THE USE OF INTEGRATION IN THE TEACHING OF HIGHER MATHEMATICS IN THE FIELD OF CHEMISTRY

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ANNOTATIONS:

One of the leading methods of teaching mathematics is the method of mathematical modeling. The use of the modeling method allows us to show the versatility of the mathematical apparatus, it makes it possible to unify the description of processes that are diverse in nature. The use of concepts related to modeling, directly in the process of teaching mathematics, allows you to improve the methodology of teaching it, avoid a formal approach to teaching, and implement integration ties. Students develop ideas about the role of mathematical methods in transformative activities, about the nature of the reflection of the phenomena of the surrounding world by mathematics.

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INTRODUCTION:

It is known that mathematics is related to all areas of society. Therefore, the subject "Higher Mathematics" is included in the curricula of almost all areas of higher education. In solving such problems, it is useful to address the interaction of mathematics with other disciplines.

In particular, for students majoring in Chemistry, each topic can be taught in terms of its relevance to science. What problems can matrices and determinants be used to solve? What are the purposes of using elementary functions? answering such questions with the help of an issue during the lesson will help to make students to attentive to the lesson.

As an example, consider the topic of Function. [2]

Relationships between quantities are referred to as functions which we usually denote f(x), pronounced'f of x'.

In general, we have y is a function of x:

$y = f(x)$

This means that y is equal to an expression 'made up' of x's. For example, $y = x + 11$ or $y = e^{11x}$.

— So a function takes a quantity (a variable or number) and applies operations to it. This producesnew quantity.

— Although we have used the notation f (x) there is no reason why we could not use g(x) or even

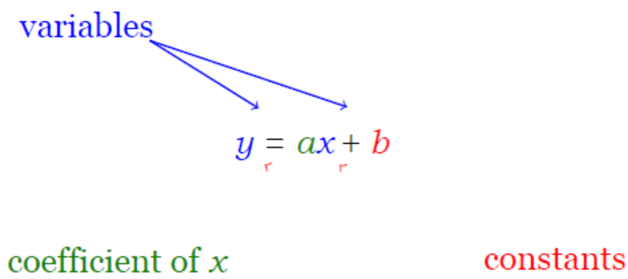
φ(x).

— We can also have f (z) or g(θ) if we have functions 'made up' of variables other than x. For example

$f(z) = z^{-1}$ and $g(\theta) = \sin(\theta)$.

Note: We can often think of f (x) and y as interchangeable.

Physical and chemical quantities are often linked in equations.



— Variables are quantities that can take different values; they can vary.

— Constants are fixed numbers so unlike variables cannot change.

— The coefficient of x is the constant before the x. In the same way for the equation $y = 5t^2 + t$ the coefficient of t^2 is 5 and the coefficient of t is 1.

Chemistry Example1 [3]:

In an experiment, the pressure of a gas is monitored as the temperature is changed, while the volume and amount of gas remain constant and the following relationship was established:

p = 0.034T

1. Identify the variables and coefficients in the equation.
2. What is p a function of?
3. Given that T = 343 what is the value of p?

Solution:

1. In the experiment, p can vary and T can also vary. This means that p and T are both **variables**. The 0.034 is multiplying the T, making it a coefficient. The coefficient of p is 1.
2. In the equation p = 0.0341T the only other variable apart from p is T. Hence p is a function of T and T alone.
3. To find this we will substitute 343 for T into the equation to get, p = 0.0341×343 = 11.662

Chemistry Example 2 [3]**:**

Results from a mass spectrometry experiment show that 2 fragments of a molecule both contain hydrogen and carbon. The empirical formula for the first fragment is C_2H_5 which has a mass of 29 amu and the second has a formula of C_8H_{18} with a mass of 114 amu. Calculate the mass of the carbon and hydrogen atoms.

Solution: First we write the information provided in equations. We shall use the variables C and H to be the mass of the carbon and hydrogen respectively. For the first fragment we can write 2C+5H = 29 and for the second fragment 8C+18H = 114. So we have the simultaneous equations:

2C + 5H = 29 1

8C + 18H = 114 2

To solve these we use substitution. In 1 we make C the subject by first subtracting 5 H from both sides to give:

2 C = 29 − 5 H 3

From here we notice that in 2 there is a 8 C. We can multiply both sides of 3 by 4 to get 8 C = 116 − 20 H which can be substituted into 2 to give:

(116 − 20 H) + 18 H = 114

=⇒ 116 − 2 H = 114

=⇒ 116 − 114 = 2 H

=⇒ 2 = 2 H

=⇒ 1 = H

Now that we have found H, all we need to do is put that value into one of the equations and then we solve for C. Substituted into 1 gives:

2 C + 5 H = 29

=⇒ 2 C + 5 = 29

=⇒ 2 C = 29 − 5

=⇒ 2 C = 24

=⇒ C = 12

We have seen above only the problem of simple linear functions. There are problems in chemistry that require the use of exponential functions.

The Exponential Function[**1**]

So far we have used the word exponential to describe equations in the form $y = a^x$ however the word is usually reserved to describe a special type of function. It is quite likely we will have seen the symbol π before and know it represents the infinite number 3.14159265 . . . In this section we will be working with the number e = 2.7182818 …

Like π, e is another number that goes on forever! When we refer to the exponential function we mean $y = e^x$. This can be seen as a special case of the previous section when the constant is a = e in the equation $y = a^x$. When we refer to e^x we say 'e to the x'.

Note: Another notation for e^x is exp(x). They mean the same thing.

Chemistry Example 3: [3]

The Arrhenius equation below describes the exponential relationship
between the rate of a reaction k and the temperature T

$$\mathbf{k= Aexp}(-\frac{\mathbf{E}}{\mathbf{RT}})$$

where R, E_a and A are all constants. Suppose for a reaction that the activation energy is E_a = 52.0 kJ mol^{-1}, the gas constant R = 8.31 J K^{-1} mol^{-1} and A = 1.00. What is the rate of the reaction k when the temperature T = 241 K?
Solution: We substitute our given values from the question into the Arrhenius equation.

$$\mathbf{k= \ Aexp}\left(-\frac{\mathbf{E}}{\mathbf{RT}}\right) = \mathbf{1} \times \mathbf{exp}(-\frac{\mathbf{52\times10^3}}{\mathbf{8.31\times241}}) \rightarrow \mathbf{k=}$$

exp(-25.9648…) → k= 5.2920… × 10^{-12} → k= 5.29×10^{-12}

Remember we can use the e button on our calculator to find the final answer
Incorporating topics like these in the classroom will help students become more effective in learning the subject

REFERENCES:

1) "Math for Chemists".Martin Cockett,Graham Doggett
2) "Principles of Mathematical Analysis". Walter Rudin. http:// fulviofrisone. com/ attachments/article/453/Principles%20Of %20Mathematical%20Analysis%20- %20W.Rudin.pdf
3) "Maths for Chemists". Allan Cunningham, Rory Whelan