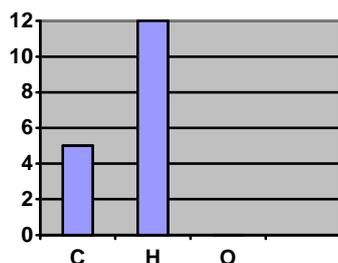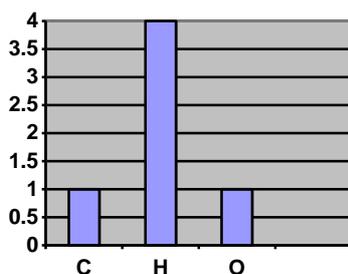Grade: 9

chemistry

First Exercise (6points)
Organic Compounds

The following histograms show the number of each type of atoms found in each molecule of 3 organic compounds (A), (B), and (C).
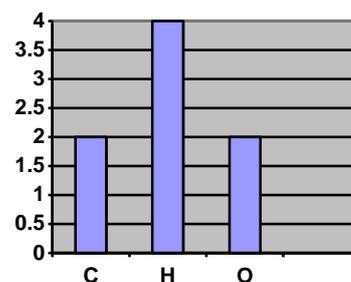

Histogram (I)   Histogram (II)   Histogram (III)

1- Histogram (I) gives information about compound (A).
   a- Write the molecular formula of compound (A).
   b- Identify the family of hydrocarbons to which compound (A) belongs.
   c- (A) has 3 isomers. Write their condensed structural formulae and their systematic names (IUPAC names).

2- Compound (B) is a carboxylic acid.
   a- Identify the histogram that corresponds to (B).
   b- Write the molecular formula of compound (B).
   c- Write and give the name of its functional group.

3- Identify the family to which compound (C) belongs.
4- (B) and (C) react together in the presence of H_2SO_4 and heat.
   a- Give the name of this reaction.
   b- Write, using molecular formulae, the equation of this reaction.

Second Exercise (7points)
Petroleum Products and Environment

Products of petroleum such as octane and vinyl chloride are widely used nowadays.
A- Octane (C_8H_{18}) is an alkane with linear chain used as combustible fuel in cars.
   1- Give the name of the technique (process) allowing to obtain octane from crude oil.
   2- On what property is this technique of separation of hydrocarbons based?
   3- Ethene (C_2H_4) can be obtained from octane according to the following equation:

$$C_8H_{18} \xrightarrow{\text{Heat}} CxHy + C_2H_4$$

   a- Give the name of this reaction.
   b- Determine x and y.

   4- Carbon dioxide (CO_2) is one of the products of the complete combustion of octane.
      We give: **Z(C)=6   Z(O)=8**
   a- Write the equation of the complete combustion reaction of octane.

b- Write the Lewis dot symbol of the two elements constituting CO_2, and the Lewis structure of CO_2.

5- The increase of CO_2 concentration in the atmosphere is at the origine of different air pollution problems.
 a- Give the name of the major environmetal problem related to this increase of CO_2.
 b- List two consequences of this problem.

B- Vinyl chloride ($CH_2=CHCl$) is a raw material that undergoes polymerization reaction to form a polymer: the polyvinil chloride (plastic material).
 1- Write, using condensed formulae, the corresponding polymerization equation.
 2- Indicate the type of the obtained polymer (homopolymer or copolymer). Justify your answer.
 3- Does it correspond to an addition polymerization or condensation polymerization? Justify your answer.

Third Exercise (7 points)
Metals Activity and Galvanic Cells

Consider 4 different metals: M_1, M_2, M_3 and M_4. We want to classify these metals in a horizontal axis according to their tendency to lose electrons. Among these metals M_4 has the least tendency to lose electrons and M_1 has the greatest one.

M_4 M_1

⊢————————————————⊢————➤ Tendancy to lose e^-

The following table shows the metals with their corresponding cations.

Metal	M_1	M_2	M_3	M_4
Corresponding Cation	M_1^{+1}	M_2^{3+}	M_3^{2+}	M_4^{2+}

Given the following materials:
Beakers(250 ml), solutions containig the ions of different metals (M_1^{1+}, M_2^{3+}, M_3^{2+} and M_4^{2+}), strips of the 4 metals, U tube containing magnesium chloride solution($MgCl_2$) , connecting wires, alligator clips, voltmeter.

1- Describe, while indicating the materials, the procedure followed to build the cell G_1 (M_2-M_3).
2- This cell functions for 30 minutes. After this duration the mass of the M_2 strip decreases about 0.25g.
 a- Identify the cathode of this cell.
 b- Copy the above axis and locate on it the two metals M_2 and M_3.

3- Consider now the galvanic cell (G_2): M_4-M_1.
 a- Write the symbolic representation of this cell.
 b- Write the two half equations taking place at each electrode of the cell (G_2).
 c- Deduce the overall equation.
 d- Indicate the direction of the ions migration in the salt bridge. Deduce its role.
 e- Explain the formation of the compound $MgCl_2$ found in the salt bridge.
 Mg(Z=12)   Cl(Z=17)