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# **Chemical Formula Encryption Using 7 – bit Periodic Table**

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**Abstract:** Periodic table best represents the chemical elements. A drug is in general represented by its chemical formula. In the process of finding a new drug, information regarding the chemical composition of the drug is must. In current communication system, communication online is unavoidable. Secured transformation of information is of common concern. In this paper we propose a new periodic table using the properties of the standard periodic table, and hence use it for encrypting details about any drug using the drug name, or its chemical formula.

Keywords: Periodic table, Chemical formula, Encryption.

### Introduction

In the increasing improvement in modern communication, safe communication of data is always of concern, and new techniques keep developing. In this paper we develop a new periodic table and hence use it to encrypt any chemical formula.

### **Periodic Table**

The periodic table is a tabular arrangement of the <u>chemical elements</u>, organized on the basis of their <u>atomic numbers</u>, <u>electron configurations</u> (electron shell model), and recurring <u>chemical properties</u>. Elements are presented in order of increasing atomic number (the number of protons in the nucleus). The standard form of the table consists of a grid of elements laid out in 18 columns and 7 rows, with a double row of elements below that [1].

Today, the periodic table organizes 112 named elements and acknowledges several more unnamed ones. It has become one of the most useful tools in chemistry, not only for students, but for working chemists as well. It classifies the elements according to their atomic number (more on that soon), tells us about the nuclear composition of any given element, describes how electrons are arranged around a given element and allows us to predict how one element will react with another [2].

The base periodic table used for developing a new one is provided in table 1 [3].

### **Proposed Periodic Table**

#### **Construction of the 7 – bit periodic table**

The usual properties of the chemical elements is used in the construction of the 7 – bit periodic table. We use the standard periodic table 1 as the base table for the construction of this table. Since the group number varies from 1 - 18 the first two place of the 7 – bit is assigned the group number. The mass number of the chemical elements varies from 1 - 300 and hence the last three bits for the mass number. Bit 3 represents the

metal, non metal, semimetal or noble gas. The fourth bit for the unique group name. The base for the 7 bits is provided in the table 2.

The 7 – bit periodic table thus constructed is provided in table 3.

Table 1



BIT 1 / 2	BIT 3	BIT 4	BIT 5 / 6 / 7
Group Number		Unique group name	Mass Number
<b>Note</b> For Lanthanoids and Actinoids Group Number is not fixed . Hence default 0 is used	M for Metal S for Semi Metal N for Non Metal G for Noble Gas	L-Lanthanide O-Actinoid A-Alkaline Metal E-Alkaline Earth Metal C-Chalcogen P-Pnicogen H-Halogen B-Noble Gas O-No Unique name or	
		default	

#### Table 2

### Molecular Formula Encryption Using 7 – bit Periodic Table

Any existing drug, new findings etc have a base molecular formula. We now propose a method of encryption of any molecular formula or drug name using the 7 – bit periodic table. Any molecular formula contains alphabets and numbers. So we randomly assign any 36 elements from the periodic table to the alphabets and numbers. We then use the 7 - bit code for encryption.

A sample table is provided in table 4.

We can adopt any one of the following methods. Let us consider **CROCIN** as a sample for discussion.

### **Encryption Using Drug Name**

- Consider the drug name for example **CROCIN**.
- Split the name into alphabets.
  C |R|O|C|I|N
- Now using table 4 find the element for each alphabet.

### C-Be, R-Mn, O-Kr, I-Ar, N-Rf

- Use the periodic table and write the 7-bit equivalent of each element to generate S.
  S: 02ME00907MT05518NG08402ME00917NH12704MT261
- Send S to the receiver.

### **Encryption Using Chemical Name of the Drug**

- Consider the chemical name of the drug.
- Proceed as done in encryption of drug name to generate S
- Send S to the receiver. The chemical name of CROCIN is PARACETAMOL P|A|R|A|C|E|T|A|M|O|L From table 4 P-Co, A-He, R-Mn, C-Be, E-Ne, T-Mo, M-I, O-Kr, L-Os So PARACETAMOL is encrypted as 15NP03118NG00407MT05518NG00402ME00918NG02006MT09617NH12718NG08408MT190

Table 3



Α	He	L	Os		0	Hf		
E	Ne	Μ	Ι		1	TT	-	Bh
Ι	Ar	Ν	Rf		1	HS		2
0	Kr	Р	Co		2	F		
U	Xe	Q	Κ		3	Br	(	Ti
В	Li	R	Mn		4	R <sub>2</sub>	<u>``</u>	
С	Be	S	Ag		-	Da		
D	Mg	Т	Mo		5	Cs	)	Db
F	Ge	V	Hg		6	Rh	1	
G	0	W	Cr		7	Fe		
Η	Р	Х	La		0	Co	White	Na
J	Fr	Y	Pu		0	Ga	Space	
Κ	W	Ζ	Ir		9	Y		

Table 4

#### **Encryption Using IUPAC Name of Drug**

- Consider the IUPAC name of the drug.
- Proceed as done in encryption of drug name to generate S.
- Send S to the receiver.

The IUPAC name of CROCIN is *N*-(4-hydroxyphenyl) ethanamide.

 $N|{\boldsymbol{\cdot}}|(|4|{\boldsymbol{\cdot}}|H|Y|D|R|O|X|Y|P|H|E|N|Y|L|)|E|T|H|A|N|A|M|I|D|E$ 

From table 4

N-Rf, -Bh, (-Ti, 4-Ba, H-P, Y-Pu, D-Mg, R-Mn, O-Hf, X-La, P-Co, E-Ne, N-Rf, L-Os, T-Mo, M-I, I-Ar, )-Db

So we send the following string to the receiver.

 $04MT26107MT26204MT04802ME13707MT26215NP03100MO24402ME02407MT05504MT17803ML13\\900M024409MT25915NP03118NG02004MT26100MO24408MT19005MT26218NG02006MT09615NP031\\18NG00404MT26118NG00417NH012718NG04002ME02418NG020$ 

#### **Encryption Using chemical formula of Drug**

In this method we directly use the metal name instead of using alphabets. For numbers we use the element names in order to protect the encryption.

- Consider the chemical formula of the drug.
- Replace each chemical name by its respective 7 bit code from the periodic table. Numbers by their respective chemical names from table and hence by their respective 7 bit code to generate S.
- Send S to the receiver.

The chemical name of CROCIN is C8H9NO2, which is replaced as follows from tables 3 and 4.

C-14N0012, 8-Ga-14S0073, H-01MA001, 9-Y-03MT089, N-15NP014, O-16NC016, 2-F-17NH019

We send the following string to the receiver.

### 14N001214007301MA00103MT08915NP01416NC01617NH019

## Conclusion

The new periodic table created is based on the properties of the table known to anyone who knows chemistry. This actually helps in safe encryption of the drug combination. While decoding when we break into 7 - bit segments, anyone would try to relate to the chemical element in the table, but since we have randomly assigned chemicals to the alphabets and then used for encryption, the proposed method is safe for any communication relating any chemical combination. For the 36 alphanumeric characters, there are 118C36 possibilities, which increases the safety of the encrypted chemical formula.

## References

- 1. http://en.wikipedia.org/wiki/Periodic\_table.
- 2. http://science.howstuffworks.com/periodic-table.htm.
- 3. http://officetemplate.net/periodic-table-of-elements-templates.html.

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