Grade-8 Science (Mastermind)

Chapter 1: Exploring the Investigative World of Science

A. Tick (✓) the Correct Option

1. What causes a puri to puff up when fried?
   Ans. (a) Steam pressure inside
2. Which of the following is a pure substance?
   Ans. (d) Element
3. What effect causes light to bend when passing through lenses?
   Ans. (b) Refraction
4. What protects Earth from harmful ultraviolet rays?
   Ans. (b) Atmosphere
5. The phases of the Moon are caused by
   Ans. (c) Positions of Earth, Moon and Sun
6. Which variable should be changed in an experiment to test the effect of oil temperature on puri puffing?
   Ans. (b) Oil temperature
7. What is the main reason for Earth's suitable conditions for life?
   Ans. (a) Perfect distance from the Sun
8. In ecosystems, which of the following is not a factor affecting organisms?
   Ans. (c) Rocks
9. What is the main difference between elements and compounds?
   Ans. (b) Compounds have chemically bonded elements
10. Which scientific method step involves changing one factor at a time?
    Ans. (c) Controlled experiment

B. Fill in the Blanks

1. The swelling of a puri in hot oil is caused by **steam** inside the dough.
2. The atmosphere protects Earth by filtering **ultraviolet** rays from the Sun.
3. A solution is formed when a **solute** dissolves in a liquid.
4. The Moon’s phases result from the relative positions of the Earth, Moon, and **Sun**.
5. Scientific investigation often requires changing only **one** variable at a time.

C. Decide Whether the Following Statements are True or False

1. Elements can be physically separated into simpler substances.
   False
2. Reflection occurs when light bounces off a surface.
   True
3. Human activities cannot affect Earth's climate.
   False
4. Careful observation is the first step in scientific inquiry.
   True
5. Oil temperature does not affect how a puri puffs up.
   False

D. Match the Following

Column A	**Column B**
1. Reflection	d) Light bouncing
2. Refraction	e) Light bending
3. Atmosphere	c) Protective layer
4. Compound	b) Chemically bonded elements
5. Ecosystem	a) Interaction of organisms and environment

E. Answer the Following Questions in Brief

1. What is meant by a controlled experiment?

Answer:
A controlled experiment is an experiment in which only one variable is changed while all other variables are kept constant. This helps scientists identify the effect of that particular variable on the outcome.

2. Why is it important to change only one variable at a time in an experiment?

Answer:
Changing only one variable at a time helps determine the exact cause of the observed result. It makes the experiment fair and the conclusions reliable.

3. Name two factors that affect the puffing of a puri when fried.

Answer:

1. Temperature of the oil
2. Thickness of the dough

4. What causes the phases of the Moon?

Answer:
The phases of the Moon are caused by the changing positions of the Earth, Moon, and Sun. Different portions of the Moon's illuminated side become visible from Earth.

5. Why is Earth called a suitable planet for life?

Answer:
Earth is called a suitable planet for life because it has water, air, a suitable temperature, and an atmosphere that protects living organisms from harmful radiation.

F. Answer the Following Questions in Detail

1. Explain the role of scientific curiosity in everyday life with an example.

Answer:
Scientific curiosity encourages us to ask questions and seek answers about things happening around us. It helps develop scientific thinking and problem-solving skills.

Example: When we observe that a puri puffs up while frying, we may wonder why this happens. Investigating this question can lead us to understand the role of steam pressure inside the dough.

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2. Describe how the classification of matter into elements, compounds and mixtures helps in understanding materials.

Answer:
Classification of matter helps us understand the composition and properties of different substances.

- **Elements:** Pure substances made of one type of atom (e.g., Oxygen, Iron).
- **Compounds:** Formed when two or more elements combine chemically (e.g., Water).
- **Mixtures:** Physical combinations of substances (e.g., Air, Salt water).

This classification helps scientists study materials and their uses more effectively.

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3. Discuss how controlled experiments help in finding reliable conclusions.

Answer:
Controlled experiments allow scientists to change only one factor while keeping all others constant. This ensures that any observed effect is due to the changed factor alone. As a result, the conclusions drawn are accurate and reliable.

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4. Explain how the atmosphere supports life on Earth and protects it from harmful effects.

Answer:
The atmosphere supports life by providing essential gases such as oxygen and carbon dioxide. It also maintains Earth's temperature and water cycle. The ozone layer in the atmosphere absorbs harmful ultraviolet rays from the Sun, protecting living organisms.

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5. Describe how observing the Moon's phases helped humans develop calendars.

Answer:
People noticed that the Moon changes appearance in a regular pattern every month. These observations helped ancient civilizations create lunar calendars to track time, seasons, festivals, and agricultural activities.

G. Brain Teaser

1. If you observe that a puri does not puff up in oil, what possible factors could be responsible? How would you test these?

Answer:
Possible factors:

- Oil temperature too low
- Dough too thick
- Dough not rolled evenly
- Insufficient moisture in dough

Testing Method:
Change one factor at a time while keeping all others constant and observe the results.

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2. How might human activities disrupting Earth's climate affect ecosystems? Suggest scientific ways to study and address these changes.

Answer:
Climate change can cause:

- Rising temperatures
- Droughts and floods
- Loss of biodiversity
- Habitat destruction

Scientific Ways to Study and Address:

- Monitor temperature and rainfall data
- Study changes in plant and animal populations
- Plant more trees
- Reduce pollution and greenhouse gas emissions
- Promote renewable energy sources

Competency-Based Questions (Assertion–Reason)

1.

Assertion (A): The puri puffs up because steam forms inside it during frying.
Reason (R): Steam expands when heated, creating pressure inside the puri.

Answer: (a) Both A and R are true, and R is the correct explanation of A.

2.

Assertion (A): The Moon's phases occur because the Moon changes shape every night.
Reason (R): The phases are caused by the relative positions of Earth, Moon and Sun.

Answer: (d) A is false, but R is true.

3.

Assertion (A): A controlled experiment changes only one variable at a time.
Reason (R): This ensures that the results are due to that one variable only.

Answer: (a) Both A and R are true, and R is the correct explanation of A.

4.

Assertion (A): Elements can be separated into simpler substances by physical methods.
Reason (R): Elements are made of only one type of atom and cannot be broken down further by physical methods.

Answer: (d) A is false, but R is true.

5.

Assertion (A): The atmosphere allows life on Earth by providing oxygen.
Reason (R): Oxygen is a vital gas required for respiration in most living organisms.

Answer: (a) Both A and R are true, and R is the correct explanation of A.

Case Study-Based Questions

1. What is the independent variable in this experiment?
   Ans. (d) Temperature of oil
2. Why is it important to keep the method of dropping dough into oil constant?
   Ans. (b) To control one variable
3. Which of these is a dependent variable?
   Ans. (c) Puffing times
4. If the puri puffs up faster in hotter oil, what conclusion can be drawn?
   Ans. (a) Oil temperature affects puffing time
5. If puris made with maida puff up more than those made with atta, what does this suggest?
   Ans. (a) Flour type affects puffing

Art Integration

1. Traditional Indian Lunar Calendar (Panchang)

Answer:

The Panchang is a traditional Indian calendar based on the phases of the Moon. Farmers use it to decide the best time for sowing, harvesting, and other agricultural activities.

Role of Moon and Seasons:

- Moon phases help in calculating months.
- Seasonal changes guide farming activities.
- Farmers observe weather patterns and lunar cycles for crop planning.

Importance of Artistic Representation:

- Preserves traditional knowledge.
- Makes learning interesting.
- Helps future generations understand indigenous practices.
- Connects science with culture and history.

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2. Comic Strip on India's Diverse Ecosystems

Answer:

Scene 1: Western Ghats – Dense forests with rich biodiversity.

Scene 2: Villagers protect forests through sacred groves.

Scene 3: Thar Desert – People use rainwater harvesting techniques.

Scene 4: Himalayan Region – Terrace farming prevents soil erosion.

Scene 5: Sundarbans – Communities protect mangrove forests.

Traditional Sustainable Practices:

- Rainwater harvesting
- Terrace farming
- Sacred groves
- Organic farming

Scientific Basis:

- Conserves water.

- Prevents soil erosion.
- Maintains biodiversity.
- Reduces environmental degradation.

Critical Thinking

1. Community-Based Plan for Climate Challenges

Answer:

To address droughts and floods, communities can work together using simple scientific methods.

Steps:

1. Collect rainfall and temperature data regularly.
2. Install rain gauges and water-level markers.
3. Organize awareness campaigns in schools.
4. Promote rainwater harvesting.
5. Plant trees to reduce soil erosion.
6. Create emergency response teams.
7. Use mobile alerts and local communication systems.

Role of Schools:

- Conduct surveys and data collection.
- Spread awareness among citizens.
- Participate in environmental projects.

Role of Local Bodies:

- Maintain water resources.
- Provide disaster preparedness training.
- Coordinate relief and rescue operations.

Subject Link

1. Women's Role in Environmental Conservation

Answer:

Women play an important role in:

- Water conservation
- Sustainable agriculture
- Waste management
- Tree plantation drives

Benefits of Women's Participation:

- Better community decision-making
- Increased awareness
- Strong leadership
- Sustainable development

Social Skills Required:

- Communication
- Teamwork
- Leadership
- Cooperation
- Problem-solving

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2. Community Awareness Campaign for Pollution and Waste Management

Answer:

Campaign Name: "Clean Environment, Healthy Future"

Objectives:

- Reduce air pollution.
- Promote waste segregation.
- Encourage recycling.

Activities:

- Cleanliness drives.
- Tree plantation programs.
- Poster-making competitions.
- Door-to-door awareness campaigns.
- Workshops on waste management.

Encouraging Cooperation:

- Involve schools, local authorities, and residents.
- Form environmental clubs.
- Reward active participants.
- Conduct regular community meetings.

Chapter 2: The Invisible Living World – Beyond Our Naked Eye

NCERT Corner

Q1. Complete the Venn Diagram

Common to all three cells

- Cell Membrane
- Cytoplasm

Only in Animal Cell

- Nucleus

Only in Plant Cell

- Chloroplast

Only in Bacterial Cell

- Nucleoid

Common to Plant and Bacterial Cells

- Cell Wall

Q.2

Anandi took two test tubes and marked them A and B. She put sugar solution in both test tubes. In test tube B, she added yeast and attached balloons to both test tubes.

(i) What do you predict will happen after 3–4 days? She observed that the balloon attached to test tube B was inflated. What can be a possible explanation for this?

Answer:
After 3–4 days, the balloon attached to test tube B will inflate, while the balloon attached to test tube A will remain unchanged.

Yeast in test tube B ferments the sugar solution and produces carbon dioxide gas (CO_2). This gas collects in the balloon and causes it to inflate.

Correct Option:
(c) Yeast produced a gas inside the test tube B which inflated the balloon.

(ii) She took another test tube, 1/4 filled with lime water. She removed the balloon from test tube B without letting the gas escape and attached it to the test tube containing lime water. She then shook it well. What does she want to find out?

Answer:
She wants to find out whether the gas produced in test tube B is carbon dioxide.

When the gas from the balloon is passed into lime water, the lime water turns milky.

This happens because carbon dioxide reacts with lime water to form calcium carbonate.

Chemical Equation:

$Ca(OH)_2 + CO_2 \rightarrow CaCO_3 + H_2O$

Conclusion:
The gas produced during fermentation by yeast is carbon dioxide.

Additional Observation

Test Tube	Contents	Observation After 3–4 Days
A	Sugar solution only	Balloon remains deflated
B	Sugar solution + Yeast	Balloon inflates due to CO_2 gas

Result

This experiment proves that yeast is a living microorganism that carries out fermentation and produces carbon dioxide gas. This gas inflates the balloon and turns lime water milky.

Q.3

A farmer growing wheat added nitrogen-rich fertilizer because wheat requires a large amount of nitrogen for healthy growth and good yield. The farmer growing bean crops did not add nitrogen fertilizer because beans are leguminous plants. Their roots contain nitrogen-fixing bacteria (*Rhizobium*) that convert atmospheric nitrogen into usable forms, enriching the soil naturally.

Q.4

Snehal is trying to test whether mixing fruit and vegetable waste with dried leaves helps in faster and better compost formation.

Expected Observation:
Pit A (waste + dried leaves) will decompose faster and produce better compost than Pit B.

Q.5 Identify the following microorganisms:

(i) I live in every kind of environment and inside your gut.
Answer: Bacteria

(ii) I make bread and cakes soft and fluffy.
Answer: Yeast

(iii) I live in the roots of pulse crops and provide nutrients for their growth.
Answer: *Rhizobium*

Q.6

Experiment to show microorganisms need optimal temperature, air, and moisture:

1. Take four slices of bread.
2. Keep Slice A moist and warm.
3. Keep Slice B dry.
4. Keep Slice C in a refrigerator.
5. Keep Slice D in an airtight container.
6. Observe after a few days.

Observation:
Maximum fungal growth appears on Slice A.

Conclusion:
Microorganisms require suitable temperature, air, and moisture for growth.

Q.7

Bread Slice	Observation after 3 days
Near sink	Fungal growth (green/black patches)
Refrigerator	Little or no fungal growth

Reason:
The area near the sink is warm and moist, which favors microbial growth. The low temperature in the refrigerator slows down the growth of microorganisms.

Q.8

Curd becomes more sour when left outside because:

1. Lactic acid bacteria continue to multiply.
2. More lactic acid is produced, increasing the sour taste.

Q.9

(i) What happens to the sugar solution in flask A?

The yeast ferments the sugar solution and converts sugar into alcohol and carbon dioxide gas.

(ii) What do you observe in test tube B after four hours? Why?

Observation: Lime water turns milky.

Reason: Carbon dioxide produced during fermentation passes into the lime water and reacts with it to form calcium carbonate, making the lime water milky.

(iii) What would happen if yeast was not added in flask A?

Fermentation would not occur. No carbon dioxide or alcohol would be produced, and the lime water would not turn milky.

Discover, Design and Debate

Q.1 Biogas Programme in India

The Ministry of New and Renewable Energy (MNRE) promotes biogas through the **National Biogas and Manure Management Programme (NBMMP)**. The programme encourages the installation of family-size biogas plants that use cattle dung and organic waste to produce clean fuel and organic manure.

Benefits:

- Clean and renewable energy
- Reduces use of firewood and LPG

- Produces nutrient-rich manure
- Reduces environmental pollution

Q.2 Examples of Fermented Foods in India

Food Item	Main Ingredient	Microorganism
Curd	Milk	Lactobacillus
Idli	Rice and urad dal	Lactic acid bacteria and yeast
Dosa	Rice and urad dal	Lactic acid bacteria and yeast
Dhokla	Gram flour	Yeast and bacteria

Importance:

- Improves digestion
- Increases nutritional value
- Enhances taste and shelf life
- Part of traditional food culture

Q.3 Parts of a Mushroom

- Cap (Pileus)
- Gills (Lamellae)
- Ring (Annulus)
- Stalk (Stipe)
- Mycelium

Observation: Gills contain spores used for reproduction.

Q.4 Steps for Mushroom Cultivation

1. Prepare compost.

2. Fill compost in trays or bags.
3. Add mushroom spawn.
4. Maintain suitable temperature and humidity.
5. Allow mycelium to grow.
6. Mushrooms develop within a few weeks.
7. Harvest mature mushrooms carefully.

Assessment Corner

A. Tick (✓) the Correct Option

1. (b) Cell
2. (a) Nucleus
3. (c) Nucleus
4. (b) Unicellular
5. (c) Lactobacillus
6. (d) Perform life processes
7. (b) Yeast
8. (b) Cheek cell
9. (c) A low-cost paper microscope
10. (c) Fixing nitrogen

B. Fill in the Blanks

1. Nucleus
2. Animal
3. Microscope
4. Yeast
5. Rhizobium

C. True or False

1. True
2. False
3. True
4. False
5. True

D. Match the Following

Column A	Column B
Lactobacillus	Curd formation
Yeast	Bread making
Rhizobium	Nitrogen fixation
Cytoplasm	Site of cell activities
Foldscope	Low-cost microscope

E. Answer the Following Questions in Brief

1. What is a cell?

Answer:
A cell is the basic structural and functional unit of life. All living organisms are made up of cells.

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2. What is the function of the cell membrane?

Answer:
The cell membrane protects the cell and controls the movement of substances into and out of the cell.

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3. Name two unicellular organisms.

Answer:
Amoeba and Bacteria are unicellular organisms.

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4. How does yeast make dough rise?

Answer:
Yeast ferments sugar and releases carbon dioxide gas. This gas makes the dough soft and fluffy.

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5. What is the use of Rhizobium?

Answer:
Rhizobium fixes atmospheric nitrogen in the roots of leguminous plants and improves soil fertility.

F. Answer the Following Questions in Detail

1. Explain how you can observe onion cells under a microscope.

Answer:
Take a thin peel from the inner layer of an onion and place it on a slide. Add a drop of iodine solution and cover it with a coverslip. Observe it under a microscope. You can see the cell wall, cytoplasm, and nucleus clearly.

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2. Describe the differences between onion cells and cheek cells.

Answer:
Onion cells are plant cells and have a cell wall, while cheek cells are animal cells and do not have a cell wall. Onion cells are rectangular, whereas cheek cells are irregular in shape.

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3. What are microorganisms? Where can they be found?

Answer:
Microorganisms are tiny living organisms that cannot be seen with the naked eye. They are found in air, water, soil, food, and inside living organisms.

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4. How do microbes help the environment?

Answer:
Microbes decompose dead plants and animals into simpler substances. They recycle nutrients and help maintain the balance of nature.

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5. Explain the levels of organisation in multicellular organisms.

Answer:
Cells combine to form tissues. Tissues form organs, organs form organ systems, and organ systems together form an organism. This organisation helps the body function efficiently.

G. Brain Teaser

1. If dough with yeast is kept in a cold place, what will happen?

Answer:
Yeast becomes less active in cold conditions. As a result, fermentation slows down and the dough does not rise properly.

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2. Name some invisible organisms that affect our daily life.

Answer:
Bacteria in our digestive system, fungi, viruses, and algae affect our daily life. They help in digestion, food production, and environmental processes.

Competency-Based Questions

Assertion–Reason

1.

Answer: (c) A is true but R is false.

2.

Answer: (c) A is true but R is false.

3.

Answer: (a) Both A and R are true and R is the correct explanation.

4.

Answer: (c) A is true but R is false.

5.

Answer: (a) Both A and R are true and R is the correct explanation.

Case Study Based Questions

1. Why was yeast added to the dough?

Answer:
(c) To help it rise through fermentation.

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2. Which gas causes the dough to rise?

Answer:
(d) Carbon dioxide

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3. What is the role of warmth in the experiment?

Answer:
(c) It helps yeast grow and ferment effectively.

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4. Which observation shows fermentation occurred?

Answer:
(b) The dough rose and developed a sour smell.

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5. What causes the change in smell?

Answer:
(c) Formation of alcohol during fermentation.

Critical Thinking

1. Limitation of Microscope in Studying Viruses

Answer:
Most ordinary microscopes cannot show viruses because they are extremely small. Scientists use powerful electron microscopes to study them.

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2. What if Decomposers Suddenly Disappeared?

Answer:
Dead plants and animals would accumulate on Earth. Nutrients would not return to the soil, affecting ecosystems and agriculture.

Subject Link

1. Community Awareness Campaign

Answer:
The campaign should promote hygiene, proper sanitation, vaccination, and awareness about useful microbes. Communication, teamwork, and leadership skills are important for making the campaign successful.

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2. Explaining Microorganisms to Younger Students

Answer:
Use simple language, pictures, charts, and everyday examples such as curd making and bread preparation. Good communication helps others understand scientific concepts easily.

Art Integration

1. Visual Diary of a Cell

Answer:
Draw a labelled onion cell and cheek cell showing the nucleus, cell membrane, cytoplasm, and cell wall. This helps understand cell structure and functions.

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2. Educational Mural on Microorganisms

Answer:
The mural can show decomposition, curd formation, bread making, nitrogen fixation, and oxygen production by algae. It helps explain the importance of microorganisms in daily life.

Chapter 3: Health – The Ultimate Treasure

NCERT Corner

Q1. Classify the diseases as Communicable or Non-communicable

Communicable Diseases

- Cold and Flu
- Typhoid
- Chickenpox

Non-Communicable Diseases

- Diabetes
- Asthma

Q2. Identify the non-communicable diseases

Answer:
(b) (ii) and (iii)
Asthma and Diabetes

Q3. Flu Outbreak in School

(i) What actions should the school take?

