Letters

Communicating Chemical and Mathematical Equations in Email

To communicate technical materials, especially complex mathematical formulas and chemical equations such as

$$CO(g) + 2H_2(g) \rightarrow CH_3OH(l) \qquad \Delta H = -128.3\ kJ \tag{1}$$

$$CH_4(g) + H_2O(g) \rightarrow CO(g) + 3H_2(g) \qquad \Delta H = +206\ kJ \tag{2}$$

using email,[1] you can acquire MathCast from *http://mathcast.sourceforge.net/home.html,* that is, download it to your PC and install it somewhere. Then, you need to learn how to use it. The `Help` is rudimentary, and the Help File's extension conflicts with ChemDraw, so there are some problems with it,[2] but I will give some help in this document that may be of value. In any case, once you have gotten an equation into MathCast, you need to export it.[3] Under Menu `Equation` → `Export Equation`, you can export the chosen equation to the desktop in png format that, when opened with Microsoft Photo Editor, will result in a picture version of your equation, which can be cut or copied and then pasted into your email message at the appropriate place. When you execute the paste, Microsoft Outlook asks if you want to change format to HTML, and if you answer yes, the actual picture of the equation is copied into your message at the appropriate place and can be viewed and printed by others provided they are using modern software.

As a mini-tutorial to use this scheme, consider writing a simple chemical equation of the form:

$$A(g) + 2B(s) \rightarrow 3D(l) \tag{3}$$

The big + sign (on the left side of the MathCast screen) adds an empty equation line to your current list. Then on the input line at the bottom, you type what you need using the special symbols as required by the science and included in the various menus (Figure 1). Click `OK` when done.[4] In our case, we need script l (ℓ) that is under the `Math` → `special letters` menu. `Math` → `arrows` supplies the requisite chemical reaction arrow usually employed. To create subscripts, you need the special symbol, third from the left at the bottom of the MathCast screen, (I cannot type it here, but it is a quarter circle. The "^" is the superscript operator that makes the next character a superscript. The broken vertical line symbol, fifth from the left, is the composite, comma separated super–sub script symbol. See Figure 2). More complicated mathematics may be harder to compose, specifically vectors and matrices, but not so much as to be daunting. For example, the equation can be composed using the vector scheme of MathCast (Figure 3).

Finally, to illustrate multiline equations we have equations 1 and 2, where the comma separator is required to sepa-

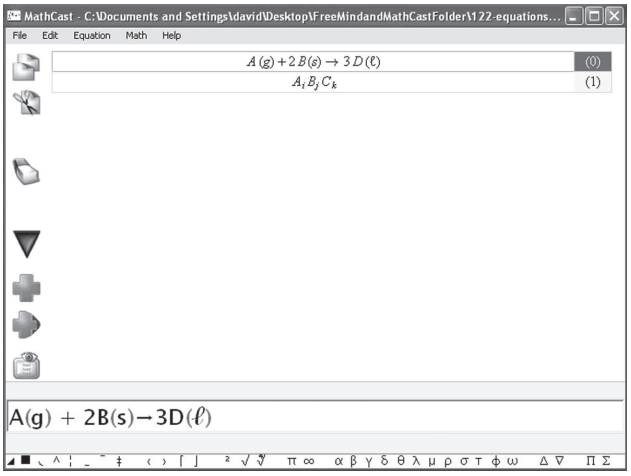

Figure 1. Screen showing eq 3.

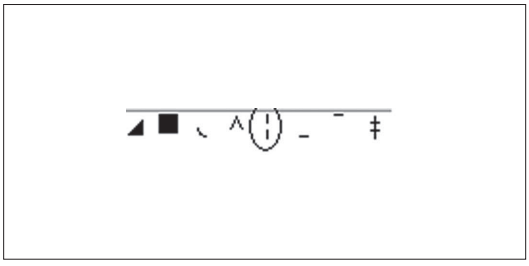

Figure 2. First portion of the symbol line at the bottom of the screen page. The composite symbol is circled.

