



SCIENCE WORKBOOK



CREST Science Olympiad (CSO)

Science Olympiad Exams Preparation Book

CSO | NSO | USO | iOS | NSTSE | HSO





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CREST Science Olympiad Workbook for Grade 9

Fourth Edition

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Disclaimer: The information in the Workbook is to give you the path to success but it does not guarantee 100% success as the strategy is completely dependent on its execution. And it is based on previous year papers of CSO exam.

Published & Distributed by: Loyalty Square Analytic Solutions Private Limited Corporate Office: B2 -234, Spaze IT Park, Sector-49, Gurgaon, Haryana-122018, India

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ISBN Number: 978-81-957994-4-2

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Preface

We are pleased to launch a thoroughly revised edition of this workbook. We welcome feedback from students, teachers, educators and parents. For improvements in the next edition, please send your suggestions at info@crestolympiads.com. Our team will make an effort to work on those suggestions. The status of the improvements can be checked at https://www.crestolympiads.com/corrections-class9-516

CREST Olympiads is one of the largest Olympiad Exams with students from more than 60 countries. The objective of these exams is to build a competitive spirit while evaluating students on conceptual understanding of the concepts.

We strive to provide a superior learning experience, and this workbook is designed to complement the school studies and prepare the students for various competitive exams including the CREST Olympiads. This workbook provides a crisp summary of the topics followed by the practice questions. These questions encourage the students to think analytically, to be creative and to come up with solutions of their own. There is a previous year's paper given at the end of this workbook for the students to attempt after completing the syllabus. This paper should be attempted in 1 hour to get an assessment of the student's preparation for the final exam.

Publishers



Matter in Our Surroundings

Matter

Matter is anything that occupies space and has mass. Matter consists of tiny particles which cannot be seen with the naked eye.

Characteristics of Particles of Matter

- Particles of matter have spaces between them
- Particles of matter are in always in motion
- Particles of matter attract each other

States of Matter

Matter can be classified as solid, liquid and gas on the basis of inter particle forces and arrangement of particles.

Solids	Liquids	Gases
They have a definite shape	They have indefinite shape	They indefinite shape as well as
and volume	but definite volume.	volume.
Particles are held together by	Particles are held together by	Particles have very weak
strong intermolecular	intermolecular attractive	intermolecular attractive forces.
attractive forces.	forces which are weaker than	
	solid state.	
Particles are closely packed	Particles are loosely packed	Particles are very loosely packed
They are completely	They are almost	They are highly compressible.
incompressible.	incompressible.	
Kinetic energy of particles is	Kinetic energy of particles is	Kinetic energy of particles is
minimum	more than solids less than	maximum
	gases	
Particles cannot freely move	Particles can move freely	Particles can move freely and
but only vibrate and spin	and slide over one another.	randomly at high speeds.
around their fixed position		
Highest density	Less than the density of solid	Lowest density
	state	
Cannot flow	Can flow	Can flow

Diffusion

The intermixing of particles of two substances on their own is called diffusion. Diffusion becomes faster on heating.

Change of State

Change of state depends on two factors:

- Temperature
- Pressure

Effect of Change of Temperature on State of Matter



Solid to Liquid

- On heating (increasing temperature), the kinetic energy of the particles increases and they start vibrating with greater energy. The interparticle force of attraction decreases and solid converts into liquid.
- The temperature at which solid melts to become liquid at atmospheric pressure is called melting point.

Liquid to Gas

- The process in which a liquid substance changes into a gas on heating is called boiling or vaporisation.
- The temperature at which liquid boils (evaporates) to become gas at atmospheric pressure is called boiling point.
- Boiling point increases, when pressure is increased.

Gas to Liquid

• The process in which gas changes into liquid on cooling is called condensation.

Liquid to Solid

- The process in which liquid changes into solid on cooling is called freezing.
- The temperature at which liquid freezes to become solid at atmospheric pressure is called freezing point.

Solid to Gas or Gas to Solid

- The process in which solid changes directly into gaseous state on heating without passing through liquid state is called sublimation.
- The process in which gas changes directly into solid state on cooling without passing through liquid state is called deposition.

