

## VERIFYING PROUST'S LAW

### Abstract

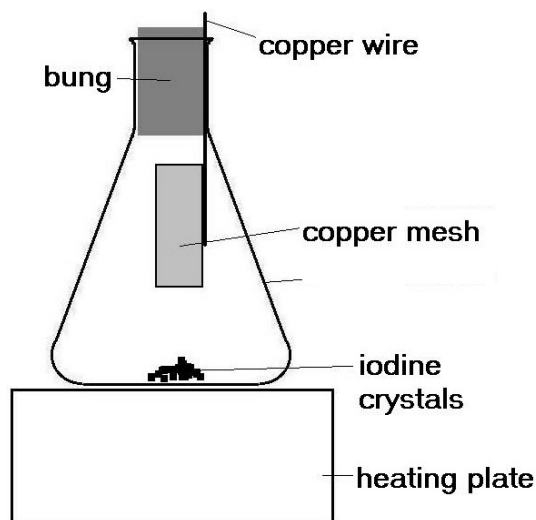
This law, also called the law of definite proportions, states that, in a pure compound, the elements combine in definite proportions by mass to each other. Eight groups of pupils conducted the same experiment in which different amounts of copper and iodine reacted. The proportions between the mass of the reacted copper and the mass of the reacted iodine in each experiment were approximately constant.

### Apparatus

250 mL conical flask, bung, heating plate, hair drier, analytical balance( $\pm 0.0001$ g)

### Reactants

Pure copper mesh (c.m.), iodine crystals, nitric acid solution, thiosulphate solution, acetone (also called propanone)



### Experimental Procedure

1. The copper mesh (c.m.) was cleaned in a nitric acid solution, rinsed in water, rinsed in acetone, dried with an hair drier
2. The c.m. was weighed with the balance and the mass was recorded as M1
3. About 2g of iodine crystals were put in a 250 mL conical flask and the c.m. was hanged as described in the diagram
4. The heating plate was turned on for about ten minutes, the iodine sublimated and reacted with the copper
5. The c.m. was extracted and the unreacted iodine was removed blowing hot air with an hair drier
6. The c.m. was weighed and the mass was recorded as M2
7. The c.m. was put into a thiosulphate solution to remove the copper compound, rinsed with water, rinsed with acetone, dried with the hair drier
8. The c.m. was weighed and the mass was recorded as M3

The steps from 1 to 8 were conducted by the 8 groups and data were collected in table 1.

### Safety

Steps 1,4, 5, 7 were carried on in a fume cupboard (iodine vapours, nitrogen oxides, acetone vapours are harmful)

Safety goggles were used

### Calculations

mass difference  $M3 - M1$  = the mass of reacted copper

mass difference  $M2 - M1$  = the mass of reacted iodine

Mass ratio = mass of reacted copper / mass of reacted iodine

The theoretical value of the mass ratio was calculated:  $63.5\text{g}/127\text{g} = 0.500$

(1 mol Cu =63.5g ; 1 mol I = 127g)

