Ministry of Education and Technical Education
Central Administration for General Education
Science Consultant office



Biosphere



Atmosphere

INTEGRATED SCIENCE

2026/2027

First Academic Term

1st Year of Secondary stage



Geosphere



Hydrosphere

Review
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Preparation
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رئيس الإدارة المركزية التعليم العام
والمشرف على مستشاري المواد الدراسية
د/ هالة عبد السلام خفاجي

مستشار العلوم
د/ عزيزة رجب خليفة

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Homework

First: Choose the correct answer

1) When ammonium chloride salt NH_4Cl dissolves in water, the change that occurs to the solution is:

A) Increase in the concentration of OH^- ions
B) Increase in the concentration of H^+ ions
C) The ion concentrations remain equal
D) Decrease in the concentration of H^+ ions

2) If the pH value of a sample of acid rain water equals 4.5, this means that:

A) The concentration of hydroxide ions is higher than the concentration of hydrogen ions
B) The solution is neutral because rainwater is pure
C) The concentration of hydrogen ions is higher than the concentration of hydroxide ions
D) The pH value of the solution lies in the alkaline range

3) Sodium bicarbonate salt $NaHCO_3$ was dissolved in water. If you know that the hydrolysis reaction produces a weak acid and a strong base, what happens to the water equilibrium?

A) pH decreases as a result of consuming hydroxide ions
B) pH increases as a result of the decrease in the concentration of free H^+ ions
C) pH remains constant at the number 7 because the salt is neutral
D) The solution turns strongly acidic due to the evolution of gases

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4) During an experiment to measure the density of liquids using a hydrometer, you noticed that the submerged part of the device in sample (A) is smaller than the submerged part in sample (B). This means that

A) Sample (A) is less dense than sample (B)
B) Sample (A) is denser than sample (B)
C) Sample (A) and sample (B) have the same density
D) Hydrometer is buoyancy equally in sample (B) and sample (A)

5) If a farmer measures the pH of the soil and finds that it is strongly acidic, and he wants to treat it using the salt-hydrolysis technique, what is the suitable salt recommended to be applied to the soil to raise the pH value?

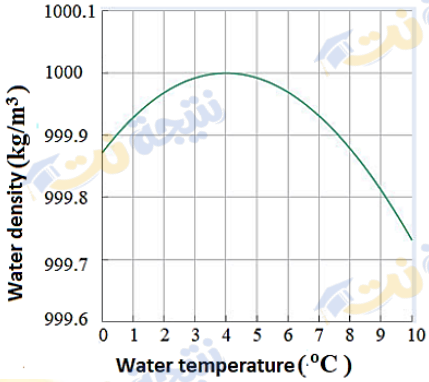
A) An acidic salt such as NH_4Cl
B) A basic salt such as $NaHCO_3$
C) A neutral salt such as NH_4HCO_3
D) Pure distilled water with a pH equal to 7

6) A water sample was taken from a lake affected by nearby mine wastes, and a pH test strip was dipped; the strip was colored matching the number 3.5 on the scale guide. Which of the following procedures must be applied scientifically to deal with this water?

A) Stop cooling because the water is very alkaline and causes corrosion
B) Treat it with acidic salts to increase the concentration of H+
C) Add a basic substance to neutralize the large increase in the concentration of H^+ ions
D) Use a hydrometer to lower the density until the pH value reaches 7

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7) Using the opposite graph, what do you conclude when cooling a pure water sample from 4 °C to 2 °C?



A) The molecules move closer to each other, so the density increases

B) The intermolecular spaces expand and the density decreases

C) The density remains constant at its maximum value 1000 kg/m^3

D) The density increases suddenly as a result of increased kinetic energy.

8) If you know that the pH of mine waters is (3 to 4) and that of lakes is (7.3 to 8.5). If a leak occurs from a mine into a nearby lake, how do you evaluate the expected effect on the aquatic ecosystem?

