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Constructing Mathematical Models to Find a Relationship between Physical Compounds Using the Graph Theory

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ABSTRACT

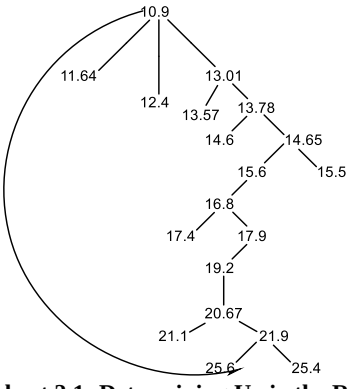
The current study aims to construct a mathematical models in order to assist the researchers to determine the specific activities of radionuclides in soil samples where we found
a relationship between uranium element and radionuclide activities. A summary study was conducted to measure the concentration of radon activity in lung cancer cases per 100 000 people by year and a summary study to measure the concentration of radon activity and effective exposure to absorption using the graph theory is presented as well. The proposed our determined values have shown conformity with the experimental data of other researchers

1. Introduction

The graph theory is the best theory in exploring the methods of proof in the discrete mathematics[1,2,3] and other applications in many computational and social sciences and natural sciences based on its results[4,5].We will compare between the physical compounds and then study the specific activities of radionuclides in soil samples where we found a relationship between uranium element and radionuclide activities[6,7].A summary study was conducted to measure the concentration of radon activity in lung cancer cases per 100 000 people by year and a summary study to measure the concentration of radon activity and effective exposure to absorption using the graph theory is presented as well.
In this paper we concerned with the issue of finding a relationship between the two components Ra and U using graph theory and find a relationship between the two components CR_n and L_c using the graph theory. Finally presents the steps of finding a relationship between the two components AE and L_c using the graph theory.

2-A Establishing Mathematical Models to Estimate the Calculations of U via Ra by Using Graph Theory

We will study the specific activities of radionuclides in soil samples.Where we found a relationship between uranium element and radionuclide activities using the graph theory. We used graph theory to establish a relationship between the physical compounds Ra and U. We ge as follows [1]:



Flowchart 2.1: Determining U via the Ra and comparing them with the obtained experimental values,

where l_{ei} ,i=1,2,…19 is length of edges and l_e is variable dependent

$$Y(l_e) = \frac{(l_e - l_{e1})R_{a19} - (l_e - l_{e18})R_{a1}}{(l_{e18} - l_{e1})}$$
$$= \frac{(l_e - 10.9)42.9022 - (l_e - 15.4)19.6754}{25.4 - 10.9}$$
$$= \frac{43.42 l_e - 471.316 - 18.41 l_e + 471.296}{14.5}$$
$$= \frac{24.83\ l_e - 0.02}{14.5}$$
$$Y(l_e) = 1.71241379\ l_e - 0.00137931$$

Table 2.1: U via the Ra and comparing them with the obtained experimental values .

No.	U	Ra	Cal.	Error	E^2
1	10.9	18.41	18.663931	0.253931	0.06448095
2	11.64	19.66	19.9311172	0.27111724	0.07350456
3	12.4	20.95	21.2325517	0.28255172	0.07983548
4	13.01	21.98	22.2771241	0.829712414	0.08828275
5	13.57	22.92	23.2360759	0.31607586	0.09990395
6	13.78	23.28	23.5956828	0.31568276	0.0996556
7	14.6	24.66	24.9998621	0.33986207	0.011550623
8	14.65	24.75	25.0854828	0.33548276	0.011254868
9	15.6	26.35	26.7122759	0.36227586	0.01312438
10	15.6	26.35	26.7122759	0.36227586	0.01312438
11	16.8	28.38	28.7671724	0.3871724	0.014990247
12	17.4	29.39	29.7946207	0.40462069	0.01637179
13	17.9	30.24	30.6508276	0.41082759	0.016877931
14	19.2	32.43	32.8769655	0.44696552	0.19977817
15	20.67	34.92	35.3942138	0.48261379	0.023291607
16	21.1	35.64	36.1305517	0.49055172	0.024064099
17	21.9	36.99	37.5004828	0.51048276	0.026059265
18	25.4	42.91	43.493931	0.583931	0.034097541
19	25.6	43.24	43.8364138	0.59641379	0.035570941

Figure 2.1 shown compare among the Ra, which is determined by Equation (1), and another exp. Ra by graph theory.

