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The risks of reusing the polymeric materials on the human's health

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ABSTRACT

The code on plastic water bottles and food container's items appears as a triangle with a number between 1 and 7. The understanding of the seven plastic codes is very important for the people to decide the reusing plastic and food containers to know which plastics can be recycled. This study is aimed to investigate the level of people's education toward this matter and to raise the awareness of the dangers of reusing plastic water bottles and food containers items as containers for storage of food and water. A questionnaire containing three different groups of questions was distributed for people working in chemistry field. The people are undergraduate student, postgraduate students and staff member. The results indicate that there is a lake of education about the dangers of reusing plastic water bottles and food container's items. Only one staff member has an excellent knowledge about these concerns. This person specializes in organic chemistry and was studied polymer in his postgraduate study. The study is concluded helping to keep the people away from dangerous diseases. The numbers of the persons that shared in this questionnaire are 62 persons; this number was consisted of 35 males and 27 females.

Keywords: plastic's risks, plastic codes, reusing of plastic, plastic food containers, plastic water bottles, and plastic soft drink bottles.

Introduction:

The plastics are an indispensable part of human lifestyle because of their flexibility, cheap, ease of fabrication, toughness and suitable physical properties for varying applications [1,2]. In view of the fact that leads to raise the manufacture process of varies plastic types. These plastics contain different codes started with number 1 and finished with number 7 as shown in figure 1[3], this code was based on the ability of recycling, the degree of dangers, type of used polymer and the type of used. In spite of the fact that the wrong used they obtain, because have no knowledge of plastic code, and that will cause an enormous disaster on health and environment. Hence, in today's sustainability-focused culture, the recycling polymers is a significant and vital subject to depress the pollutions[4].

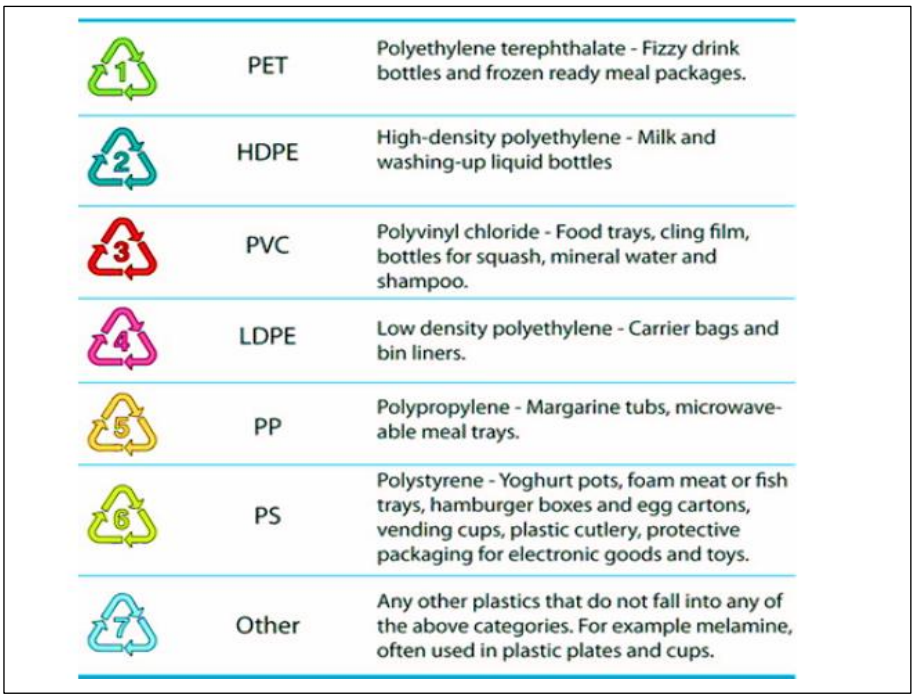


Figure 1: plastic codes ranged from 1 to 7 [3]

In general, plastic can be classified based on backbone to two kinds; the first is C-C backbone polymers, which includes polymers with cods ranging from 2 to 6, this structure is the resistance the hydrolysis, biodegradation[5]. on the contrary, the second kind (C-O backbone polymers) has strong hydrolysis, photo-oxidation, and biodegradation[6]. The one big problem in plastic is degradation by solar (photo degradation)[7-11], heat (thermal degradation)[7,11-

13] and bio organisms (bio degradation) [7,14-16]. This problem steer the some researches to study them, so must prevent used plastic containers in microwave furnace. Some studies used pyrolysis of polymers to small molecular weight species by microwave, then recycle them based on chain reaction that leads to condensate[17-19]. In this work, the plastic's codes are put in our interested by preparation an application form for questionnaire about these codes and some signs that printed under the plastic's goods. These application forms for questionnaire were closely distributed for people working in chemistry field.

