

Chapter 7 — Thermal Properties of Matter

Exercise — Short Answer Questions (with Answers)

Class 9 Physics (New Syllabus) — Board Level

Q 7.1. Why do solids have a fixed volume and shape according to particle theory of matter?

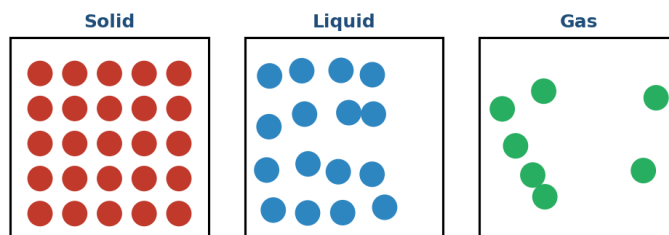
Ans: In solids the intermolecular forces are very strong. These strong forces keep the molecules bound at fixed positions, and the molecules only vibrate about these fixed points. Since the molecules cannot leave their places, a solid has both a definite shape and a definite volume.

Q 7.2. What are the reasons that gases have neither a fixed volume nor a fixed shape?

Ans: In gases the molecules are relatively very far apart, so the intermolecular forces of attraction are extremely weak. Therefore, the molecules move freely and randomly in all directions and spread to fill the whole container. That is why a gas has neither a fixed volume nor a fixed shape.

Q 7.3. Compare the spacing of molecules in the solid, liquid and gaseous states.

Ans: In solids the molecules are very close together (closely packed) at fixed positions. In liquids they are a little farther apart and can slide over one another. In gases the molecules are very far apart from one another. So the spacing increases from solid to liquid to gas.



Spacing of molecules: closely packed (solid), slightly apart (liquid), far apart (gas).

Q 7.4. What is the effect of raising the temperature of a liquid?

Ans: When the temperature of a liquid is raised, heat is supplied and the kinetic energy of its molecules increases. The molecular motion becomes more vigorous and the internal energy increases. As a result, the liquid expands (its volume increases) — this expansion is the basis of a liquid-in-glass thermometer.

Q 7.5. What is meant by temperature of a body?

Ans: The temperature of a body is the degree of its hotness or coldness. It also determines the direction of flow of thermal energy — heat always flows from a body at higher temperature to one at lower temperature. It depends on the average kinetic energy of the molecules.

Q 7.6. Define heat as 'energy in transit'.

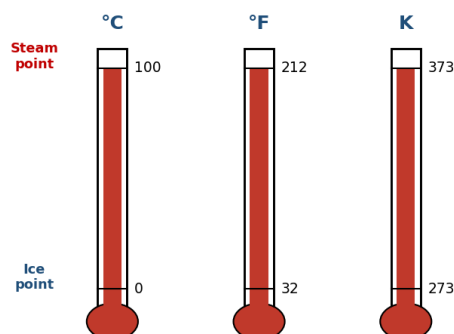
Ans: Heat is the energy transferred from one body to another due to a difference of temperature between them. It is called 'energy in transit' because it is not stored in a body; the word heat is used only while the energy is actually flowing from a hotter body to a colder body. A body contains internal energy, not heat.

Q 7.7. What is meant by thermometric property of a substance? Enlist some thermometric properties.

Ans: A thermometric property is a physical property of a substance that changes appreciably and uniformly with temperature, and so can be used to measure it. Examples: the volume (expansion) of a liquid, the pressure of a gas, the volume of a gas, and the electrical resistance of a wire.

Q 7.8. State the main scales used for the measurement of temperature.

Ans: The three main scales are the Celsius (centigrade) scale, the Fahrenheit scale, and the Kelvin (absolute) scale. Their ice point and steam point are: Celsius 0°C and 100°C , Fahrenheit 32°F and 212°F , Kelvin 273 K and 373 K .



Ice point and steam point on the Celsius, Fahrenheit and Kelvin scales.

Q 7.9. What is meant by sensitivity of a thermometer?

Ans: Sensitivity is the ability of a thermometer to detect small changes in temperature. For example, if the smallest division on one thermometer is 1°C but on another it is 0.1°C , the second one is more sensitive because it can measure temperature more precisely (up to 0.1°C).

Q 7.10. What do you mean by the linearity of a thermometer?

Ans: Linearity means a direct proportional relationship between the temperature and the scale reading over the whole range. A good linear thermometer shows equal changes on the scale for equal changes in temperature, i.e. the scale markings are evenly (uniformly) spaced over the entire range.

Q 7.11. What makes the scale reading of a thermometer accurate?

Ans: High linearity makes the reading accurate. When the thermometric liquid expands uniformly for equal rises in temperature, the scale markings are evenly spaced and the readings stay proportional over the whole range. A uniform (even-bore) capillary tube is needed to ensure this accuracy.

Q 7.12. What determines the direction of heat flow?

Ans: Temperature determines the direction of heat flow. Heat (thermal energy) always flows from a body at higher temperature to a body at lower temperature, until both reach the same temperature. It depends only on the temperature difference, not on the amount of heat contained.

Q 7.13. Distinguish between heat and internal energy.

Ans: Internal energy is the sum of the kinetic and potential energies of all the molecules of a body, and a body always contains internal energy. Heat is only energy in transit — the part of energy transferred from a hotter body to a colder body due to a temperature difference. So a body contains internal energy, not heat.

Q 7.14. When you touch a cold surface, does cold travel from the surface to your hand, or does energy travel from your hand to the cold surface?

Ans: There is nothing called 'cold' that travels. Since heat always flows from a higher temperature to a lower temperature, thermal energy travels from your warmer hand to the colder surface. Losing this energy is what makes your hand feel cold.

Q 7.15. Can you feel your fever by touching your own forehead? Explain.

Ans: No, usually not. Heat flows only when there is a temperature difference. Your hand and your forehead are parts of the same body and are at nearly the same temperature, so there is little or no heat flow between them and your hand cannot sense the fever. A thermometer, which is at a different temperature, is needed to detect it.