

## 6. INORGANIC NOMENCLATURE I

### 1. SPEAKING. Grammar – Time Clauses.

Complete these sentences with your ideas. Then ask about them in pairs.

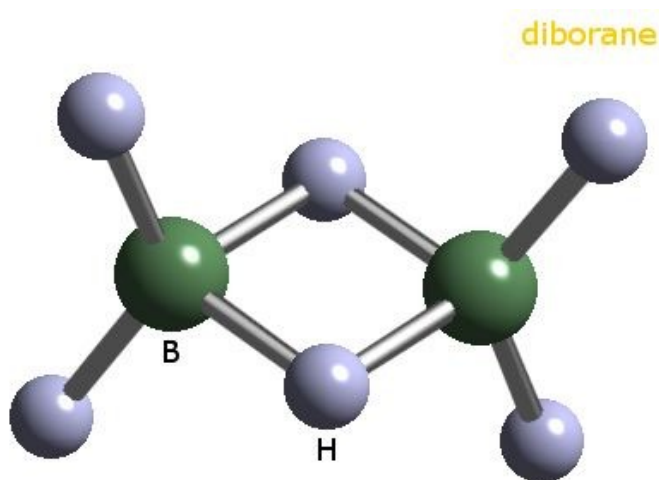
*Example: When I get home ... I'm going to have a bath.*

*Q: What are you going to do when you get home?*

- a) When as I get home today .....
- b) As soon as this lesson finishes .....
- c) After I finish my studies .....
- a) When I was a child .....
- d) When I attended secondary school .....
- e) ..... before I get too old.
- f) When I'm on holiday .....

### 2. Elements and compounds. Revision. Work in small groups. Try to answer these questions.

- a) What is the difference between an element (e.g. H) and a compound (e.g.  $\text{H}_2\text{SO}_4$ )?  
Try to write a definition of an element and a compound.
- b) What types and groups of elements do you know?
- c) Do you know any names of elements? What do you know about them?
- d) What is an ion? What types of ions do you know? What is their charge?
- e) What is an isotope? Give examples of isotopes.
- f) What is the difference between binary and ternary compounds?
- g) Give examples of some organic and inorganic compounds, acids and bases, salts, oxides, hydroxides. What do you know about them? What are their properties? What is their use?
- h) Explain these terms: chemical symbol, chemical formula, chemical equation. Give examples.



### 3. Listening. Listen to the Song of the elements by Tom Lehrer and fill in the gaps. <sup>1</sup>

<p>There's antimony, arsenic, aluminum, selenium, And hydrogen and _____ and nitrogen and rhenium. And nickel, neodymium, neptunium, germanium, And _____, americium, ruthenium, uranium, Europium, zirconium, lutetium, vanadium, And lanthanum and osmium and astatine and _____ And gold, protactinium and indium and gallium, And _____ and thorium and thulium and thallium.</p>	<p>There's holmium and helium and hafnium and erbium, And _____ and francium and fluorine and terbium. And manganese and mercury, molybdenum, _____ Dysprosium and scandium and cerium and cesium, And lead, praseodymium, and platinum, plutonium, Palladium, promethium, _____, polonium, Tantalum, technetium, titanium, tellurium, And cadmium and _____ and chromium and curium.</p>
<p>There's yttrium, ytterbium, actinium, _____ And boron, gadolinium, niobium, iridium. And strontium and _____ and silver and samarium, And bismuth, bromine, lithium, beryllium and barium.</p>	<p>There's sulfur, californium and fermium, berkelium, And also mendelevium, einsteinium and nobelium. And argon, _____, neon, radon, xenon, zinc and rhodium, And chlorine, carbon, cobalt, copper, Tungsten, tin and _____.</p>
	<p>These are the only ones of which the news has come to Harvard, And there may be many others but they haven't been discovered.</p>

Now look at the at the periodic table with pronunciation.