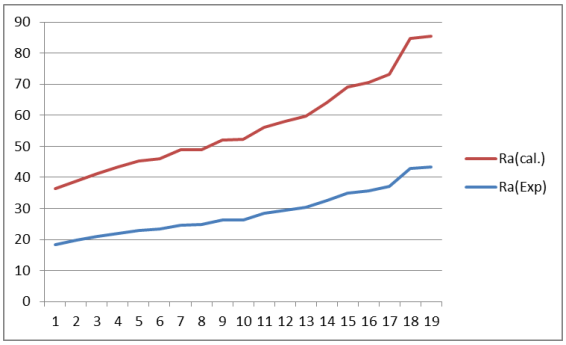
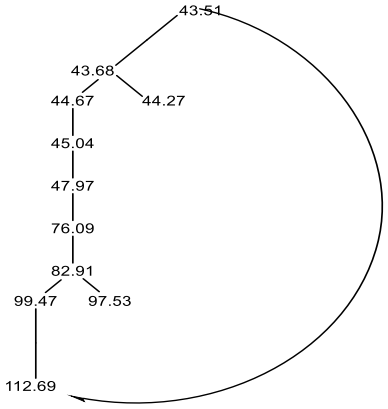


Fig. 2.1: figure of calculating Ra in term of U and the theoretical results by graph theory.

2-B. Establishing Mathematical Models to Estimate the Calculations of CR_n via L_c by Using Graph Theory

We will study a summary to measure the concentration of radon activity in the cases of lung cancer per 1000 000 people by year using the graph theory.

We used graph theory to establish a relationship between the physical compounds CR_n and L_c. When using Graph theory as follows [2]:



Flowchart 2.2: Compare among the results of calculating CR_n in term of L_c and the theoretical results by graph theory.

$$Y(l_e) = \frac{(l_e - l_{e1})\mathrm{CRn}_{11} - (l_e - l_{e11})\mathrm{CR1}}{(l_{e11} - l_{e2})} \quad (2)$$
$$= \frac{(l_e - 43.51)48.244 - (l_e - 112.69)18.627}{112.69 - 43.68}$$
$$= \frac{48.244\ l_e - 2099.096 - 18.627\ l_e + 2099.076}{69.01}$$
$$\frac{29.617\ l_e - 0.02}{69.01}$$
$$Y(l_e) = 0.42916969\ l_e - 0.00028981$$
$$Y(l_e) = 1.01162791\ \mathrm{CRn}_i\ ,\mathrm{I}=1,2,\ldots 11$$

Table 2.2: Calculating CR_n via the Lung Experiment and comparing them with the obtained experimental values, using graph theory.

NO.	CRn	Lung Exp.	Lung Cal.	Error	E^2
1.	43.51	18.627	18.6728832	0.04588321	0.00210527
2.	43.68	18.7	18.7458421	0.045821	0.00209956
3.	44.27	18.925	18.9990522	0.07405217	0.00548372
4.	44.67	19.124	19.17072	0.04672004	0.00218276
5.	45.04	19.282	19.3295128	0.04751282	0.00225747
6.	47.97	20.536	20.58698	0.05098	0.00259896
7.	76.09	32.575	32.6552316	0.08023156	0.0064371
8.	82.91	35.494	35.5821688	0.08816882	0.00777374
9.	97.53	41.753	41.7566296	0.0036296	0.00001317
10.	99.47	42.584	42.5892188	0.0052188	0.00002724
11.	112.69	48.244	48.2628421	0.0188421	0. 00035502

Figure 2.2 shows a comparison between the CR_n and Lung Experiment., which is determined by utilizing Equation (2), and another exp. CR_n by using graph theory.

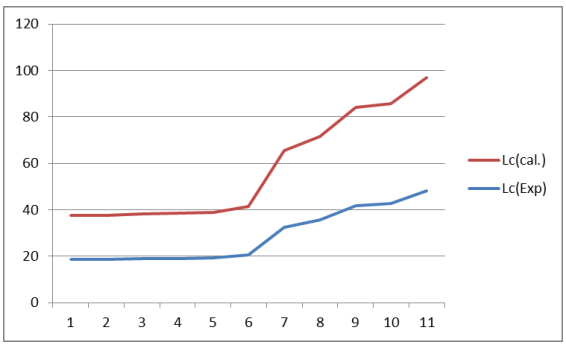
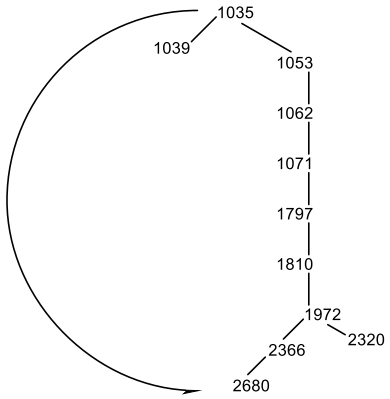


Fig. 2.3: Figure of calculating CR_n in term of Lung Experiment and the theoretical results, using graph theory.

