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) Which of the following represents the homogeneous mixture consisting of a solvent (such as water) and a solute (such as salts)?

A) Closed system.
B) Solution.
C) Semipermeable membrane.
D) Dynamic equilibrium.

2) When a non-volatile substance is dissolved in a liquid, the vapour pressure of the resulting solution behaves as follows ……..

A) It increases directly with an increase in the volume of the liquid.
B) It decreases compared with the vapor pressure of the pure liquid at the same temperature.
C) It remains constant and equal to the boiling point of pure water.
D) It doubles as a result of increasing the surface area exposed to evaporation.

3) Pure water molecules have intermolecular attractive forces resulting from special bonds, in addition to the polarity of their molecules. What are these bonds that contribute to increasing its boiling point and are affected by the addition of a solute?

A) Strong ionic bonds.
B) Hydrogen bonds.
C) Semipermeable membranes.
D) The vapor pressure of water.

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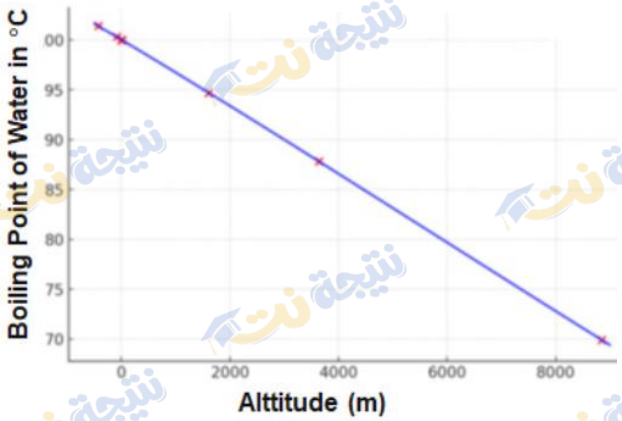
4) Under normal atmospheric pressure, if you want to confirm the purity of a water sample in the laboratory, the constant boiling-point value that the sample should reach when it becomes stable is ……

A) 0° C
B) 80° C
C) 100° C
D) 120° C

5) Two aqueous solutions were prepared. The first contains one mole of sugar, while the second contains two moles of sugar in the same amount of water. Which of the following statements would you expect to be experimentally correct?

A) The first solution has a higher boiling point than the second solution.
B) The second solution evaporates faster because of its higher osmotic pressure.
C) The vapor pressure of the two solutions is exactly equal because they contain the same type of solute.
D) The second solution has a decrease in vapor pressure and a higher boiling point than the first solution.

6) While cooking in a high mountainous region located at an altitude of 6000 m above sea level, the data in the adjacent figure indicate that the boiling point of pure water there decreases to approximately ……



A) 100° C
B) 95° C
C) 80° C
D) 70° C

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7) Osmosis is a biophysical phenomenon in which water moves through a semipermeable membrane due to a difference in the concentration of solutions. What is the correct direction of water movement?

A) From the dilute solution (lower concentration) to the concentrated solution (higher concentration).

B) From the higher-concentrate solution to the lower-concentrate solution.

C) The movement of water molecules completely stops because the vapor pressure becomes equal.

D) From the region with higher osmotic pressure to the region with lower osmotic pressure.

8) Osmotic pressure arises in solutions as a result of a difference in the concentration of the solute between their regions. What is the direct effect of this pressure on the movement and diffusion of water molecules?

A) It causes the non-volatile solute to evaporate through the membrane.

B) It causes water to move from the lower-concentration solution (with lower osmotic pressure) toward the higher-concentration solution (with higher osmotic pressure).

C) It lowers the boiling point of the concentrated solution and restores its physical purity.

D) It prevents water molecules from bonding with one another to form ice crystals at 0° C.

