

First Exercise (5.5points)

The carbon cycle

The carbon cycle is one of the essential mechanisms of life on earth .Using carbon dioxide (CO₂)found in the atmosphere the green plants make photosynthesis .During this process the plants produce the organic carbon, which is a fundamental constituent in all living things, in a form of carbohydrates.

On the other hand,through respiration, the organic substances are degraded by the plants and the organic carbon is returned to the form of CO₂.

Carbon dioxide is also released by the dissolution of lime stone rocks by rain or is produced by volcanic activities .

Document -1 represents a part of the periodic table that shows the position of some elements.

column	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Line																		
1	H																	He
2														C		O		Ne
3																		
4		Ca																

Document-1

1-By referring to the text , answer the following questions:

- a-Indicate the product obtained by the photosynthesis in green plants
- b-Indicate 2 sources of production of carbon dioxide.

2-Determine, referring to the given part of the periodic table, the atomic number of the carbon element.

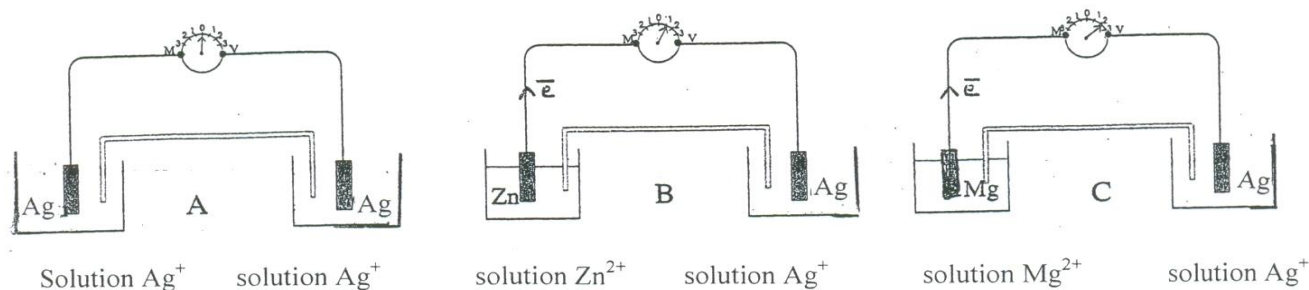
- 3- a) Write the Lewis representation of each of the 2 atoms : carbon and oxygen .
b) Deduce the valence of each atom.

- 4- a)Explain the bond formation between the carbon and oxygen atoms in CO₂.
b) Indicate the type of this bond.
c) Write the Lewis representation of the molecule CO₂ .

**Second Exercise (8.5points)
Galvanic Cell**

3 students in grade 9 want to construct 3 galvanic cells

The figures below represent the 3 galvanic cells constructed by those 3 students



Given : In a galvanic cell ,the greater is the difference in the reactivity between the using metals , the greater is the voltage produced by the cell .

- 1- The voltmeter indicates zero in cell(A)? Why?
- 2-Determine the cations that are present in the beaker containing the anode of cell (B) .
- 3- a)Write the 2 half equations that take place in cell (C) indicating the oxidation and reduction half equation
b)Write the overall equation .
- 4-Identify the reductant in cell (C) .
- 5-In cell (B), identify the metal whose mass increased when the cell is functioning.
- 6-Arrange the 3 using metals in the increasing order of reactivity .Justify your answer .
- 7-Specify the role of the salt bridge that is used in the construction of the galvanic cell .

**Second Exercise (6points)
Physical Properties of Hydrocarbons**

The table below represents some physical constants of 2 hydrocarbons A and B.

Physical constant	Butane(A)	2-methylpropane(B)
Melting point	-138 °C	-145°C
Boiling point	0°C	-10°C
Density	0,62g/ml	0,6g/ml

- 1-a)Write the condensed structural formula of A and B .
b)Deduce their molecular formula .
- 2-What relation exists between A and B ? Justify
- 3-Compare their boiling and melting points, then deduce how these 2 physical constants change according to the ramification of carbon chain
- 4-Indicate the physical state of butane at 25°C.Justify your answer.
- 5-At what temperature can we find butane in the solid state ?

Barème (20 points)

<p>Question-1(5.5points) 1 a-the carbohydrates b-Dissolution of limestone rocks by rain and volcanic activities 2-The element carbone is in period 2 so it has 2 energy levels (K et L) and it is in group IV so it has 4 valence electrons ,its electron configuration K^2L^4 , nb of electrons = 2+4=6é , in a neutral atom the nb of e- is equal nb of p : $Z=6$ 3-a) C O b)the valence is the nb of single e- in the outer energy level $V_C=4 V_O=2$ 4-a) C needs 4 é to be stable(octet rule) O needs 2 é to be stable (octet rule) To be stable C must share 2 pair of é with each of 2 O atoms b) double covalent bond c) $O \equiv C \equiv O$</p>	<p>Note 0.25 0,25+0,25 1.5 0.25+0.25 0.25 0.25 +0.25 1.5 0.25 0.25</p>	<p>Commentaire</p>
<p>Question-III(6points) 1- a)A: $CH_3-CH_2-CH_2-CH_3$ B : $CH_3-CH-CH_3$ CH_3 b) A: C_4H_{10} B:C_4H_{10} 2 - 2 isomers they have the same molecular formula but diffent condensed structural formula 3- the melting point of A (-138^0C) is greater than that of B (-145^0C) The boiling point of A (0^0C) is greater than that of B (-10^0C) Conclusion: when the ramification increases(in the same molecular formula)the physical constant decreases 4- gaseous state, because $T=25^0C > 0^0C$ the boiling point ofbutane. 5- $T < -138^0C$</p>	<p>0.5 +0.5 0.25+0.25 0.5+0.5 0.5+0.5+1 0.25+0.5 0.75</p>	
<p>Question II(8.5points) 1-The 2 electrodes have the same nature(Ag) 2- Zn^{2+} ions, because é move from Zn to Ag, thus the half cell containing Zn is the anodic one. 3-a)- Reduction half equation (C) : $Ag^+ + 1é \text{ --- } Ag$ Oxydation half equation (C) : $Mg \text{ --- } Mg^{2+} + 2 é$ b)$Mg + 2Ag^+ \text{ --- } Mg^{2+} + 2Ag$ 4-Mg because it is oxidized 5-Ag, The ions Ag^+ transform into solid Ag after gaining 1é each and then precipitate in a form on Ag plate. 6-Ag,Zn,Mg .Ag is the less active because in both cells B and C is the cathode. Mg is more active then Zn because the voltage produced by the cell $Mg \backslash Ag$ is greater than that produced in cell $Zn \backslash Ag$ 7-the salt brige is used to ; Close the electrical circuit Conserve the electrical neutrality in solutions .</p>	<p>1 0.5+0.5 0.25+0.5 0.25+0.5 1 1 1 0.5 +0.25+0.25 0.5 0.5</p>	<p>o.n increases from 1 to +II. Zero if no justification.</p>

