

Supporting Information

Do-It-Yourself: Creating and Implementing a Periodic Table of Elements Chemical Escape Room

TABLE OF CONTENTS

Table of contents.....	1
The background story of the escape room.....	3
General instructions to teachers for preparing the inspector's kit & dividing the class:.....	5
1.The domino puzzle	
Description of the puzzle	7
<i>The solution to the puzzle</i>	7
Preparation of the puzzle	7
<i>Materials and tool</i>	7
2.The iodine puzzle	
Description of the puzzle	8
<i>The solution to the puzzle</i>	8
Preparation of the puzzle	9
<i>Materials and tools</i>	9
3.Connect the dots puzzle	
Description of the puzzle.....	10
Preparation of the puzzle:	11
<i>Materials and tools:</i>	11
4.The hydrogel puzzle	
Description of the puzzle.....	12
The solution to the puzzle.....	12
Preparation of the puzzle:	12
<i>Materials and tools:</i>	13
5.Treasure map with coins puzzle	
Description of the puzzle.....	14
Preparation of the puzzle:	15
<i>Materials and tools:</i>	15

6.The envelope puzzle	
Description of the puzzle.....	16
<i>The solution of the puzzle</i>	18
Preparation of the puzzle:	18
<i>Materials and tools:</i>	19
7. Message in a bottle puzzle	20
Description of the puzzle.....	20
<i>The solution of the puzzle:</i>	20
Preparation of the puzzle:	20
<i>Materials and tools:</i>	20
8. The slime puzzle	21
Description of the puzzle.....	21
Preparation of the puzzle:	21
<i>Materials and tools:</i>	22
9. The WAZE puzzle.....	23
Description of the puzzle.....	23
<i>The solution of the puzzle:</i>	23
Preparation of the puzzle:	23
<i>Materials and tools:</i>	23
10. The Chromatography puzzle	24
Description of the puzzle.....	24
<i>The solution of the puzzle:</i>	25
Preparation of the puzzle:	25
<i>Materials and tools:</i>	26
11. The songs puzzle	27
Description of the puzzle.....	27
<i>The solution of the puzzle: Au, Ti, Ag</i>	27
Preparation of the puzzle:	27
12. The Md-101 puzzle	28
Description of the puzzle.....	28
<i>The solution of the puzzle: 101</i>	29
Preparation of the puzzle:	29
<i>Materials and tools:</i>	29
13. The solution of the mystery.....	30
Description of the puzzle.....	30

Preparation of the puzzle:	30
<i>Materials and tools:</i>	30
14. Flexibility of the activity - an example of a change.....	31

INTRODUCTION TO THE SUPPORTING INFORMATION

In order to build the ChEsRm, you should use this file, the ppt file and the corpse.pdf file which contain the printable materials found in the following link [Associated Content to DIY: The ChEs of the PTOE](#) - Good luck!!

It takes time to prepare the ChEsRm, but once you do it you can use it many times. It is cheap compared to any other escape room. We suggest teachers to join and make one kit that serves various teachers in different schools.

Duration (done usually during two lessons of 45 minutes each):

- Gathering to tell the story and give instructions – 10-15 minutes.
- The activity of the ChEsRm - 40 - 55 minutes
- Closure meeting in which students reflect on the activity and ask questions regarding the puzzles – 10-15 minutes.

Usually, not everybody finishes at the same time. Students understand by then that they are not competing but they need to cooperate to succeed. Students may give hints to other students.

THE BACKGROUND STORY OF THE ESCAPE ROOM

The background story of ChEsRm is told to the participating students by the teacher before entering the room: "This morning I came to the lab and I was horrified...I am so sorry for allowing my students to throw a party here!! They made a big mess, all the lights were on, and music was playing, as you can hear... but the worst part is that I found a corpse in the corner of the room!. The police arrived, and they are certain that you, the students can help determine what happened here. Please help! Let's

take Sherlock Holmes' advice; he always claimed: "It's **Elementary**, my dear Watson!"

In the lab, the music is loud and in the corner of the room there's a silhouette of a body marked with black duct tape. There's a "Do Not Cross" sign-(slide no. 1) The entrance to the area is forbidden.

The students are divided into 4 groups (red, yellow, green and purple). Each group receives an inspector's forensic kit and a periodic table (PT) printed on a transparency.

Every group must find 19 elements that are concealed in different puzzles, most of the puzzles have a sign that highlights the elements hidden in the puzzle. All groups are provided with the same mechanisms to solve the puzzles (e.g., chromatography, preparing slime, etc), but each group discovers different elements that are revealed in their puzzles.

Each group is given a transparency of the PT and blackens the squares of the elements they find on this transparency.