Answer:
The school should encourage hand washing, use of masks, proper ventilation, and advise sick students to stay at home.

(ii) How should you respond to a classmate with flu?

Answer:
Be kind and supportive. Encourage the classmate to rest and follow medical advice.

(iii) How can you protect yourself?

Answer:
Wash hands regularly, avoid sharing personal items, and maintain cleanliness.

Q4. Travelling to a Malaria-Prone Area

(i) What precautions should be taken?

Answer:
Use mosquito nets, mosquito repellents, and wear full-sleeved clothes.

(ii) Why are mosquito nets and repellents important?

Answer:
They prevent mosquito bites and reduce the risk of malaria infection.

(iii) What may happen if precautions are ignored?

Answer:
Travellers may get infected with malaria and suffer from fever and weakness.

Q5. Smoking

(i) What would you say to him?

Answer:
I would politely explain that smoking damages health and can lead to serious diseases.

(ii) What would you do if offered a cigarette?

Answer:
I would refuse firmly and choose a healthy alternative.

(iii) How can schools help?

Answer:
Schools can organise awareness programmes and health education campaigns.

Q6. Antibiotics and Infection

Answer:
Vinita may ask:

- Do antibiotics work against viruses?
- Can antibiotics cure cold and flu?
- Why do doctors prescribe antibiotics only for certain infections?

These questions help explain that antibiotics work mainly against bacterial infections.

Q7. Dengue Cases Data Analysis

(i) In which three months were dengue cases highest?

Answer:
July, August, and September (65 cases each).

(ii) In which month were cases lowest?

Answer:
January (10 cases).

(iii) What factors may increase dengue cases?

Answer:
Rainfall, stagnant water, humidity, and mosquito breeding.

(iv) Suggest preventive measures.

Answer:
Remove stagnant water, use mosquito nets, spray insecticides, and maintain cleanliness.

Q8. School Health Campaign

Answer:
Key messages:

- Wash hands regularly.
- Eat nutritious food.
- Exercise daily.
- Get vaccinated.
- Avoid tobacco and smoking.
- Maintain cleanliness.

Q9. Why should antibiotics not be taken for cold, cough, or flu?

Answer:
These diseases are usually caused by viruses, while antibiotics work only against bacteria.

Q10. Diseases spread through contaminated drinking water

Answer:

- Hepatitis A
- Cholera
- Poliomyelitis

Chickenpox does not spread through contaminated water.

Q11. Why is the immune response stronger on second exposure?

Answer:
The immune system forms memory cells after the first infection. These cells recognise the pathogen quickly during the second exposure and respond faster.

Discover, Design and Debate

Q.1

Students maintain a health diary for at least a month to track food, hygiene, exercise, sleep, screen time and emotional state.

Sample Observation:

Activity	**Daily Record**
Food	Balanced diet with fruits and vegetables
Hygiene	Bathing and hand washing regularly
Exercise	30–45 minutes daily
Sleep	8 hours daily
Screen Time	Less than 2 hours
Emotional State	Happy and active

Conclusion:

Maintaining healthy habits improves physical and mental well-being.

Q.2

Read about Indian scientists like Suniti Solomon, Asima Chatterjee, Dr Vallabhbhai Subbarao, Dr Mary Poonen Lukose for their contributions in health and diseases.

Contributions:

1. Dr Suniti Solomon

- Discovered the first HIV cases in India.
- Worked extensively on HIV/AIDS awareness and treatment.

2. Asima Chatterjee

- Renowned chemist.
- Developed medicines for malaria and epilepsy.

3. Dr Yellapragada Subbarao

- Discovered important drugs used in treating diseases.
- Contributed significantly to medical research.

4. Dr Mary Poonen Lukose

- One of India's first women doctors.
- Improved public health and healthcare services.

Q.3

The deadly disease smallpox was eradicated by vaccination. Discover how this was done and why it worked. Debate whether everyone should be required to get vaccinated to protect others.

Answer:

Smallpox was eradicated through a worldwide vaccination campaign led by the **World Health Organization (WHO)**. People were vaccinated against the smallpox virus, which helped their bodies develop immunity.

Why it worked:

- Vaccination produced antibodies against the virus.
- Vaccinated people did not spread the disease easily.
- Continuous vaccination reduced the number of cases.
- Eventually, the virus had no host to infect and disappeared.

Conclusion:

Vaccination is one of the most effective ways to prevent infectious diseases and protect public health.

Q.4

Learn the correct sequence of steps for performing CPR on an adult.

Steps:

1. Check the person's responsiveness.
2. Call for emergency medical help.

3. Check breathing.
4. Begin chest compressions (30 compressions).
5. Give 2 rescue breaths if trained.
6. Continue CPR until help arrives or the person recovers.

Q.5

Invite a doctor to the school. Students may interact with the doctor on malnutrition, under-nutrition and over-nutrition.

Summary:

- **Malnutrition:** Lack of proper nutrition.
- **Under-nutrition:** Insufficient intake of nutrients causing weakness and poor growth.
- **Over-nutrition:** Excessive intake of food leading to obesity and related health problems.

Prevention: Eat a balanced diet, exercise regularly and maintain healthy eating habits.

Q.6

Create your own health card.

Sample Health Card

Name: _____

Age: _____

Blood Group: _____

Height: _____

Weight: _____

BMI: _____

Vaccination Status: _____

Allergies: _____

Medical Conditions: _____

Emergency Contact: _____

Doctor's Name: _____

Regular Exercise: Yes / No

Balanced Diet: Yes / No

Q.7

Have a debate on "Are there ill-effects of fast food on companion animals?"

Answer:

Yes, frequent consumption of fast food can harm companion animals.

Ill-effects:

- Obesity
- Digestive problems
- Heart diseases
- Diabetes
- Nutritional deficiencies

Conclusion:

Companion animals should be fed a balanced and nutritious diet rather than human fast food to maintain good health.

Assessment Corner

A. Tick (✓) the Correct Option

1. **(b) The body's natural ability to fight diseases**
2. **(b) Diabetes**
3. **(b) Edward Jenner**

4. **(b) Washing hands regularly**
5. **(d) Eye colour**
6. **(c) A disease not caused by pathogens and doesn't spread**
7. **(b) Measures air cleanliness**
8. **(b) Fungi**
9. **(c) Eating a balanced diet**
10. **(b) Complete physical, mental and social well-being**

B. Fill in the Blanks

1. Immunity
2. Edward Jenner
3. Communicable
4. Artificial
5. Vaccination

C. True or False

1. False
2. True
3. False
4. True
5. True

D. Match the Following

Column A	**Column B**
Immunity	Natural body defence system
Edward Jenner	First vaccine inventor

Column A	Column B
Non-communicable disease	Diabetes, cancer
Communicable disease	Disease caused by pathogens
Vaccine	Protection against diseases

E. Answer the Following Questions in Brief

1. What are communicable diseases?

Answer:
Communicable diseases are diseases that spread from one person to another through pathogens.

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2. Name two non-communicable diseases.

Answer:
Diabetes and asthma are non-communicable diseases.

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3. Why is a clean environment important for health?

Answer:
A clean environment reduces the spread of diseases and promotes healthy living.

---

4. How do vaccines work?

Answer:
Vaccines train the immune system to recognise and fight disease-causing pathogens.

---

5. What is antibiotic resistance?

Answer:
Antibiotic resistance occurs when bacteria stop responding to antibiotics due to their misuse or overuse.

F. Answer the Following Questions in Detail

1. Explain the difference between communicable and non-communicable diseases.

Answer:
Communicable diseases are caused by pathogens and can spread from one person to another. Examples include typhoid and chickenpox. Non-communicable diseases do not spread between people and are often related to lifestyle or genetic factors, such as diabetes and asthma.

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2. Describe the role of immunity and vaccines in protecting our health.

Answer:
Immunity helps the body fight disease-causing germs. Vaccines strengthen immunity by preparing the immune system to recognise and destroy pathogens before they cause illness.

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3. What are some healthy lifestyle habits that support good health?

Answer:
Healthy habits include eating a balanced diet, exercising regularly, getting enough sleep, maintaining personal hygiene, and avoiding tobacco and harmful substances.

---

4. Why is it important to use antibiotics carefully?

Answer:
Incorrect use of antibiotics can lead to antibiotic resistance. This makes bacterial infections harder to treat and reduces the effectiveness of medicines.

---

5. How does environmental cleanliness impact public health?

Answer:
Clean surroundings reduce the spread of disease-causing organisms. Proper waste disposal and sanitation help protect community health.

Brain Teaser

1. How can climate change affect the spread of diseases?

Answer:
Climate change can increase mosquito breeding and alter weather patterns. This may increase the spread of diseases such as malaria and dengue.

---

2. Compare communicable and non-communicable diseases.

Answer:
Communicable diseases spread through pathogens and can pass from person to person. Non-communicable diseases do not spread and are often linked to lifestyle, genetics, or environmental factors.

Competency-Based Questions

Assertion–Reason

1.

Answer: (c) A is true, but R is false.

2.

Answer: (d) A is false, but R is true.

3.

Answer: (a) Both A and R are true, and R is the correct explanation.

4.

Answer: (c) A is true, but R is false.

5.

Answer: (a) Both A and R are true, and R is the correct explanation.

Case Study Based Questions

1. Main goal of the sanitation campaign

Answer:
(b) To build and use toilets, reducing open defecation

---

2. Impact on children's health

Answer:
(c) Fewer cases of diarrhoea and infections

---

3. Practice encouraged by the campaign

Answer:
(b) Better hygiene and cleanliness

---

4. Why are toilets important?

Answer:
(b) It helps stop the spread of communicable diseases

---

5. Age group that benefited most

Answer:
(c) Children

Art Integration

1. Health Awareness Campaign

Answer:
The campaign may include posters, slogans, skits, and social media messages promoting vaccination, hand washing, balanced diet, and exercise. These activities help spread awareness and encourage healthy habits.

---

2. Story on Community Cooperation

Answer:
A community can work together by maintaining cleanliness, promoting vaccination, and following health guidelines. Cooperation helps prevent disease outbreaks and improves public health.

Critical Thinking

1. Challenges in controlling diseases in India

Answer:
Challenges include lack of awareness, poor sanitation, overcrowding, limited healthcare access, and unhealthy lifestyles. Education and healthcare improvements can help address these issues.

---

2. "Health is not just the absence of disease."

Answer:
Good health includes physical fitness, mental well-being, and social happiness. A healthy person feels well in all aspects of life, not just free from illness.

Subject Link

1. Role of social connections in health

Answer:
Support from family, friends, and schools helps reduce stress and improves mental health. Positive relationships encourage healthy habits.

---

2. Importance of community-led initiatives

Answer:
Community programmes promote awareness, teamwork, and responsibility. They help improve sanitation, health practices, and overall well-being.

Chapter 4: Electricity: Magnetic and Healing Effects

NCERT Corner

Q1. Fill in the Blanks

(i) The solution used in a Voltaic cell is called **electrolyte**.

(ii) A current-carrying coil behaves like a **magnet**.

Q2. Choose the Correct Option

(i)

Dry cells are less portable compared to Voltaic cells.

Answer: False

(ii)

A coil becomes an electromagnet only when electric current flows through it.

Answer: True

(iii)

An electromagnet using a single cell attracts more clips than one using two cells.

Answer: False

Q3. Choose the Correct Option

Statements:

1. The wire becomes warm.
2. A magnetic compass placed below the wire is deflected.

Answer: (c) Both (i) and (ii) are correct.

Q4. Match the Following

Column A	Column B
Voltaic cell	Generates electricity by chemical reactions
Electric iron	Works on heating effect of electric current
Nichrome wire	Best suited for electric heater
Electromagnet	Works on magnetic effect of electric current

Q5. Why is nichrome wire used in heating devices?

Answer:
(ii) It generates more heat for a given current.

Q6. Why are electric heating devices more convenient?

Answer:
Electric heaters are cleaner, faster, safer, and do not produce smoke or harmful gases. They reduce pollution and save time.

Q7. Compass and Current-Carrying Coil

(i)

Current should be shown flowing from the positive terminal of the battery through the coil and back to the negative terminal.

(ii)

The compass needle deflects because the current-carrying coil produces a magnetic field.

(iii)

If battery terminals are reversed, the direction of current changes and the compass needle deflects in the opposite direction.

Q8. Why did the electromagnet stop lifting clips?

Answer:
The battery may have become weak and could no longer supply enough current. Therefore, the electromagnet became weak and stopped attracting clips.

Q9. In which setup will the LED glow?

Answer:
The LED will glow in the **lemon juice setup** because lemon juice acts as an electrolyte and conducts electricity.

Q.10

Neha keeps the coil exactly the same as in Activity 1 but slides the iron nail out, leaving only the coiled wire. Will the coil still deflect the compass? If yes, will the deflection be more or less than before?

Answer:
Yes, the coil will still deflect the compass needle because a current-carrying coil produces a magnetic field.

However, the deflection will be **less than before** because the iron nail acts as a magnetic core and increases the strength of the magnetic field. When the iron nail is removed, the magnetic field becomes weaker.

Conclusion:
The coil will still behave like a magnet, but its magnetic effect will be weaker without the iron nail.

Q.11

We have four coils of similar shape and size, made up of iron, copper, aluminium and nichrome as shown in the figure. When current is passed through the coils, compass needles placed near the coils will show deflection.

Options:

(i) Only in circuit (a)

(ii) Only in circuits (a) and (b)

(iii) Only in circuits (a), (b), and (c)

(iv) In all four circuits

Answer:
(iv) In all four circuits

Reason:
Whenever electric current flows through a conductor, a magnetic field is produced around it, irrespective of whether the conductor is made of iron, copper, aluminium, or nichrome. Therefore, the compass needle will show deflection in all four circuits.

Discover, Design and Debate

Q1. Effect of Number of Turns on Electromagnet

Answer:
As the number of turns increases, the strength of the electromagnet increases. More turns produce a stronger magnetic field.

Q2. Thick and Thin Nichrome Wires

Answer:
The thinner wire heats up more because it offers greater resistance to the flow of electric current.

Q3. Electric Cell Project

Answer:
Different fruits and vegetables such as lemon, potato, and tomato can produce small amounts of electricity when fitted with suitable electrodes.

Assessment Corner

A. Tick (✓) the Correct Option

1.

Who discovered that electric current produces a magnetic field?

Answer: (b) Hans Christian Oersted

2.

Which part of a dry cell acts as the positive terminal?

Answer: (b) Carbon rod

3.

Which increases the strength of an electromagnet?

Answer: (b) Increasing the current

4.

The compass needle deflects because:

Answer: (b) Current produces a magnetic field

5.

In a lemon cell, the electrolyte is:

Answer: (c) Lemon juice

6.

Which device works on the heating effect of electric current?

Answer: (c) Electric iron

7.

How can poles of an electromagnet be reversed?

Answer: (b) By changing the direction of current

8.

Why does nichrome wire get heated?

Answer: (b) It resists current flow

9.

Main advantage of rechargeable batteries:

Answer: (b) They can be used multiple times

10.

Practical application of lifting electromagnets:

Answer: (b) Scrap yard cranes

B. Fill in the Blanks

1. magnetic field
2. magnet
3. turns
4. electrolyte
5. heater
6. carbon rod

C. True or False

1. False
2. True
3. True
4. False
5. False
6. True

D. Match the Following

Column A	**Column B**
Voltaic cell	Electrochemical battery
Nichrome wire	Electrical resistance
Electromagnet	Temporary magnet
Hans Christian Oersted	Demonstrates magnetic effect of current
LED connected to lemon cell	Heat generation in appliances

Column A	Column B
Electric iron	Heat generation in appliances

E. Answer the Following Questions in Brief

1. What is a magnetic field?

Answer:
A magnetic field is the region around a magnet or current-carrying conductor where magnetic force can be detected.

---

2. Name two applications of the heating effect of electric current.

Answer:
Electric iron and electric heater.

---

3. How does a compass needle behave near a current-carrying wire?

Answer:
The compass needle gets deflected because the current-carrying wire produces a magnetic field.

---

4. What is the purpose of an iron nail in an electromagnet?

Answer:
The iron nail strengthens the magnetic field and acts as the core of the electromagnet.

---

5. Why does reversing current reverse the poles of an electromagnet?

Answer:
The direction of the magnetic field depends on the direction of current. Reversing the current reverses the magnetic poles.

---

6. Difference between a dry cell and a rechargeable battery.

Answer:
A dry cell is generally used once and discarded, while a rechargeable battery can be charged and used many times.

F. Answer the Following Questions in Detail

1. Explain the magnetic effect of electric current using a simple wire and compass.

Answer:
When electric current flows through a wire, it produces a magnetic field around it. If a compass is placed near the wire, the compass needle deflects. This shows that electric current creates a magnetic effect.

---

2. Describe how to make a simple electromagnet.

Answer:
Take an iron nail and wrap insulated copper wire around it. Connect the wire ends to a battery. When current flows through the coil, the nail becomes an electromagnet and can attract small iron objects.

---

3. How does the number of coil turns affect electromagnet strength?

Answer:
Increasing the number of turns increases the magnetic field produced by the coil. Therefore, the electromagnet becomes stronger and can attract more objects.

---

4. Describe the heating effect of electric current with two examples.

Answer:
When electric current passes through a conductor, heat is produced due to resistance. This is called the heating effect of electric current. Electric irons and electric heaters work on this principle.

---

5. Explain how a lemon cell produces electricity.

Answer:
A lemon cell uses two different metal electrodes placed in lemon juice. The lemon juice acts as an electrolyte. Chemical reactions between the electrodes and electrolyte produce electric current.

---

6. Describe the structure and working of a dry cell.

Answer:
A dry cell consists of a zinc container, carbon rod, electrolyte paste, and metal cap. Chemical reactions inside the cell convert chemical energy into electrical energy, producing current.

Brain Teaser

1. LED glows dimly in a lemon battery. How can brightness be increased?

Answer:

- Connect more lemon cells in series.
- Use fresh lemons.
- Ensure tight wire connections.
- Use larger electrodes.

---

2. Which wire produces maximum heat: Copper, Nichrome, or Aluminium?

Answer:
Nichrome wire produces maximum heat because it has higher electrical resistance. Therefore, it is used in heaters, geysers, and electric irons.

Competency-Based Questions

Assertion-Reason

1.

A: Electromagnets lose magnetism when current stops.
R: Magnetic field is produced only by flowing current.

Answer: (a) Both A and R are true and R is the correct explanation.

2.

A: Increasing the number of turns strengthens an electromagnet.
R: More turns allow magnetic fields to combine and increase strength.

Answer: (a) Both A and R are true and R is the correct explanation.

3.

A: Nichrome wire is used in electric heaters.
R: Nichrome offers high resistance and converts electrical energy into heat efficiently.

Answer: (a) Both A and R are true and R is the correct explanation.

4.

A: A dry cell cannot be recharged.
R: Chemicals inside a dry cell are consumed and cannot be restored.

Answer: (a) Both A and R are true and R is the correct explanation.

Case Study Based Questions

1. Role of the iron nail

Answer: (b) It strengthens the magnetic field

2. Why does the electromagnet attract more clips with four cells?

Answer: (a) More current increases magnetic field

3. What happens when current direction is reversed?

Answer: (b) Poles are reversed

4. Why does the nail lose magnetism?

Answer: (b) Magnetic field disappears with current

5. Practical application

Answer: (c) Scrap yard lifting magnet

C. Art Integration

1. Using your knowledge of electromagnets and the heating effect of electric current, create a visual poster.

Answer:

Title: *Effects of Electric Current in Daily Life*

The poster should show:

- An electric iron and heater to represent the heating effect.
- An electromagnetic crane and electric bell to represent the magnetic effect.
- Arrows showing the flow of current.
- Labels explaining each device.

Caption:
"Electric current produces heat and magnetism, making many modern devices useful and efficient."

---

2. Develop a 6-frame comic strip showing how an electron travels through a circuit.

Answer:

Frame 1: An electron leaves the battery saying, “My journey begins!”

Frame 2: It moves through a wire and enters a coil.

Frame 3: The coil creates a magnetic field and turns the iron nail into an electromagnet.

Frame 4: The electron then passes through a nichrome wire.

Frame 5: Due to resistance, heat is produced and the heater becomes hot.

Frame 6: The switch is turned off and the electron says, “Current stops, so magnetism and heating stop too.”

D. Critical Thinking

1. Compare the challenges faced in controlling communicable diseases versus non-communicable diseases in India today.

Answer:

Communicable diseases spread through pathogens and require vaccination, hygiene, and sanitation for control. Non-communicable diseases are mainly caused by unhealthy lifestyles, pollution, stress, and genetic factors. Controlling them requires regular exercise, a balanced diet, awareness, and good healthcare facilities. Both types of diseases need public awareness and proper medical support.