3. Establishing Mathematical Models to Estimate the Calculations of AE via Lung Experiment by Using Graph Theory.

We will study a summary to measure the concentration of radon activity and the effective dose of absorption using the graph theory.

We used graph theory to establish a relationship between the physical compounds AE and Lung Experiment. When using graph theory, the rule can be written as follows [3]:



Flowchart 3.3: Comparison between the obtained results of calculating AE in term of Lung Experiment. and the theoretical results, using graph theory.

$$Y(l_e) = \frac{(l_e - l_{e1})Lung_1 - (l_e - l_{e11})Lung_{11}}{(l_{e11} - l_{e2})} \quad \ldots\ldots (3)$$

$$= \frac{(l_e - 1035)48.244 - (l_e - 2680)18.627}{2680 - 1039}$$

$$= \frac{48.244\, l_e - 49932.54 - 18.627\, l_e + 49932.36}{1641}$$

$$\frac{29.617\, l_e - 12.18}{1641}$$

$$Y(l_e) = 0.01804814\, l_e - 0.0074223$$

Table 3.3 : Calculating AE via the Lung by using graph theory.

NO.	AE	Lung	Cal.	Error	E^2
1.	1035	18.67	18.626362	0.04363803	0.00190428
2.	1039	18.7	18.7445966	0.04459659	0.00198886
3.	1053	18.952	18.9972706	0.04527057	0.00204942
4.	1062	19.124	19.1597038	0.03570384	0.00127476
5.	1071	19.282	19.3221371	0.04013711	0.00161099
6.	1141	20.536	20.585507	0.04950701	0.00245094
7.	1810	32.575	32.6597136	0.08471359	0.00717639
8.	1972	35.494	35.5835125	0.08951249	0.00801249
9.	2320	41.753	41.7642657	0.0112657	0.00012692
10.	2366	42.584	42.5944802	0.0104802	0.00010983
11.	2680	48.244	48.2615966	0.0175966	0. 00030964

Figure 3.4 shown a compare among the AE, which is determined by Equation (3), and another exp. AE by graph theory.

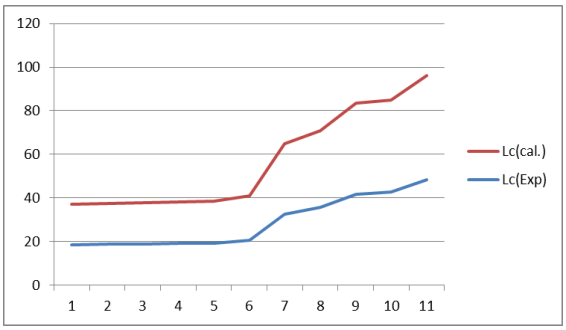


Fig. 3.4: Figure of calculating AE in term of Lung and the theoretical results

Conclusion

The main aim of this paper is to present the importance of graph method to finding a relationship between the two components Ra and U , finding a relationship between the two components CR_n and Lung. and finding relationship between the two components AE and Lung . We have concluded that the results were as low as possible and are the best possible results.

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بناء نماذج رياضية لإيجاد علاقة بين المركبات الفيزيائية باستخدام نظرية الرسم البياني

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الملخص

تهدف الدراسة الحالية إلى بناء نماذج رياضية من أجل مساعدة الباحثين على تحديد الأنشطة المحددة للنويدات المشعة في عينات التربة حيث وجدنا علاقة بين عناصر اليورانيوم وأنشطة النويدات المشعة. أجريت دراسة موجزة لقياس تركيز نشاط الرادون في حالات سرطان الرئة لكل 100000 شخص بحلول العام ، كما تم تقديم دراسة موجزة لقياس تركيز نشاط الرادون والتعرض الفعال للامتصاص باستخدام نظرية الرسم البياني. وقد أظهرت القيم المحددة لدينا المقترحة مطابقة مع البيانات التجريبية للباحثين الآخرين.