### 4. Quiz – matching. Match each phrase with an element<sup>2</sup>:

- |   |               |
|---|---------------|
| 1. a twenty-fifth wedding <b>anniversary</b>  | A. mercury    |
| 2. maybe the first metal used by man          | B. nickel     |
| 3. a can is made of it                        | C. oxygen     |
| 4. an American coin                           | D. nitrogen   |
| 5. 1st place medal                            | E. copper     |
| 6. breathe in                                 | F. phosphorus |
| 7. good for your teeth                        | G. silver     |
| 8. think of matches                           | H. iron       |
| 9. 80% of the air                             | I. tin        |
| 10. nuclear power can come out of this        | J. hydrogen   |
| 11. the most widely used metal of all         | K. gold       |
| 12. describes a particular type of blond hair | L. plutonium  |
| 13. think of the bomb                         | M. calcium    |
| 14. gives out light in the dark               | N. sulphur    |
| 15. used in thermometers                      | O. platinum   |

### 5. What alloys or other substances will you get if you mix the following?

- |                                       |                 |
|---------------------------------------|-----------------|
| 1. copper and tin                     | A. <b>brass</b> |
| 2. copper and zinc                    | B. cement       |
| 3. iron and carbon                    | C. concrete     |
| 4. <b>lime, clay</b> , sand and water | D. bronze       |
| 5. the above plus <b>gravel</b>       | E. steel        |

Now say it in a sentence. *e.g. When / if we mix copper and tin, we get ...*

## INORGANIC NOMENCLATURE:

### A. IONS.

**Cations**  $H^+$  h plus / hydrogen ion / univalent positive hydrogen ion

$Cu^{2+}$  c u two plus / divalent positive cuprum (copper) ion

$Fe^{2+}$  Fe two plus / iron (2+), iron (II), ferrous ion, divalent positive iron ion

$Fe^{3+}$  Fe three plus / iron (3+), iron (III), ferric ion, trivalent positive iron ion

$Hg_2^{2+}$  h g two two plus / mercury (I) ion

**Anions:**  $Cl^-$  c l minus / negative chlorine ion / negative univalent chlorine ion

$OH^-$  OH minus / hydroxide ion

### 6. Nomenclature quiz. Complete these sentences.

a) The chemical symbol for the calcium ion is .....

b) The chemical symbol for the fluoride ion is .....

c) The chemical symbol for the ammonium ion is.....

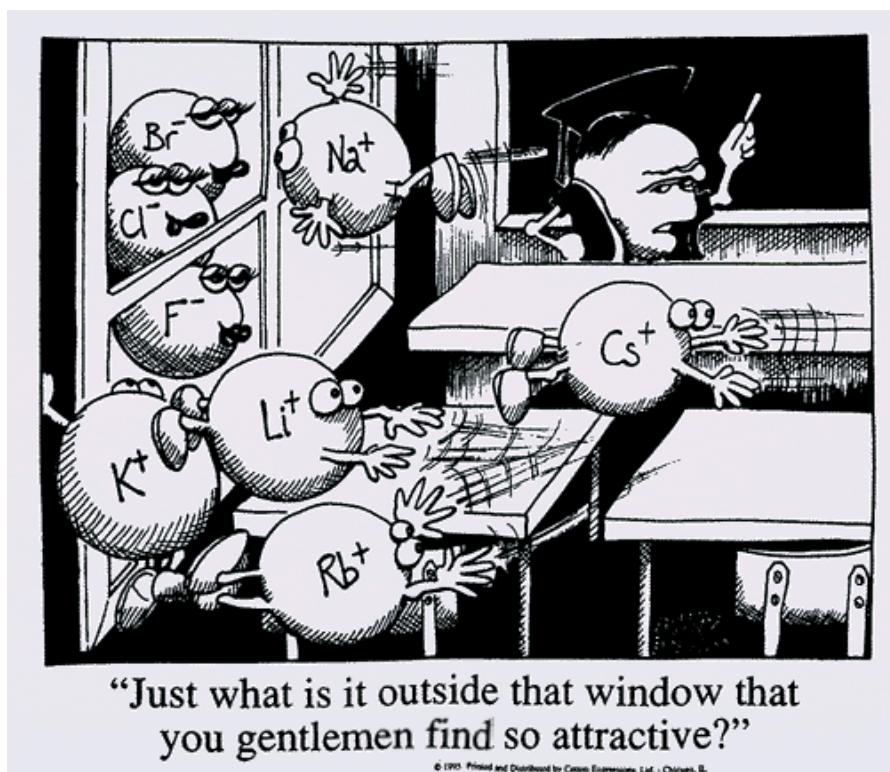
d) The chemical symbol for the magnesium ion is.....

e) The chemical symbol for the sodium ion is.....

f) The chemical symbol for the aluminum ion is.....

