

الدورة الإستثنائية للعام 2011	الشهادة المتوسطة	وزارة التربية والتعليم العالي المديرية العامة للتربية دائرة الامتحانات
الاسم: الرقم:	مسابقة في مادة الكيمياء المدة: ساعة واحدة	

**This Exam Is Composed of Three Exercises. It Is Inscribed on 2 Pages.
Answer The Three Following Exercises:**

First Exercise (7 points)

Ammonia: NH₃

Ammonia is a colorless gas having a pungent odor that resembles the odor of urine. It is often sold as ammoniacal aqueous solution found in cleaning products. Nitric acid is obtained from ammonia. Ammonia reacts with nitric acid to produce a compound ammonium nitrate, which is used as soil fertilizer and which can be a frightening explosive.

Given : ${}^1_1\text{H}$ and ${}^{14}_7\text{N}$

1-Ammonia is made up of two elements: hydrogen (H) and nitrogen (N).

1.1-Determine the number of the fundamental particles of the nitrogen atom.

1.2- Write the electron configuration of the nitrogen atom.

1.3-Indicate the placement of nitrogen in the periodic table: group (column) and period (row).

2- Ammonia molecule:

2.1- Explain the bond formation between the N atom and each of the H atoms in ammonia molecule.

2.2- Give the Lewis dot structure of ammonia molecule.

3-The synthesis reaction of ammonia is represented by the equation:



3.1- Show that it is an oxidation-reduction reaction.

3.2- Identify the reducing agent in this reaction.

4- Pick up from the text two uses of ammonia.

Second Exercise (6 points)

Polyethene: A Synthetic Polymer

The polymerization of ethene produces polyethene according to the reaction given by the following equation:



Polyethene (*polyethylene*) is one of the most common and important synthetic polymers. Its softness and flexibility make it suitable for plastic bags, refrigerator ice-dishes, electric insulation... Like most synthetic polymers, it is non-biodegradable.*

- 1- Specify whether polyethene is addition polymer or condensation polymer.
- 2- One molecule of the monomer of polyethene adds one molecule of hydrogen to produce one molecule of compound (A).
 - 2.1- Write, using condensed structural formulas, the equation of the reaction involved.
 - 2.2- Identify to what class (family) of hydrocarbons compound (A) does belong.
- 3 - Ethene is a hydrocarbon. It undergoes complete combustion.
 - Write the equation for the complete combustion of ethene and give the name of each of the products obtained.

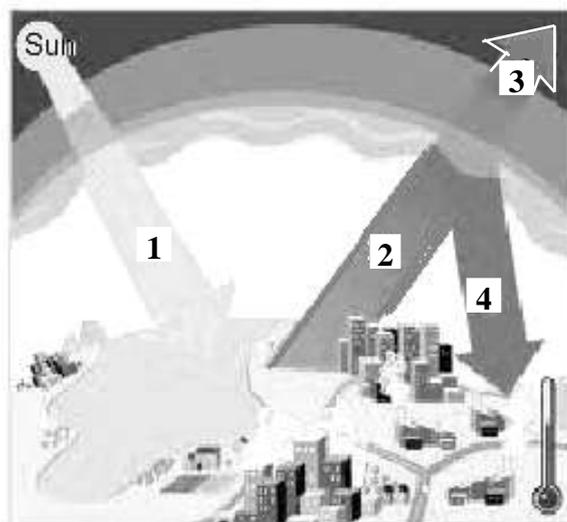


- 4 –Referring to the text :
 - 4.1-Indicate for what purposes polyethene can be used.
 - 4.2-Give a reason why this polymer could cause environmental problem.
- Remark:*** Non-biodegradable: Cannot be broken down by micro-organisms.

Third Exercise (7 points) The Greenhouse Gases

The solar rays stream through the atmosphere, reach the surface of the Earth and warm it. The heat radiated back by the Earth is absorbed by the greenhouse gases in particular by carbon dioxide. Part of the absorbed heat is emitted into the space and a part is returned onto the ground. This natural phenomenon is called the greenhouse effect. The greenhouse gases: carbon dioxide, water vapor, oxides of nitrogen (NO_x) and methane are produced by human activities.

When the amount of these gases increases in the atmosphere, the quantity of absorbed heat also increases; thus causing a worrying problem called " global warming " .