---

2. Reflect on the statement "Health is not just the absence of disease."

Answer:

Health means complete physical, mental, and social well-being. A person may not have any disease but may still be unhealthy due to stress, anxiety, loneliness, or poor lifestyle habits. Good nutrition, exercise, emotional balance, and healthy relationships are equally important for overall health.

E. Subject Link

1. Imagine you are in a group tasked with demonstrating an electromagnet to a class.

Answer:

I would assign different roles to group members. One student would arrange the materials, another would connect the circuit, a third would explain the working of the electromagnet, and another would record observations. We would explain safety precautions, such as not touching exposed wires and switching off the battery after use. We would ask classmates to predict the results before the demonstration. Teamwork helps us share ideas, learn from one another, and understand scientific concepts more clearly.

---

2. Discuss why understanding the heating effect of electric current is important for community safety.

Answer:

Understanding the heating effect of electric current helps people prevent electrical accidents such as shocks, short circuits, and fires caused by overheating wires and appliances.

Awareness Campaign: "Electrical Safety First"

Safety Tips:

- Do not overload sockets.
- Replace damaged wires immediately.
- Switch off appliances when not in use.
- Keep electrical appliances away from water.
- Use proper fuses and safety devices.

Awareness Methods:

- Display posters in schools and public places.
- Conduct live demonstrations on electrical safety.
- Share safety messages through social media and school assemblies.

This campaign would help people use electricity safely and reduce accidents in the community.

CHAPTER 5: Exploring Forces

NCERT CORNER

Q.1 Match the following

Column A	**Column B**
(i) Muscular force	(b) A child lifting a school bag
(ii) Magnetic force	(e) A compass needle pointing North
(iii) Frictional force	(a) Cricket ball stopping near boundary line

Column A	Column B
(iv) Gravitational force	(c) A fruit falling from a tree
(v) Electrostatic force	(d) Balloon rubbed on woollen cloth attracting hair strands

---

Q.2 True or False

(i) A force is always required to change the speed of motion of an object.
True

(ii) Due to friction, the speed of the ball rolling on a flat ground increases.
False

(iii) There is no force between two charged objects placed at a small distance apart.
False

Q.3

Two balloons rubbed with a woollen cloth are brought near each other. What will happen and why?

Answer

The balloons will repel each other because both balloons acquire the same type of electric charge when rubbed with a woollen cloth. Like charges repel each other.

Q.4

When you drop a coin in a glass of water, it sinks, but when you place a bigger wooden block in water, it floats. Explain.

Answer

The coin sinks because its weight is greater than the buoyant force acting on it. The wooden block floats because the buoyant force exerted by water balances or exceeds its weight.

Q.5

If a ball is thrown upwards, it slows down, stops momentarily and then falls back.

(i) During upward motion

Force acting: Gravitational force

Direction: Downward

(ii) During downward motion

Force acting: Gravitational force

Direction: Downward

(iii) At the topmost position

Force acting: Gravitational force

Direction: Downward

Q.6

A ball is released from point P and moves along an inclined plane and then on a horizontal surface.

(i) Why does it stop before point A?

Answer

The ball stops because friction acts opposite to its motion and gradually reduces its speed until it comes to rest.

(ii) Why do we sometimes slip on smooth surfaces like ice or polished floors?

Answer

Smooth surfaces provide very little friction. Due to insufficient friction, our feet cannot get a proper grip and we slip.

Q.7

Is any force being applied to an object in non-uniform motion?

Answer

Yes. In non-uniform motion, the speed or direction changes continuously. Such changes occur due to the action of an unbalanced force.

Q.8

Why does a metallic object float on mercury but sink in water?

Answer

Mercury is much denser than water and exerts a greater buoyant force. Therefore, a metallic object floats on mercury but sinks in water.

Q.9

The weight of an object on the Moon becomes one-sixth of its weight on Earth. Does its mass also become one-sixth on the Moon?

Answer

No. Mass remains the same because it represents the amount of matter present in the object. Only weight changes because gravitational force on the Moon is weaker.

Q.10

Three objects 1, 2 and 3 of the same size and shape but made of different materials are placed in water.

Answer

Object 1 is submerged the most, object 2 less and object 3 the least.

Therefore,

$\mathbf{W_1 > W_2 > W_3}$

DISCOVER, DESIGN AND DEBATE

Q.1

Collect objects made of different materials and test whether they get charged.

Observation Table

Material	Rubbed With	Observation
Balloon	Woollen cloth	Attracts paper bits
Plastic scale	Hair	Attracts paper bits
Glass rod	Silk cloth	Attracts paper bits
Metal spoon	Cloth	No attraction

Conclusion

Some materials become electrically charged on rubbing and attract light objects.

Q.2

Imagine a scenario where gravity disappears.

Answer

One morning, gravity suddenly disappeared from Earth. People, animals and vehicles began floating in the air. Water rose from rivers and oceans and drifted like giant bubbles. Buildings became unsafe because objects were no longer held to the ground.

Scientists worked together to solve the problem. After several hours, gravity returned and everything settled back to normal. People realized how important gravity is for life on Earth.

Q.3

Friction – A Necessity or a Problem?

Answer

Friction as a Necessity

- Helps us walk without slipping.
- Allows vehicles to move safely.
- Helps us write on paper.
- Prevents objects from sliding.

Friction as a Problem

- Produces unwanted heat.
- Causes wear and tear.
- Wastes energy.
- Reduces machine efficiency.

Conclusion

Friction is both useful and harmful. It is necessary in daily life, but excessive friction should be reduced.

Q.4

Make a spring balance and calculate the ratio of weight and mass.

Observation Table

Object	Mass (kg)	Weight (N)	Weight/Mass
Book	0.5	5	10
Bottle	1	10	10
Pencil Box	0.2	2	10

Conclusion

The ratio of weight to mass remains approximately 10 N/kg, showing that weight is directly proportional to mass.

Q.5

Prepare an electroscope and explain its uses.

Answer

Uses of Electroscope

1. Detects electric charge.
2. Determines whether an object is charged.
3. Demonstrates electrostatic force.
4. Compares the amount of charge on different objects.

Conclusion

An electroscope is a simple device used for studying electric charges.

ASSESSMENT CORNER

A. Tick (✓) the Correct Option

1. A force is defined as:
   (a) A push or pull on an object resulting from interaction with another object
2. Which of the following is a non-contact force?
   (c) Magnetic force
3. The SI unit of force is:
   (b) Newton (N)
4. What happens to two similarly charged balloons when brought near each other?
   (b) They repel
5. Which of the following is true about gravitational force?
   (a) It is always attractive
6. What causes a ball rolling on the ground to eventually stop?
   (b) Friction
7. A spring balance measures:
   (c) Both mass and weight

8. Buoyant force acts:
   (b) Upward
9. When an object is at rest, does it mean no force is acting on it?
   (b) No, forces may be balanced
10. The force responsible for moving blood through the heart is:
    (b) Muscular force

B. Fill in the Blanks

1. A push or pull that can move, stop, or change the direction of an object is called a **force**.
2. The force that opposes the motion of an object on a surface is called **friction**.
3. **Non-contact** forces can act even without physical contact between objects.
4. The SI unit of weight is **Newton (N)**.
5. The upward force exerted by a liquid on an immersed object is called **buoyant force**.
6. Like charges **repel** each other while unlike charges **attract** each other.

C. Match the Following

Column A	Column B
1. Muscular force	(b) Force due to muscular action
2. Gravitational force	(d) Pulls objects toward Earth
3. Magnetic force	(c) Attracts or repels objects at a distance
4. Electrostatic force	(f) Force due to static charges
5. Friction	(e) Opposes motion between two surfaces

Column A	Column B
6. Buoyant force	(a) Force exerted by liquid upward

D. True or False

1. Friction is a non-contact force.
   False
2. Magnetic force can act at a distance.
   True
3. Mass and weight are the same physical quantity.
   False
4. Gravitational force is always attractive.
   True
5. Muscular force is an example of a contact force.
   True
6. Buoyant force depends on the density of the liquid.
   True

E. Answer the Following Questions in Brief

1. What is a force?

A force is a push or pull acting on an object that can change its state of motion, direction, or shape.

---

2. Give an example of a contact force and a non-contact force.

Contact Force: Muscular force while lifting a bag.
Non-contact Force: Gravitational force acting on a falling apple.

---

3. Define weight.

Weight is the gravitational force acting on an object.

---

4. What is the difference between mass and weight?

Mass is the amount of matter in an object and remains constant. Weight is the force due to gravity and can change from place to place.

---

5. What happens when a ball is thrown vertically upwards?

The ball slows down due to gravity, stops momentarily at the highest point, and then falls back to the ground.

---

6. What is electrostatic force?

Electrostatic force is the force of attraction or repulsion between electrically charged objects.

F. Answer the Following Questions in Detail

1. Explain how friction affects the motion of objects.

Friction is a force that opposes motion between two surfaces in contact. It slows down moving objects and eventually brings them to rest. Friction is useful because it helps us walk, write, and drive vehicles safely. However, excessive friction causes wear and tear and produces unwanted heat.

---

2. Describe the experiment to demonstrate magnetic force between two ring magnets.

Suspend one ring magnet with a thread and bring another magnet close to it. When similar poles face each other, the magnets repel. When opposite poles face each other, they attract. This demonstrates magnetic force acting without physical contact.

---

3. How can a spring balance be used to measure weight?

An object is suspended from the hook of a spring balance. The spring stretches due to the object's weight. The reading on the scale gives the weight of the object in Newtons.

---

4. Explain how buoyant force determines whether an object floats or sinks.

When an object is placed in a liquid, the liquid exerts an upward force called buoyant force. If the buoyant force is equal to or greater than the weight of the object, it floats. If the buoyant force is less than its weight, it sinks.

---

5. What are the effects of a force on the shape, speed, and direction of an object?

A force can:

- Change the speed of an object.
- Change its direction of motion.
- Start or stop motion.
- Change its shape or size.

---

6. Describe the observation and conclusion when two similarly charged balloons are brought near each other.

When two balloons rubbed with wool are brought near each other, they move apart. This happens because both balloons acquire the same type of charge. Like charges repel each other.

COMPETENCY-BASED QUESTIONS

A. Assertion–Reason Questions

1.

Assertion (A): Friction always opposes motion.
Reason (R): Friction acts in the direction opposite to the motion of an object.

Answer: (a) Both A and R are true, and R is the correct explanation of A.

2.

Assertion (A): Objects have less weight on the Moon than on Earth.
Reason (R): The gravitational force on the Moon is weaker than on Earth.

Answer: (a) Both A and R are true, and R is the correct explanation of A.

3.

Assertion (A): Electrostatic force is a non-contact force.
Reason (R): It acts between charged objects without physical contact.

Answer: (a) Both A and R are true, and R is the correct explanation of A.

4.

Assertion (A): A floating object experiences buoyant force.
Reason (R): Liquids exert an upward force on immersed objects.

Answer: (a) Both A and R are true, and R is the correct explanation of A.

5.

Assertion (A): Mass remains constant at all places.
Reason (R): Mass depends on the amount of matter present in an object.

Answer: (a) Both A and R are true, and R is the correct explanation of A.

B. Case Study-Based Questions

Read the case study and answer the following questions.

A group of students observed that a wooden block floated in water while a metal coin sank. They also noticed that a large ship made of iron floated on water.

1. Why does the wooden block float?

Answer:
(b) The buoyant force balances its weight.

---

2. Why does the coin sink in water?

Answer:
(a) Its weight is greater than the buoyant force acting on it.

---

3. Why can a large iron ship float?

Answer:
(c) Its shape allows it to displace a large amount of water.

---

4. Which force helps objects float in water?

Answer:
(b) Buoyant force

---

5. Which factor mainly affects buoyant force?

Answer:
(c) Density of the liquid

C. ART INTEGRATION

1. Design an illustrated page explaining different types of forces.

Answer:

Title: *Forces in Our Daily Life*

Draw and label:

- Child lifting a school bag → Muscular Force
- Apple falling from a tree → Gravitational Force
- Magnet attracting pins → Magnetic Force
- Balloon attracting paper bits → Electrostatic Force
- Football slowing down on grass → Frictional Force

Caption:
"Forces are pushes and pulls that affect the motion and shape of objects."

---

2. Create a storyboard showing forces acting on a football.

Answer:

Frame 1: A player kicks the football. *(Muscular Force)*

Frame 2: Football moves forward. *(Motion due to applied force)*

Frame 3: Gravity pulls the ball downward. *(Gravitational Force)*

Frame 4: Ball bounces on the ground. *(Contact Force)*

Frame 5: Friction slows the ball. *(Frictional Force)*

Frame 6: Ball comes to rest. *(Friction stops motion)*

D. CRITICAL THINKING

1. Why do astronauts feel lighter on the Moon?

Answer:

The Moon has weaker gravity than Earth. Since weight depends on gravitational force, astronauts weigh less on the Moon. However, their mass remains the same because the amount of matter in their bodies does not change.

---

2. How do engineers reduce friction in machines?

Answer:

Engineers use lubricants such as oil and grease to reduce friction. They also use ball bearings and smooth surfaces to decrease wear and tear. Reduced friction improves efficiency and increases the life of machines.

E. SUBJECT LINK

1. Investigate the effect of friction on different surfaces.

Answer:

Observation

Surface	Observation
Smooth surface	Object moves farther
Rough surface	Object stops quickly
Carpet	Maximum friction

Conclusion

Rough surfaces produce more friction, while smooth surfaces produce less friction.

---

2. Build a floating boat using recycled materials.

Answer:

Materials Used

- Plastic bottle
- Cardboard
- Thermocol
- Tape

Observation

The boat floated because the buoyant force exerted by water balanced its weight.

Conclusion

Objects float when the buoyant force acting on them is equal to or greater than their weight.

Chapter 6: Pressure, Winds, Storms and Cyclones

NCERT Corner

Q.1 Choose the correct statement

(i)

Answer: (d) Equal in all three vessels

Reason: The vessels are connected. In connected vessels containing the same liquid, the liquid level becomes equal in all vessels.

(ii)

Answer: (c) M will stick but N will not stick

Reason: A suction cup sticks properly on a smooth surface because air cannot enter. On a rough surface, air enters through gaps, so it does not stick.

(iii)

Answer: (b) Decrease the height H at which the tank is placed

Reason: Water pressure depends on the height of the water column.

(iv)

Answer: (a) PA = PB, FA = FB

Reason: Pressure at the same depth in the same liquid is equal.

Q.2 State whether the following statements are True or False

1. Air flows from a region of higher pressure to a region of lower pressure. → **True**
2. Liquids exert pressure only at the bottom of a container. → **False**
3. Weather is stormy at the eye of a cyclone. → **False**
4. During a thunderstorm, it is safer to be in a car. → **True**

Q.3

Figure (a)

Boy lying horizontally on sand.

Figure (b)

Boy standing vertically on sand.

Answer: The boy in figure (b) sinks more into the sand because his weight acts on a smaller area, producing greater pressure.

Q.4

Weight of elephant = 20000 N

Area of one foot = 0.25 m^2

Total area of four feet = 4 × 0.25 = 1 m^2

Pressure = Force ÷ Area

= 20000 ÷ 1

= **20,000 Pa**

Answer: Pressure exerted = **20,000 Pascal**

Q.5

Boat A

Base area = 7 m^2

Persons = 5

Boat B

Base area = 3.5 m^2

Persons = 3

Weight of each person = 700 N

Pressure on Boat A

Total force = 5 × 700 = 3500 N

Pressure = 3500 ÷ 7

= **500 Pa**

Pressure on Boat B

Total force = 3 × 700 = 2100 N

Pressure = 2100 ÷ 3.5

= **600 Pa**

Answer: Boat B experiences more pressure because **600 Pa > 500 Pa**.

Q.6

Answer: No.

Air is a poor conductor of electricity. Lightning occurs because of the build-up and sudden discharge of electric charges in clouds.

Q.7

Answer: Both balloons will bulge equally because pressure in a liquid acts equally in all directions.

Q.8

Answer: A storm becomes a cyclone when warm moist air rises rapidly, creating a low-pressure area. Surrounding air rushes in, producing strong winds and heavy rain.

Q.9

Answer: Land is on side **A**.

Reason: During summer afternoons, cool air from the sea moves towards the warmer land.

Q.10

Activity

Take two plastic bottles with holes at different heights.

Fill them with water.

You will observe that water comes out farther from the lower hole.

Conclusion: Pressure is greater at lower depths. Air also moves from high-pressure regions to low-pressure regions.

Q.11

Answer:
A thunderstorm is a storm accompanied by lightning, thunder, strong winds and heavy rainfall.

Q.12

Answer:
Lightning is caused by the accumulation of electric charges in clouds. When the charge difference becomes very large, a sudden discharge of electricity occurs, producing lightning.

Q.13

Answer:
Holes are made in banners and hoardings so that air can pass through them. This reduces wind pressure and prevents them from being blown away.

Discover, Design and Debate

Q.1

Hold a strip of paper and blow over it. What do you observe?

Observation:

When air is blown over the strip of paper, the paper rises upward.

Interpretation:

Fast-moving air above the paper creates low pressure. The air below the paper has higher pressure and pushes the paper upward.

Conclusion:

Air moves from high pressure to low pressure. Faster-moving air exerts lower pressure.

Q.2

Three major cyclones in India during the last 20 years

Cyclone	Year	Destruction Caused
Cyclone Amphan	2020	Houses damaged, trees uprooted
Cyclone Fani	2019	Power lines destroyed, heavy flooding
Cyclone Tauktae	2021	Coastal damage, loss of property

Measures Taken by Government and Communities

1. Early warning systems were issued.
2. People were evacuated to cyclone shelters.
3. Rescue teams were deployed.
4. Food, water and medical aid were provided.

Suggestions to Local Government

1. Build more cyclone shelters in coastal areas.
2. Conduct regular disaster management drills and awareness programs.

Q.3

Thunderstorms in Different Regions of India

Findings:

- Assam and Northeast India experience frequent thunderstorms.
- West Bengal experiences Nor'westers.
- Coastal regions often experience thunderstorms during monsoon seasons.
- Rajasthan experiences comparatively fewer thunderstorms.

Regions More Prone:

Northeastern states and coastal areas.

Reasons:

1. High humidity.
2. Warm temperatures.
3. Abundant moisture from seas and oceans.
4. Rapid rising of warm air leading to cloud formation.

Assessment Corner

A. Tick (✓) the Correct Option

1. What causes wind to blow?
   Ans. (b) Air moves from high pressure to low pressure
2. Why does a broad bag strap feel more comfortable than a narrow strap?
   Ans. (b) It distributes force over a larger area
3. What determines the pressure at the bottom of a liquid column?
   Ans. (b) Height of the liquid column
4. In a cyclone, the calm centre is called
   Ans. (b) Eye
5. What happens when fast-moving air passes over the roof of a house?
   Ans. (b) Pressure decreases
6. Lightning occurs because
   Ans. (b) Charge separation occurs in clouds
7. Why is the base of a dam broader than the top?
   Ans. (b) To withstand higher horizontal water pressure
8. Which of the following shows air pressure in everyday life?
   Ans. (d) All of the above
9. Thunder is produced due to
   Ans. (b) Expansion of air heated by lightning
10. What type of winds occur due to differences in air pressure between land and sea?
    Ans. (b) Land and sea breeze

B. Fill in the Blanks

1. Pressure is defined as **force** per unit area.
2. Liquids exert pressure in **all** directions.
3. Air pressure acting on a surface is called **atmospheric** pressure.
4. The calm centre of a cyclone is called the **eye**.
5. Thunder is produced due to rapid **expansion** of air caused by lightning.
6. Wind moves from **high** pressure to **low** pressure.

C. Decide whether the following statements are True or False

1. Fast-moving air creates a high-pressure zone between objects.
   False
2. A narrow bag strap produces higher pressure on the shoulder than a broad strap.
   True
3. Cyclones form only over land.
   False
4. Atmospheric pressure is the same on the surface of the Earth everywhere.
   False
5. Water pressure at the bottom of a tank depends on the height of the water column.
   True
6. Lightning occurs due to charge separation in clouds.
   True

D. Match the Following

Column A	**Column B**
1. Suction cup	c. Low pressure system with spinning winds
2. Cyclone	b. Air pressure difference

Column A	Column B
3. Balloon	d. Force per unit area
4. Thunder	e. Rapid expansion of air
5. Dam base	a. Height of liquid column
6. Broad bag strap	f. Reduces pressure on shoulders

Answers:

1 → b
2 → c
3 → d
4 → e
5 → a
6 → f

E. Answer the Following Questions in Brief

1. Define pressure.

Pressure is the force acting per unit area on a surface.