**Then check the exercise in pairs.**

**Ask and answer questions. (What is the chemical symbol for...?)**



## B. BINARY COMPOUNDS (compounds that consist of a combination of two elements).

### a) METALS WITH A FIXED CHARGE (one oxidation state)

Salts of oxo-acids, metal oxides and other binary compounds.

- metal + nonmetal with -ide [ aid ]

E.g. NaCl - En : sodium chloride [aid]

Cz : **chlorid sodný** (note: in Czech different order of elements than in English)

NaCl	sodium <b>chloride</b>	[kloraid]
ZnCl <sub>2</sub>	zinc <b>chloride</b>	
CaC <sub>2</sub>	calcium <b>carbide</b>	[ka:baid]
MgS	magnesium <b>sulphide</b>	[salfaid]
KHS	potassium hydrogen <b>sulphide</b>	
Ca <sub>3</sub> N <sub>2</sub>	calcium <b>nitride</b>	[naitraid]
KNH <sub>2</sub>	<b>amide</b>	[ə'maid]
KCN	<b>cyanide</b>	[ 'sai'naid]
K <sub>2</sub> O	potassium <b>oxide</b>	
ZnO	zinc <b>oxide</b>	
CaO	calcium <b>oxide</b>	

### 7. Nomenclature quiz: Write the chemical formulas of :

- sodium fluoride
- potassium hydrogen sulphide
- silicon carbide
- potassium cyanide
- aluminum chloride
- calcium nitride
- zinc oxide

### 8. Write the names of these compounds:

- Na<sub>2</sub>C.....
- NaCN.....
- BaS.....
- CaCl<sub>2</sub>.....
- Mg<sub>3</sub>N<sub>2</sub> .....
- NaNH<sub>2</sub>.....
- CaF<sub>2</sub>.....
- CaO .....

Now check your answers in pairs. Spell the formulas.

**b) METALS WITH A NON-FIXED CHARGE (occur in more than one oxidation state)**  
**Metal oxides and other binary compounds with a non-fixed charge**

**2 methods of nomenclature:**

**Rational nomenclature (named according to IUPAC regulations)**

**Roman numeral expresses oxidation state**

FeO	iron <b>(II)</b> oxide
Fe <sub>2</sub> O <sub>3</sub>	iron <b>(III)</b> oxide
Cu <sub>2</sub> S	copper <b>(I)</b> sulfide
CuS	copper <b>(II)</b> sulfide
FeCl <sub>2</sub>	iron <b>(II)</b> chloride
FeCl <sub>3</sub>	iron <b>(III)</b> chloride

**Older method (Latin name, trivial name)**

- suffix **-ous** [ -s ] - indicates **lower** oxidation state
- suffix **-ic** [ ic ] - indicates **higher** oxidation state

*Example:*

FeO	ferrous oxide	( <u>lower</u> oxidation state)
Fe <sub>2</sub> O <sub>3</sub>	ferric oxide	are oxides of iron ( <u>higher</u> oxidation state)
Cu <sub>2</sub> S	cuprous sulfide	
CuS	cupric sulfide	are sulfides of copper

mercuric chloride and mercurous chloride are chlorides of mercury  
arsenic oxide and arsenous oxide are oxides of arsenic  
plumbic iodide and plumbous iodide are iodides of lead  
stannic bromide and stannous bromide are bromides of tin, etc

**Important: These suffixes have no absolute meaning. They just indicate the lower and the higher valence. Thus e.g. -ic means a valence of 2 in the case of copper and 3 in the case of iron . It is for this reason that Roman numerals are used.**

**c) NON-METALS (trivial names)**

- Greek prefixes indicate the number of atoms of the element in the compound:  
**mono-, di-[dai], tri-[trai], tetra-, penta-, hexa-, hepta-, octa-, nona-, deca-      ± ide**