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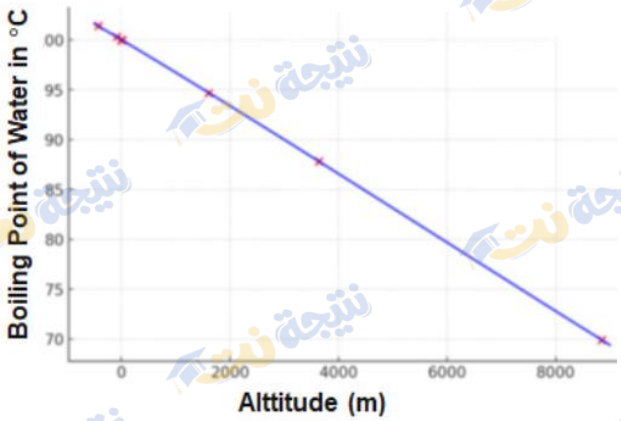
Second: Essay Questions

Q9: Explain the physical relationship between vapour pressure and the surface of the liquid, clarifying how this pressure is basically established in closed systems.

Q10: Identify the unique chemical property of water molecules that gives them a high ability to dissolve ionic compounds and other molecules, and mention two physical properties that result from this property according to what you have studied.

Q11: Analyse the biological and environmental importance of the presence of dissolved and suspended substances in natural water bodies, and discuss how these substances directly affect the properties of water and the dynamics of aquatic ecosystems.

Q12: In light of your study of the curve shown in the adjacent figure, summarize in one specific sentence the effect of altitude above sea level on both the atmospheric pressure acting on the water and the resulting boiling point of pure water.



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Q13: **Explain: Why is the boiling point of an aqueous solution containing a non-volatile solute always higher than the boiling point of pure water at the same normal atmospheric pressure?**
(According to the energy of the system.)

Q14: **In an Experiment you separated two flasks containing rainwater. One contains pure water, while the other is contaminated with non-volatile salts. The two flasks are exposed to a sharp decrease in temperature below 0 °C. Apply your understanding of the mechanism of ice-crystal formation and clarify which flask will freeze first**
Explain the role of attractive forces in hindering or facilitating this physical change.

Q15: **Explain the pathway of water molecules across the semipermeable membrane based on the concentration values (dilute and concentrated).**

Q16: **Explain how the phenomenon of osmosis is related to the difference in solute concentration, and how the resulting osmotic pressure contributes to directing the movement of water molecules from solutions with lower pressure to those with higher pressure.**

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Assessment

Model (A)

First: Choose the correct answer

1) When dynamic equilibrium is reached between a liquid and its vapor inside a closed flask, which of the following statements correctly describes the system?

A) The liquid molecules completely stop evaporating, and the amount of vapor remains constant.

B) The rate of evaporation of the liquid becomes equal to the rate of condensation of the vapor, while the amount of each remains constant.

C) The liquid completely disappears, and the flask contains entirely with a vapour that exerts osmotic pressure.

D) The attractive forces between the solute molecules overcome the hydrogen bonds of water.

2) The boiling point of a sample of pure water was measured at the top of a high mountain, and the recorded value was 88 °C. What is the approximate altitude of this mountain above sea level?

A) 0 m

B) 2000 m

C) 3700 m

D) 8000 m

3) The colligative properties of aqueous solutions, such as osmotic pressure and depression of the freezing point, depend completely and directly on ……

A) The number of molecules or ions of the non-volatile solute in the solution.

B) The chemical nature and structural composition of the solute.

C) The extent to which pure solvent molecules are volatile at low temperatures.

D) The type of covalent bonds within the solute molecule only.

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Second: Essay Questions

Q4: A certain mass of table salt, a non-volatile substance, was dissolved in one liter of pure water. Analyse in detail the physical and chemical effect of this solute on the surface of the liquid. Discuss how it affects each of the following:

1. The number of water molecules capable of escaping from the surface.
2. The attractive forces formed in the solution.
3. The final vapour pressure compared with that of pure water.

Q5: Briefly compare the behaviour of pure water and the aqueous solution in a table with respect to:

1. The value of the boiling point under normal atmospheric pressure.
2. The extent to which the boiling point remains constant as a property used to indicate purity.

Q6: Give a reason: Why do municipalities in countries with very cold climates spread large amounts of salt on asphalt roads after rainfall and snowfall?

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Model (B)

First: Choose the correct answer

1) What happens to the vapour pressure of a liquid when the temperature remains constant and the rate at which molecules dynamically escape from the surface becomes equal to the rate at which they return to the surface?

