a way to guarantee that new copies of the formula look only to that specific cell (that absolute address) for the time increment. We need to specify what is known as an absolute address for the B9 part of the formula. In Excel formulas the dollar sign ($) is used to turn relative addresses into absolute addresses. The absolute column and absolute row must both be specified, so in this case we need to edit the formula and add two dollar signs as follows:

=A12+$B$9

With this modification in place, we can copy the formula down the column and the new copies will all refer to cell B9 to find the time increment value.

Using a mixture of relative and absolute addresses we can also calculate the new position at each time. In the top cell of the position column of the table add the following formula:

=$B$8*A12

This is the familiar "distance equals rate times time" formula. The distance, or displacement, is displayed. The initial velocity at time zero is in cell B8 and the time is in the cell to the left, namely A12. Save your spreadsheet.

Why is cell address B8 written as an absolute address, $B$8, in the last formula?

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g) The formulas in A13 and B12 contain not only the correct results but they also contain formulas that we have designed for correct copying down a column in a table yielding correct answers for later times and positions. Highlight cells A13 thru A49. The highlight continues down to the bottom of the page. Use the **Edit, Fill, Down** feature from the main menu to copy the top row of the highlighted region into all the highlighted lines below. Repeat for B12 thru B49. Save your spreadsheet again. Always spot-check copied formulas to make sure they are working.

h) Before printing the spreadsheet, we need to make an adjustment to the default printing options. By default Excel does not print the row and column addresses. In this course you will be graded in part on how carefully and clearly you create your spreadsheet in compliance with the laboratory instructions. So, in this course you will generally need to print out your spreadsheets with the row numbers and column letters showing.

Use the **Tools, Options, View** tab, starting from the main menu. Click on the box labeled **Gridlines** and on the box labeled **Row & column headers**. Make sure that check marks appear in both boxes. Save your spreadsheet again.

Again, check all the column widths for columns A thru G, again. Make sure that all the labels and numbers show clearly and that all columns will be printed on one page. After making any additional column width adjustments, save your spreadsheet again. Now print the spreadsheet to make sure that it prints correctly.

Carefully read over your printout and compare locations and formatting with the instructions in this lab handout. Make any necessary changes. After any changes are made save and print the spreadsheet again. Do this as many times as it takes to get all the details right. Save your spreadsheet and print a final completely correct copy to turn in.

i) After all that, you're ready to turn in your printout of the file for grading.

Save this handout for future reference. All you need to hand in is the printout of your spreadsheet. Keep the handout for reference when we complete this table with added calculations.

Make sure you don't accidentally delete the worksheet from you're H:\ folder. As you may have noticed, we are not finished working with this spreadsheet, yet. We will be using it again.

Due Date: _____