---

2. Why does water spurt out of holes in a bottle?

Water exerts pressure on the walls of the bottle. This pressure forces water out through the holes.

---

3. What is atmospheric pressure?

The pressure exerted by the air surrounding the Earth is called atmospheric pressure.

---

4. Explain why a broad knife edge cuts better.

A sharp edge has a smaller area. The same force acts on a smaller area, producing greater pressure, so it cuts more easily.

5. Why does the height of a water column affect pressure at the bottom?

As the height of water increases, the weight of water above increases, producing greater pressure at the bottom.

---

6. Give one example of air pressure in daily life.

Drinking juice with a straw is an example of air pressure.

F. Answer the Following Questions in Detail

1. Explain how cyclones are formed over warm ocean waters.

Cyclones form over warm ocean waters where the temperature is high. Warm, moist air rises upward and creates a low-pressure area. The surrounding air rushes towards this low-pressure region. Due to the Earth's rotation, the moving air begins to spin. As more warm air rises, the cyclone gains strength and develops into a powerful storm with strong winds and heavy rainfall.

---

2. Describe how lightning and thunder occur during storms.

During a storm, positive and negative charges accumulate in different parts of clouds. When the difference in charges becomes very large, a sudden discharge of electricity occurs. This is called lightning. The intense heat produced by lightning causes the surrounding air to expand rapidly. This rapid expansion creates a loud sound called thunder.

---

3. How does fast-moving air reduce pressure, and what effect does this have on buildings during storms?

Fast-moving air creates a region of low pressure. During storms, strong winds move rapidly over rooftops, reducing the air pressure above the roof. The pressure inside the building remains higher and pushes the roof upward. This can damage or even blow off roofs during severe storms.

---

4. Discuss why dams have broader bases and how water pressure acts on them.

Water pressure increases with depth. Therefore, the lower part of a dam experiences greater pressure than the upper part. To withstand this greater force, dams are constructed with broad and strong bases. This design helps the dam remain stable and prevents damage due to water pressure.

---

5. Explain the formation of land and sea breezes.

Sea Breeze (Daytime)

During the day, land heats up faster than water. The air above the land becomes warm and rises, creating a low-pressure area. Cooler air from the sea moves towards the land. This movement of air is called a sea breeze.

Land Breeze (Nighttime)

At night, land cools faster than water. The air above the sea remains warmer and rises. Cool air from the land moves towards the sea. This movement is called a land breeze.

---

6. Describe an activity to demonstrate that liquids exert pressure in all directions.

Materials:

- Plastic bottle
- Water
- Pin

Procedure:

1. Make small holes on different sides of a plastic bottle.
2. Cover the holes and fill the bottle with water.
3. Remove the coverings from the holes.

Observation:

Water spurts out from all the holes in different directions.

Conclusion:

The activity shows that liquids exert pressure in all directions.

G. Brain Teaser

1. Two identical balloons are connected with a straw. One is inflated, the other empty. Predict what happens and why.

Answer:
Air will move from the inflated balloon (high pressure) to the empty balloon (low pressure) through the straw until the pressure becomes nearly equal. The empty balloon will inflate while the inflated balloon will partially deflate.

---

2. If a narrow strap bag and a broad strap bag have the same weight, why does one feel heavier than the other?

Answer:
The narrow strap has a smaller area of contact with the shoulder. Therefore, it exerts greater pressure and feels heavier. A broad strap distributes the same weight over a larger area, reducing pressure and making it more comfortable.

Competency-Based Questions

A. Assertion–Reason Type Questions

Options:
(a) Both A and R are true, and R is the correct explanation of A.
(b) Both A and R are true, but R is not the correct explanation of A.
(c) A is true, but R is false.
(d) A is false, but R is true.

1.

Assertion (A): Cyclones have strong winds and heavy rainfall.

Reason (R): Warm moist air rises over oceans, creating low-pressure zones.

Answer: (a)

Explanation: Warm moist air rising creates low-pressure areas, leading to cyclone formation with strong winds and heavy rain.

2.

Assertion (A): Water pressure depends on the height of the water column.

Reason (R): Pressure increases with the area of the base of the container.

Answer: (c)

Explanation: Pressure depends on the height (depth) of water, not on the base area.

3.

Assertion (A): Suction cups stick firmly to smooth surfaces.

Reason (R): The air inside the cup has higher pressure than outside.

Answer: (c)

Explanation: Suction cups stick because pressure inside is lower than outside.

4.

Assertion (A): Lightning can occur between clouds, within clouds, or between cloud and ground.

Reason (R): Charge separation occurs in clouds due to upward and downward air movement.

Answer: (a)

Explanation: Charge separation causes lightning in various forms.

5.

Assertion (A): Land breezes blow from land to sea at night.

Reason (R): The land cools faster than the sea, creating high-pressure areas on land.

Answer: (a)

Explanation: Cooler land creates high pressure, causing air to move towards the sea.

B. Case Study Based Questions

Answers

1. Why should people avoid standing near trees during a cyclone?

Answer: (b) Strong winds may topple them

---

2. Why is heavy rainfall dangerous during a cyclone?

Answer: (a) Causes flooding and landslides

---

3. Why do authorities recommend shelters?

Answer: (b) To stay safe from high winds and water surges

---

4. What causes ocean water to surge towards the shore during cyclones?

Answer: (b) High-speed winds pushing water

---

5. What is the eye of a cyclone?

Answer: (c) A low-pressure zone with calm wind

C. Art Integration

1. Cyclone Safety Poster

Title:

"Stay Safe During Cyclones"

Poster Content:

- Follow weather warnings.

- Move to safe shelters.
- Keep emergency kits ready.
- Stay away from trees and electric poles.
- Store clean drinking water.
- Do not go near flooded areas.

Importance:

This poster helps people understand cyclone dangers and safety measures.

---

2. Model Showing Air Pressure

Materials:

- Balloons
- Plastic bottle
- Straw
- Chart paper

Working:

Blowing air into a balloon increases pressure inside it. The model demonstrates how pressure differences create movement of air.

Conclusion:

Air always moves from high-pressure areas to low-pressure areas.

D. Critical Thinking

1. Roofs sometimes lift off during storms while houses remain intact. Why?

During storms, fast-moving air above the roof creates low pressure. The pressure inside the house remains higher and pushes the roof upward. This pressure difference may lift or damage roofs.

Measures:

- Strong roof anchoring.

- Better construction materials.
- Regular maintenance.
- Cyclone-resistant designs.

---

2. Climate change and cyclones

Warmer ocean water provides more energy to cyclones. As ocean temperatures rise, cyclones may become more frequent and stronger.

Ways to Reduce Impact:

- Early warning systems.
- Coastal shelters.
- Plantation of mangroves.
- Strong infrastructure.
- Disaster preparedness programs.

E. Subject Link

1. Explaining Thunderstorms to Younger Children

I would calmly explain that lightning is a bright flash of electricity in clouds and thunder is the sound produced by it. I would reassure them that they are safe indoors. I would use simple language, patience, empathy, and answer their questions gently so they feel comfortable and informed.

---

2. Preparing the Community for a Cyclone

Division of Responsibilities:

- Team 1: Spread warning messages.
- Team 2: Help elderly people.
- Team 3: Arrange food and water.
- Team 4: Assist children and pets.

- Team 5: Coordinate transportation and shelters.

Teamwork and Leadership:

Everyone should cooperate, communicate clearly, solve conflicts peacefully, and help one another.

Conclusion:

Working together improves safety, reduces panic, and makes the community stronger and more prepared for emergencies.

Chapter 7: Particulate Nature of Matter

NCERT CORNER

Q.1 Choose the correct statement.

Answer: (iv) Closely packed in solids and move past each other in liquids.

Q.2 Which statements are true? Correct the false statements.

(i)

True

(ii)

True

(iii)

True

(iv)

True

(v)

True

(vi)

False

Correct Statement: On heating, we add energy to camphor. The camphor particles gain energy and spread into the air, causing the smell to reach all corners.

Q.3 Choose the correct answer with justification.

Answer: (iii) Nothing of the chair will remain.

Justification: Every object is made up of particles. If all particles are removed, the chair will cease to exist.

Q.4 Why do gases mix easily, while solids do not?

Gases mix easily because their particles are far apart and move freely in all directions. Solid particles are tightly packed and cannot move freely, so solids do not mix easily.

Q.5 Milk spreads out but the glass tumbler remains the same shape. Justify.

Milk is a liquid and has no fixed shape, so it flows and spreads. A glass tumbler is a solid with a fixed shape and therefore remains unchanged.

Q.6 Represent diagrammatically the changes in arrangement of particles.

Ice (Solid)

● ● ● ●
● ● ● ●
● ● ● ●

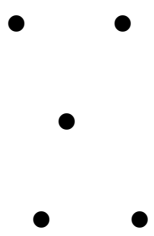
↓ Heating

Water (Liquid)

● ● ●
 ● ●
● ● ●

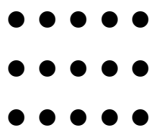
↓ Heating

Water Vapour (Gas)

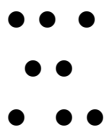


Q.7 Draw particles present in:

(i) Aluminium Foil (Solid)



(ii) Glycerin (Liquid)



(iii) Methane Gas

Q.8 Candle Activity

Matching:

- **Solid Wax** → Figure with closely packed particles
- **Molten Wax (Liquid)** → Figure with particles slightly apart

- **Wax Vapour (Gas)** → Figure with particles far apart

Q.9 Why does ocean water taste salty?

Ocean water contains dissolved salts. These salts break into tiny particles and mix uniformly with water, making it taste salty even though the salt is not visible.

Q.10 Rice grains and rice flour take the shape of containers. Are they solids or liquids?

They are **solids** because each grain and flour particle has a definite shape and volume. They only appear to take the container's shape when many particles are collected together.

Discover, Design and Debate

Q.1 Fix a balloon over the neck of a bottle and put the bottle in hot water. Explore what will happen.

Observation:

The balloon inflates when the bottle is placed in hot water.

Reason:

The air inside the bottle gets heated and expands. The expanded air moves into the balloon and fills it.

Conclusion:

Gases expand on heating because their particles move faster and occupy more space.

Q.2 Design and create simple models to represent particles of solids, liquids and gases.

Solid Model

- Use clay balls or beads.
- Arrange them very close together in a fixed pattern.

- Shows strong intermolecular force and very little space.

Liquid Model

- Arrange beads close together but not fixed.
- Allow slight movement.
- Shows moderate intermarticle space.

Gas Model

- Place beads far apart.
- Shows large spaces and free movement.

Conclusion:

The arrangement of particles differs in solids, liquids and gases.

Q.3 Pretend to be particles of solids, liquids and gases at different temperatures.

Solid

Students stand closely packed and only vibrate.

Liquid

Students stay close but move around each other slowly.

Gas

Students move freely in all directions with large gaps.

At Higher Temperature

All students move faster, showing increased kinetic energy.

Conclusion

Heating increases particle motion.

Q.4 Debate: “Gases can spread and fill all the available space.” Is this property beneficial or harmful?

Beneficial Effects

1. Oxygen spreads throughout a room for breathing.
2. LPG reaches burners through pipes.
3. Fragrance spreads in a room.
4. Air fills tyres and balloons.

Harmful Effects

1. Leakage of poisonous gases spreads rapidly.
2. Smoke spreads during fire accidents.
3. Air pollution affects large areas.

Conclusion

The property is both beneficial and harmful depending on the situation.

Assessment Corner – A. Tick (✓) the Correct Option

1. (b) Molecule
2. (a) Solids
3. (b) Liquid
4. (c) Diffusion
5. (b) Increases slightly
6. (c) Large interparticle spaces
7. (c) Particles have empty spaces
8. (b) Liquid particles escape rapidly
9. (a) Evaporation
10. (b) Move randomly and rapidly

B. Fill in the Blanks

1. The forces acting between particles of matter are called **interparticle forces**.
2. Matter is made up of extremely small **particles**.

3. Gases can be compressed because they have large **interparticle** spaces.
4. The temperature at which a solid changes into a liquid is called **melting point**.
5. The spreading of potassium permanganate colour in water is due to the **motion** of particles.
6. Liquids take the shape of their container because their particles can **slide** past each other.

C. Decide Whether the Following Statements are True or False

1. Solids have the weakest interparticle forces. → **False**
2. Gases have no definite shape or volume. → **True**
3. Liquids are easily compressible. → **False**
4. Sugar disappears in water because it is destroyed. → **False**
5. Diffusion occurs faster in hot water than in cold water. → **True**
6. Air particles are in continuous motion. → **True**

D. Match the Following

Column A	**Column B**
1. Solid	b. Fixed shapes
2. Liquid	c. Weak forces
3. Gas	a. Large spaces
4. Diffusion	d. Random spreading
5. Melting point	e. Heat to turn solid into liquid

Answer:

1-b, 2-c, 3-a, 4-d, 5-e

E. Answer the Following Questions in Brief

1. What are constituent particles?

Constituent particles are the tiny particles that make up matter and retain its properties.

---

2. Why do gases fill the entire container?

Gas particles move freely in all directions and have large spaces between them, so they spread and fill the entire container.

---

3. Explain why solids have a definite shape.

Solid particles are tightly packed and held together by strong interparticle forces, giving solids a fixed shape.

---

4. What is diffusion?

Diffusion is the movement of particles from a region of higher concentration to a region of lower concentration.

---

5. Why does sugar dissolve in water?

Sugar dissolves because there are spaces between water particles into which sugar particles move.

---

6. Why does evaporation occur faster at higher temperature?

At higher temperatures, particles gain more kinetic energy and escape from the liquid surface more easily.

F. Answer the Following Questions in Detail

1. Explain how interparticle forces determine the states of matter.

Interparticle forces are the forces of attraction between particles.

- In **solids**, these forces are very strong, so particles remain closely packed and solids have a fixed shape and volume.
- In **liquids**, the forces are weaker, allowing particles to slide past one another. Liquids have a fixed volume but no fixed shape.
- In **gases**, the forces are very weak, so particles move freely and occupy all available space.

Thus, the strength of interparticle forces determines whether matter exists as a solid, liquid, or gas.

---

2. Describe the behaviour of particles in solids, liquids and gases.

Solids:

- Particles are closely packed.
- Strong forces of attraction.
- Particles vibrate about fixed positions.

Liquids:

- Particles are less closely packed.
- Moderate force of attraction.
- Particles move and slide over each other.

Gases:

- Particles are far apart.
- Very weak force of attraction.
- Particles move freely in all directions.

---

3. How does heating change the state of matter? Explain with an example.

Heating increases the kinetic energy of particles. The particles move faster and overcome intermolecular forces.

Example:

- Ice (solid) on heating changes into water (liquid).

- Further heating changes water into steam (gas).

Thus, heating can change matter from solid → liquid → gas.

---

4. Describe an activity that shows gases have large interparticle spaces.

Activity:
Take a syringe and pull its plunger. Fill it with air and close its nozzle. Now push the plunger.

Observation:
The air gets compressed easily.

Conclusion:
Air particles have large spaces between them, which allow compression.

5. Explain boiling and evaporation with differences.

Boiling:
Boiling is the process in which a liquid changes into vapour throughout the liquid at a fixed temperature called the boiling point.

Evaporation:
Evaporation is the process in which a liquid changes into vapour from its surface at any temperature.

Boiling	Evaporation
Occurs at a fixed temperature (boiling point).	Occurs at any temperature.
Takes place throughout the liquid.	Takes place only at the surface.
Happens rapidly.	Happens slowly.
Requires continuous heating.	Can occur without heating.

---

6. How does the potassium permanganate experiment prove particle motion?

When a few crystals of potassium permanganate are placed in water, the purple colour gradually spreads throughout the water without stirring. This happens because the particles of potassium permanganate and water are

continuously moving and mixing with each other. Thus, the experiment proves that particles of matter are always in motion.

G. Brain Teaser

1. If air particles are always moving, why don't we see them colliding with each other?

Air particles are extremely tiny and invisible to the naked eye. Although they move continuously and collide with each other, their size is too small for us to observe directly.

---

2. If gases expand on heating, why don't we notice expansion in metal keys or glass objects in daily life?

Metals and glass also expand on heating, but the amount of expansion is very small. Therefore, it is not easily noticeable in everyday life.

Competency-Based Questions

Assertion–Reason Type

1.

Assertion: Gases are highly compressible.
Reason: Gas particles have large spaces between them.

Answer: (a) Both A and R are true, and R is the correct explanation of A.

2.

Assertion: Solids have a definite shape.
Reason: Particles in solids can move freely in all directions.

Answer: (c) A is true, but R is false.

3.

Assertion: Diffusion is faster in hot liquids.
Reason: Temperature increases the speed of particle movement.

Answer: (a) Both A and R are true, and R is the correct explanation of A.

4.

Assertion: Liquids do not have a fixed shape.
Reason: Liquids have very strong interparticle forces.

Answer: (c) A is true, but R is false.

5.

Assertion: Evaporation occurs at the surface.
Reason: Some particles possess enough energy to escape from the surface.

Answer: (a) Both A and R are true, and R is the correct explanation of A.

6.

Assertion: Sugar dissolves in water because it reacts chemically.
Reason: Sugar particles occupy spaces between water particles.

Answer: (d) A is false, but R is true.

(B. Case Study Based Questions)

1. The spreading of ink in water shows:

Answer: (b) Diffusion

2. Ink spreads faster in hot water because:

Answer: (c) Water particles move faster

3. The activity proves that particles of matter are in:

Answer: (b) Motion

4. The interparticle spaces in liquids allow:

Answer: (c) Other particles to mix

5. Diffusion is faster at high temperature because:

Answer: (c) Particles gain kinetic energy

C. Art Integration

1. Draw and label diagrams showing interparticle spacing in solids, liquids and gases. Write a paragraph explaining how these differences influence their physical properties.

Paragraph:

In solids, particles are tightly packed with very little space between them. Therefore, solids have a fixed shape and volume. In liquids, particles are less tightly packed and can slide over one another, so liquids have a fixed volume but no fixed shape. In gases, particles are very far apart and move freely in all directions. Hence, gases have neither a fixed shape nor a fixed volume and can be compressed easily.

---

2. Create a flowchart or poster illustrating how heating affects the state of matter.

SOLID (Ice)
    |
    | Heating
    ▼
LIQUID (Water)
    |
    | Heating
    ▼
GAS (Steam)

Cooling Process:
Steam → Water → Ice

D. Critical Thinking

1. If gases have very weak forces of attraction, how do they stay bound to Earth and not escape into space?

Although gas particles have weak forces of attraction between them, they are held near Earth by Earth's gravitational force. Gravity pulls the particles towards Earth and prevents them from escaping into space.

---

2. Why does a wet cloth dry faster on a sunny, windy day compared to a humid day? Use the concepts of particle motion and evaporation.

A wet cloth dries faster on a sunny, windy day because heat from the Sun increases the kinetic energy of water particles, causing faster evaporation. Wind carries away water vapour from around the cloth, allowing more water to evaporate. On a humid day, the air already contains a large amount of water vapour, so evaporation occurs more slowly.

E. Subject Link

1. How does the movement of air particles explain the formation of winds, land breeze and sea breeze?

Air moves from areas of high pressure to low pressure.

- During the day, land heats up faster than water. Warm air over land rises and cooler air from the sea moves towards land, forming a sea breeze.
- During the night, land cools faster than water. Warm air over the sea rises and cooler air from land moves towards the sea, forming a land breeze.

Thus, winds, land breezes and sea breezes are caused by the movement of air particles.

---

2. Explain how diffusion helps in breathing—movement of oxygen and carbon dioxide in the lungs.

In the lungs, oxygen diffuses from the air in the alveoli into the blood because its concentration is higher in the alveoli. Carbon dioxide diffuses from the blood

into the alveoli because its concentration is higher in the blood. This exchange of gases helps us breathe and obtain oxygen for our body.

Chapter 8: Nature of Matter: Elements, Compounds and Mixtures

NCERT CORNER

Q.1 Consider the reaction:

A + B → C

Given:

- A and B cannot be broken down by chemical reactions.
- Only C has a fixed composition.

Answer: (iv) A and B are elements, C is a compound and has a fixed composition.

Q.2 Assertion–Reason

Assertion: A mixture is formed when two or more substances are mixed without undergoing any chemical change.