After the four groups complete their work with the puzzles, they are instructed to place the transparencies together, so they overlap (slide no.41). As a result, the number 101 is revealed (i.e., the atomic number of the element mendelevium, named after the scientist who invented the periodic table). This number opens a combination lock on a pencil case or a jar with a UV flashlight and a note, which reads: "Illuminate me! ". Once the students shine the light on the note, the following words are revealed:" Chemistry - Something to die for " With this revelation, the students have collectively succeeded to "solve the murder mystery". slides no. 36-39 show the marked transparencies of each group. These slides are provided to overlap and reveal number 101. A H5P file in the one computer serves as the answer key used to check if the elements that are being discovered are the correct ones.

GENERAL INSTRUCTIONS TO TEACHERS FOR PREPARING THE INSPECTOR'S KIT & DIVIDING THE CLASS:

1. Prepare stickers or colored crepe paper to divide the students into four groups by color: red, yellow, green, purple.

2. Each student group receives a forensic kit (Figure 1).

Tape the image from slide no. 2 to either a plastic box (1/2-liter volume), a pencil case or a purse. The content of the box includes (Figure 2):



Figure 1. Forensic kit

- A bottle with a dropper 20 ml of iodine and a sticker:

"Solution of [?] used for disinfecting wounds"

- A bottle or centrifuge test tube with 50 ml of water (write: $H_2O_{(l)}$)
- A bottle with 10 ml of alcohol (write: Alcohol) or a hand sanitizing gel.
- A bottle or centrifuge test tube with 10 ml of borax 4% (write: Borax)
- Strong magnet (if it's small, you should put it in a small storage tool and write: Magnet)
- Permanent marker. Make sure that the acetone does not spill on the PT or the marker
- Non-sharpened pencil
- A list of all the elements names and symbols (slide no. 6)
- One transparency PT for blackening the elements found by each group in the puzzles (slide no. 7 , Figure 3).



Figure 2. Content of forensic kit

The table will help you solve the mystery. Mark the squares of elements that you will discover. To succeed, take Sherlock Holmes' advice, as he always claimed: It's **Elementary**, my dear Watson! . Good luck – we're counting on you to solve the mystery!!

Figure 3. Transparency of PTOE

slides 12, 26, 33, 35 & 40 should be hanged up inside the room.

The students can use them during the activity for solving the puzzles.

1. THE DOMINO PUZZLE

Description of the puzzle

An envelope is hidden in the room with the writing:



Figure 4. Image on the envelope of the Domino puzzle

Students find an envelope with the sign of a domino (Figure 4). Inside each envelope are 5 cards, and each card has 2 images on it. The students reveal 4 elements by matching images from different domino cards related to the same element. The first card has an arrow sign on it and the last card has a stop sign on it. The fifth element is revealed from the combination of all the small letters that are written on each card. Only when the domino sequence is correct the name will be spelled correctly.

The solution to the puzzle

The red group: No, U, He, N, Rb

The yellow group: Es, Pb, Mg, Pu, Sr

The purple group: Pd, Hg, Ne, H, Zr

The green group: Kr, C, Si, Cm, Np

Preparation of the puzzle

1. Print slides 8-11.
2. Cut and laminate the domino cards and the cover of the envelope "Find 5 elements".
3. Stick stickers of the color of the group on the back of each card.
4. Put in the cards in an envelope.
5. Stick the "Domino: Find 5 elements" sign on the envelope.

Materials and tools

Slides 8-11

4 envelopes

Stickers: red, yellow, green, purple

2. THE IODINE PUZZLE

Description of the puzzle

A plastic Petri dish with a lid is placed on a table.

White letters are glued to the bottom of the petri dish.

They seem to be made of the same material, but they aren't; some are paper and some are plastic (Figure 5 right).

On the lid of the petri dish written:

"Add iodine and reveal the ?"

In the forensic kit there is a "Solution of used to disinfect wounds "

When students add some iodine solution drops into the dish, the paper letters turn black (Figure 5 left).



Figure 5 .The iodine puzzle, left- with lugol solution, right as seen before adding the lugol solution

The following elements are revealed:

The red group: Ar

The yellow group: Pt

The purple group: Bi

The green group: Se

Preparation of the puzzle

Print slide 13 (The letters' size should be reduced before printing).

1. Cut and paste (with a stick adhesive) the colored paper letters of the elements that should be revealed to the bottom of the petri dish.
2. Cut the rest of the letters (black) from a plastic folder and paste them (with a stick adhesive) to the bottom of the petri dish,
3. Write on the lid top "Add iodine and reveal the ?."

Materials and tools

Slide no. 13

4 petri dishes with lids (at least 10 cm diameter)

A plastic white folder

Glue stick

4 bottles containing 20 ml iodine solution -

Text: "Solution used to disinfect wounds ?"

The solution to the puzzle

When the solution comes in contact with the paper letters, a black color is created.

The rest of the letters are plastic and their color remains white.

nect the dots puzzle

Description of the puzzle

Four balloons (colored red, green, purple and yellow) hang in different places in the room (Figure 6). Next to each balloon is a note that says:

"If you want an element to reveal,

squirt the balloon with an orange peel. "

In addition to this note is a bag that includes an orange peel.