A) It decreases to zero because the molecules disappear.

B) It always becomes equal to the osmotic pressure of the concentrated solution.

C) It continuously increases without stopping because of hydrogen-bond attractive forces.

D) The vapor pressure remains constant as a result of reaching a state of dynamic equilibrium.

2) If a sample of pure water is boiled inside a closed pressure device (pressure cooker), where the pressure exerted on the liquid surface is increased to twice the normal atmospheric pressure, the expected boiling point will ……..

A) Remain exactly constant at 100 °C.

B) Become lower than 100 °C as a result of increased attractive forces.

C) Become higher than 100 °C because more energy is required for the vapor pressure to equal the external pressure.

D) Decrease directly toward 0 °C.

3) Which of the following physical changes is directly proportional to an increase in the number of non-volatile solute particles in an aqueous solution?

A) An increase in boiling point and an increase in vapor pressure.

B) The rate of formation of pure ice crystals at 0 °C.

C) An increase in chemical purity and a decrease in osmotic pressure.

D) A decrease in vapor pressure and an increase in boiling point.

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Second: Essay Questions

Q4: **Based on your study of intermolecular bonds and attractive forces, analyse chemically and physically how dissolving sugar, as a non-volatile substance, in water weakens the ability of water molecules at the surface to evaporate, showing in detail the resulting change in the vapour pressure of the closed system.**

Q5: **Mention the factors that cause variation in the boiling point of pure water, explaining the effect of each of the following:**

1. **Using a pressure cooker.**
2. **Moving to a location at a very high altitude above sea level.**

Q6: **Give a reason: Why does an aqueous salt solution always have a lower freezing point than that of the pure solvent (water) under normal pressure?**

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Model (C)

First: Choose the correct answer

1) The vapour pressure of a liquid is the pressure exerted by the vapor formed above the surface of the liquid when ……..

A) The liquid is completely boiling and continuously evaporating in an open system.

B) The liquid and its vapor are in dynamic equilibrium inside a closed system.

C) The osmotic pressure is equal to the melting point of ice.

D) The number of solute molecules is greater than the number of pure solvent molecules.

2) Based on the curve showing the decrease in the boiling point of water with altitude, if we want to cook food in a mountainous region where the boiling point of pure water is 95 °C, what is the approximate altitude of this region above sea level?

A) 0 m

B) 1500 m

C) 6000 m

D) 9000 m

3) Why does evaporation of an aqueous solution require greater thermal energy when is converted into vapour compared with pure water at the same pressure?

A) Because the semipermeable membrane prevents water molecules from spreading toward the surface.

B) Because attractive forces exist between the ions or molecules of the solute and the solvent, and these forces must first be overcome.

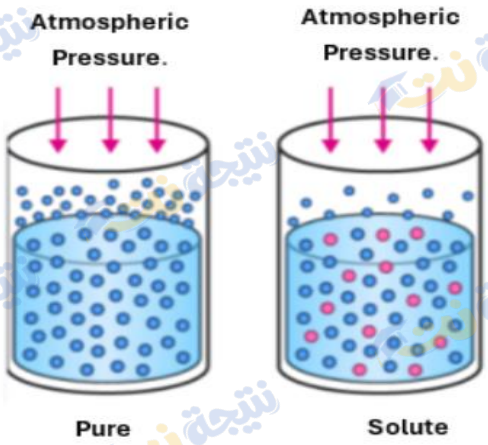
C) Because non-volatile solute molecules suddenly increase the vapor pressure of the solution.

D) Because the boiling point of solutions is generally lower than that of pure water.

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Second: Essay Questions

Q4: **The adjacent figure illustrates the microscopic difference between a pure liquid and a solution. Analyse how the presence of dissolved ions causes a decrease in vapour pressure, indicating the effect of intermolecular bonds and additional attractive forces in restricting the free movement of water molecules.**



Q5: **Explain the boiling point of a liquid in terms of the concept of vapour pressure. Then, state the constant boiling-point value of pure water under normal atmospheric pressure and explain the scientific importance of this value.**

Q6: **Give a reason: Why does salt sprinkled on rainwater in cold countries prevent cars from slipping and reduce accidents?**

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

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