Reason: A mixture is formed when two or more substances are mixed without undergoing any chemical change.

Answer: (i) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.

Q.3 Water, a compound, has different properties compared to hydrogen and oxygen.

Answer:

Water has properties different from hydrogen and oxygen because hydrogen and oxygen chemically combine in a fixed ratio (2:1) to form a new substance.

- Hydrogen burns.

- Oxygen supports burning.
- Water neither burns nor supports burning.

Hence, compounds have properties different from their constituent elements.

Q.4 Match the following correctly

(i) Elements

✓ Nitrogen
✓ Iron

Reason: Both contain only one type of atom.

(ii) Uniform Mixtures

✓ Seawater
✓ Air

Reason: Components are evenly distributed throughout.

(iii) Pure Substances

✓ Carbon dioxide
✓ Iron
✓ Oxygen

Reason: They have fixed composition.

(iv) Non-uniform Mixtures

✓ Sand
✓ Air (dusty air)
✓ Brass (treated as alloy mixture)

Q.5 Iron reacts with oxygen and magnesium burns in oxygen.

Elements:

- Iron
- Magnesium
- Oxygen

Compounds Formed:

- Iron oxide
- Magnesium oxide

Classification:

These are **elements and compounds**, not mixtures, because new substances are formed through chemical reactions.

Q.6 Classify the following

Elements	Compounds	Mixtures
Iron	Carbon dioxide	Sand
Magnesium	Water	Seawater
Aluminium	Glucose	Air
Gold	Sodium chloride	Muddy water
Oxygen	Iron sulphide	Fruit juice
Nitrogen	Baking soda	Rust
Sulphur		
Hydrogen		

Pure Substances

Elements

- Iron

- Magnesium
- Aluminium
- Gold
- Oxygen
- Nitrogen
- Sulphur
- Hydrogen

Compounds

- Carbon dioxide
- Water
- Glucose
- Sodium chloride
- Iron sulphide
- Baking soda

Q.7 Identify pure substances and list them below

Pure Substances

Elements

- Iron
- Aluminium
- Gold
- Oxygen
- Nitrogen
- Sulphur
- Hydrogen
- Magnesium

Compounds

- Water
- Carbon dioxide
- Glucose
- Sodium chloride
- Iron sulphide
- Baking soda

Q.8 What new substance is formed when a mixture of iron filings and sulphur powder is heated?

Answer:

Iron sulphide (FeS) is formed.

Difference from original mixture:

Mixture	**Iron Sulphide**
Components retain properties	New substance formed
Can be separated physically	Cannot be separated physically
Iron remains magnetic	Not magnetic
No chemical reaction	Formed by chemical reaction

Word Equation:

Iron + Sulphur → Iron Sulphide

Q.9 How would our daily lives change if water were a mixture of hydrogen and oxygen?

If water were a mixture:

- It could be separated easily.
- It would not have fixed composition.

- Hydrogen could burn.
- Oxygen could support combustion.
- Water would not be stable for life.

Therefore, life on Earth would not be possible in its present form.

Q.10 Analyse the figure

Gas A = Hydrogen sulphide (H_2S)

Word Equation:

Iron Sulphide + Hydrochloric Acid → Iron Chloride + Hydrogen Sulphide

---

Q.11 Write formulae and two uses

Carbon Dioxide (CO_2)

Uses:

1. Fire extinguishers
2. Soft drinks

Water (H_2O)

Uses:

1. Drinking
2. Irrigation

Q.12 How can gold be classified as both a mineral and a metal?

Gold occurs naturally in the Earth's crust as a **mineral** and possesses properties like lustre, malleability and conductivity, making it a **metal**.

Discover, Design and Debate

Q.1 Design a comic strip to differentiate between elements, compounds and mixtures.

Answer:

Frame 1:

🟢 **Element (Gold)**
"I am made of only one type of atom."

Frame 2:

💧 **Compound (Water)**
"I am formed when hydrogen and oxygen chemically combine in a fixed ratio."

Frame 3:

🥗 **Mixture (Salad)**
"My components are mixed physically and can be separated easily."

Conclusion:
Element → One type of atom
Compound → Chemically combined substances
Mixture → Physically mixed substances

Q.2 Search for discoveries of elements, compounds and mixtures.

Answer:

Category	**Example**
Element	Phosphorus, Sodium
Compound	Penicillin, Water
Mixture	Brass, Bronze, Stainless Steel

Q.3 Read labels on detergents or snacks and list compounds present.

Answer:

Detergent:

- Sodium carbonate
- Sodium sulphate
- Sodium silicate

Snack Packet:

- Common salt (Sodium chloride)
- Sugar
- Citric acid

Q.4 Debate: Which is more important – Element, Compound or Mixture?

Answer:

All three are equally important.

- Elements are the basic building blocks of matter.
- Compounds form useful substances like water and medicines.
- Mixtures are used in daily life such as air, soil and food.

Assessment Corner

A. Tick (✓) the Correct Option

1. Which of the following is a homogeneous mixture?
   Answer: (c) Sugar dissolved in water
2. Water is a compound because:
   Answer: (c) Hydrogen and oxygen are chemically combined in a fixed ratio
3. Which of these is an element?
   Answer: (b) Oxygen
4. Which of the following is a metalloid?
   Answer: Silicon *(if given in options)*
5. Hydrogen gas collected during electrolysis of water is:
   Answer: (d) Oxygen volume is twice the volume of hydrogen
   Correct Answer: **Hydrogen volume is twice the volume of oxygen**
6. Iron filings and sulphur powder mixed together form:
   Answer: (b) A homogeneous mixture

7. Which process separates sugar from water?
   Answer: (b) Evaporation
8. Air is composed of:
   Answer: (b) Nitrogen and oxygen
9. Which cannot be separated physically?
   Answer: (b) Sugar dissolved in water
10. Which property of iron is lost when it forms iron sulphide?
    Answer: (c) Magnetism

B. Fill in the Blanks

1. A mixture in which components are uniformly distributed is called a **homogeneous mixture**.
2. An atom made up of only one type of atom is called an **element**.
3. Hydrogen and oxygen are chemically combined in water in a **fixed** ratio.
4. Sugar decomposes on heating to give water and **carbon**.
5. A naturally occurring solid substance of definite chemical composition is called a **mineral**.
6. Components of a mixture can be separated by **physical** methods.

C. Decide Whether the Following Statements are True or False

1. Compounds can be separated into their elements by physical methods.
   False
2. Air is a homogeneous mixture.
   True
3. Metals are good conductors of heat and electricity.
   True
4. Carbon is a metalloid.
   False
5. Hydrogen supports combustion.
   False

6. In a mixture, components lose their original properties.
   False

D. Match the Following

Column A	**Column B**
1. H_2O	d. Compound (H_2O)
2. Iron filings + Sulphur	c. Heterogeneous mixture
3. Air	a. Mixture of nitrogen and oxygen
4. Gold	b. Element
5. Sugar	e. Compound ($C_6H_{12}O_6$)
6. Boron	f. Metalloid

E. Answer the Following Questions in Brief

1. Define matter.

Matter is anything that has mass and occupies space.

---

2. What is the difference between a mixture and a compound?

Mixture	**Compound**
Formed by physical mixing	Formed by chemical combination
Variable composition	Fixed composition
Components retain properties	New properties formed
Can be separated physically	Cannot be separated physically

---

3. Give two examples of heterogeneous mixtures.

1. Sand and water

2. Oil and water

---

4. Why can water not be separated into hydrogen and oxygen by physical means?

Because hydrogen and oxygen are chemically combined in water.

---

5. What are metalloids? Give one example.

Metalloids are elements showing properties of both metals and non-metals.

Example: Boron

---

6. Explain why iron filings are attracted by a magnet but iron sulphide is not.

Iron filings retain magnetic properties. Iron sulphide is a new compound formed after a chemical reaction and does not retain the magnetic property of iron.

F. Answer the Following Questions in Detail

1. Explain the difference between homogeneous and heterogeneous mixtures with examples.

Homogeneous Mixture

- Uniform composition throughout.
- Components are not visible separately.

Examples: Air, salt solution.

Heterogeneous Mixture

- Non-uniform composition.
- Components can be seen separately.

Examples: Sand and water, oil and water.

---

2. Describe an experiment to show that water is made of hydrogen and oxygen.

- Take water in an electrolysis apparatus.
- Pass electric current through it.
- Collect gases at both electrodes.
- Hydrogen is collected at the cathode and oxygen at the anode.
- Volume of hydrogen is twice the volume of oxygen.

Thus water contains hydrogen and oxygen.

---

3. Explain the decomposition of sugar on heating and identify the elements present.

When sugar is heated strongly, it decomposes into carbon and water vapour.

Elements present in sugar:

- Carbon
- Hydrogen
- Oxygen

---

4. How is a mixture of iron and sulphur different from iron sulphide?

Iron + Sulphur Mixture	**Iron Sulphide**
Physical mixture	Chemical compound
Can be separated by magnet	Cannot be separated physically
Iron remains magnetic	Not magnetic
Components retain properties	New properties formed

---

5. Discuss the importance of elements, compounds and mixtures in daily life.

- Elements like oxygen are essential for respiration.

- Compounds like water and salt are necessary for life.
- Mixtures like air, soil and food are important in everyday life.

---

6. Explain how minerals are classified as elements or compounds with examples.

- Minerals containing only one type of atom are classified as elements.
  Example: Gold.
- Minerals containing two or more chemically combined elements are classified as compounds.
  Example: Iron oxide.

G. Brain Teaser

1. I am a compound made of two gases. One supports combustion and the other is flammable. I am essential for life. What am I?

Answer: Water (H_2O)

(Oxygen supports combustion and hydrogen is flammable.)

---

2. I can be separated physically and my components retain their properties. I can be solid-solid, solid-liquid or gas-gas. What am I?

Answer: Mixture

Competency-Based Questions

A. Assertion–Reason Type Questions

1.

Assertion (A): Hydrogen gas burns with a pop sound.
Reason (R): Hydrogen is highly flammable.

Answer: (a) Both A and R are true, and R is the correct explanation of A.

2.

Assertion (A): Water cannot be separated into H and O physically.
Reason (R): H and O are chemically bonded in a fixed ratio.

Answer: (a) Both A and R are true, and R is the correct explanation of A.

3.

Assertion (A): Air is a homogeneous mixture.
Reason (R): Components are evenly distributed and not chemically bonded.

Answer: (a) Both A and R are true, and R is the correct explanation of A.

4.

Assertion (A): Sugar is a compound.
Reason (R): On heating, sugar decomposes into water and carbon.

Answer: (a) Both A and R are true, and R is the correct explanation of A.

5.

Assertion (A): Iron sulphide is magnetic.
Reason (R): It is formed by chemical combination of iron and sulphur.

Answer: (d) A is false, but R is true.

6.

Assertion (A): Mixtures can be separated physically.
Reason (R): Components retain their individual properties.

Answer: (a) Both A and R are true, and R is the correct explanation of A.

B. Case Study Based Questions

Answers

1. What type of mixture is Sample A?

Answer: (b) Heterogeneous mixture

---

2. Why is Sample B not attracted by a magnet?

Answer: (a) Iron lost its magnetic property due to chemical bonding

---

3. What gas is evolved when Sample B reacts with dilute hydrochloric acid?

Answer: (a) Hydrogen sulphide

---

4. Which statement is correct?

Answer: (b) Sample A is a mixture, Sample B is a compound

---

5. What is the key difference between Sample A and Sample B?

Answer: (b) Sample A's components can be separated physically, Sample B's cannot

---

D. Critical Thinking

1. Two transparent liquids are given—one is salt solution and the other is distilled water. How would you identify them?

Answer:

- Take a small amount of both liquids in separate dishes.
- Heat them gently.
- Distilled water evaporates completely.
- Salt solution leaves salt crystals behind.

Thus the liquid leaving residue is the salt solution.

---

2. A factory releases smoke containing tiny dust particles. Suggest a method to separate pollutants from air.

Answer:
Electrostatic precipitators and air filters can be used to trap dust particles before the smoke is released into the atmosphere.

---

3. Two colourless liquids are provided—one is salt solution and the other distilled water. Design a simple experiment.

Answer:

- Take equal quantities in separate beakers.
- Evaporate both samples.
- Salt solution leaves a white solid residue.
- Distilled water leaves no residue.

Therefore the sample leaving residue is the salt solution.

E. Subject Link

1. Photosynthesis produces glucose containing carbon, hydrogen and oxygen. Explain.

Answer:
During photosynthesis, plants use carbon dioxide and water in the presence of sunlight and chlorophyll to produce glucose.

Word Equation:

Carbon dioxide + Water → Glucose + Oxygen

Glucose is a compound made of carbon, hydrogen and oxygen.

---

2. Electrolysis of water separates hydrogen and oxygen. Explain its importance.

Answer:
Electrolysis decomposes water into hydrogen and oxygen using electricity.

Importance:

- Produces hydrogen fuel.

- Helps understand chemical composition of water.
- Used in fuel-cell technology.
- Demonstrates decomposition reactions.

---

3. During digestion, carbohydrates break down into glucose. Explain why glucose is important.

Answer:

- Glucose is the primary source of energy in the body.
- Cells use glucose during respiration.
- It helps in growth, repair and daily activities.
- It is essential for proper functioning of organs and the brain.

Chapter 9 – The Amazing World of Solutes, Solvents and Solutions

NCERT CORNER

Q1. State whether the statements are True (T) or False (F). Correct the false statements.

(i) Oxygen gas is more soluble in hot water than in cold water.

❌ False

Oxygen gas is more soluble in cold water than in hot water.

(ii) A mixture of sand and water is a solution.

❌ False

Sand and water form a heterogeneous mixture, not a solution.

(iii) The amount of space occupied by any object is called its mass.

❌ False

The amount of space occupied by an object is called its volume.

(iv) An unsaturated solution has more solute dissolved than a saturated solution.

❌ False

A saturated solution contains the maximum amount of solute at a given temperature.

(v) The mixture of different gases in the atmosphere is also a solution.
True

Q2. Fill in the blanks

(i) The volume of a solid can be measured by the method of displacement, where the solid is **immersed** in water and the water level is measured.

(ii) The maximum amount of **solute** dissolved in a **solvent** at a particular temperature is called solubility at that temperature.

(iii) Generally, the density **decreases** with increase in temperature.

(iv) The solution in which glucose has completely dissolved in water and no more glucose can dissolve at a given temperature is called a **saturated** solution of glucose.

Q3. Oil floats on water. What does this tell you?

Answer:
Oil is less dense than water. Therefore, it floats on the surface of water.

Q4. Stone sculpture

Mass = 225 g
Volume = 90 cm^3

Density = Mass ÷ Volume

= 225 ÷ 90

= **2.5 g/cm^3**

Since density is greater than water (1 g/cm^3), the sculpture will **sink in water**.

Q5. Which statement is most appropriate?

Answer: (ii)

An unsaturated solution has dissolved the maximum amount of solute possible at a given temperature.

Why others are incorrect:

(i) Saturated solution cannot dissolve more solute.

(iii) More solute can dissolve if temperature increases.

(iv) Saturated solution may form even at room temperature.

Q6. Bottle Capacity

Bottle volume = 2 litres

Water already present = 500 mL

= 0.5 litre

More water bottle can hold

= 2 – 0.5

= **1.5 litres**

Q7. Object Density

Mass = 400 g

Volume = 40 cm^3

Density = 400 ÷ 40

= **10 g/cm^3**

Q8. Orange Experiment

Unpeeled orange floats because trapped air in the peel decreases overall density.

Peeled orange sinks because its density becomes greater than water.

Q9. Compare densities

Object A

Density = 200 ÷ 40

= 5 g/cm³

Object B

Density = 240 ÷ 60

= 4 g/cm³

Object A is denser.

Q10. Modelling Clay

Initial Density

= 120 ÷ 60

= 2 g/cm³

When flattened into a sheet, mass and volume remain unchanged.

Density remains **2 g/cm³**

Q11. Iron Block

Mass = 600 g

Density = 7.9 g/cm³

Volume = Mass ÷ Density

= 600 ÷ 7.9

≈ **75.95 cm³**

≈ **76 cm³**

Q12. Why does water rise in the glass tube?

Heating causes water to expand.

Volume increases while mass remains same.

Density decreases.

Therefore water level rises in the glass tube.

DISCOVER, DESIGN AND DEBATE

Q1. Why is there no aquatic life in the Dead Sea?

Because the Dead Sea contains extremely high salt concentration. Most aquatic organisms cannot survive in such highly saline water.

Q2. Solubility Investigation

Observation:

- Salt dissolves well in water.
- Less soluble in vinegar.
- Very little soluble in oil.

Conclusion:

Water is the best solvent among them.

Q3. Is water the most versatile solvent?

Yes. Water dissolves a large number of solids, liquids and gases and is therefore called the **universal solvent**.

Assessment Corner

A. Tick (✓) the Correct Option

1. Which of the following is a solvent in a sugar solution?
   (b) Water
2. When a solution cannot dissolve more solute at a given temperature, it is called:
   (c) Saturated solution
3. Which factor increases the solubility of most solid solutes?
   (b) Increasing temperature

4. What happens to gas solubility in water when temperature rises?
   (b) Decreases
5. What property determines whether an object floats or sinks?
   (b) Density
6. Which unit is commonly used for density of liquids?
   (b) g/mL
7. Air is considered a solution because:
   (a) Nitrogen and oxygen are mixed evenly
8. A dilute solution contains:
   (b) Very little solute
9. Which method is used to measure volume of irregular solids?
   (b) Water displacement method
10. What is the effect of heating on density of a substance?
    (b) Decreases density

B. Fill in the Blanks

1. A substance that dissolves in a liquid is called a **solute**.
2. The amount of solute dissolved in a fixed quantity of solvent is called **concentration**.
3. A solution with less solute is called **dilute solution**.
4. The curved surface of liquid in a measuring cylinder is called **meniscus**.
5. Density is calculated using the formula **Mass ÷ Volume**.
6. The solubility of gases **decreases** with increase in temperature.

C. True or False

1. Water is a universal solvent.
   True
2. Concentrated solutions always contain less solute than dilute solutions.
   ❌ False

3. Solubility of solids generally increases with temperature.
   True
4. An object floats if its density is higher than the liquid.
   ❌ False
5. Volume of irregular solids can be measured using water displacement.
   True
6. Pressure has significant effect on density of solids.
   ❌ False

D. Match the Following

Column A	**Column B**
1. Solute	c) Substance that dissolves
2. Solvent	a) Dissolving medium
3. Meniscus	e) Curved surface of liquid
4. Saturated solution	f) Maximum solute dissolved
5. Density	b) Mass per unit volume
6. Water displacement	d) Method for irregular solids

Answer:

1-c, 2-a, 3-e, 4-f, 5-b, 6-d

E. Answer the Following Questions in Brief

1. Define solubility.

Answer:
Solubility is the maximum amount of solute that can dissolve in a given amount of solvent at a particular temperature.

---

2. Explain why air is considered a gaseous solution.

Answer:
Air is a homogeneous mixture of gases such as nitrogen, oxygen, carbon dioxide and argon. Therefore, it is considered a gaseous solution.

---

3. Difference between saturated and unsaturated solutions.

Saturated Solution	Unsaturated Solution
Cannot dissolve more solute	Can dissolve more solute
Contains maximum solute	Contains less than maximum solute

---

4. How can the volume of irregular solids be determined?

Answer:
By the water displacement method. The increase in water level after immersing the solid gives its volume.

---

5. Why does oil float on water?

Answer:
Oil is less dense than water, so it floats on the surface.

---

6. How does heating affect the solubility of solids in water?

Answer:
Heating generally increases the solubility of solids, allowing more solute to dissolve.

F. Answer the Following Questions in Detail

1. Explain concentration with example.

Answer:
Concentration refers to the amount of solute dissolved in a given amount of solvent.

Example:
A solution containing 20 g sugar in 100 mL water is more concentrated than a solution containing 10 g sugar in 100 mL water.

---

2. Effect of temperature on solubility of gases and solids.

Answer:

For solids: Solubility generally increases with temperature.

For gases: Solubility generally decreases with temperature.

Example: Hot water dissolves more sugar but contains less dissolved oxygen.

---

3. How is density measured for solids and liquids?

Answer:

Density = Mass ÷ Volume

For solids: Measure mass using a balance and volume using dimensions or displacement method.

For liquids: Measure mass and volume using measuring cylinders and balances.