2. Procedure:

In this work, the prepared application form for questionnaire was included to portions such as the sex, the age and the stage. There are three pivots were made in the questioner. The first pivot deals with the meaning of the essential signals that printed on the plastic materials, the second pivot deals with filling the spaces for giving the meaning of the pictures that printed on the some types of polymer materials, whereas, the third pivot involves the chooses of the corrected plastic's code for the suggested picture of the polymer materials as shown in table1.

Table1. Questionnaire for the plastic's codes

Sex	○ **Male**			○ **Female**		
Ages	○ **Less than 20 years old**	○ **Less than 40 years old**		○ **Less than 60 years old**	○ **More than 60 years old**	
Stages	○ **Undergraduate**	○ **Bachelor**	○ **Postgraduate-MSC**	○ **MSC**	○ **Postgraduate-Ph.D.**	○ **Ph.D.**

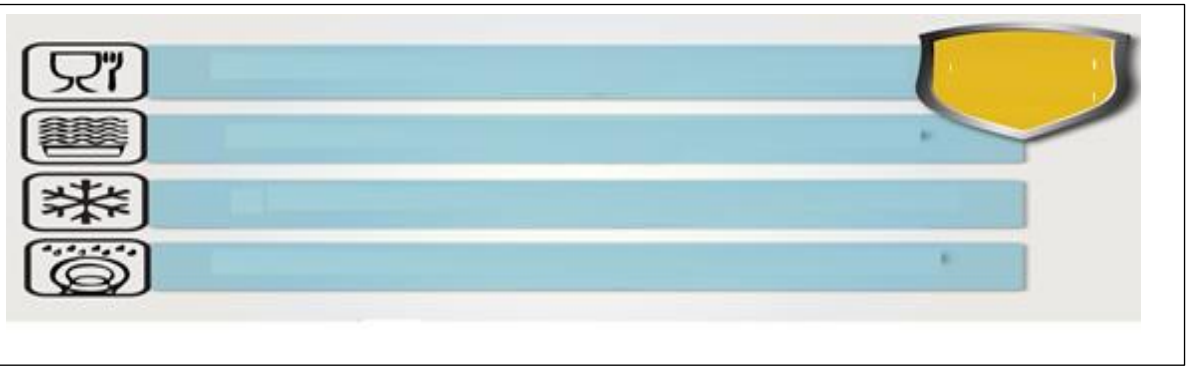
Is you have any information about the plastic's codes that found on the plastic water bottles, fizzy drink bottles and the leaser blanks

- Please, answer "**yes**" to continue the following question.
- If you answer "**No**" you can throw the following questions.

A- Please, put sign (√) on the corrected choosing.

RESIN CODE	POLYMER NAME & ABBREVIATION	Choosing
1	Polyethylene Terephthalate PETE or PET	○ Safe foe once only ○ Safe and recycling ○ No have any class
2	High-Density Polyethylene HDPE	○ Safe foe once only ○ Safe and recycling ○ Hazards and toxic
3	Polyvinyl Chloride PVC or V	○ Best and more safe type of plastic ○ Safe and recycling ○ Hazards and toxic
4	Low-Density Polyethylene LDPE	○ Hazards and toxic ○ Relatively Safe and recycling ○ Best and more safe type of plastic
5	Polypropylene PP	○ Best and more safe type of plastic ○ No have any class ○ Safe foe once only
6	Polystyrene PS	○ Safe and recycling ○ Hazards and no safe ○ No have any class
7	Other	○ Safe and recycling ○ Hazards and toxic ○ No have any class

B-Please fill all the spaces in suitable solutions according the signs.



C- Please, put sign (√) on the corrected plastic's code choosing.

Plastic's codes		Polymeric materials
7 OTHER	2 HDPE	
2 HDPE	5 PP	
4 LDPE	1 PETE	
3 V	6 PS	
5 PP	4 LDPE	

3. Results and discussions

The numbers of persons which shared in this questionnaire were sorting as sex, ages and the stage of education and listed in table 2.

Table2. The listed in the sorting numbers of persons shared in the questionnaire.

