

**LESSON 6: NUMBERS AND MEASUREMENTS** ( adapted from A. Rozkošná materials)



**I. Discuss the questions below in your groups/pairs.**

1. Do you have any lucky/unlucky number? Do you believe in numerology?
2. *“Mathematics is the father of all sciences.”, “Everything in science has its origin in mathematics.”, Mathematics is the most primary science.* – do you agree with these statements? Why? Why not?
3. What could you calculate or measure ( express in numbers) in this room?
4. What are the things that these people need to calculate?
  - a. biologist
  - b. astronomer
  - c. physicist
  - d. geologist
  - e. chemist

**II. Read these numbers or fractions:**

0.2	3000 000 000
0.05	7000 000 000 000
26	1st
138	2nd
2479 (ordinal number/hotel room)	43 <sup>rd</sup>
503349777 (telephone number)	2000 000
2,053	67 <sup>th</sup>
2.053 (g/kg)	1/3
	3/5

### III. Simple arithmetics

Look at the way we say these examples:

$4 + 4 = 8$	four and (plus) four is / equals eight
$9 - 2 = 7$	nine minus two is seven
$5 \times 5 = 25$	five times five is twenty-five or five multiplied by five is twenty-five
$8 \div 4 = 2$	eight divided by four is two

Here are some more arithmetical symbols. Notice how to say them.

$2^2$	two squared	$\sqrt{\quad}$	square root of ...
$- 2^3$	minus (negative) two cubed	$\sqrt[3]{\quad}$	cube root of ...
$2^4$	two to the power of four	$\pi$	pi
$\log_{10}7$	log of seven to the base ten	$x=3(a+b)$	x equals three, bracket a plus b, bracket

### IV. Work in pairs. Solve these maths problems.

- |                         |                               |                           |
|-------------------------|-------------------------------|---------------------------|
| a) $12 - 6 = \dots$     | d) $\sqrt{16} = \dots$        | g) $\sqrt[3]{27} = \dots$ |
| b) $9 \times 5 = \dots$ | e) $4 + 7\frac{1}{5} = \dots$ | h) $2^4 = \dots$          |
| c) $30 \div 6 = \dots$  | f) $9^2 = \dots$              | i) $\pi = \dots$          |

Look at this example:

Add six to seven. Now multiply by four. Subtract four. Divide by twelve. What is the answer?

$$6 + 7 = 13, \quad 13 \times 4 = 52 \quad 52 - 4 = 48 \quad 48 \div 12 = ?$$

Work in pairs. Write down graphical image of the problems below, then take turns in saying them aloud and finding the answer (one of you should say the equation and the other should give the answers without looking at the paper). See how quickly you can do it.

- Multiply 7 by 9. Add 9. Divide by 6. Subtract 3. What is the answer?
- Subtract 8 from 24. Divide by 2. Add two. Multiply by 10. What is the answer?
- Add six to eight. Multiply by 10. What is the answer?
- Take 50% of the students in your class. Multiply by 2. Divide by 4. What is the answer?

**V. Units of measurement.**

**1. Give the names of measurement units missing in the table below:**

	QUANTITY	UNIT	ABBR.	NOTES
SI BASE UNITS	length mass time temperature		K	=39.36 inches/in =2.2 pounds/lb
SI DERIVED UNITS	area volume velocity density frequency acceleration force work/energy/heat amount of substance molar concentration			mol/m <sup>3</sup>
NON-SI UNITS USED IN	volume typical radius of an atom about the mass of a proton or neutron	<ul style="list-style-type: none"> <li>• _____</li> <li>• _____</li> </ul>		=1000 cm <sup>3</sup> =10 <sup>-10</sup> m  =1.66054x10 <sup>-27</sup> kg  1/12 of the rest mass of an unbound neutral atom of carbon-12 in its nuclear and electronic ground state

**Some more measurements and their units:**

electric current	ampere (amp)
electric power	watt (W)
electric resistance	ohm (Ω)
electric potential difference	volt (V)
temperature	degrees Centigrade (°C)/ Fahrenheit (F)