---

4. Steps to measure liquid volume using a measuring cylinder.

Answer:

1. Place the measuring cylinder on a flat surface.
2. Pour the liquid carefully.
3. Keep eyes at the level of the liquid.
4. Read the lower meniscus.
5. Note the volume reading.

---

5. Explain why hot air rises using density.

Answer:
When air is heated, it expands. Its density decreases and it becomes lighter than surrounding air. Therefore, hot air rises upward.

---

6. Effect of pressure on density of gases, liquids and solids.

Answer:

- **Gases:** Density increases greatly with pressure.
- **Liquids:** Density changes very little.
- **Solids:** Density remains almost unchanged.

G. Brain Teaser

1. Wooden block floats but an iron ship of same mass also floats. Why?

Answer:
A ship is hollow and contains air, making its average density less than water. Therefore, it floats. A wooden block also floats because its density is lower than water.

---

2. If salt is dissolved in water and sugar is added, which dissolves first?

Answer:
Sugar will dissolve only if the solution is not saturated. Dissolving depends on the remaining solubility capacity of water and the solubility of the substances.

Competency-Based Questions

1.

Assertion: Stirring helps more solute dissolve. True
Reason: Stirring increases temperature. ❌ False

Answer: (c) A is true, but R is false.

2.

Assertion: Some objects float while others sink. True
Reason: Objects float if their density is less than the liquid. True

Answer: (a) Both A and R are true, and R explains A.

3.

Assertion: Gas dissolved in water decreases when water is heated. True
Reason: Higher temperature causes gas molecules to escape. True

Answer: (a)

4.

Assertion: A saturated solution can become unsaturated on heating. True
Reason: Most solids dissolve more at higher temperatures. True

Answer: (a)

5.

Assertion: Metal block sinks while wooden block floats. True
Reason: Wooden block weighs less than metal block. ❌ False

Answer: (c)

6.

Assertion: Measuring cylinders are used to measure liquid volume accurately. True
Reason: Meniscus should be read at eye level. True

Answer: (a)

B. Case Study Based Questions

1. Why did sugar dissolve more after heating?

Answer: (a) Heating increases sugar solubility

2. The sugar that settled at the bottom initially made the solution:

Answer: (b) Saturated

3. Why does oil float on water?

Answer: (b) Oil is less dense than water

4. Why did the stone sink in water?

Answer: (a) Its density is higher than water

5. Which factor helped sugar dissolve faster in water?

Answer: (a) Stirring and heating

C. Art Integration

1. Difference between Saturated, Unsaturated and Supersaturated Solutions

Type of Solution	**Meaning**	**Example**
Unsaturated	More solute can dissolve	A few spoons of sugar dissolve completely in water
Saturated	No more solute can dissolve at that temperature	Extra sugar settles at the bottom
Supersaturated	Contains more dissolved solute than a saturated solution (usually prepared by heating)	Sugar syrup prepared by heating water

Effect of Temperature and Stirring:

- Heating increases solubility.
- Stirring helps solute dissolve faster.
- Cooling may cause excess solute to crystallize out.

---

2. Layers of the Earth

Earth's Layers (Outer to Inner)

1. **Crust**

    - Outermost layer
    - Lightest and thinnest layer
2. **Mantle**
    - Thickest layer
    - Contains semi-molten rocks
3. **Outer Core**
    - Liquid iron and nickel
4. **Inner Core**
    - Solid iron and nickel
    - Densest and hottest layer

Note:

As depth increases inside Earth:

- **Temperature increases**
- **Pressure increases**
- **Density increases**

D. Critical Thinking

1. Why does heating or stirring help dissolve more sugar? What if water is already boiling?

Heating increases the kinetic energy of water molecules. The water molecules move faster and can dissolve more sugar. Stirring brings fresh water particles into contact with sugar, increasing the rate of dissolution.

If the water is already boiling, it can dissolve much more sugar than at room temperature, producing a highly concentrated solution. If cooled carefully, a supersaturated solution may form.

---

2. Fish tank exposed to sunlight; fish gasp for air. Explain and suggest solutions.

Sunlight increases the temperature of water. As temperature rises, the solubility of oxygen in water decreases. Therefore, less dissolved oxygen is available for fish, causing them to gasp near the surface.

Solutions:

1. Use an **air pump or aerator** to increase dissolved oxygen.
2. Keep the tank in a **cooler or shaded place**.
3. Add aquatic plants that release oxygen.
4. Change a portion of the water regularly.

E. Subject Link

1. Explain how density and buoyancy are applied in real life.

Ships Float

Ships are made of heavy metal, but their hollow shape increases volume and lowers average density. Their average density becomes less than water, so the buoyant force keeps them afloat.

Hot Air Balloons Rise

Heating air inside the balloon makes it less dense than the surrounding air. The buoyant force pushes the balloon upward.

Oil Floats on Water

Oil is less dense than water. Therefore, it stays on the surface instead of sinking.

---

2. Water Displacement Method

The water displacement method is used to find the volume of irregular objects.

Steps:

1. Fill a measuring cylinder with water and note the initial reading.
2. Immerse the irregular object completely in water.
3. Note the new reading.

4. Volume of object = Final reading − Initial reading.

Importance:

This method helps calculate density using:

Density = Mass ÷ Volume

Real-Life Use:

Jewellers use this method to determine the volume and density of irregularly shaped gold ornaments and gemstones.

Chapter 10 – Light: Mirrors and Lenses

NCERT Corner

Q.1 A light ray is incident on a mirror and gets reflected by it. The angle made by the incident ray with the normal to the mirror is 40°. What is the angle made by the reflected ray with the mirror?

Given:

- Angle of incidence = 40°
- Angle of reflection = 40° (Law of Reflection)

Angle with mirror = 90° − 40° = **50°**

Answer: (ii) 50°

Q.2 Figure shows three situations where a light ray falls on a mirror.

(i) Light ray falls along the normal

- Angle of incidence = 0°
- Angle of reflection = 0°
- Reflected ray retraces the same path.

(ii) Mirror tilted but light ray still falls along the normal

- Angle of incidence = 0°
- Angle of reflection = 0°

- Reflected ray returns along the same path.

(iii) Light ray falls at 20° from the normal

- Angle of incidence = 20°
- Angle of reflection = 20°

Q.3 Match each image with the correct mirror.

Image	Mirror
(i)	Convex mirror
(ii)	Concave mirror
(iii)	Plane mirror

Answer:
(i) → Convex Mirror
(ii) → Concave Mirror
(iii) → Plane Mirror

Q.4 Match each image with the correct type of lens/glass.

Image	Lens/Glass
(i)	Convex lens
(ii)	Concave lens
(iii)	Flat transparent glass piece

Answer:
(i) → Convex Lens
(ii) → Concave Lens
(iii) → Flat Transparent Glass Piece

Q.5 When the light is incident along the normal on the mirror, which statement is true?

(ii) Angle of incidence is 0°

Because the incident ray coincides with the normal.

Q.6 Three mirrors (plane, concave and convex) are shown.

Based on image size:

- Largest image → **Concave mirror**
- Same size image → **Plane mirror**
- Smallest image → **Convex mirror**

Q.7 In a museum, a woman walks towards a large convex mirror.

As she comes closer:

(iii) Her inverted image keeps increasing in size and eventually becomes erect.

Q.8 Holding a magnifying glass over text and moving it away.

Observation:

- Letters first appear enlarged.
- On moving farther away, image becomes inverted.

Lens used = **Convex Lens**

Q.9 Match Column I with Column II

Column I	**Column II**
Concave mirror	(a) Spherical mirror with reflecting surface curving inward
Convex mirror	(b) Forms an image always erect and diminished
Convex lens	(c) Object behind it may appear inverted at some distance
Concave lens	(d) Object placed behind it always appears diminished

Answer:

(i)-a, (ii)-b, (iii)-c, (iv)-d

Q.10 Assertion–Reason

Assertion: Convex mirrors are preferred for observing traffic behind us.
Reason: Convex mirrors provide a larger field of view than plane mirrors.

Both statements are true and Reason correctly explains Assertion.

Answer: (i) Both Assertion and Reason are correct and Reason is the correct explanation of Assertion.

Q.11 O = Object, M = Mirror, I = Image

Figure (a):

- Image behind mirror
- Same distance from mirror as object

Plane Mirror

Figure (b):

- Diminished image behind mirror

Convex Mirror

Answer: (iv) Figure (a) indicates a plane mirror and Figure (b) indicates a convex mirror.

Q.12 Pencil behind a glass tumbler half-filled with water

Answer:
The pencil appears bent or broken at the water surface because light rays bend when passing from water to air. This phenomenon is called **refraction of light**.

Discover, Design and Debate

Q.1 Visit a nearby hospital or clinic of an ENT specialist or a dentist. Identify the kind of mirror used.

Answer:

- **Dentists** use a **concave mirror** because it forms an enlarged image of teeth.
- **ENT specialists** use a **concave mirror** to obtain a magnified view of the ear, nose, and throat.

Q.2 Harnessing sunlight is key to solving future energy challenges. Prepare a proposal for a solar cooker.

Answer:

Proposal for a Solar Cooker

Objective: To cook food using solar energy and reduce fuel consumption.

Materials Required:

- Large concave mirror/parabolic reflector
- Cooking vessel
- Stand
- Insulating box

Working:

- The concave mirror concentrates sunlight at one point (focus).
- The cooking vessel is placed at the focus.
- Concentrated heat cooks the food.

Advantages:

- Eco-friendly
- No fuel cost
- Reduces pollution
- Uses renewable energy

Estimated Budget: ₹2000–₹5000

Q.3 Use online tools or animations to observe how the image changes.

Answer (Observation):

Mirror/Lens	Image Formed
Plane Mirror	Virtual, erect, same size
Concave Mirror	Real/virtual, enlarged or diminished
Convex Mirror	Virtual, erect, diminished
Convex Lens	Real or virtual depending on object position
Concave Lens	Virtual, erect, diminished

A. Tick (✓) the Correct Option

1. A concave mirror has a reflecting surface that curves:
   (b) Inward
2. A convex mirror always forms an image that is:
   (c) Erect and diminished
3. The angle between the incident ray and the normal is called:
   (d) Angle of incidence
4. Which mirror is used in vehicle side-view mirrors?
   (c) Convex
5. A convex lens is thicker at the:
   (a) Middle
6. A concave lens always forms an image that is:
   (b) Virtual and diminished
7. The reflected ray, incident ray and normal lie in the:
   (a) Same plane
8. Parallel rays converge at a point after passing through a:
   (b) Convex lens
9. A magnifying glass uses:
   (b) Convex lens

10. The process of light bouncing back from a surface is:
    (c) Reflection

B. Fill in the Blanks

1. A mirror with a flat surface is called a **plane** mirror.
2. A concave mirror can form **real and inverted** images when the object is far away.
3. A convex mirror always gives a **wider** field of view.
4. A convex lens is also called a **converging** lens.
5. A concave lens **diverges** parallel rays of light.
6. The angle of incidence is always equal to the angle of **reflection**.

C. True or False

1. A concave mirror can form an inverted image.
   True
2. A convex lens always forms an inverted image.
   ❌ False
3. A plane mirror always forms a virtual image.
   True
4. A convex mirror forms enlarged images.
   ❌ False
5. A concave lens diverges rays of light.
   True
6. Reflected light always lies in the same plane as the incident light.
   True

D. Match the Following

Column I	Column II
1. Concave mirror	d) Used in torches
2. Convex mirror	c) Used as rear-view mirror
3. Convex lens	b) Converging lens
4. Concave lens	a) Diverging lens

Answer:

1-d, 2-c, 3-b, 4-a

E. Answer the Following Questions in Brief

1. What is lateral inversion?

Answer:
The left-right reversal of an image formed by a plane mirror is called lateral inversion.

---

2. Define a convex mirror.

Answer:
A mirror whose reflecting surface bulges outward is called a convex mirror.

---

3. What is the focal point of a concave mirror?

Answer:
The point where parallel rays of light meet after reflection from a concave mirror is called the focal point.

---

4. Why does a concave mirror burn paper in sunlight?

Answer:
A concave mirror converges sunlight at one point, producing enough heat to burn paper.

---

5. Define incident ray.

Answer:
The ray of light that falls on a reflecting surface is called the incident ray.

---

6. What is meant by convergence of light?

Answer:
The coming together of light rays at a point is called convergence of light.

---

7. Difference between convex and concave lens.

Convex Lens	Concave Lens
Thicker at centre	Thinner at centre
Converges light rays	Diverges light rays
Can form real images	Forms only virtual images

---

8. Why do vehicle mirrors use convex mirrors?

Answer:
Convex mirrors provide a wider field of view and form erect images, allowing drivers to see more area behind them.

F. Answer the Following Questions in Detail

1. Characteristics of images formed by a concave mirror at different distances.

- Beyond C → Real, inverted, diminished.
- At C → Real, inverted, same size.
- Between C and F → Real, inverted, enlarged.
- At F → Image at infinity.
- Between F and P → Virtual, erect, enlarged.

---

2. Laws of Reflection

1. Angle of incidence = Angle of reflection.
2. Incident ray, reflected ray and normal lie in the same plane.

---

3. How convex and concave lenses form images

Convex lens: Converges light rays and may form real or virtual images.

Concave lens: Diverges light rays and always forms virtual, erect and diminished images.

---

4. Differences between concave and convex mirrors

Concave Mirror	Convex Mirror
Curves inward	Curves outward
Converges light	Diverges light
May form real or virtual image	Always forms virtual image

---

5. How does a convex lens act as a magnifying glass?

Answer:
When an object is placed between the optical centre and focal point of a convex lens, a virtual, erect and enlarged image is formed.

---

6. Activity proving incident ray, reflected ray and normal lie in same plane

Draw a normal on a mirror. Shine a light ray on the mirror and observe the reflected ray. All three can be drawn on the same sheet of paper, proving they lie in the same plane.

---

7. Explain convergence and divergence of light.

Convergence: Light rays meet at a point (Convex lens, concave mirror).

Divergence: Light rays spread apart (Concave lens, convex mirror).

---

8. Real-life applications

Concave mirror: Torches, headlights, shaving mirrors, solar cookers.

Convex mirror: Rear-view mirrors, security mirrors.

Convex lens: Magnifying glass, camera, microscope.

Concave lens: Spectacles for myopia.

Competency-Based Questions

1. **Answer: (a)** Both A and R are true and R explains A.
2. **Answer: (c)** A is true, but R is false.
3. **Answer: (c)** A is true, but R is false.
4. **Answer: (a)** Both A and R are true and R explains A.
5. **Answer: (b)** Both A and R are true, but R is not the correct explanation.
6. **Answer: (c)** A is true, but R is false.

Case Study Answers

1. **(c) Glass plate**
2. **(a) Convex lens**
3. **(b) Convex lens**
4. **(b) Spread outward**
5. **(c) Rays meeting at a point**

Chapter 11 – Keeping Time with the Skies

NCERT Corner Answers

Q.1 State whether the following statements are True or False.

(i) We can only see that part of the Moon which reflects sunlight towards us.
True

(ii) The shadow of Earth blocks sunlight from reaching the Moon causing phases.
False (Moon phases are caused by the changing positions of the Sun, Earth and Moon.)

(iii) Calendars are based on various astronomical cycles which repeat in a predictable manner.
True

(iv) The Moon can only be seen at night.
False (The Moon is often visible during the day.)

Q.2 Amol was born on 6th May on a Full Moon day. Does his birthday fall on the Full Moon day every year?

Answer:
No. The date **6th May** is based on the **Gregorian (solar) calendar**, while the **Full Moon** is based on the **lunar cycle**. Since lunar and solar calendars do not match exactly, the Full Moon does not occur on the same Gregorian date every year.

Q.3 Name two things that are incorrect in the figure.

Answer:

1. The **crescent Moon is shown among stars and clouds during the day/night incorrectly** (the illuminated side should face the Sun).
2. The **crescent is facing the wrong direction** because the bright side of the Moon must always point towards the Sun.

Q.4 Moon Phases

(i) Match the pictures with phases:

Picture	**Phase**
A	Three days after Full Moon

Picture	Phase
B	Day of New Moon
C	A week after Full Moon
D	Three days after New Moon
E	Full Moon
F	Three days after Full Moon

(ii) Picture labels for the given phases

Phase	Picture
Three days after New Moon	**D**
Full Moon	**E**
Three days after Full Moon	**A**
A week after Full Moon	**C**
Day of New Moon	**B**

Q.5 Malini saw the Moon overhead in the sky at sunset.

(i) Draw the phase of the Moon.

Answer: First Quarter Moon (Half Moon)

(ii) Is the Moon in the waxing or waning phase?

Answer: Waxing Phase

Q.6 Ravi saw a crescent Moon in the East at sunset. Kaushalya saw a gibbous Moon in the East during the afternoon. Who is correct?

Answer:
Kaushalya is correct.

A waxing gibbous Moon can be seen in the eastern sky during the afternoon. A crescent Moon is generally seen in the western sky after sunset, not in the east.

Q.7 The Moon is getting farther away from Earth and slower in its revolution. Will lunisolar calendars need an intercalary month more often or less often?

Answer:
Less often.

A slower revolution means a slightly longer lunar month. The difference between lunar and solar years decreases, so intercalary months would be required less frequently.

Q.8 A total of 37 Full Moons must happen during 3 years in a solar calendar.

Answer:

3 solar years ≈ **365 × 3 = 1095 days**

37 lunar months ≈ **37 × 29.5 = 1091.5 days**

Since 1095 > 1091.5, there can be **37 Full Moons in 3 years**.

At least two Full Moons must occur in the same calendar month.

Q.9 Vaishali saw the Moon in the sky from sunset to sunrise. What phase did she notice?

Answer: Full Moon

Q.10 If we stopped having leap years, after approximately how many years would Independence Day happen in winter?

Answer:

Each year the calendar would lag by about **¼ day**.

To shift by about **182 days (half a year):**

182 ÷ 0.25 = **728 years**

Approximately **730 years**

Q.11 What is the purpose of launching artificial satellites?

Answer:

Artificial satellites are launched for:

- Communication
- Weather forecasting
- Navigation (GPS)
- Scientific research
- Earth observation
- Disaster management

Q.12 On which periodic phenomenon are the following measures of time based?

(i) **Day** → Earth's **rotation** on its axis

(ii) **Month** → Moon's **revolution around Earth**

(iii) **Year** → Earth's **revolution around the Sun**

Discover, Design and Debate Answers

Q.1 The Moon's crescent always faces towards the Sun. Explain.

Answer:
The Moon does not produce its own light. It reflects sunlight. Therefore, the illuminated (bright) side of the crescent Moon always points towards the Sun. If we draw a line joining the tips of the crescent, it points roughly in the direction of the Sun.

Q.2 Most dates in the Indian National Calendar map to the same dates in the Gregorian calendar. Can you find out which ones may differ for certain years?

Answer:
The dates around **leap years** may differ. Since the Gregorian calendar adds an extra day in February during leap years, some dates in the Indian National Calendar may shift by one day in those years.

Q.3 New Year Festivals in India

State	Festival	Calendar Type
Punjab	Baisakhi	Solar
Tamil Nadu	Puthandu	Solar
Kerala	Vishu	Solar
Assam	Bohag Bihu	Solar
West Bengal	Poila Boishakh	Solar
Maharashtra	Gudi Padwa	Luni-solar
Karnataka	Ugadi	Luni-solar
Andhra Pradesh	Ugadi	Luni-solar
Gujarat	Bestu Varas	Luni-solar
Kashmir	Navreh	Luni-solar

Observation: Solar-calendar festivals occur almost on the same date every year, while luni-solar festivals shift slightly.

Q.4 Eid-ul-Fitr and Diwali Dates

Answer:

- Eid-ul-Fitr follows the **lunar calendar**, so its date shifts about **10–11 days earlier each year** in the Gregorian calendar.
- Diwali follows the **luni-solar calendar**, so its date changes but stays within a limited range.

- An extra month called **Adhika Maasa** is added occasionally to keep lunar months aligned with seasons.

Q.5 Sunrise Observation Activity

Answer:

The position of sunrise changes gradually during the year.

- From January to June, sunrise shifts towards the **north** (Uttarayan).
- From July to December, sunrise shifts towards the **south** (Dakshinayan).

This observation helped ancient people understand seasonal changes and create calendars.