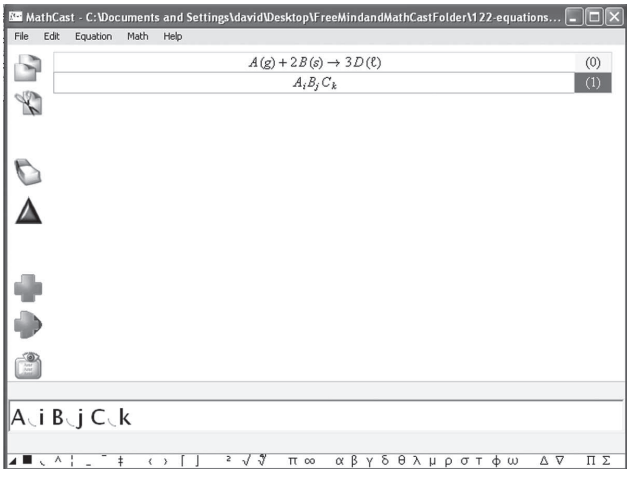

Figure 3. Screen showing subscript creation.

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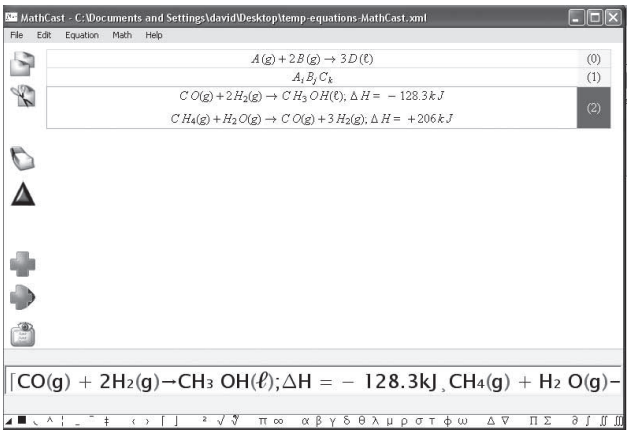

Figure 4. Screen showing eqs 1 and 2 and the vector scheme for grouping items.

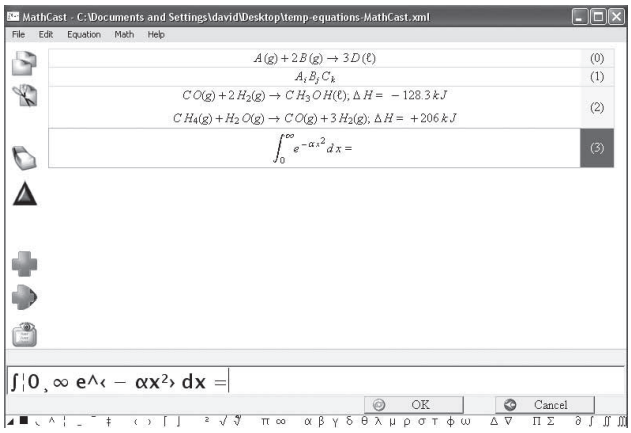

Figure 5. Screen showing integral equation. Note the use of commas.

rate the two lines (Figure 4). Also note that commas are required also in setting upper and lower bounds to integrals, that is, see equation in Figure 5.

And that is the way it is written.[5] Have fun.

Notes

1. We have also used this method to insert equations in a Maple document's text, as well as using the method in standard word processing applications.

2. A font file must be downloaded and installed from an additional site to make this program work, which requires some extra care. One may have to close the application, perform the download, and then reopen the application.

3. Actually, we have been able to just cut and paste the MathCast equation directly into Word and email documents (Outlook) successfully, as well as into Maple. All of this has been done without exporting anything.

4. The screen captures have excluded the OK button to conserve space. It only appears when the cursor is in the editing box.

5. You can use "Math/markup/text" to turn off (and turn back on) the italics.

Note Added in Proof

In the time between writing the above and seeing it being typeset, I have learned of other schemes that accomplish the same (and more) and therefore request the readers' patience in drawing attention to alternate schemes for incorporating equations (and drawings) into emails (and documents in general).

(1) TeXaide (*http://www.dessci.com/en/products/texaide/*) is a free Windows-based LaTeX equation creator that allows the same point-and-click creation of equations that Microsoft Word employs. Rather than export the results to Word, one can screen capture the typeset equation from TeXaide (or Word) using Cropper.

(2) Cropper (*http://www.snapfiles.com/get/Cropper.html*) "grabs" a selected part of the computer's screen (the equation itself) and puts it into the Clipboard, waiting for an appropriate paste. Similar equation editors and screen grabbers are available in the Mac community (MAC OSX grab) and the Linux community (xwd followed by ImageMagick). I have no direct experience with these latter two schemes.

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