When the students squirt the orange peel juice towards the balloon or rub the balloon with the orange peel, the balloon pops and the note inside it is revealed.



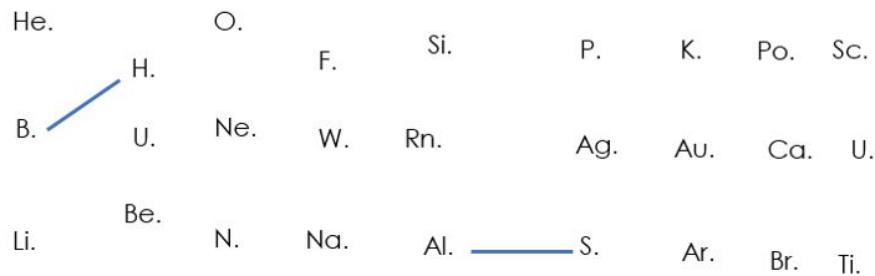
Figure 6. Balloon containing the connect the dots puzzle

<https://www.chemedx.org/blog/how-does-orange-peel-pop-balloon-chemistry-course>

In the note there is a "connect the dots" puzzle. Instead of numbers there are symbols of elements. The dots should be connected only between elements with a sequential atomic number, and the name of the element is revealed.

The solution of the puzzle (Figure 7):

Connect only between elements with a sequential atomic number to reveal



The red group: Bromine (Br)
The yellow group: Sodium (Na)
The purple group: Calcium (Ca)
The green group: Tellurium (Te)

Preparation of the puzzle:

1. Print slides: 14-15
2. Fold each page and insert it in a colored balloon.
3. Hang the balloons with a thread to decorate the room.
4. Cut an orange into eight pieces (peel with the fruit flesh) without pressing it, carefully remove the contents, the flesh, so that the peels remain intact.
5. Place the **peel** strips in a bag and hang next to the balloon.
6. Print the following note, cut and paste it next to each balloon (slide 27).

**IF YOU WANT AN ELEMENT ? TO REVEAL,
SQUIRT THE BALLOON WITH AN ORANGE PEEL**

Materials and tools:

Slides 14-15.

One orange

A knife

Thread to hang the balloons

4 non-galvanized balloons (red, purple, green and yellow)

3. THE HYDROGEL PUZZLE

Description of the puzzle

4



plastic centrifuge test tubes containing hydrogel balls are hidden in the room

(Figure 8). There is a hole in the lid (Figure 9).



Figure 8. The hole in the lid used to add water with a syringe

Figure 9. Plastic tubes with hydrogel.

On each test tube there is a hint, so students understand that they need to add water:



and **DO NOT OPEN**

The students use the syringe from the forensic kit fill it with water and



Figure 10. Syringe connected to the lid

add it to the centrifuge test tube through the hole on the lid (Figure 10). When the centrifuge test tube (containing hydrogel) is filled with water; the hydrogel balls which are surrounded by water, become invisible, revealing a sentence related to an element (Figure 11).



Figure 11. Tubes with hydrogel after adding water, the hydrogel become invisible allowing to see the code

The solution to the puzzle

The red group: Li

The yellow group: Cl

The purple group: F

The green group: Al

Preparation of the puzzle:

1. Paste on four plastic tubes 50 ml a sticker "water needed".
2. Write on the white part of a color sticker the following sentences:

a. On the green test tube:

When cooking you use ? foil

b. On the yellow test tube:

Swimming pools are disinfected with ?

c. On the purple test tube:

? compounds are used to protect teeth against caries.

d. On the red test tube:

? is the lightest alkaline metal.

Its compounds are used to treat mental illness.

3. Paste the sticker on the centrifuge test tube while making sure the written part is not visible. You may use the sticker “water needed” or “Do not open” for this purpose.

4. Fill the tube with hydrogel balls.

5. Heat a metallic pin or needle with a flame and pierce the plastic lid with it. The hole should fit the syringe. Close the tube.

6. Hide the centrifuge test tube with simple 10 ml syringe in the room. (check the fit between the syringe and the hole on the lid).

7. Keep the tubes with water and remove the water before the activity or keep without water with the hole covered to prevent evaporation from the hydrogels.

Materials and tools:

- 4 plastic 50 ml centrifuge test tubes with lid (or a jar with a plastic lid)
- 4x 10 ml syringe with and edge that fit to the hole in the lid
- Transparent Hydrogel balls (you can buy in any toy store)
- Caption: Water needed and DO NOT OPEN (slide no.16)
- Duct tape for taping the caption on the tube

4. TREASURE MAP WITH COINS PUZZLE

Description of the puzzle

A transparent plastic bag contains a map of a hidden treasure and some coins (slide no. 17, Figure 12). The bag is hidden in the room.

