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

د/ حسين عبد الرحمن بخات

Preparation

أ/ عبد المسيح حزين

أ/ عمرو مالي احمد

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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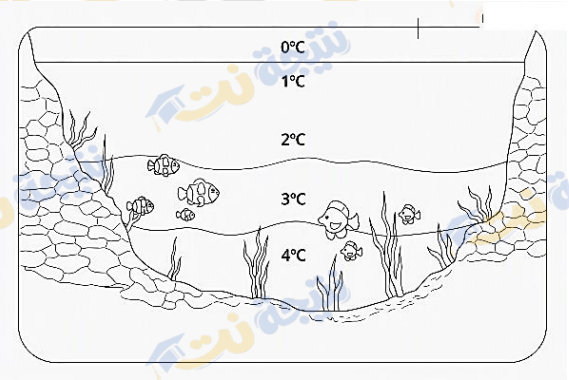
Homework

First: Choose the correct answer

1) **Why does solid ice at 0 °C occupy a much larger volume than the same mass of liquid water, causing it to float on the surface?**

A) Because water molecules are spaced farther apart in ice than in liquid water
B) Because water molecules in ice completely lose their electrical charges
C) Because oxygen atoms separate from hydrogen atoms upon freezing
D) Because atmospheric pressure doubles over the surface of the ice

2) **In the harsh winter of polar regions, which of the following water layers provides the warmest and most stable habitat for bottom-dwelling fish according to the figure**



A) The surface layer in direct contact with ice at 0 °C
B) The middle layer at 2°C
C) The deep bottom layer at 4°C
D) All layers provide a stable environment

3) **If the melting point of a substance is 300K on the absolute Kelvin scale, what is this temperature on the Celsius scale?**

A) - 27 °C
B) 27 °C
C) 100 °C
D) 573 °C

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4) **Calculate the amount of lost heat when a piece of iron with a mass of 0.5 kg cools from 80 °C to 30 °C given that the specific heat capacity is 450 J/ Kg.k**

A) 11250 J
B) - 11250 J
C) - 18000 J
D) 6750 J

5) **Why is water with a high concentration of dissolved salts more inclined to sink toward the ocean floor compared to fresh water at the same temperature**

A) Because atmospheric pressure is zero over salty oceans
B) Because salts increase the volume of water and decrease its specific weight
C) Because available water loses its covalent bonds when salt is added
D) Because an increase in water salinity increases its density, making it heavier and causing it to sink downward

6) **If equal masses (1 kg) of the following substances are exposed to the same heat source for the same duration of time, given their specific heat capacities (Lead 128, Mercury 140, Copper 390, Aluminum 900), which substance heats up faster and experiences the greatest temperature increase**

A) Aluminum
B) Mercury
C) Lead
D) Copper

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7) **What happens when deep water coming from the bottom rises to the surface in the oceans?**

A) Oxygen becomes depleted and evaporation stops
B) Surface salinity increases, tripling its density
C) Surface water freezes immediately
D) Settled nutrients are transported to the surface, supporting the growth of marine life

8) **What is the direct physiological cause of the death of coral reefs in oceans when surface water temperatures rise due to global warming**

A) A drop in bottom pressure leading to complete oxygen depletion
B) Coral reefs requiring a very specific temperature range to survive
C) Freezing of hydrogen bonds within their calcareous structures
D) Transformation of coral into warm-blooded organisms with rapid metabolism

Second: Essay Questions

Q9: **Give reason: Why does solid ice at 0 °C float on the surface of liquid water instead of sinking to the bottom**

Q10: **Describe what happens to the vibrational amplitude of molecules and their speed of motion when a water sample is supplied with thermal energy?**

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Q11: **Explain why the amount of thermal energy required to raise the temperature of 1kg of different substances by 1kg varies under the same conditions**

Q12: **Calculate the amount of heat required to raise the temperature of 1kg of pure water specific heat capacity (C = 4200 J/Kg. K) and 1 kg of salt water (C = 3900 J/kg. K) by 20 K, deducing which requires more energy and explaining why?**

Q13: **An atmospheric air sample has a mass of 10 kg and a specific heat capacity of 1005 J/Kg.K Calculate the heat energy gained to raise its temperature by 10 K over land during the day**

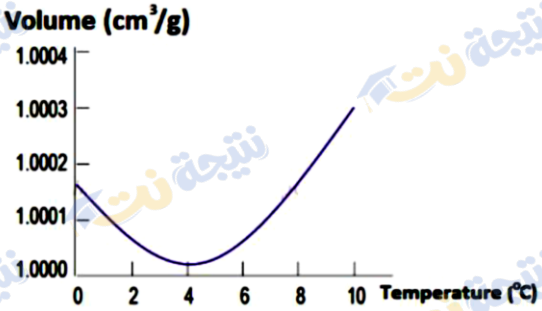
Q14: **Give reason: Why are dolphins and polar bears able to swim in freezing polar waters without a drop in their internal body temperature?**

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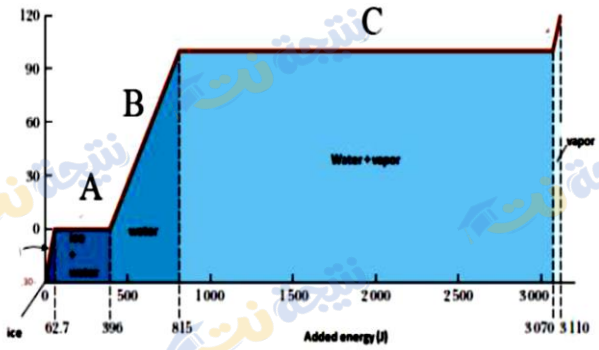
Q15: From the corresponding graph:

Determine the thermal inflection point at which the density of water reaches its maximum value? Then explain the anomalous behavior of water at this point?