Sex		Male		Female	
Answers		**Yes**	**No**	**Yes**	**No**
Ages	**Less than 20 years old**	-	-	-	-
	Less than 40 old years	15	9	11	14
	Less than 60 years old	7	2	1	1
	More than 60 years old	-	2	-	-
Education stages	**Undergraduate**	1	1	2	1
	Bachelor	-	3	1	3
	Postgraduate-MSC	6	2	4	5
	MSC	5	1	4	3
	Postgraduate-Ph.D.	-	2	1	3
	Ph.D.	10	4	-	-

3.1 The sorting data depended on sex

From figure 2, the curve indicate to the maximum wrong answer for both (male and female) were occurred in questions 5-7 in section 1, that due to the low knowledge in the most healthy polymers that have code 5. The worse polymers that have high risk are using them for heating food and as food containers. Whereas, figure 3 explains that the maximum wrong ratio in answers of section 2 is determined at pictures 2 and 4, these pictures refer to the plastic can be used in microwave oven and washing in dish's washer respectively. Hence, any plastics that printed these pictures on the bottom are thermal resistance (thermoplastic).

The results in figure 4 show, that the maximum wrong answers at questions was obtained at all pictures in section 3. That indicates to the lake knowledge of persons in plastic's codes; hence, the reused of these plastic materials were done by packaging of any residue food's materials.

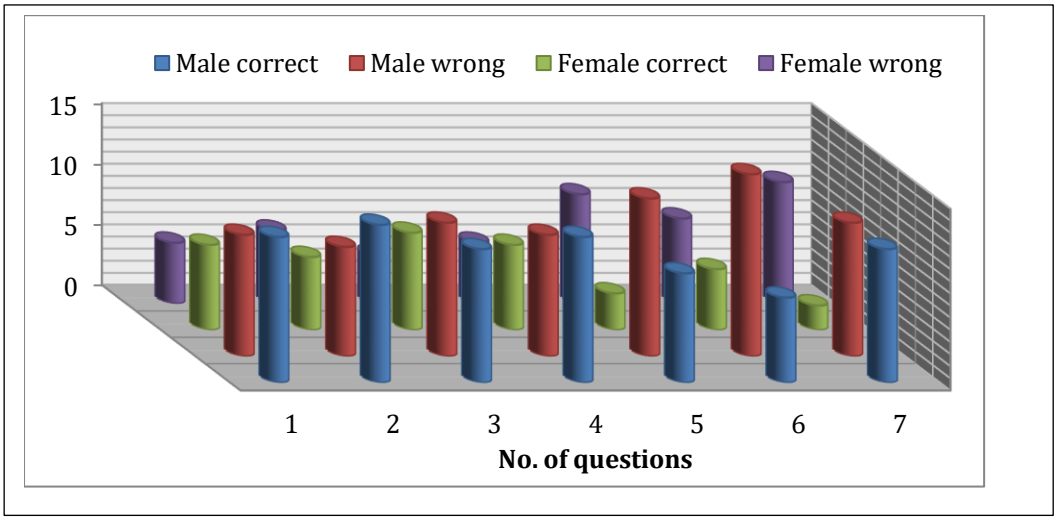


Figure 2: The sorting data of section 1for questionnaire depended on sex.

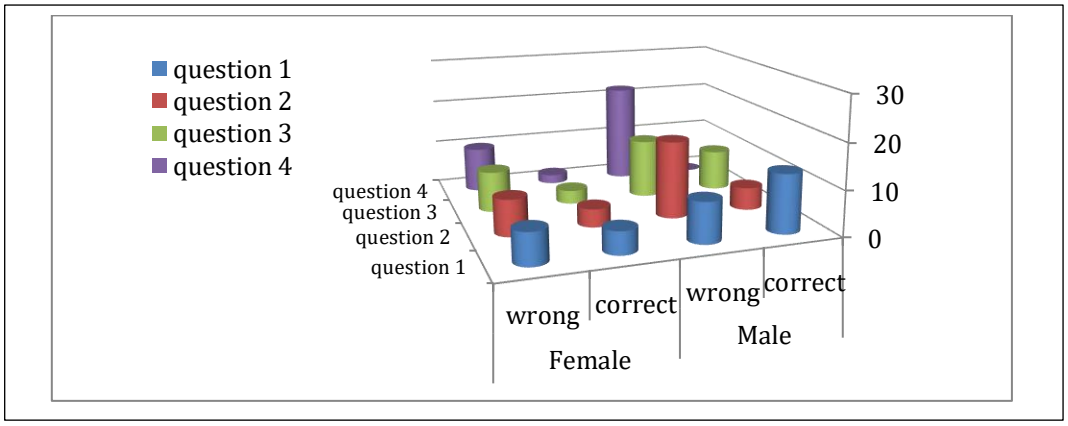


Figure 3: The sorting data of section 2 for questionnaire depended on sex.