A) The relative density of the water decreases, making it easier for fish to float

B) The concentration of OH^- ions increases, causing poisoning of living organisms

C) An acid-base imbalance occurs as a result of the sharp rise in the concentration of H^+ threatening aquatic organisms

D) The solution turns into a state of neutral hydrolysis and food chains become stable

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Second: Essay Questions

Q9:

Explain: When ammonium bicarbonate salt (NH_4HCO_3) dissolves in water, the pH value of the solution remains neutral, and the ionic equilibrium of water is not affected?

Q10:

Explain: Using chemical equations, how does dissolving ammonium chloride in water change the nature of the solution, what happens to the concentration of (OH^-) ions?

Q11:

Explain the relationship between the pH scale line, the concentration of Hydrogen ions H^+, and when a solution is classified as alkaline?

Q12:

You have water sample, and you are asked to measure its relative density using a hydrometer. Mention three successive steps that you must apply practically to ensure obtaining a correct and accurate reading from the device?

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Q13:

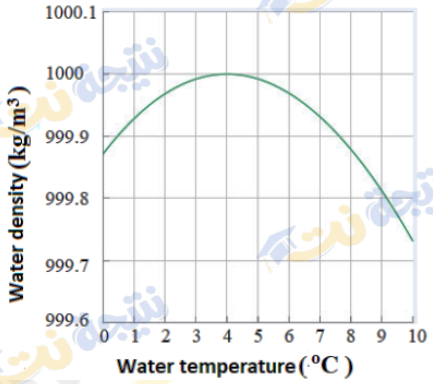
While a group of students worked an experiment to measure the pH of different water samples using pH meter device, the students neglected the calibration step and started measuring directly. Apply what you have studied to clarify the scientific error resulting from this procedure, and suggest the approved correction method in the laboratory?

Q14: You have three beakers containing: (distilled water at 4 ^{o}C) - (saline sea water) - (pure frozen water at 0 ^{o}C). Apply your understanding of the laws of density and buoyancy to predict the ascending order of these samples (according to density)?

Q15: From the opposite graph :

Analyze unique physical properties of water when its temperature drops below 4 ^{o}C toward zero Celsius.

Explain the changes that occur in volumetric mass and intermolecular spaces?



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Q16: The pH values recorded for water from different sources in the opposite table are "approximate values." Analyze this statement scientifically in light of what you studied, deducing two external factors that might cause actual pH values of (fresh water) to vary from one region to another?

Material		pH Value
Distilled water (pure water)		7
Sea water		7.5 to 8.4
Fresh water	River water	6.8 to 7.8
	Lakes water	7.3 to 8.5
Ground water		6 to 8.5
Cloud water		4.5 to 5
Mine water		3 to 4

Assessment

Model (A)

First: Choose the correct answer

1) **What happens directly when dissolving an acidic salt such as ammonium chloride salt (NH_4Cl) in pure water?**

A) The amount of solid materials increases and the pH value changes to 14
B) Hydrolysis occurs, leading to a decrease in the concentration of (OH^-) and an increase in the concentration of (H^+).
C) The concentrations of Hydrogen and Hydroxide ions remain exactly equal
D) The concentration of Hydroxide ion (OH-) increases and the concentration of Hydrogen decreases

2) **If you measure the pH of two water samples, and the value of the first sample equals 5, and the value of the second sample equals 9. How do you classify these two samples in order based on the pH scale?**

A) The first sample is alkaline, and the second sample is acidic
B) The first sample is acidic, and the second sample is alkaline (basic).
C) The two samples are exactly neutral in effect and equal to pure water
D) The first sample is neutral, and the second sample is extremely acidic

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3) When the temperature of pure water decreases from 4 degrees Celsius down toward the freezing point (zero Celsius), what is the correct physical analysis of the change that occurs to its molecules and density?

A) The molecules strongly approach each other so the density keeps increasing

B) The intermolecular spaces increase and the density of water decreases

C) The density remains exactly constant and equals 1000 kg/m^3

D) The water molecules evaporate and the density turns into a negative value

Second: Essay Questions

Q4:

During the laboratory activity to measure pH values of various water samples (sea water, river water, well water) using a pH meter, what is the importance of using distilled water in the experiment?