*Examples:*

NO <sub>2</sub>	nitrogen <b>dioxide</b> = nitrogen (IV) oxide	(1 atom of nitrogen, 2 atoms of oxygen)
N <sub>2</sub> O <sub>4</sub>	<b>dinitrogen tetroxide</b> = dimer of Nit. (IV) oxide	
N <sub>2</sub> O <sub>5</sub>	<b>dinitrogen pentoxide</b> = nitrogen (V) oxide	
CO	carbon <b>monoxide</b>	
CO <sub>2</sub>	carbon <b>dioxide</b>	
P <sub>2</sub> O <sub>3</sub>	<b>(di)phosphorus trioxide</b>	
OsO <sub>4</sub>	osmium <b>tetroxide</b>	
P <sub>2</sub> O <sub>5</sub>	<b>diphosphorus pentoxide</b>	
PCl <sub>3</sub>	phosphorus <b>trichloride</b>	
CCl <sub>4</sub>	carbon <b>tetrachloride</b>	
CS <sub>2</sub>	carbon <b>disulfide</b>	

## d) PEROXIDES

An oxide containing more oxygen than some other oxide of the same element is called a peroxide.

$H_2O_2$             hydrogen peroxide            [ $ˈhaɪdrədʒ \text{ ʌn } pə \text{ ˈrɒ},ksaɪd$ ]  
 $Na_2O_2$             sodium peroxide

### Exercises:

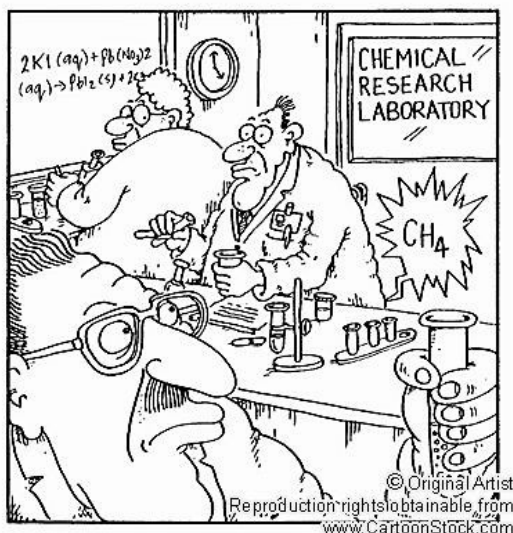
#### 9. Write the formulas of the following binary molecular compounds:

nitrogen monoxide.....  
dinitrogen monoxide.....  
sulfur trioxide.....  
iron (II) sulphide.....  
iron (III) sulphide.....  
dichlorine monoxide.....  
tetraphosphorus decoxide.....  
oxygen difluoride.....  
iron (II) cyanide.....  
sodium peroxide .....

#### 10. Write the names for the following formulas:

$PI_3$   
 $SbF_5$   
 $P_2O_5$   
 $SO_3$   
 $FeCl_3$   
 $FeCl_2$   
 $ZnCl_2$   
 $CaO$   
 $H_2O_2$

Now check your answers in pairs.



# 11. HOMEWORK: CONDITIONALS - PODMÍNKOVÉ VĚTY<sup>3</sup>

## 1. GRAMATICKÁ KONSTRUKCE TYPU I:

*If I (+ čas přítomný)....., I'll .....*

*If we go by bus, it will be cheaper.*

### *Příklady:*

*If we go by bus, it will be cheaper.*

Jestli pojedeme autobusem, bude to levnější.

*If you don't hurry, you'll miss the train.*

Jestli si nepospíšíš, zmeškáš ten vlak

POZOR NA ZÁMĚNU IF A WHEN!

**If** I go out = je možné, že půjdu ven, ale nejsem si jista. → Jestli půjdu ven....

**When** I go out = určitě půjdu ven. → Až půjdu ven....

## 2. GRAMATICKÁ KONSTRUKCE TYPU II:

*If I (+ čas minulý)....., I would*

*If we went by bus, it would be cheaper.*

Po *if* se používá tvar minulého času, nejde ale o minulost, význam je přítomný.