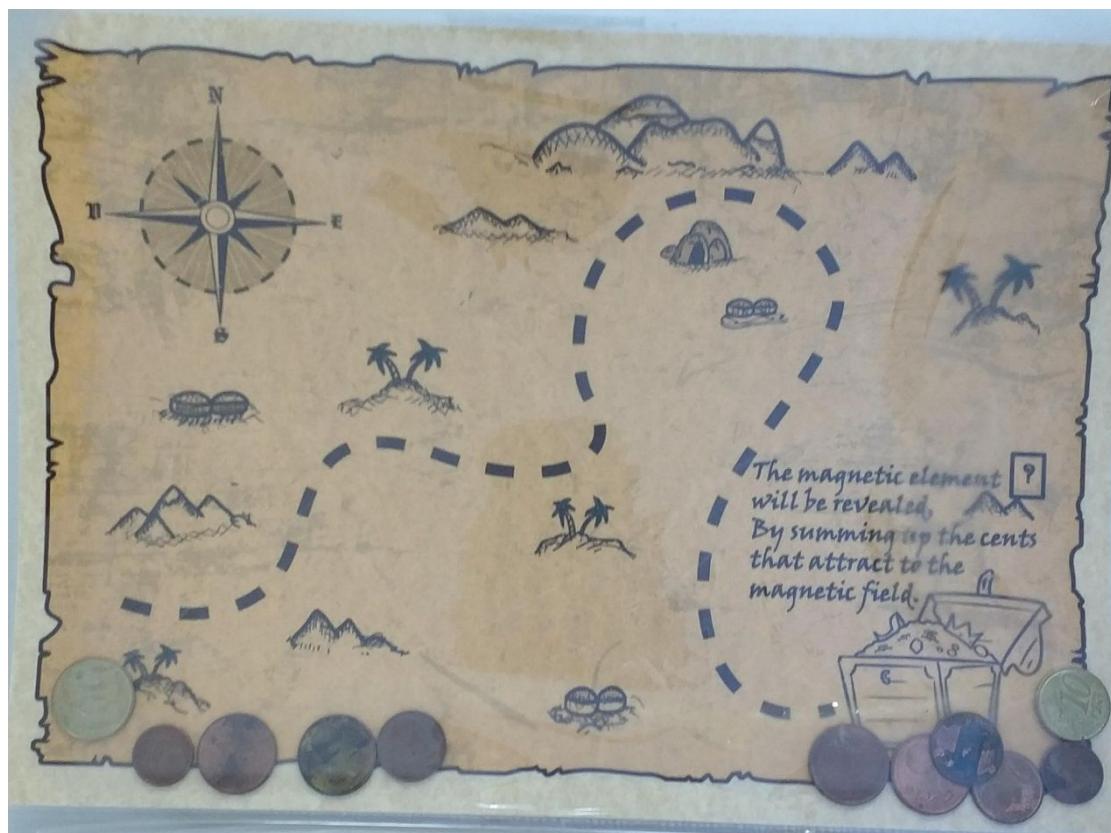


Figure 12. Treasure map with coins

There is a note on the map:

*The magnetic element
will be revealed,
By summing up the cents
that attract to the
magnetic field.*

Using the magnet in the forensic kit, the students move the magnetic coins to the treasure box.

Once adding up the value of the coins that are drawn to the magnet, the students receive the atomic number of their element.

The solution of the puzzle:

The magnetic elements:

The red group: Co

The yellow group: Ni-28

The purple group: Co-27

The green group: Fe-26

Preparation of the puzzle:

1. Print slide no. 17

2. Insert the map into a transparent Ziploc polyethylene bag.

3. (Optional) With a fishing thread and a needle, sow an open "pocket" for the coins and fill the pocket with the number of coins which are attracted to a magnet according to the group color; add some other coins which are not attracted to magnets.

4. Close the plastic bag with duct tape

Materials and tools:

1. Slide no. 17 printed.

2. 4 transparent Ziploc polyethylene bag A4 size.

3. In Euro: 1,2 & 5 cents coins attract to a magnet. We recommend: using 5 cents X 4, 2 cents x 3 add up to 26, 1 cent (27) and 2 cents (28)

4. In Euro: 10 cents coins do not attract to a magnet. Use pennies (dollars) or other coins. In total add no more than 4 coins.

5. Duct tape

6. 4 strong magnet (inside the forensic kit)

Some countries may not have coins that are magnetic. We suggest using Euros or other magnetic coins. It is one of the best puzzles, would not suggest to omit it.

5. THE ENVELOPE PUZZLE

Description of the puzzle

A bag containing an envelope and a painting brush is hidden in the room. The envelope is closed and has this caption on one side:

"IN VINO VERITAS" in Latin they say.

"In wine there's the truth" is the English way.

"In alcohol lies the truth" is the Chemist's play,

Wipe it on the envelope and 2 elements from it will display.

On the other side, another note (Figure 13).



Figure 13. Envelope puzzle (showing both sides of the envelope)

Once the student smears alcohol or hand sanitizing gel (from the forensic kit) on the white side of the envelope (the side where there is a drawing of the brush), they will find a puzzle, and the solution of the puzzle reveals an element (Figure 14).