Q5:

Clarify the scientific concept of the process of "water hydrolysis of salts" and mention the chemical equation that expresses this reaction in the case of equilibrium.

Q6:

Explain scientifically: Based on the study of water hydrolysis of salts, why does the solution of ammonium bicarbonate salt (NH_4HCO_3) maintain its chemical neutrality without affecting the balance when dissolved in water?

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Model (B)

First: Choose the correct answer

1) When hydrolysis of a basic salt such as sodium bicarbonate salt ($NaHCO_3$) occurs in water, what is the ionic change that occurs to the solution?

A) The concentration of Hydroxide ion decreases and acidity increases

B) The concentration of Hydrogen ion (H^+) decreases and the concentration of Hydroxide ion (OH^-) increases

C) All ions of Sodium turn into solid molecules that precipitate at the bottom

D) The concentration of Hydrogen ion doubles and the pH value is fixed at zero

2) Why do scientists call the "pH scale" a quantitative scale based on the nature of its chemical work?

A) Because it measures the weight of solid salt molecules in grams inside the beakers

B) Because it numerically expresses the degree of acidity or alkalinity of solutions within a defined range from 0 to 14

C) Because it measures the boiling point of liquids and the change in their volumes upon cooling

D) Because it depends only on measuring the total salinity of well waters geographically

3) If you know that the density of a substance generally depends on the mass of its molecules and the intermolecular spaces separating them, what is the standard value of the density of pure water at a temperature of 4 °C in the approved international units?

A) 1 g/cm^3

B) 1000 kg/m^3

C) 14 kg/m^3

D) 0 kg/m^3

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Second: Essay Questions

Q4:

Water possesses unique physical properties that distinguish it from other liquids and gases. Identify the two unique physical properties of water that have impact on the environment and living organisms?

Q5:

Explain the "pH scale" as you studied, and determine precisely the full numerical range within which this scale moves, stating the three fields in which it is widely used.

Q6:

Explain scientifically: Based on ionic equilibrium, why is pure water classified as a completely neutral substance, and why its value is fixed at the number 7 on the pH scale?

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Model (C)

First: Choose the correct answer

1) Under which chemical category is ammonium bicarbonate salt (NH_4HCO_3) classified when studying its water hydrolysis of salt?

A) Acidic salts
B) Alkaline salts
C) Neutral salts
D) Non-ionized solutions

2) If the concentration of Hydrogen ions (H^+) inside a certain aqueous solution increases suddenly as a result of adding one of the chemical substances, how will the pH value of this solution be affected according to the properties of the pH scale?

A) The value increases and becomes greater than 7
B) The value decreases and becomes less than 7, and the solution turns acidic
C) The value is fixed at the number 14 exactly without change
D) The value doubles to reach 28 on the scale

3) What does the overall change in the density value of a substance at a given temperature depend on, based on its internal structural composition?

A) It depends only on the volume of the outer rounded vessel and its surface area
B) It depends on the mass of the molecules composing the substance and the intermolecular spaces separating them
C) It depends on the coloring of the substance molecules and the change in their pH values
D) It depends on the speed of flow and pumping of the liquid inside open pipes

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Second: Essay Questions

Q4:

"Compare between an acidic salt and a basic salt in terms of: the change in the concentration of Hydrogen ions (H^+) and Hydroxide ions (OH^-), mentioning an example for each?

Q5:

Determine precisely the ionic changes that occur to the chemical equilibrium of water when dissolving a basic salt, and mention the substances produced from the hydrolysis reaction of sodium bicarbonate salt ($NaHCO_3$) according to the chemical equation you studied.

Q6:

Explain scientifically the following statement based on the chemical composition of salts: "Why does dissolving ammonium chloride salt (NH_4Cl) in water convert the aqueous solution into a solution with acidic effect?"

***** End of Questions *****

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