**2. Work with a neighbour. Complete the table and then describe these numbers:**

**Example:**

a) *One kilometer equals a thousand meters* or ten to the power of three

a) kilo-	one thousand: $1 \text{ km} = 1000 \text{ m}$	$10^3$
b) deci-	one tenth: $1 \text{ dm} = \frac{1}{10} \text{ m}$	10
c) centi-	one hundredth: $1 \text{ cm} = \frac{1}{100} \text{ m}$	10
d) milli-	one thousandth: $1 \text{ mm} = \frac{1}{1000} \text{ m}$	10
e) micro-	one millionth: $1 \mu\text{m} = \frac{1}{1000000} \text{ m}$	10
f) nano-	one thousand millionth: $1 \text{ nm} = \frac{1}{1000000000} \text{ m}$	10
g) pico-	one picometer: $1 \text{ pm}$	10
h)	one _____ : $1 \text{ fm}$	$10^{-15}$
i)atto-	one _____ : $1 \text{ m}$	$10^{-18}$

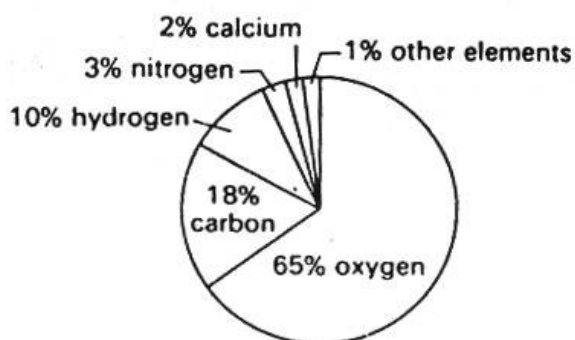
**VI. Percentages**

*65% (per cent) of our body weight is oxygen.*

*Our body contains 65% of oxygen.*

*Oxygen represents 65% of our body weight.*

Describe the rest of the diagram below using the structures given



**VII. Reading simple equations<sup>1</sup>: here are some common compounds, their names and FORMULAS:**

NaCl – sodium chloride    H<sub>2</sub>SO<sub>4</sub> – sulphuric acid    ZnSO<sub>4</sub> – zinc sulphate    C<sub>6</sub>H<sub>6</sub> - benzene  
 ZnO – zinc oxide    HCl – hydrochloric acid    Na<sub>2</sub>CO<sub>3</sub> – sodium carbonate    NH<sub>3</sub> - ammonia  
 CO<sub>2</sub> - carbon dioxide    NaOH – sodium hydroxide

These formulas are useful for writing EQUATIONS.



*We spell as:*        H Cl                    plus        Na OH                    gives    Na Cl                    plus    H<sub>2</sub>O

*We read as:* hydrochloric acid **reacts with** sodium hydroxide **to form** sodium chloride **and** water.  
**combines with**

**Complete these equations.**



(copper oxide reacts with hydrogen to form copper and water)

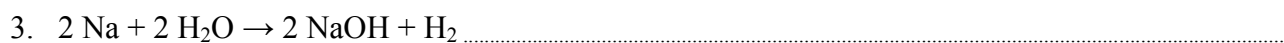
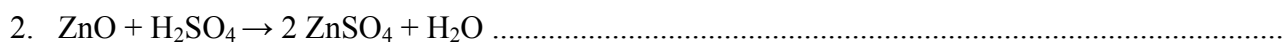


(sodium carbonate reacts with hydrochloric acid to form sodium chloride, carbon dioxide and water)



(zinc reacts with hydrochloric acid to form zinc chloride and hydrogen)

**Express these equations in words:**



**VIII. Watch the beginning of the video lecture about pH calculation given by Dr.Goldwhite.<sup>2</sup> Do the calculation, then watch the remaining part of the video and see whether you were right**

**Useful vocabulary:**

acid (n) - kyselina	base (n) – zásada	obtain (v) – získat
strongly acidic (adv+adj) – silně kyselý	basic (adj) - zásadité	species (n) - vzorek
concentration of a solution (n) – koncentrace roztoku		ion (n) - iont

**X. Say whether the following statements are true or false. Correct the false statements.**

- a) Duration is measured in degrees Centigrade T/F
- b) The second is a unit of time T/F
- c) Speed is measured in kilograms per hour. T/F
- d) The watt is a unit of electrical charge. T/F
- e) Density is measured in grams per metre cubed. T/F
- f) The gram is a unit of mass. T/F
- g) Liquid measurements are made in litres, or cubic decimetres. T/F