1- solar rays reach the Earth

2- heat radiated by the Earth

3- heat emitted into the space by CO₂

4- heat returned onto the ground by CO₂

- 1-Referring to the text and the schema, give an explanation of the greenhouse effect.
- 2-Indicate the greenhouse gases that are produced by human activities.
- 3-Justify what happens when the amount of carbon dioxide gas released into the atmosphere increases.
- 4- State one consequence of the global warming.
- 5-Methane and its derivative CH₃Cl react with chlorine gas according to the following equations:



- 5.1-Specify whether equation (II) represents an addition or a substitution reaction.
- 5.2- Give the IUPAC name of the compounds CH₃Cl and CH₂Cl₂.

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First exercise (7 points)		
Part of the Q	Answer	Mark
1.1	An atom is represented by ${}^A_Z X$, where Z=atomic number= number of protons =7 An atom is neutral, number of electrons = number of protons = 7 where number of neutrons = A-Z = 14-7 = 7 6x(0.25)	1.5
1.2	<i>An atom is neutral, number of electrons = number of protons = 7</i> The electron configuration of nitrogen atom is : $K^2 L^5$	0.5
1.3	Nitrogen belongs to group (V) the periodic table. Nitrogen belongs to period 2 of the periodic table. 2x(0.5)	1
2.1	The electron configuration of hydrogen atom is: K^1 (0.25) A nitrogen atom needs three electrons to attain stable configuration (to satisfy the octet rule). (0.25) A hydrogen atom needs one electron to attain stable configuration (satisfy the duet rule). (0.25) Each hydrogen atom shares a pair of electrons with the nitrogen atom. The nitrogen atom shares 3 pairs of electrons with three hydrogen atoms, thus forming three simple covalent bonds. (0.25)	1
2.2	The Lewis dot structure of ammonia molecule is : $\begin{array}{c} \text{H} - \overset{\cdot\cdot}{\underset{\cdot\cdot}{\text{N}}} - \text{H} \\ \\ \text{H} \end{array}$	0.5
3.1	The oxidation number of nitrogen in the free state (N_2) = 0 and that of hydrogen = (0). In ammonia (NH_3), the oxidation number of H = +1 and that of N = -3. The oxidation number of N decreases from 0 to -3 , it undergoes reduction (0.5) and that of H increases from 0 to +1, it undergoes oxidation => the given reaction is oxidation –reduction reaction. (0.5)	1
3.2	Hydrogen is the reducing agent because it undergoes oxidation.	1
4	Soil fertilizer Cleaning products 2x(0.25)	0.5
Second exercise (6 points)		
1	The polymerization reaction of ethene is addition polymerization; All atoms of the monomers are found in the polymers. *The double covalent bonds in the identical monomers break and join together to form addition polymer with single covalent bonds.	1
2.1	$CH_2=CH_2 + H_2 \rightarrow CH_3-CH_3$	1
2.2	The monomer molecule is unsaturated, it contains double covalent bond between the two carbon atoms, by adding H_2 molecules it becomes saturated. The bond between the two carbon atoms is single covalent bond. (A) is an alkane. * Molecular formula of (A) satisfies the general formula $C_nH_{(2n+2)} \Rightarrow$ (A) is an alkane.	1
3	The equation of the complete combustion reaction is: $C_2H_4 + 3O_2 \rightarrow 2CO_2 + 2H_2O$ (1) The products are carbon dioxide and water. 2x(0.25)	1.5
4.1	It is suitable to make plastic bags, refrigerator ice-dishes and for electric insulation. 3x(0.25)	0.75
4.2	It is non-biodegradable.	0.75

Third exercise (7 points)

1	The solar rays stream through the atmosphere, reach the surface of the Earth and warm it. The heat radiated back by the Earth is absorbed by the greenhouse gases. Part of the absorbed heat is emitted into the space and a part is returned onto the ground. 4x(0.25)	1
2	Carbon dioxide, water vapor, oxides of nitrogen (NO _x) and methane are produced by human activities. 4x(0.5)	2
3	The increase in the amount of carbon dioxide released to the atmosphere increases the amount of heat absorbed and the part returned to the ground increases which causes the increase of greenhouse effect.	1
4	The increase in temperature of the Earth increases and one consequence is the melting of ice caps causing certain coastal areas to be flooded.	1
5.1	Reaction (II) is a substitution reaction because one hydrogen atom of CH ₃ Cl is replaced by a Cl atom.	1
5.2	CH ₃ Cl : chloromethane and CH ₂ Cl ₂ :dichloromethane 2x(0.5)	1