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# **Science 9 Final Exam Review**

## ***Unit 3 : Environmental Chemistry***

**Knowledge**

* I am able to investigate and describe the role of different substances in the environment in supporting or harming humans and other living things:
  + I can identify common organic and inorganic substances
  + I can identify common organic and inorganic substances that are essential to the health and growth of humans and other living things, and I can illustrate the roles served by these materials.
    - I can identify calcium as an essential material for bones
    - I can identify minerals that are known to enhance plant growth but that limit growth if too much or too little is available
  + I can describe the forms of organic matter synthesized by plants and animals.
  + I can describe and illustrate processes by which chemicals are introduced to the environment.
  + I can describe ways that the concentration of chemicals are changed. For example, I can describe dilution in streams, and bio-magnification in food chains.
  + I can describe the uptake of materials by living things through ingestion or absorption, and investigate and describe evidence that some materials are difficult for organisms to break down or eliminate. (DDT, mercury)
  + I can identify questions that may need to be addressed in deciding what substances , in what amounts, can be safely released into the environment. For example, I can identify questions and considerations that may be important in determining how much phosphate can be released into river water without significant harm to living things.
* I am able to identify processes for measuring the quantity of different substances in the environment and for monitoring air and water quality:
* I can identify substrates and nutrient sources for living things within a variety of environments
* I can describe and illustrate the use of biological monitoring as one method for determining environmental quality. For example, I can assess water quality, by observing the relative abundance of various vertebrate and invertebrate species.
* I can identify chemical factors in an environment that might affect the health and distribution of living things in that environment. (eg. Available oxygen, pH, dissolved nutrients in soil)
* I can apply and interpret measures of chemical concentration in parts per million, billion, or trillion.
* I can identify acids, bases, and neutral substances, based on measures of their pH. For example, I can use indicator solutions or pH meters to measure the pH of water samples.
* I can safely investigate and describe the effects of acids and bases on each other and on other substances. For example, I can investigate and describe the reaction that results when baking powder is dissolved in an acid. I can describe the role of acids and bases in neutralizing each other.
* I can describe the effects of acids and bases on living things. (e.g. acid rain in lakes, antacids for upset stomachs, pH in shampoos and conditioners)
* I am able to analyze and evaluate mechanisms affecting the distribution of potentially harmful substances within an environment:
* I can describe mechanisms for the transfer of materials through air, water and soil, and identify factors that may accelerate or slow down distribution. (e.g. wind speed, soil porosity)
* I can describe mechanisms for biodegradation, and interpret information on the bio-degradability of different materials
* I can comprehend and interpret information on the biological impacts of hazardous chemicals on local and global environments.
  + I can interpret evidence for environmental changes in the vicinity of a substance release.
  + I can interpret LD50 data for toxicity values
  + I can identify concerns with the disposal of domestic wastes, such as paints and oils, and industrial wastes
* I can describe and evaluate methods used to transport, store and dispose of hazardous household chemicals
* I can describe and evaluate potential risks resulting from consumer practices and industrial processes, and identify processes used in providing information and setting standards to manage these risks.
  + I can interpret and explain the significance of manufacturer’s information on how wood preservatives can be safely applied.
  + I can recognize that some individuals in a group may have greater sensitivity to particular chemical substances than do others in the general population.
* I can identify and evaluate information and evidence related to an issue in which environmental chemistry play a major role.
  + I can evaluate evidence that the use of insecticides to control mosquitoes has an effect/ has no effect, on bird populations.

**Skills**

* I am able to ask questions about the relationship between and among variables, and plan investigations to address those questions:
  + I can identify science-related issues. (e.g. I can identify issues regarding the use of soil fertilizers)
  + I can identify questions arising from practical problems and issues (e.g. ask questions about the needs of different living things for nutrients and about the mechanisms by which these nutrients are obtained)
  + I can state a prediction and a hypothesis about the concentration or dispersal of a chemical substance within an environment. (e.g. state a hypothesis that relates the amount of oxygen in a local sample to the presence or absence of dissolved nutrients)
  + I can select appropriate methods and tools for collecting data and information and for solving problems. (e.g. I can design an investigation to compare the chemical characteristics of two soils)
* I am able to conduct investigations into the relationships between and among observations, and gather and record qualitative and quantitative data’
* I can identify data and information that are relevant to the issue.
* I can select and integrate information that is relevant to the issue. For example, I can demonstrate proficiency in uploading and downloading text, image, audio, and video files.
* I can organize data, using a format that is appropriate to the task or experiment.
* I am able to analyze qualitative and quantitative data, and develop and assess possible explanations:
* I can identify strengths and weaknesses of different ways of displaying data.