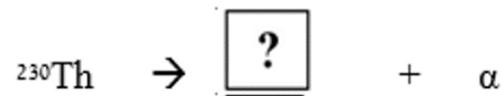


Figure 15. Envelope puzzle after smearing alcohol

There are 2 options for the puzzle:

1. For students who studied radioactivity, two elements will be revealed in the envelope:

Atomic mass (a.m.u.)	169
#protons	69
#neutrons	100
The element	?



solution	Tm
	Ra

2. For students who haven't studied radioactivity, the reaction will be deleted and the symbol of the other element will appear.

The solution of the puzzle

Color				
Atomic mass (a.m.u.)	169	165	160	152
#protons	69	67	64	62
#neutrons	100	98	96	90
The element	Tm	Ho	Gd	Sm

The red group: Sm

The yellow group: Gd

The purple group: Tm

The green group: Ho

Radioactivity

The red group: Rn

The yellow group: Th

The purple group: Ra

The green group: Am

Preparation of the puzzle:

- Insert the puzzles from slide 20 (for radioactivity) or part of the slide (for students who haven't studied radioactivity) into 4 white long envelopes. Make sure that the puzzle is placed to the front of the envelope (the side without the closing strip) and that the paper fits the size of the envelope so that the puzzle does not move.
- Close the envelope and tape on this side (with the opening) slide no. 19.
- Tape the brush symbol  and a colored sticker of on each envelope, on the side that will be smeared with alcohol
- Place the envelope with a painting brush in a bag and stick a note "Do not open the envelope – Chemists have better solutions!" and hide it in the room.

Materials and tools:

- Slides no. 19-20 printed
- 4 long white envelopes
- Duct tape
- 4 bottles or centrifuge test tube with 10 ml of alcohol or hand sanitizing gel (from the forensic kit)
- 4 painting brushes
- 4 bags or boxes to put in the envelop and the painting brush

7. MESSAGE IN A BOTTLE PUZZLE

Description of the puzzle

Inside a bottle (Figure 15), the students will find a rolled map with a the sign on a place that has an element named after it. The bottles are hidden in the room.

The solution of the puzzle:

The red group: Po

The yellow group: Ge

The purple group: Fr

The green group: Cf



Figure 16. Bottle with map in it-message in a bottle puzzle

Preparation of the puzzle:

Print on a pale yellowish, ancient-looking paper 4 maps (slides: 22-25), roll each map and tie it with a rubber band. Put each map in a bottle, mark the bottle with a colored sticker (using the color of each group) and hide it in the room.

Students can get hints regarding the name of the element by looking at slide 26 that is hanging on the wall.

Materials and tools:

- Slides no. 22-25 printed
- 4 bottles 1-1.5 liter, preferably with a wide opening
- 4 rubber bands
- Slide 26 (to hang on the wall)

8. THE SLIME PUZZLE

Description of the puzzle

A covered transparent cup containing white plastic glue (Figure 16) in it is on a table in the room. The following instructions are written on the cup:

1. Add 10 ml water and stir.
2. Add the Borax.
3. Again, Stir.

The element ? you looked for



Figure 17. Cup of the slime puzzle.

on the bottom will appear.

Next to the cup there is a disposable teaspoon or a popsicle stick. Once the students add the borax from the forensic kit, slime is formed. A symbol of an element which is taped to the bottom of the cup is revealed when the slime is removed from the cup.

The solution of the puzzle:

The red group: Cu

The yellow group: Zn

The purple group: Cs

The green group: Xe

Preparation of the puzzle:

1. Tape the element symbol under each cup (slide no. 27). Make sure that the symbol is seen from the inside of the cup.
2. Put a sticker with the color of the group above the symbol (from the outside). Make sure the symbol *cannot be seen* through the sticker.
3. Paste the puzzle instructions on the cup from the outside (slide no. 27).
4. Just before the activity, put inside the cup 10 ml of white plastic glue (the glue can dry if prepared too early).

5. Use duct tape to tape a disposable teaspoon or a popsicle stick to the cup.
6. Hide the cup in the room.

Materials and tools:

- 4 disposable cups, preferably with a lid
- Slide no. 27 printed
- 40 ml of white plastic glue
- 40 ml of water
- 4 centrifuge test tubes or bottles with 10 ml borax solution 4% (from the forensic kit)
- 4 disposable teaspoons or popsicle sticks taped to the cup with duct tape

9. THE WAZE PUZZLE

Description of the puzzle

Hidden in the room, there's a paper with route directions (Figure 17). Once the students mark the route on the periodic table in the puzzle, they'll receive a symbol of an element.

Figure 18. The solution of one of the WAZE puzzles

The solution of the puzzle:

The red group: P

The yellow group: S

The purple group: C

The green group: O

Preparation of the puzzle:

1. Copy slides no. 28-31 (preferable with lamination)
 2. Hide the slides in the room.

Materials and tools:

- Copies of slides no. 28-31
 - 4 Markers or a pencils (markers are needed for laminated sheets while pencils are required only if paper is used)

10. THE CHROMATOGRAPHY PUZZLE

Description of the puzzle

The students find a cup with filter paper hanged on a stick.