Q16: With reference to the figure:

Explain why area (C) requires a huge amount of thermal energy to vaporize water compared to area (B) without a change in temperature (at 100 °C)?



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Assessment

Model (A)

First: Choose the correct answer

1) **Ocean water density is influenced by three main factors: pressure, salinity, and temperature. Which of the following options represents the conditions that yield the highest possible ocean water density**

A) Temperature above 4°C, low salinity, and low pressure in shallow waters
B) Temperature of 4°C, high salinity, and high pressure at great depths
C) Temperature of 0°C, low salinity, and low pressure at the surface
D) Temperature of 10°C, high salinity, and normal atmospheric pressure

2) **If the melting point of an ice sample is 273 K and the boiling point of pure water is 373 K, what is the value of the temperature change (ΔT) when water is heated from melting to boiling in degrees Celsius**

A) 100 °C
B) 0 °C
C) 273 °C
D) 373 °C

3) **Why do most marine invertebrates and cold-blooded organisms prefer living in the depths of oceans and seas?**

A) Because water density in the depths becomes equal to zero
B) Due to the availability of light and high temperature at the bottom
C) Because temperatures in the depths are relatively stable and constant
D) To escape the effect of the coastal sea breeze

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Second: Essay Questions

Q4: **How do high evaporation rates in tropical regions and fresh water freezing rates in polar regions contribute to increasing the salinity and density of ocean water?**

Q5: **Give reason: Dolphins and polar bears are able to swim in freezing polar waters without a drop in their internal body temperature?**

Q6: **A sample of a solid substance with a mass of 500 g was placed at 25 °C, and gained 4500 J of heat energy, causing its temperature to rise to 35 °C. Calculate the specific heat capacity of this substance?**

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Model (B)

First: Choose the correct answer

1) **Living organisms (such as humans and plants) use the process of water evaporation (sweating and transpiration) as a primary mechanism to regulate their body temperature. Which thermal property of water is responsible for the efficiency of this mechanism**

A) High latent heat of vaporization of water
B) Low density of water vapor at 100 °C
C) Low vibrational amplitude of sweat molecules
D) High freezing point of salt water in cells

2) **If two water masses meet in the ocean: Mass (A) is warm with high salinity, and Mass (B) is cold at 4 °C with high salinity. What is the expected physical path of Mass (B) relative to Mass (A), and what is the resulting environmental outcome**

A) Mass (B) floats above Mass (A) and vertical water currents stop
B) The densities of both masses become equal and navigation halts
C) Mass (B) evaporates immediately due to the absence of water pressure
D) Mass (B) sinks below Mass (A) to form a downward vertical water current

3) **The temperature at the bottom of a polar lake is 4 °C. What is the equivalent of this temperature on the absolute Kelvin scale**

A) 269 K
B) 277 K
C) 300 K
D) 273 K

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Second: Essay Questions

Q4: When the ocean temperature drops from 25 °C to 10 °C, how does mullet fish (cold-blooded) respond compared to a sea dolphin (warm-blooded)?

Q5: Explain the reason why closed pipes burst when water freezes inside them in polar regions?

Q6: How much heat energy is gained to raise the temperature of 0.5 kg of water vapor from 100 °C to 120 °C, given that (C = 2020 J/KG.K)

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Model (C)

First: Choose the correct answer

1) **A water sample at the ocean floor at a depth of 5000 m is under very high pressure compared to a water sample at the shallow surface at the same temperature and salinity. Which of the following statements accurately describes the change in density of the sample at great depths**

A) The sample's volume decreases and its covalent bonds break, increasing its density by half
B) Water density increases slightly because high pressure forces water molecules closer together
C) Water molecules expand and the sample's volume increases, significantly decreasing its density
D) Density remains completely identical because water is a fully compressible liquid at all depths

2) **Oceans and large lakes are described as "massive thermal reservoirs" on Earth. Which physical property is responsible for this?**

A) Increase in the freezing point of seawater to 100 °C
B) Low atmospheric pressure, which prevents liquid evaporation
C) High specific heat capacity of water
D) Presence of covalent bonds between water molecules

3) **Which of the following organisms can maintain a constant internal body temperature through metabolic processes, regardless of temperature changes in the surrounding environment?**

A) Most fish and amphibians
B) All marine invertebrates such as coral reefs
C) Reptiles such as crocodiles and mollusks
D) Birds and mammals

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Second: Essay Questions

Q4: **Water masses in the oceans move in a continuous cycle. Trace the environmental and biological importance of these vertical currents in transferring heat, salts, and nutrients between tropical and polar regions?**

Q5: **Explain how the thermal properties of oceans and large lakes contribute to protecting planet Earth from sharp temperature fluctuations between day and night and across seasons?**

Q6: **A piece of lead with a mass of 0.4 kg has an initial temperature of 70 °C, which dropped to 40 °C. Given that the specific heat capacity of lead is (C = 128 J/KG.K), calculate the amount of heat lost, explaining the significance of the sign**

*** End of Questions ***

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