### *Příklady:*

Jane lives in s city. She likes cities. She **wouldn't be** happy if she **lived** in the country.

Jane žije ve městě. Má ráda města. Nebyla by šťastná, kdyby žila na venkově.

I'm sorry I can't help you. I **d help** you if I **could**. (but I can't)

Bohužel Vám nemohu pomoci. Pomohla bych Vám, kdybych mohla (ale nemůžu)

If we **had** a car, we **would travel** more.

Kdybychom měli auto, víc bychom cestovali.

Vedle tvaru **was** se běžně používá **were**. Obojí je správně.

It would be nice if the weather **were (was)** better.

It's cold. If I **were (was)** you, I'd put your coat on.

### Věty typu I wish you were here.

Vazby **I wish** se použije, chceme-li vyjádřit, že je nám líto, že něco není tak, jak bychom si to přáli.

*I wish I knew* Paul's phone number. (je mi líto, že jej neznám)

Kdybych tak jen / Kéž bych znala Paulovo telefonní číslo.

## 3. GRAMATICKÁ KONSTRUKCE TYPU III:

*If I + (tvar předminulého času).....I would (infinitiv minulý)*

*If we had gone by bus, it would have been cheaper.*

I didn't see you when you passed me in the street. If I **d seen** you, I **would have said** hello.

Neviděla jsem Tě, když jsi mě na ulici míjel. Kdybych Tě byla (bývala) viděla / ~~Kdybych Tě viděla~~, byla bych Tě (bývala) pozdravila / ~~pozdravila bych Tě~~.

I decided to stay at home last night. I **would have gone** out if I **hadn't been** so tired.

Rozhodl jsem se, že zůstanu doma. Byl bych (býval) někam šel / ~~Šel bych někam~~, kdybych nebyl (býval) tak unavený / ~~kdybych nebyl tak unavený~~.

### *Srovnejte typ II a typ III:*

I'm not hungry. If I were hungry, I would eat something. (now)

I wasn't hungry. If I had been hungry, I would have eaten something. (past)

## Exercises:

a) Dejte slovesa do správného tvaru (*čas přítomný* nebo tvar s *will*):

1. If you **say** (say) that again, I **ll.scream**.(scream).
2. I ..... (be) surprised if she .....(manage) to sell the car.
3. If the boys ..... (come) to supper, I ..... (cook) the chicken breasts.
4. I ..... (need) some money if we ..... (go) out tonight.
5. I ..... (miss) you if we ..... (move) to Wales.
6. If you ..... (wash up), I..... (dry).

b) *If* nebo *when? If*: něco se možná stane, *when*: něco se určitě stane.

Doplňte a převeďte do češtiny:

1. ....I become a President
2. ....it gets dark
3. .... the film finishes
4. .... she passes her exam
5. ....it doesn't rain tomorrow

c) Dejte slovesa do správného tvaru:

1. They would be rather offended if I **didn't go** to see them. (not/go)
2. If you took more exercise, you **would feel** better. (feel)
3. If I was offered the job, I think I ..... it. (take)
4. I'm sure Amy will lend you the money. I'd be very surprised if she ..... (refuse)
5. If I sold my car, I ..... much money for it. (not/get)
6. A lot of people would be out of work if the factory ..... (close down)

d) Dejte sloveso do správného tvaru:

1. I didn't know you were in hospital. If **I'd known** (I/know), I **would have gone** (I/go) to visit you.
2. Ken got to the station in time to catch his train. If .....(he/miss) it, ..... (he/be) late for his interview.
3. It's good that you reminded me about Ann's birthday. .... (I/forget) if ..... (you/not/remind) me.
4. Unfortunately, I didn't have my address book with me when I was in New York. If ..... (I/have) your address, ..... (I/send) you a postcard.
5. A: How was your holiday? Did you have a nice time? B: It was OK, but ..... (we/enjoy) it more if ..... (the weather/be) better.

Sources: <sup>1</sup> Available at <http://www.privatehand.com/flash/elements.html>, Transcript <http://www.edu-cyberpg.com/iec/elementsong>.  
<sup>2</sup> Adapted from Milada Pavlovová.  
<sup>3</sup> Adapted from Marie Sabolová.