On the filter paper there's a drawing and a sentence: "dip **only** my legs in the water" (Figure 18).

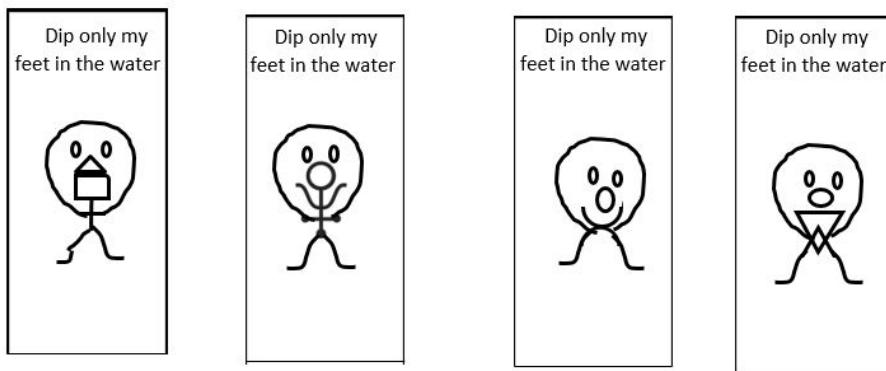


Figure 19. The chromatography papers

Once the students add 2-3 ml water (from the kit), the paper will absorb the water, part of the drawing will smear (Figure 19), revealing an alchemy symbol (chromatography) (Figure 20).



Figure 20. The different stages while performing the chromatography with water.

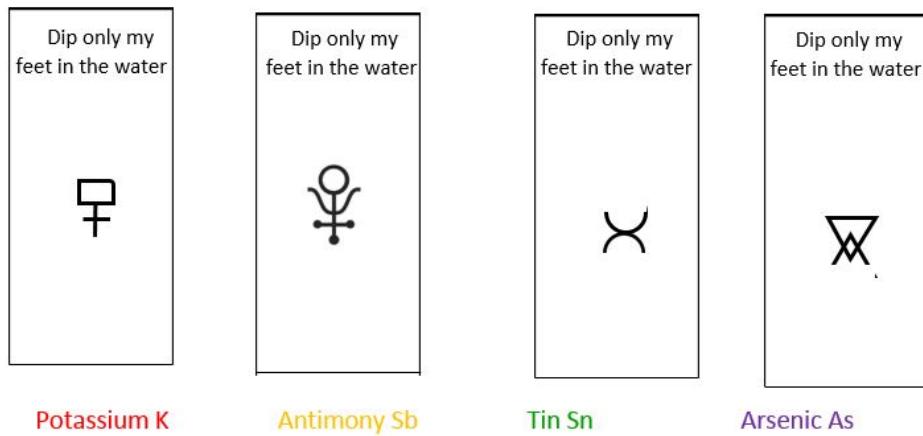


Figure 21. The alchemists' symbols of the elements revealed.

The periodic table showing the symbols of the elements that were known by alchemists (Figure 21), is hanging in the room. The students can find the symbol of the element revealed by chromatography and identify the element by its location in the table.

H 1	Alchemists are described as the first chemists. They developed a unique language to describe elements, phenomena, chemical reactions and philosophical ideas.												He 2	
Li 3	Be 4													
Na 11	D													
	Ca 20	Sc 21	Ti 22	V 23	Cr 24	Mn 25	○	Co 27	Ni 28	X	≡	Ga 31	Ge 32	
Rb 37	Sr 38	Y 39	Zr 40	Nb 41	Mo 42	Tc 43	Ru 44	Rh 45	Pd 46	Ψ	Cd 48	In 49	☿	Se 34
Cs 55	Ba 56	La 57	Hf 72	Ta 73	W 74	Re 75	Os 76	Ir 77	☽	○	♀	Tl 81	☿	Te 52
Fr 87	Ra 88	Ac 89	Rf 104	Db 105	Sg 106	Bh 107	Hs 108	Mt 109	Ds 110	Rg 111	Cn 112	Nh 113	Fl 114	Mc 115
	Ce 58	Pr 59	Nd 60	Pm 61	Sm 62	Eu 63	Gd 64	Tb 65	Dy 66	Ho 67	Er 68	Tm 69	Yb 70	Lu 71
Th 90	Pa 91	U 92	Np 93	Pu 94	Am 95	Cm 96	Bk 97	Cf 98	Es 99	Fm 100	Md 101	No 102	Lr 103	

Figure 22. The periodic table showing the symbols of the elements known by alchemists.