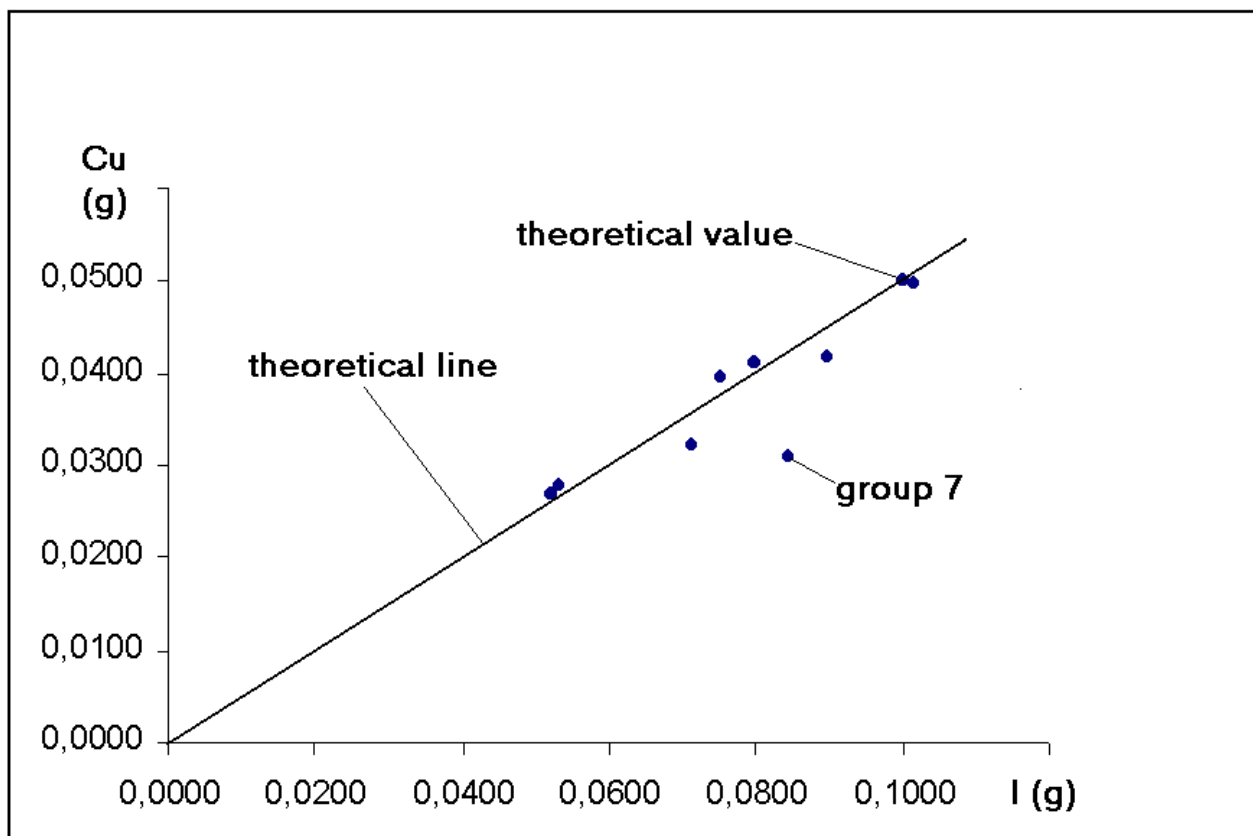
Error =  $100 \times (\text{mass ratio} - \text{theoretical value}) / \text{theoretical value}$

Calculations were reported in table 1.

**Table 1**

group	M1	M2	M3	M1-M3	M2-M1	mass ratio	error
N	g	g	g	reacted Cu	reacted I	Cu/I	%
1	4,2627	4,3150	4,2359	0,0268	0,0523	0,512	1,2
2	4,5126	4,5924	4,4715	0,0411	0,0798	0,515	1,5
3	3,8475	3,9374	3,8059	0,0416	0,0899	0,463	3,7
4	5,3684	5,4396	5,3362	0,0322	0,0712	0,452	4,8
5	4,8546	4,9077	4,8268	0,0278	0,0531	0,524	2,4
6	3,9512	4,0528	3,9014	0,0498	0,1016	0,490	1,0
7	5,1254	5,2099	5,0945	0,0309	0,0845	0,366	13,4
8	6,0132	6,0884	5,9736	0,0396	0,0752	0,527	2,7

**Graph 1** mass of reacted copper (cu) vs. mass of reacted iodine (I)



### Discussion and conclusions

All the points (with the exception of group 7 point) are close to the straight theoretical line, so the Proust's Law is confirmed.

However the scientific method suggests that it would be better to repeat the set of experiments in order to verify if the results of group 7 are or not an error.

# WRITING A LABORATORY REPORT

## GOALS

- write a structured report
- write it in plain, clear English
- create a library of words, phrases, diagrams useful for future developments

## METHOD

Don't translate Italian laboratory reports into English!

Use words and phrases from English chemistry books or from web pages, as an example

[http://www.chemsoc.org/networks/LearnNet/classic\\_exp.htm](http://www.chemsoc.org/networks/LearnNet/classic_exp.htm)

## SOME TIPS

Use:

- short phrases
- passive form
- the past tense describing the procedure
- the present tense for conclusions