Effect of Change of Pressure

- On applying pressure, the particles of matter come closer and intermolecular space deceases.
- When we compress or decrease the temperature of a gas, the gas changes into a liquid. This process of conversion of gas into liquid by increasing pressure and decreasing temperature is called liquefaction of gases.
- Dry ice (solid carbon dioxide) directly turns into carbon dioxide gas by decreasing the pressure to 1 atmosphere.

Latent Heat of Fusion

It is the amount of heat energy that is required to change 1 kg of a solid into liquid at atmospheric pressure without any change in temperature at its melting point.

Latent Heat of Vaporisation

It is the amount of heat energy that is required to change 1 kg of a liquid into gas at atmospheric pressure without any change in temperature at its boiling point.

Evaporation

The process of conversion of liquid into vapour at any temperature below its boiling point is called evaporation. Evaporation causes cooling. It is a surface phenomenon.

Factors Affecting Evaporation

- **Temperature:** The rate of evaporation increases with an increase in temperature.
- Surface area: The rate of evaporation increases with an increase in surface area.
- Humidity: The rate of evaporation decreases with an increase in humidity.
- Wind speed: The rate of evaporation increases with an increase in wind speed.

Practice Questions

- 1. Consider the following statements and choose the correct option: Statement 1: Diffusion becomes slower on heating. Statement 2: The kinetic energy of particles increases on heating.
 - a. Statement 1 is correct but statement 2 is incorrect.
 - b. Statement 1 is incorrect but statement 2 is correct.
 - c. Both the statements are correct.
 - d. Both the statements are incorrect.
- 2. Which of the following sets of phenomena would increase on raising the temperature?
 - a. Diffusion, evaporation, compression of gases
 - b. Evaporation, compression of gases, solubility
 - c. Evaporation, solubility, diffusion, expansion of gases
 - d. Evaporation, solubility, diffusion, compression of gases
- 3. A gas when transferred to a larger container from a smaller container occupy all the space available. What does this signify?
 - a. Gas has definite shape
- b. Gas has no definite shape
- c. Gas has definite volume d. Gas has no definite volume
- 4. What happens to the temperature during the melting of ice when heat is supplied continuously?
 - a. Temperature increases
 - b. Temperature decreases
 - c. Temperature first increases and then decreases
 - d. Temperature remains constant.
- 5. Choose the correct one among the following in decreasing order of their boiling points:
 - a. Alcohol > Ether > Honey > Water b. Ether > Alcohol > Water > Honey
 - c. Honey > Water > Alcohol > Ether d. Alcohol > Water > Honey > Ether
- 6. Consider the following statements and choose the correct option: Statement 1: The more the pressure, the more is the solubility of a gas. Statement 2: Applying pressure and reducing temperature can compress all solids.
 - a. Statement 1 is correct but statement 2 is incorrect.
 - b. Statement 1 is incorrect but statement 2 is correct.
 - c. Both the statements are correct.
 - d. Both the statements are incorrect.

- 7. What are two external conditions required for the matter to exist in a particular physical state?
 - a. Temperature and humidity
 - c. Pressure and humidity
- 8. Which of the following option is correct?
 - I. 1 kg of water at 100°C
 - II. 1 kg of steam at 100°C
 - a. I contain more heat than II
 - b. I contain more heat than II
 - c. Both I and II contain same amount of heat
 - d. Cannot be determined
- 9. Which of the following substance sublimes?
 - I. Ammonium chloride
 - II. Potassium chloride
 - III. Sodium chloride
 - IV. Calcium chloride
 - a. Only I
 - c. I and II

- b. Only II d. II and IV
- 10. Which of the following statement is true for amorphous solids?
 - I. They have fixed arrangement of atoms and molecules.
 - II. They do not have fixed melting point.
 - III. They have regular geometry.
 - a. Only I
 - c. I and II

- b. Only II
- d. II and III



- b. Temperature and pressure
- d. Density and pressure