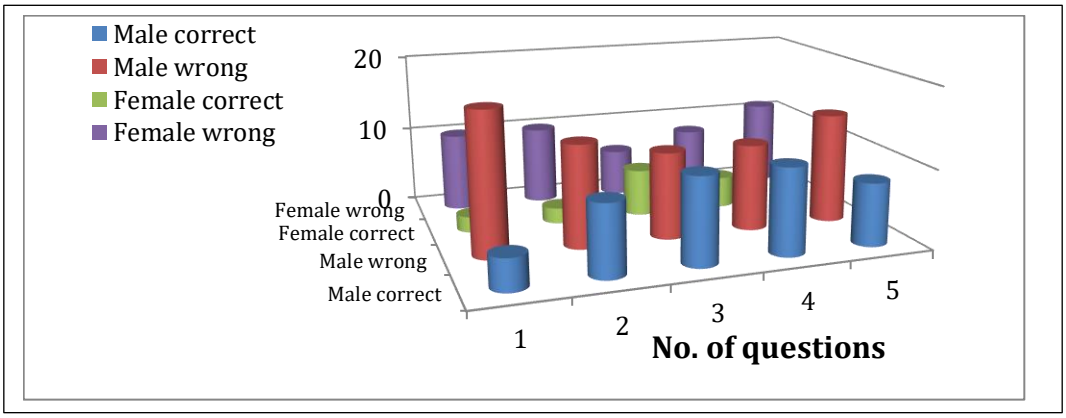


Figure 4: The sorting data of section 3 for questionnaire depended on sex.

3.3 The sorting data depended on education stages.

Figures 8-10 explain the relation between the education stages and the types of answers. However, the sequence of the persons that shared in this questionnaire are postgraduate student-MSC (P.-MSC) > MSC = ph.D > undergraduate student (undergr. s.) > B.SC= postgraduate student-Ph.D (P. Ph.D). The best correct answers occur in education stages student-MSC (P.-MSC) and MSC.

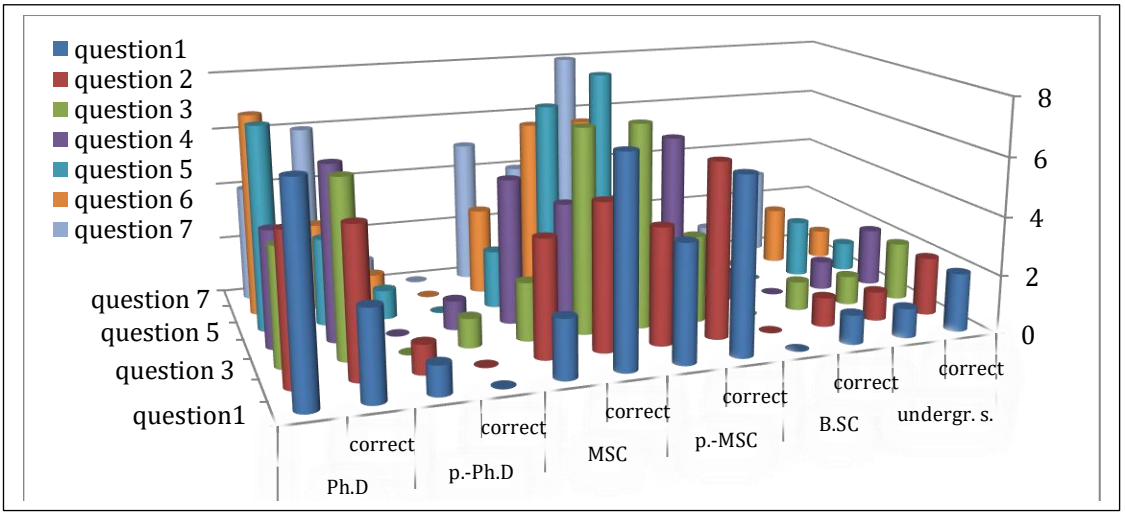


Figure 8: The sorting data of section 1for questionnaire depended on education stages.

