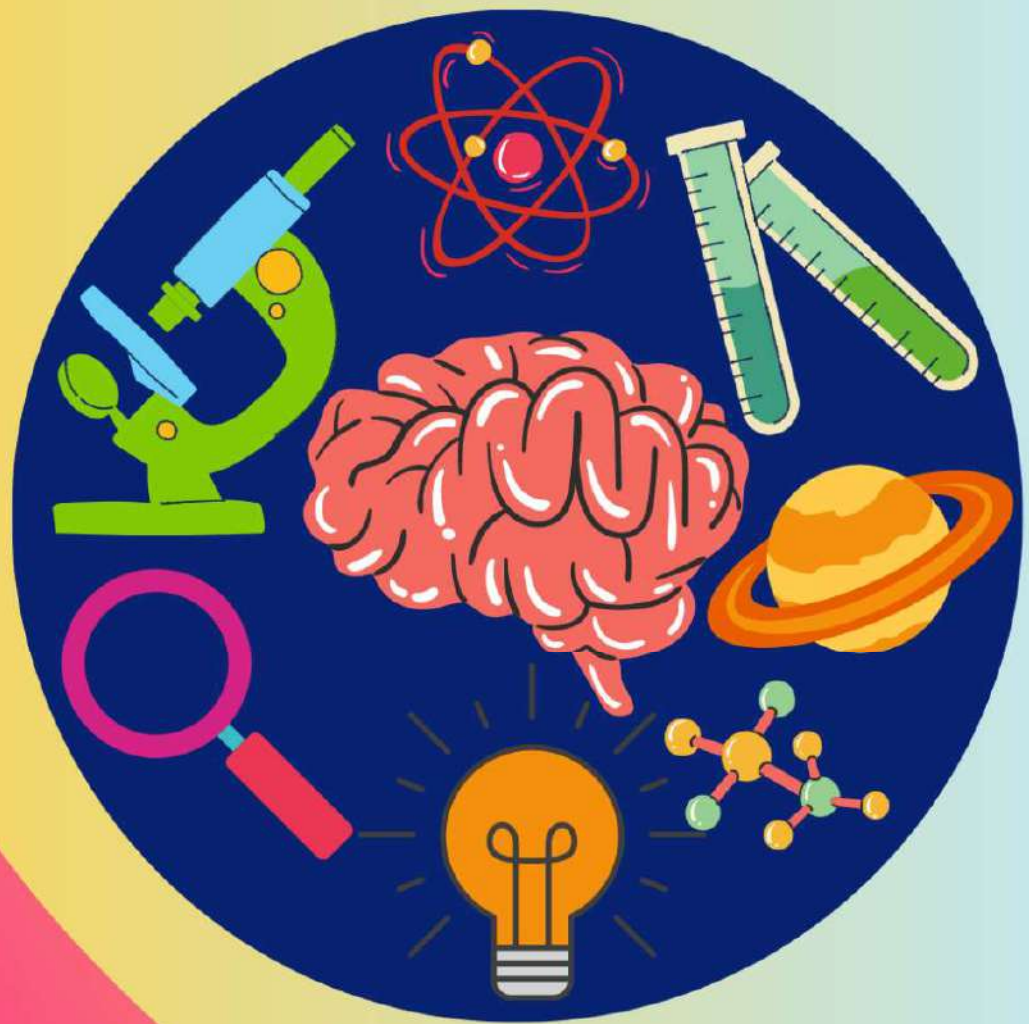


SCIENCE WORKBOOK



Science Olympiad

Exams Preparation Book

CSO | NSO | USO | IOS | NSTSE | HSO

Grade 9



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CREST Science Olympiad Workbook for Grade 9

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

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Contents

1. Matter in Our Surroundings	5
2. Is Matter Around Us Pure	10
3. Atoms and Molecules	17
4. Structure of the Atom.....	23
5. Cell-The Fundamental Unit of Life	29
6. Tissues.....	44
7. Diversity in Living Organisms	56
8. Motion	69
9. Force and Laws of Motion	75
10. Gravitation.....	80
11. Work and Energy.....	86
12. Sound.....	90
13. Why do We Fall Ill	97
14. Natural Resources.....	103
15. Improvement in Food Resources.....	113
16. Previous Year Paper (2021-22).....	123
17. Answer Key	131

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.

CREST Olympiads is one of the largest Olympiad Exams with students from more than 25 countries. The objective of these exams is to build 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's a previous year 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

Chapter 1

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

Diffusion

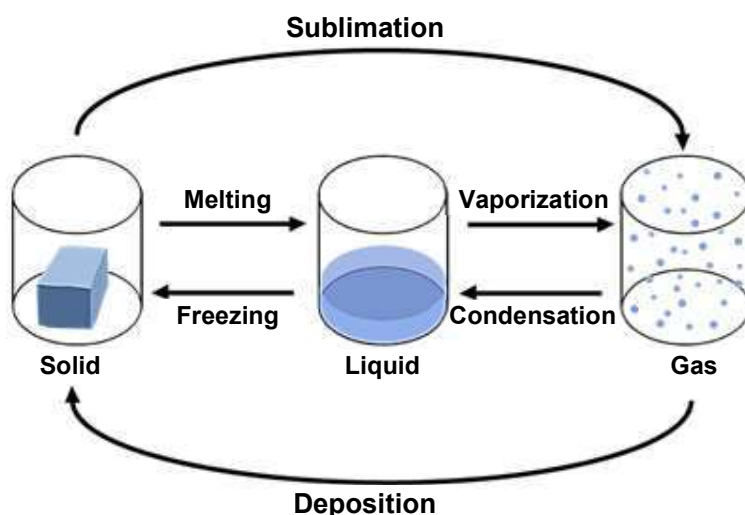
The intermixing of particles of two substances on their own is called diffusion. Diffusion becomes faster on heating.

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 decreases.
- 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.
- Statement 1 is correct but statement 2 is incorrect.
 - Statement 1 is incorrect but statement 2 is correct.
 - Both the statements are correct.
 - Both the statements are incorrect.
7. What are two external conditions required for the matter to exist in a particular physical state?
- Temperature and humidity
 - Temperature and pressure
 - Pressure and humidity
 - Density and pressure
8. Which of the following option is correct?
- 1 kg of water at 100°C
 - 1 kg of steam at 100°C
- I contain more heat than II
 - I contain more heat than II
 - Both I and II contain same amount of heat
 - Cannot be determined
9. Which of the following substance sublimates?
- Ammonium chloride
 - Potassium chloride
 - Sodium chloride
 - Calcium chloride
- Only I
 - Only II
 - I and II
 - II and IV
10. Which of the following statement is true for amorphous solids?
- They have fixed arrangement of atoms and molecules.
 - They do not have fixed melting point.
 - They have regular geometry.
- Only I
 - Only II
 - I and II
 - II and III