1. Construct a tree map that classifies nutrients. Include the following terms in your map : nutrients, organic, lipids, proteins, inorganic, macro-minerals, vitamins, minerals, trace-element, and carbohydrates.
2. Any substance that contains carbon is considered to be \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and everything else is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is an essential material for bone growth.
4. List 2 elements or minerals that are known to promote plant growth.
5. What are some common elements in fertilizers?
6. Construct a tree map that classifies pesticides. Include a definition with each term.
7. What is DDT? Why did it become such an important case study?
8. a) Describe the process of bio-magnification through food chains/food webs. What other terms mean the same thing as bio-magnification?
9. Describe the process of dilution in streams.
10. Make the following conversions
    1. 120 ppm = \_\_\_\_\_\_\_\_\_\_ ppb = \_\_\_\_\_\_\_\_\_\_\_\_ ppt
    2. 375 ppb = \_\_\_\_\_\_\_\_\_\_ ppm = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ppt
    3. 12 mL of mercury in 1 000 000 mL of water could be expressed as

\_\_\_\_\_\_\_ ppm or \_\_\_\_\_\_\_ ppb.

Numerical Repsonse 1 : How many times more concentrated is a lake that contains 12 ppm of mercury than a lake that contains 6 ppb of mercury?

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1. Define
   1. acid
   2. base
2. Assuming that you knew you were dealing with safe substances, how could you tell if a substance was acidic or basic?
3. Most cleaning solutions are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (basic/acidic)
4. Ant-acids are made of a substance called aluminum hydroxide. Would you predict that aluminum hydroxide is an acid? Defend your answer.
5. Define indicator.
6. The pH scale is a logarithmic scale. This means that a pH of 3 is \_\_\_\_\_\_ times as acidic as a pH of 4.
7. Any substance with a pH less than 7 is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and any substance with a pH greater than 7 is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
8. An acid will turn blue litmus paper \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and a base will turn red litmus paper \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
9. Acid precipitation is defined as any precipitation that has a pH less than \_\_\_\_\_\_\_\_. Use formulas and sentences to describe how acid precipitation forms. Include some of the sources of the pollutants that cause acid rain.
10. If you use accidentally spilled an acid during a lab, your teacher may instruct you to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ the spill by adding a base. If you mixed equal amounts of an acid with a pH of 2 and base with a pH of 12, what would you predict the pH would be of the resulting mixture? Explain.
11. Define oxidation
12. Describe 1 technology that exists that helps to reduce sulfur dioxide emissions from industrial factories.

Numerical Response 2 If a yogurt container indicates that it contains 2.4 % fat, how many grams of fat would be present in a 0.5 kg serving of yogurt?

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Numerical Response 3 : If the same yogurt contains 35 mg of cholesterol in a 0.5 kg serving, how many ppm of cholesterol are there in this yogurt?

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1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is the ability of a chemical to cause harm to an organism.
2. Describe the difference between chronic and acute toxicity.
3. What measurement is used to help determine the toxicity of a substance to a particular population?
4. Define LD50.
5. The higher the LD 50 number for a particular substance, the \_\_\_\_\_\_\_\_\_\_\_\_ (more/less) toxic a substance is.

Numerical Response 4 : Given the following LD 50 numbers for 4 substances, use the substance # to rank them from least toxic to most toxic.

SUBSTANCE # LD 50 Number (ppt)

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| --- | --- |
| Substance1 | 13 |
| Substance2 | 11 |
| Substance3 | 18 |
| Substance 4 | 53 |

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Least Toxic Most Toxic

1. Describe the difference between persistent and non-persistent pollutants.
2. Describe the difference between point sources and non-point sources of pollution. Provide an example of each.
3. Describe the role that CFC’s play in ozone depletion.
4. Describe the 3 stages that are in most water treatment plants.
5. What is an aquifer? How do aquifers become contaminated?
6. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ substances are those organic compounds that can be broken down by fungi and bacteria. The products of this process are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
7. A \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ waste is any discarded material that contains substances that are known to be poisonous, toxic, corrosive, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, or explosive.
8. Draw all of the WHMIS symbols here and identify them.
9. Describe the 4 R’s of waste management
10. Define Bio-remediation
11. What is the difference between a secure landfill and a sanitary landfill.
12. List some chemical factors that might affect the health of an ecosystem.

39) Imagine that there has been a hazardous waste accident that involves the release of some toxic gas into the air and some toxic liquid being spilled on the grass. A scientist explained that they were very lucky because of a few conditions that existed that limited the environmental damage. List and describe 2 conditions/factors that might have existed that restricted the environmental damage to a relatively small area.