In this table, the elements known by alchemists are shown

The solution of the puzzle:

The red group: K

The yellow group: Sb

The purple group: As

The green group: Sn

Preparation of the puzzle:

- Print slide no. 32 on a filter paper, (or draw the symbols with a permanent marker)
- Draw a creature with legs with a regular marker (soluble in water) Like those in the picture above
- Skewed the top of the paper with a stick and hang it inside a 100ml beaker.
- The paper should be just above the bottom of the chemical cup, it shouldn't touch the bottom nor the side of the beaker.
- Stick a sticker with the color of the group on the beaker and hide it in the room.
- Hang the periodic table of the alchemists (slide 33), preferable with lamination, in a visible place in the room.

Materials and tools:

- Slide no. 32 printed on a filter paper
- 4 wood sticks
- 4 100 ml beakers
- The periodic table of the alchemists (**slide no. 33**)
- Regular marker (soluble in water)
- Permanent marker
- Slide no. 33 the periodic table of the alchemists, print and laminate.

11. THE SONGS PUZZLE

Description of the puzzle

Music plays during the activity, student find a hint - Figure 22 that gives the students a clue



to listen to the music. The students notice that there are 3 elements “hidden” in the songs.

This puzzle should be adapted to each country since songs should be easy to recognize by the students. Table 1 shows a list of songs for you to choose from.

Our students identified 3 elements **Au**, **Ti**, **Ag** and marked them on their periodic table. **This puzzle**

Figure 23. The clue to listen to the elements in the songs.

is same for all groups

*The solution of the puzzle: **Au, Ti, Ag***

Preparation of the puzzle:

Download this file and play in a loop, before the students enter the room.

Name of the element	Link to the song
Silver and gold	https://www.youtube.com/watch?v=OLxScqSZ9D4
Titanium	https://www.youtube.com/watch?v=JRFuAukYTKg
Oxygen	https://www.youtube.com/watch?v=rC16KH2KVwc
Neon	https://youtu.be/_DfQC5qHhbo?t=151
Gold	https://www.youtube.com/watch?v=haR4qKm3duM
Mercury	https://youtu.be/3T3MgIRUwj0?t=44

The following links lead to sites with lists of songs that mention elements:

<https://pigeonsblue.com/2014/05/18/periodic-table-of-elements-playlist/>

<https://wyrk.com/country-song-titles-including-elements-from-the-periodic-table/>

As a clue – copy slide no. 34, crop it and paste it on the computer.

12. THE MD-101 PUZZLE

Description of the puzzle

Each group receives a transparency PT for blackening the elements found by each group in the puzzles (slide no. 7, Figure 23).

The table will help you solve the mystery. Mark the squares of elements that you will discover. To succeed, take Sherlock Holmes' advice, as he always claimed: It's **Elementary**, my dear Watson! . Good luck – we're counting on you to solve the mystery!!

H	Hydrogen	Atomic Number →	1	Symbol	He	Helium
Li	Lithium	Name →	H	Hydrogen	B	Boron
Be	Beryllium				C	Carbon
Mg	Magnesium				N	Nitrogen
K	Potassium	Ti	Titanium	O	Oxygen	
Ca	Calcium	V	Vanadium	F	Fluorine	
Sc	Scandium	Cr	Chromium	Ne	Neon	
Fe	Iron	Mn	Manganese	Ar	Argon	
Co	Cobalt	Fe	Iron	Al	Aluminum	
Ni	Nickel	Cu	Copper	Si	Silicon	
Zn	Zinc	Sn	Tin	P	Phosphorus	
Kr	Krypton	Ge	Germanium	S	Sulfur	
Rb	Rubidium	As	Arsenic	Cl	Chlorine	
Sr	Samarium	Br	Bromine	Se	Selenium	
Y	Yttrium	Ge	Gallium	Br	Bromine	
Zr	Zirconium	As	Antimony	I	Iodine	
Nb	Niobium	Pd	Palladium	Xe	Xenon	
Mo	Molybdenum	Rh	Ruthenium			
Tc	Technetium	Pt	Platinum			
Ru	Ruthenium	Ag	Silver			
Pd	Palladium	Cd	Cadmium			
Hf	Hafnium	In	Inert			
Ta	Tantalum	Sn	Tin			
W	Tungsten	Te	Tellurium			
Re	Rhenium	Pb	Lead			
Os	Osmium	Po	Polonium			
Ir	Iridium	At	Astatine			
Pt	Platinum					
Au	Gold					
Hg	Mercury					
Tl	Thallium					
Pb	Lead					
Bi	Bismuth					
Po	Polonium					
At	Astatine					
Fr	Francium					
Ra	Radium					
Ac	Actinium					
La	Lanthanum					
Ce	Cerium					
Pr	Praseodymium					
Nd	Neodymium					
Pm	Promethium					
Sm	Samarium					
Eu	Europium					
Gd	Gadolinium					
Tb	Terbium					
Dy	Dysprosium					
Ho	Holmium					
Er	Erbium					
Tm	Thulium					
Yb	Ytterbium					
Lu	Lutetium					
Tb	Thulium					
Pa	Protactinium					
U	Uranium					
Np	Neptunium					
Pm	Plutonium					
Am	Americium					
Bk	Berkelium					
Cf	Californium					
Es	Einsteinium					
Mf	Mendelevium					
No	Nobelium					
Lr	Lawrencium					

Figure 24. The transparency given to the groups.