Assessment Corner

A. Tick (✓) the Correct Option

1. b) Full Moon
2. c) 29.5 days
3. c) Solar calendar
4. c) Extra intercalary month
5. b) Holi
6. c) Relative positions of Sun, Earth and Moon
7. a) Moon's revolution
8. b) Moon
9. d) All of these
10. b) New Moon

B. Fill in the Blanks

1. 29.5
2. shadow

3. revolution
4. 12
5. lunar
6. Adhika Maasa

C. True or False

1. False
2. True
3. False
4. True
5. False
6. False

D. Match the Following

Column A	**Column B**
1. Diwali	c. New Moon of Kartika
2. Holi	d. Full Moon of Phalguna
3. Buddha Purnima	a. Full Moon of Vaishakha
4. Eid-ul-Fitr	e. Crescent Moon at Ramazan
5. Dussehra	b. Tenth day of Ashwina

E. Answer in Brief

1. Define a lunar month.

A lunar month is the time taken by the Moon to complete one cycle of phases, approximately **29.5 days**.

2. What is a solar day?

A solar day is the time taken by Earth to rotate once with respect to the Sun, about **24 hours**.

3. Name two uses of artificial satellites.

- Communication
- Weather forecasting

4. What is a waxing Moon?

A waxing Moon is the phase during which the illuminated portion of the Moon increases each day.

5. Why does the Moon appear differently each night?

Because the relative positions of the Sun, Earth and Moon keep changing, causing different phases of the Moon.

6. What is a lunar calendar?

A calendar based on the Moon's revolution and phases is called a lunar calendar.

Answer the following questions in detail

1. Explain why the Moon can be seen during the day.
The Moon does not produce its own light. It reflects the light of the Sun. Sometimes, the Moon is positioned in the sky in such a way that it remains visible even during daylight. Since it is bright enough to reflect sunlight, we can see it during the day as well as at night.

---

2. Describe the difference between waxing and waning Moon.

Waxing Moon	**Waning Moon**
The visible illuminated part of the Moon increases every day.	The visible illuminated part of the Moon decreases every day.
Occurs from New Moon to Full Moon.	Occurs from Full Moon to New Moon.
Moon appears to grow bigger each night.	Moon appears to become smaller each night.

---

3. How is a solar calendar different from a lunar calendar?

Solar Calendar	Lunar Calendar
Based on Earth's revolution around the Sun.	Based on the Moon's revolution around the Earth.
One year has about **365.25 days**.	One year has about **354 days**.
Example: Gregorian Calendar.	Example: Hindu and Islamic lunar calendars.

---

4. What is the significance of Adhik Maas in lunar calendars?
Adhik Maas (extra month) is added to the Hindu lunar calendar to balance the difference between the lunar year and the solar year. Without this extra month, festivals and seasons would gradually shift. Adhik Maas helps keep the calendar aligned with the seasons.

---

5. How can we measure the solar day using shadows?
A vertical stick can be placed in sunlight. The shadow changes its position and length throughout the day. By observing the shadow at the same position on two consecutive days, we can measure the time taken by Earth to complete one rotation relative to the Sun, which is called a **solar day**.

---

6. Why do festivals like Diwali and Holi fall on different dates every year?
Diwali and Holi are determined according to the Hindu lunar calendar. Since the lunar year is shorter than the solar year, the dates of these festivals shift each year in the Gregorian calendar.

Brain Teaser

1. Imagine you are standing outside at sunrise. We see the Moon high in the sky while the Sun is rising. How can you figure out whether it is close to being a Full Moon or a New Moon? Why?

It is likely to be **close to a Full Moon**. A Full Moon sets around sunrise and rises around sunset. Therefore, if the Moon is still visible in the sky when the Sun is rising, it is near the Full Moon phase.

---

2. A stick is placed vertically on the ground, and you mark its shadow every hour. At noon, the shadow is shortest. The next day, the shadow at the same time is slightly longer. What natural phenomenon explains this change?

This happens because of **Earth's revolution around the Sun** and the changing position of the Sun in the sky from day to day. As the Sun's apparent position changes slightly each day, the length of the shadow at the same clock time also changes.

Competency Based Questions

A. Assertion–Reason Type Questions

Options

(a) Both A and R are true, and R is the correct explanation of A.
(b) Both A and R are true, but R is not the correct explanation of A.
(c) A is true, but R is false.
(d) A is false, but R is true.

1.

Assertion (A): The Moon appears to change shape every night.
Reason (R): The Moon rotates on its axis, changing the visible portion.

Answer: (c)

Explanation: The Moon's phases occur because of the changing positions of the Sun, Earth and Moon, not because of its rotation.

2.

Assertion (A): A solar year has 365 days.
Reason (R): Earth completes one revolution around the Sun in about 365¼ days.

Answer: (d)

Explanation: A solar year is approximately 365¼ days, not exactly 365 days.

3.

Assertion (A): Waxing Moon is easiest to see at sunrise.
Reason (R): The illuminated portion of a waxing Moon grows after New Moon.

Answer: (b)

Both statements are true, but the reason does not explain why it is easiest to see at sunrise.

4.

Assertion (A): Artificial satellites move faster than stars in the sky.
Reason (R): Satellites orbit closer to Earth than stars.

Answer: (a)

5.

Assertion (A): Lunar calendars keep seasons perfectly aligned.
Reason (R): A lunar year is 354 days, shorter than the solar year.

Answer: (d)

Lunar calendars alone do not remain aligned with seasons.

6.

Assertion (A): The Moon always shows the same face to Earth.
Reason (R): The Moon rotates once per orbit around Earth.

Answer: (a)

B. Case Study Based Questions

1. Which phase of the Moon was Riya observing?

Answer: (b) Waxing Crescent

---

2. Why did the Moon appear in the western sky after sunrise?

Answer: (c) Because Moon's orbit affects its own motion

---

3. Why do Diwali and Eid fall in different Gregorian months each year?

Answer: (b) Festivals follow lunar or luni-solar calendars

---

4. Which natural cycle forms the basis of a day?

Answer: (b) Earth's rotation

---

5. Which calendar adds an extra month to align lunar and solar years?

Answer: (c) Luni-solar calendar

C. Art Integration

1. Moon Phase Storyboard

Draw and label:

🌑 New Moon → 🌒 Waxing Crescent → 🌓 First Quarter → 🌔 Waxing Gibbous → 🌕 Full Moon → 🌖 Waning Gibbous → 🌗 Last Quarter → 🌘 Waning Crescent

Write:

The Moon does not emit light. It reflects sunlight. As it revolves around Earth, different portions of its illuminated side become visible, creating phases.

---

2. Sun–Earth–Moon Model

Use:

- Large ball = Sun
- Medium ball = Earth
- Small ball = Moon

Show:

- Moon revolving around Earth.
- Sun illuminating one half of the Moon.
- Different phases observed from Earth.

D. Critical Thinking

1. If Earth had two moons instead of one?

Answer:

- Tides would be stronger and more complex.
- Nights could be brighter.
- Calendars would become complicated.
- Festivals based on lunar phases would need modification.
- Eclipses might occur more frequently.

---

2. Why are many Indian festivals linked to lunar or luni-solar calendars?

Answer:
Indian festivals were traditionally linked to natural cycles of the Moon and seasons. Lunar and luni-solar calendars help determine religious events, agricultural activities, and cultural celebrations. They connect human life with astronomical phenomena.

E. Subject Link

1. Difference between Solar, Lunar and Luni-Solar Calendars

Feature	Solar Calendar	Lunar Calendar	Luni-Solar Calendar
Based on	Earth's revolution around the Sun	Moon's revolution around the Earth	Both Sun and Moon movements
Length of Year	About 365.25 days	About 354 days	About 365 days
Months	Based on seasons and Sun's position	Based on Moon phases	Based on Moon phases but adjusted to seasons
Example	Gregorian Calendar	Islamic Calendar	Hindu Calendar, Chinese Calendar
Festivals	Occur on nearly fixed dates	Shift every year in the Gregorian calendar	Remain close to the same season

Why do some festivals shift dates while others remain fixed?

- Festivals based on the **solar calendar** (such as Christmas) occur on almost the same date every year.
- Festivals based on the **lunar calendar** (such as Eid) move about **10–11 days earlier** each year in the Gregorian calendar.
- Festivals based on the **luni-solar calendar** (such as Diwali and Holi) may shift slightly but remain in roughly the same season.

How do intercalary months correct discrepancies?

A lunar year is about **11 days shorter** than a solar year.

Difference = 365.25 – 354 = 11.25 days per year

After about 3 years:

11.25 × 3 ≈ 33.75 days

This is nearly equal to one month. Therefore, an extra month called **Adhik Maas (intercalary month)** is added to the luni-solar calendar. This keeps festivals aligned with the seasons and prevents them from drifting through the year.

---

2. Daily Angular Movement of the Moon

Given:

- Moon completes one orbit in **29.5 days**
- Total angle of one orbit = **360°**

Calculation

$$\text{Daily Angular Movement} = \frac{360^\circ}{29.5}$$
$$= 12.2^\circ \text{ per day (approximately)}$$

Answer: The Moon moves about **12.2° eastward each day** relative to the Sun and stars.

Effect on the Moon's Visibility

Because the Moon shifts about **12.2° eastward daily**, it rises approximately **50 minutes later each day**.

During Different Phases

Phase	**Sunrise Visibility**	**Sunset Visibility**
New Moon	Not visible	Not visible
Waxing Crescent	Visible after sunset	Not visible at sunrise
First Quarter	Sets around midnight	Visible in afternoon/evening
Waxing Gibbous	Visible most of evening	Sets after midnight
Full Moon	Sets at sunrise	Rises at sunset
Waning Gibbous	Visible before sunrise	Rises late evening
Last Quarter	Visible in morning sky	Not visible at sunset
Waning Crescent	Visible just before sunrise	Not visible after sunset

Chapter 12 – How Nature Works in harmony

NCERT Corner Answers

NCERT Corner (Q.1 to Q.6)

Q.1 Refer to the given diagram and select the wrong statement.

(i) A community is larger than a population. True

(ii) A community is smaller than an ecosystem. True

(iii) An ecosystem is part of a community. Wrong

Answer: (iii) An ecosystem is part of a community.

Correction: A community is a part of an ecosystem.

Q.2 A population is part of a community. If all decomposers suddenly disappear from a forest ecosystem, what changes do you think would occur? Explain why decomposers are essential.

Answer:
If decomposers disappear:

- Dead plants and animals will accumulate.
- Nutrients will not return to the soil.
- Soil fertility will decrease.
- Plant growth will be affected.
- Food chains may become disturbed.

Decomposers are essential because they break down dead organisms and recycle nutrients back into the environment.

Q.3 Selvam from Cuddalore district, Tamil Nadu, shared that his village was less affected by the 2004 tsunami compared to nearby villages due to the presence of mangrove forests. This surprised Sarita, Shabnam, and Shilo. They wondered if mangroves were protecting the village. Can you help them understand this?

Answer:
Yes, mangrove forests help protect coastal areas from natural disasters such as tsunamis and cyclones.

- Their dense roots reduce the force of waves.
- They prevent soil erosion.
- They act as natural barriers against floods and storms.

Therefore, villages surrounded by mangrove forests often suffer less damage during tsunamis.

Q.4 Look at this food chain:

Grass → Grasshopper → Frog → Snake

If frogs disappear from this ecosystem, what will happen to the population of grasshoppers and snakes? Why?

Answer:

- The population of **grasshoppers will increase** because frogs eat grasshoppers.
- The population of **snakes will decrease** because snakes feed on frogs.

This happens because organisms in a food chain depend on each other for food.

Q.5 In a school garden, students noticed fewer butterflies in previous seasons. What could be the possible reasons? What steps can students take to have more butterflies on campus?

Answer:

Possible Reasons:

- Lack of flowering plants.
- Excessive use of pesticides.
- Habitat destruction.
- Reduction in nectar-producing plants.

Steps to Increase Butterflies:

- Grow flowering plants.
- Avoid chemical pesticides.
- Create butterfly gardens.
- Protect natural habitats.
- Plant native species.

Q.6 Why is it not possible to have an ecosystem with only producers and no consumers or decomposers?

Answer:

An ecosystem cannot function with only producers because:

- Consumers help transfer energy through food chains.
- Decomposers recycle nutrients back into the soil.
- Without consumers, energy flow stops.
- Without decomposers, dead matter accumulates and nutrients are not recycled.

Therefore, producers, consumers, and decomposers are all necessary to maintain ecosystem balance.

Q.7 Observe two different places near your home or school. List the living and non-living components you see. How are the two ecosystems different?

Place 1: Park

Living Components (Biotic):

- Trees
- Grass
- Birds
- Butterflies

- Squirrels

Non-living Components (Abiotic):

- Sunlight
- Air
- Water
- Soil

Place 2: Roadside

Living Components (Biotic):

- Small plants
- Dogs
- Crows
- Humans

Non-living Components (Abiotic):

- Dust
- Air
- Sunlight
- Road surface

Difference:
The park has greater biodiversity and cleaner surroundings, while the roadside has fewer organisms, more pollution, and less vegetation.

Q.8 "Human-made ecosystems like agricultural fields are necessary, but they must be made sustainable." Comment.

Human-made ecosystems such as farms provide food and support livelihoods. However, excessive use of chemical fertilizers and pesticides can damage soil and water. Sustainable practices like crop rotation, organic farming, composting, and water conservation help maintain soil fertility and protect biodiversity. Therefore, human-made ecosystems should be managed sustainably.

Q.9 If the Indian hare population drops because of a disease, how would it affect the number of other organisms?

A decrease in the hare population would reduce food availability for predators such as foxes and eagles, causing their numbers to decline. At the same time, grasses and plants eaten by hares may increase. Thus, the balance of the food web would be disturbed.

Discover, Design and Debate

Q.1 Clean-up Day Activity

Common Types of Waste Found

- Plastic bottles
- Food wrappers
- Polythene bags
- Paper waste
- Disposable cups

Most Common Waste

Plastic waste

Ways to Reduce Waste

- Use reusable bottles and bags.
- Avoid single-use plastics.
- Segregate waste.
- Promote recycling.
- Spread awareness about cleanliness.

Q.2 Find another Indian tribe that has a special bond with an animal.

The **Bishnoi community of Rajasthan** is known for protecting blackbucks and other wildlife. They consider animals sacred and actively work for their conservation.

Q.3 Observe a Tree for Four Weeks

Sample Observation

Week	Observation
1	New leaves appeared
2	Flowers started blooming
3	Bees and butterflies visited
4	Small fruits developed

Conclusion

The tree supports many organisms and changes continuously with time.

Q.4 Sustainable Herbal Garden / Natural Farm

Steps

1. Select a sunny area.
2. Prepare fertile soil using compost.
3. Plant herbs like Tulsi, Mint, Aloe Vera, and Coriander.
4. Water regularly.
5. Avoid chemical fertilizers.
6. Use organic manure.

Benefits

- Fresh herbs
- Biodiversity conservation
- Environmental awareness

Q.5 Suggestions to Improve Farming Practices

1. Use organic fertilizers.
2. Practice crop rotation.
3. Reduce chemical pesticide use.
4. Harvest rainwater.
5. Use drip irrigation.
6. Encourage mixed cropping.
7. Protect pollinators.
8. Improve soil fertility through composting.

Assessment Corner

A. Tick (✓) the Correct Option

1. Why do elephants sometimes enter farms and villages?
   (c) Scarcity of vegetation and water in their natural habitat
2. What is a habitat?
   (b) A natural place where an organism lives
3. Which of the following are abiotic components of a habitat?
   (b) Soil, water, sunlight and air
4. What is a population in ecological terms?
   (b) A group of organisms of the same species living in a habitat at a given time
5. Which of the following is an example of mutualistic interaction?
   (b) Bees pollinating flowers
6. Which of these is a producer in a forest ecosystem?
   (c) Tree
7. What role do decomposers play in an ecosystem?
   (b) Recycle nutrients from dead plants and animals back into the soil

8. What is monoculture in farming?
   (b) Growing only one type of crop repeatedly on the same land
9. Which of the following describes a food web?
   (b) Interconnected food chains showing energy flow and interactions among organisms
10. How can farmers make agriculture more sustainable?
    (d) Adopting organic farming, crop rotation and integrated pest management

---

B. Fill in the Blanks

1. A group of organisms of the same species living in a habitat at a given time is called a **population**.
2. Organisms that make their own food through photosynthesis are called **producers**.
3. The practice of growing only one type of crop repeatedly on the same land is called **monoculture**.
4. Organisms that break down dead plants and animals to recycle nutrients are called **decomposers**.
5. Human-made ecosystems such as parks, farms and gardens require **maintenance** for their maintenance.
6. A habitat consists of both living and non-living components, called **biotic** and **abiotic** components.

C. Decide Whether the Following Statements are True or False

1. Herbivores eat only animals. **False**
2. Abiotic components include soil, water and sunlight. **True**
3. Overuse of pesticides can lead to pest resistance. **True**
4. Monoculture increases biodiversity in farmland. **False**
5. A food web shows multiple interconnected feeding relationships. **True**
6. Decomposers harm the environment by consuming dead matter. **False**

D. Match the Following

Column A	Column B
1. Producers	**(b) Make their own food through photosynthesis**
2. Herbivores	**(d) Eat only plants**
3. Omnivores	**(a) Feed on both plants and animals**
4. Decomposers	**(c) Organisms that feed on dead matter**
5. Carnivores	**(e) Eat only animals**
6. Population	**(f) Group of organisms of the same species in a habitat**

Answer: 1-b, 2-d, 3-a, 4-c, 5-e, 6-f

E. Answer the Following Questions in Brief

1. Define a habitat.

A habitat is the natural place where an organism lives, grows and reproduces.

2. What is a food chain? Give one example.

A food chain is a sequence showing how food and energy pass from one organism to another.

Example:
Grass → Grasshopper → Frog → Snake → Eagle

3. Name two abiotic components of a pond.

- Water
- Sunlight

4. What is the role of decomposers in an ecosystem?

Decomposers break down dead plants and animals and return nutrients to the soil, helping recycle matter in the ecosystem.

5. Give one example of a human-made ecosystem.

A farm (agricultural field) is a human-made ecosystem.

F. Answer the Following Questions in Detail

1. Explain the difference between a food chain and a food web. Why is a food web considered a more realistic representation of an ecosystem?

A food chain shows a single pathway of energy flow from producers to consumers. A food web consists of many interconnected food chains. A food web is more realistic because most organisms have multiple food sources and predators.

---

2. Describe the role of producers, consumers and decomposers in an ecosystem.

- **Producers** make food by photosynthesis.
- **Consumers** depend on producers or other animals for food.
- **Decomposers** break down dead organisms and recycle nutrients.

Together they maintain the balance of the ecosystem.

---

3. Discuss how small changes in an ecosystem can lead to cascading effects.

A small change, such as the decline of one species, can affect many other organisms. For example, if insects decrease, birds that feed on them may also decline. This disturbance spreads through the food web and affects ecosystem balance.

---

4. Explain the consequences of overusing synthetic fertilisers and pesticides in agriculture.

- Soil fertility decreases.
- Beneficial organisms are harmed.
- Water pollution increases.
- Pests develop resistance.

- Biodiversity declines.
- Human health may be affected.

---

5. Describe the importance of pollinator populations and communities in a habitat.

Pollinators such as bees and butterflies help plants reproduce by transferring pollen. They increase crop production, support biodiversity and maintain ecosystem stability.

---

6. Explain the concept of sustainable farming.

Sustainable farming uses methods that protect the environment while maintaining crop productivity. Practices include:

- Organic farming
- Crop rotation
- Composting
- Water conservation
- Integrated pest management

These methods preserve soil fertility and biodiversity.

G. Brain Teaser

1. Pond Ecosystem Question

If fish disappear from the pond:

- Dragonfly larvae may increase.
- Aquatic insects may become more numerous.
- Birds that eat fish may decline.
- The food chain will become unbalanced.

---

2. Food Chain Question

Food Chain:
Grass → Grasshopper → Frog → Snake → Eagle

If grass population decreases:

- Grasshoppers will decrease due to lack of food.
- Frogs will decrease because fewer grasshoppers are available.
- Snakes will decrease because frogs become fewer.
- Eagles will also decrease.

Thus, the entire food chain will be affected.

Complete Competency-Based Questions (Assertion-Reason)

1.

Assertion: A food web is more realistic than a food chain.
Reason: A food web shows multiple interconnected feeding relationships.

Answer: **(a)** Both A and R are true and R is the correct explanation.

2.

Assertion: Decomposers are essential for nutrient recycling.
Reason: Decomposers feed on living plants and animals to gain energy.

Answer: **(c)** A is true, but R is false.

3.

Assertion: Overuse of chemical fertilisers reduces soil fertility.
Reason: Excess fertilisers kill beneficial microorganisms and decrease humus.

Answer: **(a)** Both A and R are true and R correctly explains A.

