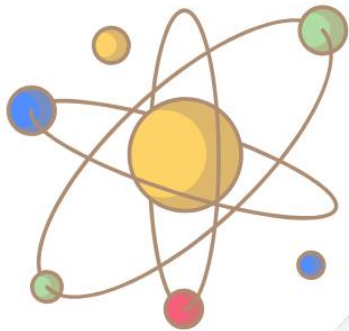




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CREST Science Olympiad (CSO) **Worksheet** *for* **Class 9**



Topic

Change in the State of Matter



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Worksheet on Change in the State of Matter

- 1. The boiling point of a liquid can be affected by changes in altitude. A group of students conducts an experiment where they measure the boiling points of water at different altitudes and create a graph. Which of the following statements best explains the observed trend in the graph?**
 - a. Higher altitudes cause higher boiling points due to increased pressure.
 - b. Higher altitudes cause lower boiling points due to decreased pressure.
 - c. Higher altitudes cause higher boiling points due to increased temperature.
 - d. Higher altitudes cause lower boiling points due to decreased temperature.
- 2. A student performs an experiment where they heat a block of ice at a constant rate while monitoring its temperature. The temperature remains constant during the melting process. Which of the following statements is the most likely explanation for this observation?**
 - a. The thermometer is not sensitive enough to detect temperature changes.
 - b. The ice is not melting, despite the applied heat.
 - c. The heat is being used to break intermolecular forces in the ice.
 - d. The heat is being converted into kinetic energy of the ice molecules.
- 3. Imagine a scuba diver diving into deep water. As the diver goes deeper, the surrounding pressure increases. How does the increased pressure affect the state of nitrogen gas in the diver's scuba tank?**
 - a. Nitrogen gas will turn into liquid nitrogen.
 - b. Nitrogen gas will freeze into a solid.
 - c. Nitrogen gas will evaporate into the surrounding water.
 - d. Nitrogen gas will remain in its gaseous state but with a higher density.
- 4. In the following question, you will find an assertion and a reason. Select the appropriate option that applies.**

Assertion: Evaporation and boiling are distinct processes with similar underlying mechanisms.

Reason: In both evaporation and boiling, liquid molecules gain enough energy to overcome intermolecular forces and become vapour, but boiling occurs throughout the liquid, while evaporation occurs only at the surface.

- a. Both assertion and reason are true and reason is the correct explanation of assertion.
- b. Both assertion and reason are true and reason is not the correct explanation of assertion.
- c. Assertion is true but reason is false.
- d. Assertion is false but the reason is true.

5. An experiment is conducted to compare the rates of evaporation of water in three different beakers: A, B, and C. The beakers have the same volume of water, but beaker A has a wider surface area, and beakers B and C have a narrow neck. Also, beaker C is placed in a windy area. After a certain time, which beaker is expected to have the highest rate of evaporation?
- a. Beaker A
 - b. Beaker B
 - c. Beaker C
 - d. All beakers will have the same rate

Answer Key

1. b - At higher altitudes, the atmospheric pressure is lower due to thinner air. Boiling occurs when vapour pressure equals atmospheric pressure. With lower atmospheric pressure, liquids require less heat to reach the vapour pressure needed for boiling. Thus, liquids boil at lower temperatures at higher altitudes. This explains the observed trend of lower boiling points on the graph.
2. c - During melting, added heat is used to break the forces holding the solid together, not to raise the temperature. This is called the latent heat of fusion. So, even as heat is applied, the temperature remains constant until all the ice turns to water.
3. d - As the scuba diver goes deeper underwater, the pressure increases due to the weight of the water above. This increased pressure affects the nitrogen gas inside the scuba tank. While the nitrogen gas will remain in its gaseous state, the higher pressure will cause the gas molecules to be compressed closer together, resulting in a higher gas density.
4. a - Both the assertion and the reason are accurate. Evaporation and boiling indeed have similar mechanisms in which liquid molecules gain energy to transition into vapour by overcoming intermolecular forces. However, the distinction lies in the intensity and conditions of the processes. Evaporation occurs at the liquid's surface, where molecules with higher energy escape into the air, cooling the liquid. Boiling, on the other hand, involves vaporisation throughout the liquid and occurs when the vapour pressure equals the external pressure. Boiling is more intense and rapid compared to slower evaporation.
5. a - Beaker A with a wider surface area will likely have the highest rate of evaporation because more water molecules are exposed to the air, allowing faster evaporation compared to beakers with smaller surface areas (B and C). Wind speed in Beaker C could enhance evaporation, but the wider surface area in Beaker A will likely have a greater impact.

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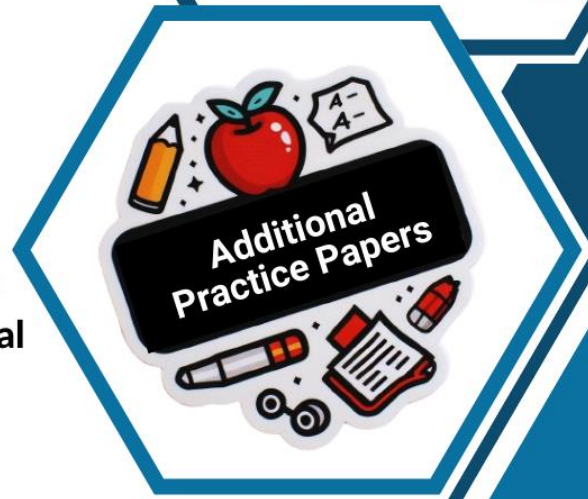
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