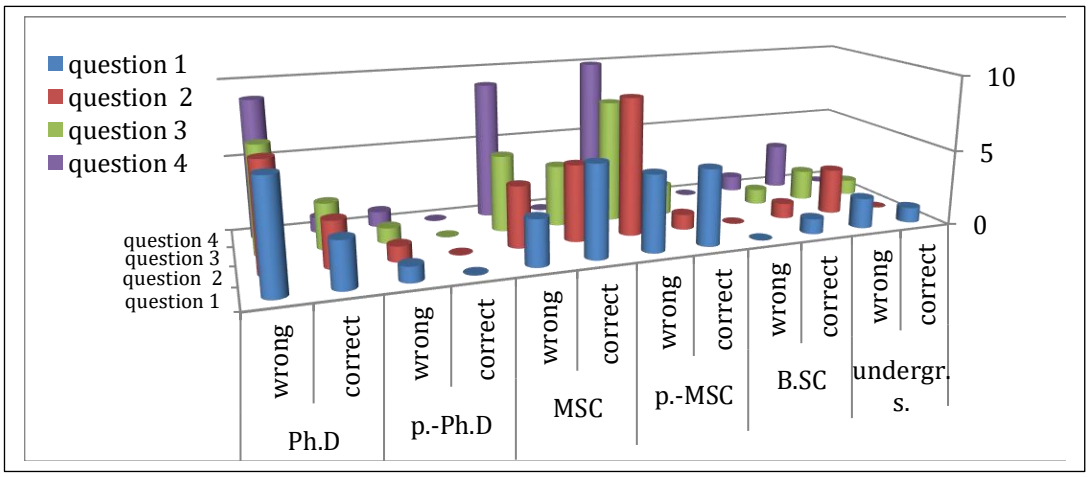


Figure 9: The sorting data of section 2 for questionnaire depended on education stages.

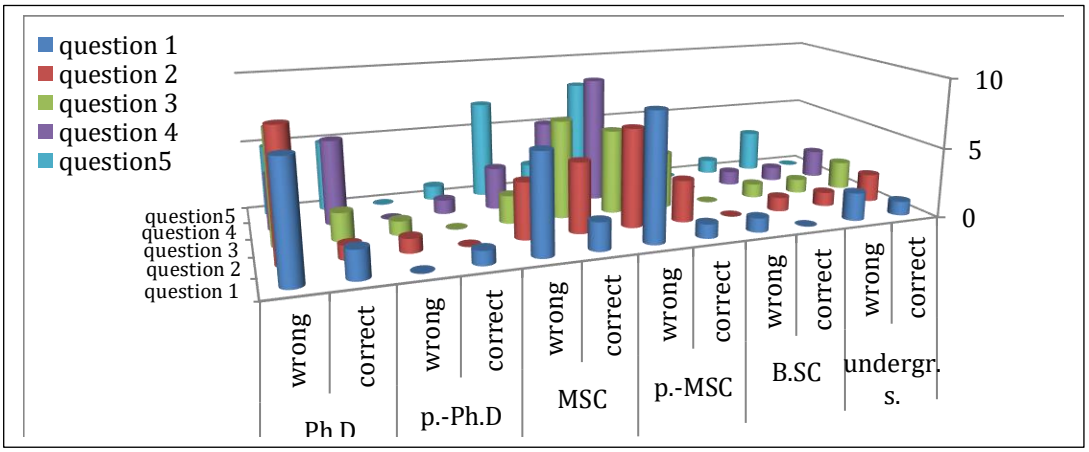


Figure 10: The sorting data of section 3 for questionnaire depended on education stages.

4. Conclusions:

The main conclusion is summarized to that most survey participants don't know enough about plastic codes, that makes it to rise in the risk of wrong reusing of plastic water bottles and food containers. Some persons have the most corrected answers especially organic chemistry because they studied the polymer chemistry.

5. The recommendations:

The future planning's for this study must be performed by following the following several recommendations:

1. Introducing some lectures about the subject of plastics, which are used in today's life, and indicating the advantages of the plastic's codes to increase the education of persons. The education of university undergraduate and postgraduate students and staff members can be a critical component in encouraging public participation in this important subject.

2. Printed posters about plastic's code and the types of plastic that contain them and then distributed them in universities, supermarkets, and small restaurants that work in delivery systems.

3. Providing information and education about the dangers of reusing these polymeric materials can shift behavior regarding reusing these materials.

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