**GRAMMAR REVISION: COUNTABLE/ UNCOUNTABLE NOUNS**

**I. Divide the words below into two categories: countable and uncountable nouns**

percentage, metre, science, molecule, nitrogen, information, radius, second, temperature, heat, fraction, chemistry, base, acid, petroleum, research, change, salt, object, ion, water, light, substance, matter, energy, electron, equilibrium, neutron

**II. Complete the sentences below with “many” or “much”**

1. How \_\_\_\_\_ electrons does an atom of carbon possess?
2. How \_\_\_\_\_ elements are there in the periodic table?
3. How \_\_\_\_\_ liquid does a beaker contain?
4. How \_\_\_\_\_ chemical elements does the atmosphere contain?
5. How \_\_\_\_\_ nitrogen does the atmosphere contain?
6. Do you find \_\_\_\_\_ useful information about chemistry on the Internet?
7. Will we exploit \_\_\_\_\_ more nuclear energy in the future than we do today? What do you think?

**III. Complete the sentences with “little”, “a little”, “few”, “a few”**

1. As very \_\_\_\_\_ research has been done in the field, we still have no antidote to the disease.
2. Doing just \_\_\_\_\_ research threw up some very useful information.
3. Only \_\_\_\_\_ scientists were invited to take part in the project. That is probably why it was not successful.
4. The project team consists of \_\_\_\_\_ well-known chemists.

<b>Week 6 – Numbers and Measurements - Vocabulary</b>	
four and (plus) four is / equals eight	čtyři plus čtyři se rovná osm
nine minus two is seven	devět mínus dva je sedm

beaker	kádinka
five times five is twenty-five / five multiplied by five is twenty-five	pět krát pět je dvacet pět
eight divided by four is two	osm děleno čtyřmi je dva
two squared	dva na druhou
minus (negative) two cubed	mínus dva na třetí
two to the power of four	dva na čtvrtou
square root of ...	druhá odmocnina
cube root of ...	třetí odmocnina
three quarters	tři čtvrtiny
a third	třetina
one thousandth/one over a thousand	jedna tisíciná / jedna lomeno tisíc
How much is five and four?	Kolik je pět plus čtyři?
one thousand two hundred and fifty-eight	tisíc dvěsta padesát osm
add (v)	přičíst
subtract (v)	odečíst
One kilometre equals nought point six two one miles.	Jeden kilometr se rovná nula celá šedesát dva mil.
7. 65 per cent of our body weight is oxygen.	7,65 procent těledné váhy je kyslík.
Hydrochloric acid reacts with sodium hydroxide to form sodium chloride and water.	Kyselina chlorovodíková reaguje s hydroxidem sodným a vytvoří chlorid sodný a vodu.
sodium chloride	chlorid sodný
carbon dioxide	oxid uhličitý
sulphuric acid	kyselina sírová
sodium hydroxide	hydroxid sodný
sodium carbonate	uhličitan sodný
acid (n) / acidic (adj)	kyselina / kyselý
base (n) / basic (adj)	zásada / zásaditý
obtain a species (v)	získat vzorek
ion (n)	iont
concentration of a solution (n+prep+n)	koncentrace roztoku
surface area (n+n)	povrch
width (n)	šířka
length (n)	délka
square metre (adj+n)	metr čtvereční
cubic metre (metre cubed) (adj+n)	metr krychlový
electric current (adj+n)	elektrický proud
electric power(adj+n)	elektrický výkon
electric resistance (adj+n)	elektrický odpor
temperature (n)	teplota
degree Centigrade (n+n)	stupeň Celsia
kilometres per hour	kilometry za hodinu
Second is a unit of time.	Sekunda je jednotka času.

Sources: Lesson based on Bates, Martin and Dudley-Evans, Tony: *Nucleus of General Science*. Longman 1990.

Adapted from Cihová, Jarmila et al. *Angličtina pre študentov chémie*. Bratislava: Univerzita Komenského, 2003.

Available at [http://www.youtube.com/watch?v=LZkl\\_vzF9js](http://www.youtube.com/watch?v=LZkl_vzF9js). Accessed 29th October 2010.