4.

Assertion: Monoculture can harm pollinators.
Reason: Growing a single crop repeatedly reduces habitat and food sources.

Answer: **(a)** Both A and R are true and R correctly explains A.

5.

Assertion: Competition among organisms helps maintain ecological balance.
Reason: Without competition, species may overpopulate and consume resources.

Answer: **(a)** Both A and R are true and R correctly explains A.

6.

Assertion: Human-made ecosystems need management to survive.
Reason: Unlike natural ecosystems, artificial ecosystems do not have biotic and abiotic interactions.

Answer: **(c)** A is true, but R is false.

C. Case Study Based Questions

1. Why has Ravi observed a decrease in soil fertility?

Answer: (a) Overuse of chemical fertilisers

---

2. Which organisms in the pond help control insect populations?

Answer: (b) Fish

---

3. What sustainable farming method can help Ravi improve soil health?

Answer: (b) Crop rotation and organic fertilisers

---

4. The increase in insects damaging crops is most likely due to

Answer: (a) Loss of natural predators

---

5. Which of the following shows the correct biotic-abiotic relationship in Ravi's ecosystem?

Answer: (d) Insects depend on sunlight for oxygen production through plants

---

Art Integration

1. Pond Ecosystem (Short Paragraph)

A pond ecosystem consists of both **biotic components** (living things) and **abiotic components** (non-living things). Biotic components include fish, frogs, insects, aquatic plants, algae, and microorganisms. Abiotic components include water, sunlight, air, soil, and minerals. Fish feed on insects and smaller organisms, while aquatic plants produce food through photosynthesis. Sunlight provides energy for plants, and water serves as a habitat for aquatic life. Pollution can disturb this ecosystem by reducing oxygen levels, killing fish and plants, and disrupting the food chain, thereby affecting the entire ecosystem.

Q.2 Draw a Food Web for a Forest Ecosystem and Explain the Effect of Disappearance of One Species.

Food Web

Grass → Deer → Tiger

Grass → Rabbit → Fox

Plants → Insects → Birds

Dead Matter → Decomposers

Effect of Disappearance

If rabbits disappear:

- Fox population may decrease.
- Grass may increase.
- Balance of the ecosystem will be disturbed.

D. Critical Thinking

1. Long-term consequences of excessive use of chemicals in farming

Excessive use of chemical fertilisers and pesticides can lead to:

- Loss of soil fertility
- Death of beneficial organisms such as earthworms
- Water pollution
- Development of pesticide-resistant pests

- Reduced biodiversity
- Health risks to humans and animals

Sustainable alternatives:

- Organic farming
- Crop rotation
- Vermicomposting
- Green manure
- Biological pest control
- Integrated Pest Management (IPM)

These practices improve soil health, protect biodiversity, and ensure sustainable crop production.

---

2. Effects of a polluted pond on the ecosystem

If a village pond becomes completely polluted:

- Fish populations will decline or die.
- Insects that depend on the pond may increase or decrease abnormally.
- Birds and animals that feed on fish will lose their food source.
- Aquatic plants may die due to reduced oxygen and sunlight.
- Pollination and pest control in nearby agricultural fields may be affected.
- The food chain will become disturbed.

Even a small environmental change can have widespread effects because all organisms in an ecosystem are interconnected through food chains and ecological relationships.

E. Subject Link

1. How do water availability and soil type influence plants and animals?

Water and soil determine which plants can grow in a region, and these plants support specific animals.

Examples from India:

- Tropical Rainforests (Western Ghats): High rainfall supports dense forests, elephants, monkeys, and many birds.
- Deserts (Rajasthan): Sandy soil and low rainfall support cactus, thorny shrubs, camels, and desert foxes.
- Pond Ecosystems: Water supports algae, lotus, fish, frogs, insects, and aquatic birds.
- Mountain Regions (Himalayas): Cold climate supports pine and deodar trees, snow leopards, and mountain goats.

Thus, the availability of water and soil conditions directly affect biodiversity.

---

2. How can understanding ecosystems reduce human-wildlife conflict?

Understanding ecosystems helps planners protect wildlife habitats and migration routes.

Measures include:

- Conserving forests and wetlands
- Creating wildlife corridors
- Avoiding construction in animal habitats
- Practising sustainable agriculture
- Planting buffer vegetation around villages
- Providing water sources inside forests

These measures reduce encounters between humans and wild animals, protecting both people and wildlife**.**

Chapter 13: Our Home – Earth, a Unique Life Sustaining Planet

Class 8 Science – Complete Solutions

KEEP THE CURIOSITY ALIVE (NCERT Corner)

Q1. What is one major reason Mars cannot currently support life like Earth?

Answer: (iii) It lacks a thick atmosphere and liquid water.

Explanation: Life needs water and a suitable atmosphere. Mars has a very thin atmosphere and no stable liquid water on its surface.

Q2. Which of these is an example of geobiodiversity?

Answer: (ii) Different landforms like mountains, valleys and deserts.

Explanation: Geobiodiversity refers to the variety of Earth's physical features such as mountains, rivers, plains, valleys, and deserts.

Q3. If the Earth were smaller with the same density, what might happen to its atmosphere?

Answer: (ii) It would escape into space due to weaker gravity.

Explanation: A smaller Earth would have weaker gravity and might not be able to hold its atmosphere.

Q4. In sexual reproduction, why are offspring different from parents?

Answer: (iv) They get mixed instructions (genes) from both parents.

Explanation: Offspring inherit genes from both parents, creating variations.

Q.5. You notice tiny green plants growing in cracks on your school wall after the monsoon. Where do you think the seeds came from? What conditions helped these plants grow there?

Answer:
The seeds may have been carried by:

- Wind
- Birds

- Insects
- Rainwater

The conditions that helped them grow were:

- Adequate moisture from monsoon rains
- Warm temperature
- Sunlight
- Dust and organic matter accumulated in wall cracks

These factors provided a suitable environment for seed germination.

Q.6. A large patch of forest is cut down for roads and buildings. How might this affect water availability, climate, and biodiversity in the area?

Answer:

Water Availability:

- Reduced groundwater recharge
- Increased runoff and soil erosion
- Less rainfall due to reduced transpiration

Climate:

- Higher temperatures
- Reduced humidity
- Increased chances of drought

Biodiversity:

- Loss of habitat for plants and animals
- Migration or extinction of species
- Disturbance of food chains

Thus, deforestation negatively affects the environment and ecosystem balance.

Q.7. How would you respond to the statement, "The Earth has always had climate changes in the past, so today's global warming is nothing new"?

Answer:
Although Earth's climate has changed naturally in the past, today's global warming is occurring much faster due to human activities such as:

- Burning fossil fuels
- Deforestation
- Industrial emissions
- Vehicle pollution

Scientists have found that current warming rates are much higher than many natural climate changes of the past. Therefore, modern global warming is a serious environmental concern.

Q.8. Imagine Earth's magnetic field suddenly disappeared. What kinds of problems could arise for life on Earth?

Answer:
Without Earth's magnetic field:

- Harmful solar radiation would reach Earth directly.
- Communication and satellite systems could be damaged.
- The atmosphere may gradually escape into space.
- Living organisms could suffer from increased radiation exposure.
- Navigation systems used by migratory birds and animals would be disturbed.

The magnetic field acts as a protective shield for Earth.

Q.9. You are tasked with designing a new settlement for humans on Mars. Name three things you would need to recreate from Earth to support human life there. Which one is hardest to replicate, and why?

Answer:

Three essential things are:

1. A breathable atmosphere
2. Liquid water
3. Suitable temperature and food production system

Hardest to replicate: Atmosphere

Reason:
Creating an atmosphere with the correct composition of gases and maintaining it around an entire planet requires advanced technology and enormous resources.

Q.10. In a village, temperature has been increasing and rainfall has become unpredictable over the past few years. What could be causing this change? Suggest two ways the village could adapt.

Answer:

Possible causes:

- Climate change
- Deforestation
- Environmental pollution
- Excessive greenhouse gas emissions

Two adaptation measures:

1. Rainwater harvesting
2. Growing drought-resistant crop varieties

These measures help conserve water and ensure agricultural productivity.

Q.11. If there were no atmosphere on Earth, how would it affect life, temperature, and water on the planet?

Answer:

Without an atmosphere:

Life:

- No oxygen for respiration
- Living organisms would not survive

Temperature:

- Extremely hot during the day
- Extremely cold during the night

Water:

- Liquid water would evaporate or freeze
- Water cycle would stop

Thus, Earth would become unsuitable for life.

Q.12. Discuss five examples of vegetative propagation.

Answer:

Plant	**Method of Vegetative Propagation**
Potato	Stem tuber
Ginger	Rhizome
Onion	Bulb
Sugarcane	Stem cutting
Bryophyllum	Leaf buds

Definition:
Vegetative propagation is a type of asexual reproduction in which new plants grow from vegetative parts such as roots, stems, or leaves instead of seeds.

Advantages:

- Faster reproduction
- New plants are identical to the parent plant
- Useful for plants that do not produce viable seeds

DISCOVER, DESIGN AND DEBATE

Q1. Design an 'Earth Survival Kit'. What must it have to support life and why?

An Earth Survival Kit should contain:

Item	Importance
Water	Essential for life processes
Oxygen	Required for respiration
Food/Seeds	Source of energy
Fertile Soil	Supports plant growth
Sunlight	Needed for photosynthesis
Shelter	Protection from harsh conditions
Medicines	Prevent diseases
Plants	Produce oxygen and food

Conclusion: These factors make life possible and sustainable on Earth.

Q2. If the Moon had water, could plants grow there?

Plants would still face several challenges:

- No breathable atmosphere
- Extreme temperatures
- Very weak gravity
- Lack of fertile soil
- No natural protection from harmful solar radiation

Conclusion: Water alone is not enough. Plants need air, suitable temperature, nutrients, and sunlight in proper conditions.

Q3. Flowers are often brightly coloured and have a pleasant smell. How do these features help the plant reproduce?

Bright colours and fragrance attract pollinators such as:

- Bees
- Butterflies
- Birds
- Insects

These pollinators transfer pollen from one flower to another, helping in fertilization and seed formation.

Q4. Why do animals like fish and frogs lay hundreds or thousands of eggs while many birds lay only a few?

Fish and frogs provide little parental care, so many eggs are eaten by predators. Producing large numbers increases the chance that some survive.

Birds:

- Lay fewer eggs.
- Build nests.
- Protect and feed their young.

Thus, fewer offspring are needed because survival rates are higher.

Q5. Birds like sparrows care for their eggs, while reptiles like snakes usually do not. How does this affect survival?

Birds:

- Protect eggs and chicks.
- Feed young ones.
- Higher survival rate.

Snakes:

- Usually leave eggs unattended.

- Many eggs are destroyed or eaten.
- Lower survival rate.

Therefore, parental care improves the chances of survival.

Assessment Corner – Complete Solutions (In Sequence)

A. Tick (✓) the Correct Option

1. Earth is called a unique planet because it

(c) supports life

2. The layer of gases surrounding Earth is called

(c) atmosphere

3. Which planet is the hottest in the solar system?

(b) Venus

4. The zone where liquid water can exist is called

(b) habitable zone

5. About how much of Earth's surface is covered with water?

(c) 71%

6. Which gas is most important for breathing?

(c) Oxygen

7. The ozone layer protects Earth from

(c) ultraviolet rays

8. Vegetative propagation is a type of

(b) asexual reproduction

9. Which part of potato helps it grow into a new plant?

(c) Stem

10. Climate change is mainly caused due to

(b) pollution

B. Fill in the Blanks

1. Earth is also known as the **Blue** planet.
2. The protective force around Earth is called its **magnetic** field.
3. Plants prepare food using sunlight by **photosynthesis**.
4. The solid part of Earth is called the **geosphere**.
5. Reproductive cells are called **gametes**.
6. Long-term changes in weather are called **climate change**.

C. Decide Whether the Statements are True or False

1. Mercury has a thick atmosphere.

❌ **False**

2. The greenhouse effect helps keep Earth warm.

True

3. All planets have life on them.

❌ **False**

4. Ginger reproduces by vegetative propagation.

True

5. Ozone is harmful to life.

❌ **False**

6. Pollution affects only humans.

❌ **False**

D. Match the Following

Column A	Column B
1. Atmosphere	c) Layer of gases
2. Hydrosphere	a) All water bodies
3. Geosphere	d) Solid Earth
4. Ozone Layer	b) UV protection
5. Biosphere	f) Zone of life
6. Venus	e) Hottest planet

Answer:

1-c, 2-a, 3-d, 4-b, 5-f, 6-e

E. Answer the Following Questions in Brief

1. Why is Earth suitable for life?

Earth is suitable for life because it has:

- Air containing oxygen
- Liquid water
- Suitable temperature
- Fertile soil
- Protective atmosphere and ozone layer

These conditions support the survival of living organisms.

---

2. What is the greenhouse effect?

The greenhouse effect is the process in which certain gases in Earth's atmosphere trap heat from the Sun and keep the planet warm enough to support life.

---

3. What is vegetative propagation?

Vegetative propagation is a type of asexual reproduction in plants in which new plants grow from roots, stems, or leaves instead of seeds.

Examples: Potato, Ginger, Onion.

---

4. Name two roles of water in living organisms.

1. Water transports nutrients and minerals.
2. Water helps regulate body temperature.

---

5. What is the biosphere?

The biosphere is the part of Earth where living organisms exist. It includes land, water, and air that support life.

---

6. Why is the ozone layer important?

The ozone layer protects living organisms from harmful ultraviolet (UV) rays of the Sun.

F. Answer the Following Questions in Detail

1. Explain why Earth is called a unique planet.

Earth is called a unique planet because it is the only known planet that supports life. It has:

- Water in liquid form
- Oxygen-rich atmosphere
- Suitable temperature
- Fertile soil
- Protective ozone layer

These conditions make Earth different from other planets.

---

2. Describe the importance of air, water, and sunlight for life.

Air

- Provides oxygen for respiration.
- Supplies carbon dioxide for photosynthesis.

Water

- Essential for all life processes.
- Helps transport nutrients.
- Maintains body temperature.

Sunlight

- Provides energy to plants.
- Supports photosynthesis.
- Maintains Earth's climate.

Together, they sustain life on Earth.

---

3. Explain asexual reproduction in plants with examples.

Asexual reproduction is reproduction involving only one parent and no fusion of gametes.

Vegetative propagation is a common method.

Examples:

- Potato (stem tuber)
- Ginger (rhizome)
- Onion (bulb)
- Bryophyllum (leaf buds)

Advantages:

- Faster reproduction.
- Produces identical offspring.

---

4. Describe sexual reproduction in animals.

Sexual reproduction involves two parents. Male and female reproductive cells (gametes) fuse to form a zygote. The zygote develops into a new organism.

Examples:

- Humans
- Birds
- Mammals
- Fish

It produces variation among offspring.

---

5. What are the major threats to life on Earth?

Major threats include:

- Pollution
- Deforestation
- Climate change
- Habitat destruction
- Loss of biodiversity
- Excessive use of natural resources

These activities disturb ecosystems and endanger life.

---

6. How can humans help protect life on Earth?

Humans can protect life by:

- Planting more trees
- Conserving water
- Reducing pollution
- Recycling waste
- Using renewable energy

- Protecting wildlife habitats

These measures help maintain ecological balance.

G. Brain Teaser

1. If Earth were the size of an apple, where would all life exist and why?

All life would exist in an extremely thin layer on the surface of the apple, similar to the biosphere on Earth.

This is because:

- Life exists only where air, water, sunlight, and suitable temperatures are available.
- The biosphere forms only a thin layer around Earth.

---

2. Why can fish lay thousands of eggs but mammals usually give birth to only one or two babies?

Fish lay many eggs because:

- Most eggs are not protected.
- Many are eaten by predators.
- Survival rate is low.

Mammals produce fewer offspring because:

- They provide parental care.
- Young ones are protected and fed.
- Survival rate is higher.

Competency-Based Questions

A. Assertion–Reason Type

1.

Assertion (A): Earth has liquid water.
Reason (R): Earth lies in the habitable zone.

Answer: (a) Both A and R are true, and R is the correct explanation of A.

2.

Assertion (A): Venus is hotter than Mercury.
Reason (R): Venus has a thick carbon dioxide atmosphere.

Answer: (a) Both A and R are true, and R is the correct explanation of A.

3.

Assertion (A): The ozone layer is important.
Reason (R): It protects Earth from UV rays.

Answer: (a) Both A and R are true, and R is the correct explanation of A.

4.

Assertion (A): Reproduction is essential for life.
Reason (R): It ensures continuity of species.

Answer: (a) Both A and R are true, and R is the correct explanation of A.

5.

Assertion (A): Pollution affects ecosystems.
Reason (R): All Earth systems are interconnected.

Answer: (a) Both A and R are true, and R is the correct explanation of A.

6.

Assertion (A): Plants cannot survive without soil.
Reason (R): Soil provides nutrients.

Answer: (b) Both A and R are true, but R is not the correct explanation of A. (Some plants can grow without soil through hydroponics.)

B. Case Study Based Questions

1. Increased carbon dioxide causes

(b) global warming

2. Melting glaciers result in

(c) rising sea levels

3. Loss of biodiversity means

(c) fewer living organisms

4. Which action helps reduce pollution?

(c) Recycling

5. Protecting Earth is the responsibility of

(d) everyone

C. Art Integration

1. Earth Systems Diagram Explanation

- **Atmosphere:** Provides air and protects from harmful radiation.
- **Hydrosphere:** Supplies water for life.
- **Geosphere:** Provides land, minerals, and soil.
- **Biosphere:** Supports all living organisms.

All four systems interact and maintain balance on Earth.

---

2. Poster Description: "Earth – A Life Supporting Planet"

4–5 Lines:

Earth is our only known life-supporting planet. It provides air, water, food, and shelter to all living beings. Trees and oceans help maintain ecological balance.

We must reduce pollution and conserve natural resources. Protecting Earth today ensures a better future for tomorrow.

D. Critical Thinking

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1. Imagine Earth did not have a magnetic field. Explain how this would affect the atmosphere, ozone layer, and life on Earth. Do you think life could still survive? Give reasons for your answer.

Answer:

Earth's magnetic field acts like a protective shield that deflects harmful charged particles coming from the Sun.

If Earth had no magnetic field:

- The atmosphere would gradually be damaged by solar winds.
- The ozone layer could become weaker and less effective.
- Harmful ultraviolet (UV) rays would reach Earth's surface.
- Living organisms would be exposed to dangerous radiation.
- Satellites and communication systems could be severely affected.

Conclusion:
Life would become extremely difficult to survive because organisms would face harmful radiation, atmospheric loss, and unstable environmental conditions. Therefore, the magnetic field is essential for sustaining life on Earth.

---

2. Humans are responsible for climate change, but they can also help reduce its effects. In 4–5 lines, explain how small actions by individuals can make a big difference in protecting Earth's life-support systems.

Answer:

Small actions by individuals can collectively create a significant positive impact on the environment. People can plant trees, save electricity, conserve water, reduce plastic use, and recycle waste. Using public transport and renewable energy can reduce greenhouse gas emissions. When millions of people adopt

these habits, they help protect Earth's atmosphere, biodiversity, and natural resources for future generations.

E. Subject Link

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1. Explain how Earth's location in the solar system and its physical features like oceans, mountains, and landforms influence climate and the distribution of plants and animals across different regions.

Answer:

Earth is located in the **habitable zone** of the solar system, where temperatures are suitable for liquid water to exist. This makes life possible.

Earth's physical features also influence climate and biodiversity:

- **Oceans** regulate temperature and bring rainfall.
- **Mountains** block winds and create different climate zones.
- **Plains and fertile lands** support agriculture and dense vegetation.
- **Deserts** have less rainfall and support drought-resistant plants and animals.

As a result, different regions of Earth have different climates, leading to a variety of ecosystems and biodiversity.

---

2. Describe how human activities such as industrial growth and urbanisation affect Earth's natural resources and ecosystems and how responsible citizenship can help protect life on Earth.

Answer:

Industrial growth and urbanisation often lead to:

- Deforestation
- Air, water, and soil pollution
- Loss of wildlife habitats
- Depletion of natural resources

- Increased greenhouse gas emissions

These activities disturb ecosystems and threaten biodiversity.

Responsible citizenship can help by:

- Conserving water and energy
- Planting trees
- Reducing waste
- Recycling materials
- Using eco-friendly products
- Protecting wildlife and natural habitats

When people act responsibly, they help preserve Earth's resources and maintain ecological balance for future generations.