Students should blacken the element **only after checking in the computer (A H5P file) if the elements that are being discovered are the correct ones**. The tables are screened so the students can follow the progress of all groups (Figure 24).



Figure 25. The screen of the HSP file - the answer key that enables to check if the elements found are correct.4

After the four groups complete their work with the puzzles and checked that they revealed the correct elements, show the marked transparencies of each group (Slides no.36-39), slide 40 (which is hanged on the wall) gives the clue to place the transparencies together, so they overlap (slides no. 36-40). As a result, the number 101 is revealed (Figure 25) (i.e., the atomic number of the element mendelevium, named after the scientist who invented the periodic table).

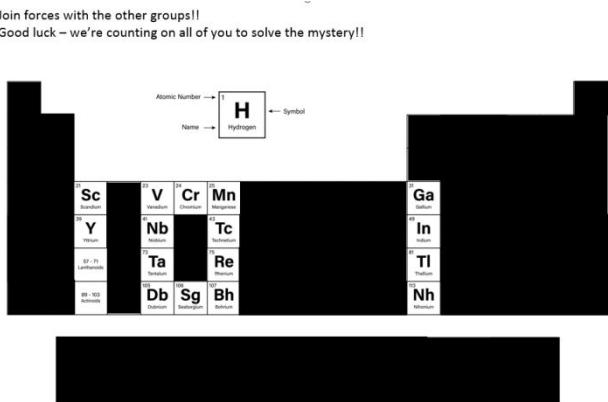


Figure 26. The 101 number revealing when all groups overlap the transparencies.

This number opens a combination lock on a pencil case or a jar with a UV flashlight and a note, which reads: "Illuminate me! ". Once the students shine the light on the note, the following words are revealed:"Chemistry - Something to die for " With this revelation, the students have collectively succeeded to "solve the murder mystery".

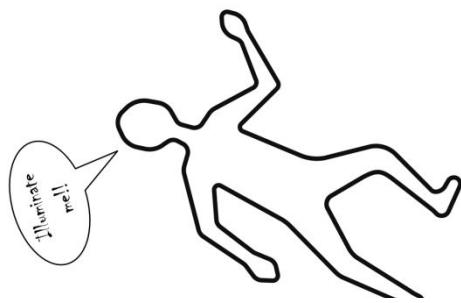
The solution of the puzzle: **101**

Preparation of the puzzle

Upload the [H5P file in the computer](#) that serves as the answer key used to check if the elements that are being discovered are the correct ones.

We suggest to screen so all groups have an idea of their situation on the game, print the blackened transparencies (slide no.36-40) so the students overlap them. The best way

to show the 101 number when all transparencies are together, is to show it on a white screen.



28

Figure 27. The note that gives the clue to use the uv flashlight to illuminate the corpse.

Place in a jar or a lockable case a UV flashlight and the note (Figure 26, slide no.42). Lock it using 101 as a code.

Materials and tools:

- A jar or a lockable case
- The note (slide no.42).
- A 3-digit Lock
- UV flashlight

UV dye with flashlight can be purchased in e-bay:

https://www.ebay.com/sch/i.html?_nkw=secret+uv+pen&ul_noapp=true&ef_id=CjwKCAjwnrjrBRAMEiwAXsCc45-81N9nB1OS0nhWpF8qZtBmehWoZFutd1AtxDbSoncPmFISDSycBoC3O0QAvD_BwE:G:s

13. THE SOLUTION OF THE MYSTERY

Description of the puzzle

Shine the UV light on the corpse, the following words are revealed:
“Chemistry - Something to die for!”

The solution of the puzzle:

The reason for the death - “Chemistry - Something to die for!”

Preparation of the puzzle:

Print the pdf file "the corpse". You will see that there several pages with black lines will be printed. Arrange the pages to form the silhouette of a corpse. Paste the pages one to the other as seen in Figure 27 with adhesive tape. Write using UV dye on the silhouette “Chemistry - Something to die for!”



Figure 28. The corpse.

Materials and tools:

- The corpse pdf file, adhesive tape

14. FLEXIBILITY OF THE ACTIVITY – AN EXAMPLE OF A CHANGE.

Teachers can replace some of the puzzles according their students' knowledge. When a puzzle is altered, we suggest that the answers should still be the same as in the original, so that the last puzzle produces an answer of 101. However, this is not essential since the teacher can change the transparencies that together form the 101 number.

For example, if a teacher hasn't taught radioactivity, an option could be to have another clue regarding an element, the easiest way (for the teacher) to do that is to think of something related to the specific elements that are supposed to be revealed in the puzzle. If the students do not know much chemistry, even writing the names of the elements and to find them in the periodic table could be challenging for them: Radon (red), Thorium (yellow) Radium (purple) Ho (green). If students studied the electronic configuration, this could also be a base for the new puzzles.