Grade: 9

chemistry

First Exercise (7.25 pts)

Magnesium Chloride

Magnesium chloride, $MgCl_2$, is a salt that has various uses. It is safe for the environment; this is why it is used in agriculture.

Magnesium chloride is a powerful hydrotherapy that has a strong excretory effect. It is used in case of cellular toxification to kick toxins out from the tissues.

Given the following extract of the periodic table.

| $_1H$																	
													$_7N$	$_8O$	$_9F$		
	Mg													$_{16}S$	Cl		
	Ca																

1- Based on the periodic table above, answer the following questions:

  a- Determine the atomic number of the element magnesium.

  b- Determine the number of valence electrons of the chlorine atom.

  c- Write the Lewis electron dot symbol of the elements nitrogen and hydrogen.

2- Write the Lewis electron dot-structure of ammonia NH_3 and indicate the type of bond in this compound.

3- Explain the formation of magnesium chloride.

4- Magnesium chloride is obtained from the reaction of magnesium with chlorine gas according to the equation:

  $$Mg + Cl_2 \rightarrow Mg\ Cl_2$$

  a- Using the oxidation numbers, justify that the above reaction is a redox reaction.

  b- Write the oxidation half equation.

  c- Specify the oxidizing agent.

5- Justify why magnesium chloride is used in cellular toxification.

Second Exercise (4.75 pts)

Isotopes

Most of the chemical elements are found in nature in many isotopic forms. For example magnesium has 3 isotopes: Mg-24, Mg-25 and Mg-26, while chlorine has 2 isotopes: Cl-35 and Cl-37.

The adjacent diagram shows the percentages of mass of magnesium isotopes.
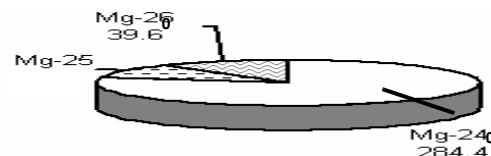
1- Calculate the percentage of mass of Mg-25.

The table below shows the number of protons and neutrons of 2 isotopes X and Y.

Atom	Number of Protons	Number of Neutrons
X	8	8
Y	8	10

2- Specify the atomic number and the mass number of X and Y.

3- Write the atomic symbol of the 2 atoms X and Y.

4- Based on the periodic table of the exercise one, identify the element(s) that X and Y belong to.

5- A bottle contains 3.2 g of the element X; determine the number of mole of X found in this bottle.
Given the molar mass of X is 16 g.mol^{-1}

Third Exercise (8 pts)

Galvanic Cells

In a lab session, a group of students in grade 9 constructed a Mg-Zn galvanic cell, by using the following materials:

Mg and Zn strips, solution containing Mg^{2+} ions, solution containing Zn^{2+} ions, connecting wires, alligator clips, a lamp, and 2 beakers, a salt bridge.

To identify the more active metal, the students measured the mass of the 2 strips every 30 minutes and they recorded the results in the table below.

Mass of the Electrode (in g)	Time (in min)	0	30	60	90	120
	Zinc Strip	10	11	12	13	14
	Magnesium Strip	10	9	8	7	6

1- Draw a line graph that represents the variation of the mass of Zn and Mg strips as a function of time.

2- Determine the anode and the cathode in the above galvanic cell.

3- Sketch and label the galvanic cell, showing the lamp in the external circuit, and the direction of the electron flow.

4- Write the half equations that take place at the anode and the cathode, and specify the type of each one.

5- Deduce the equation of the overall reaction.

6- When the salt bridge is removed, the lamp turns off. Justify why.

7- Another group constructs a Zn-Cu galvanic cell, they deduce that Zn is more active than Cu.

a- Write the schematic cell representation of this cell.

b- Classify the metals Zn, Mg and Cu in the increasing order of their reactivity.

Good Work