



Chemistry Department  
Subject: Environmental chemistry  
Code No.: [Chem404]  
Date: 10/January /2026  
Dr/Fawzia Zakaria EL- Ablack

fourth level student  
Final examination  
First semester  
Total Time: 2hr  
35 Marks

**Q1.A.) What is the meaning SIX of the following:**

(6marks)

- i.) Hardness of water    ii.) Regional pollutant    iii.) Photochemical smog    iv.) Ion exchange process  
v.) Mineralization    vi.) secondary pollutants    vii.) reverse osmosis

**B.) Define the degree of hardness and mention its units**

(4marks)

A sample of water is found to contain following dissolved salts in milligrams per liter

$MgHCO_3=73$ ,  $CaCl_2=111$ ,  $Ca(HCO_3)_2=81$ ,  $MgSO_4=40$  and  $MgCl_2=95$

Calculate temporary, permanent and total hardness of this sample .

**Q2.A.) Give explanation of the following observation:**

(5marks)

- 1.) Hardness of water is expressed in terms of calcium carbonate equivalents.
- 2.) Classical smog is known as a reducing smog
- 3.) The damage scale caused by Local pollutant affect only a certain area.
- 4.) The addition of required amount of coagulant such as alum  $Al_2(SO_4)_3$  to water before sedimentation.
- 5.) Weather balloons and jet aircrafts can fly in the Stratosphere region.

**B.) Two hard insecticide are heptachlor and chlordane show by equation how they could be synthesized from cyclopentadiene and hexachlorocyclopentadiene**

(2 marks)

**C.) Describe with mechanistic equations the synthesis of**

(3marks)

- i.) PAN from acetaldehyde (NMOC's)
- ii.) Cis, Cis muconic acid as a final product from benzene metabolism.
- iii.) DDT from chlorobenzene and chloral hydrate

**Q3.A.) Select the most suitable answer (1 point ponas)**

(13.5marks)

- 1.) Metal particles that can be easily measured and controlled are categories as \_\_\_\_\_.  
a.) Gaseous contaminant    b.) Small contaminant    c.) Chemical contaminant    d.) Microbial contaminant
- 2.) \_\_\_\_\_ are harmful chemical substances that enter directly to the air as a result of natural events or human activities  
a.) Primary pollutant    b.) secondary pollutants    c.) local pollutants    d.) no one of mentioned
- 3.) The common green house gases are  
a.)  $CO_2$     b.)  $NO_2$     c.)  $CH_4$     d.) CFCs    e.) all of them
- 4.) The Seveso accident in Italy, which caused an environmental disaster occur due to the spread of \_\_\_\_\_ over several square  
a.) dioxins    b.) mercury    c.) cadmium    d.) All of them
- 5.) The Acid rain phenomenon

- a. Its cause is the presence of high levels of oxides of Sulphur and nitrogen.
- b. pH of rain water drops anywhere below 5.6
- c. Increases the rate of corrosion and damage
- d. All the mentioned

6.) Metabolic transformation process performs by coupling of two small toxic molecules resulted in formation of less toxic product than the starting material named \_\_\_\_\_ process.

- a.) Mineralization
- b.) Polymerization
- c.) Detoxification
- d.) Degradation

7.) Hydrate sodium aluminum silicate used for softening water by exchanging reversibly its Na ion with ions forming hardness in water called zeolite and can be regenerating by adding

- a.) HCl
- b.) NaOH
- c. NaCl
- d.  $\text{Na}_2\text{CO}_3$

8.) The gaseous envelope around the earth is known as atmosphere. The lowest layer of this is extended up to 10 km from sea level, this layer is \_\_\_\_\_.

- a.) Stratosphere
- b.) Troposphere
- c.) Mesosphere
- d.) Hydrosphere

9.) The major component of air is

- a.) Nitrogen and oxygen
- a.) Argon, Carbon dioxide and water vapor
- a.) all of the mentioned

B.) Describe the Lime-Soda process used for softening of water.

(1.5 Mark)

*With my Best wishes*