

Practice Exercise Solutions

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

Time to Assess (A1)

1. Zacharias Janssen (with his father Hans Janssen) is credited with inventing the first compound microscope (around 1590). Antonie van Leeuwenhoek later improved it and first observed living microbes.
2. Robert Hooke coined the term 'cell' in 1665 while observing cork under a microscope.
3. The nerve cell (neuron) is the longest cell in the human body.
4. The red blood cell (RBC) / egg cell is round in shape.
5. A group of similar cells working together is called a tissue.
6. Lactobacillus — converts milk into curd/yoghurt. Yeast — used in baking bread and in brewing (it ferments and produces CO₂/alcohol). (Rhizobium, which fixes nitrogen in the soil, is another example.)
7. Vibrio cholerae — causes cholera. Influenza virus — causes flu/influenza. (Salmonella causes typhoid; the chickenpox virus causes chickenpox.)
8. Cell → Tissue → Organ → Organ system → Organism. Cells group into tissues, tissues form organs, organs form organ systems, and together they make up the whole organism.
9. Activity — draw both cells. Two key differences: (1) A plant cell has a rigid cell wall outside the cell membrane; an animal cell has only a cell membrane. (2) A plant cell has a large central vacuole and chloroplasts; an animal cell has small or no vacuoles and no chloroplasts. Both share a nucleus, cytoplasm and cell membrane.

NCERT QUESTIONS

This section appears in the chapter under the heading 'Recent Questions'.

1. (c) Cell — the cell is the basic structural and functional unit of all living organisms.
2. (a) Amoeba — it is made of a single cell (the others are multicellular).
3. (i) Both A and R are true and R is the correct explanation of A — yeast ferments the dough and releases CO₂, which makes bread and cakes rise.
4. Bacterial diseases: Cholera, Typhoid, Tuberculosis. Viral diseases: Common cold, Chickenpox, Influenza.
5. Microorganisms are extremely tiny — far smaller than the eye can see. We can observe them with the help of a microscope, which magnifies them so their shape and structure become visible.

PRACTICE FOCUS —

A. Choose the most appropriate answer

1. b. Cell
2. c. Hans and Zacharias Janssen
3. a. Robert Hooke
4. c. Mushroom
5. c. Nucleus
6. c. Curdling milk
7. b. Antonie van Leeuwenhoek

B. Fill in the blanks

1. Microscope
2. Cytoplasm
3. Antonie van Leeuwenhoek
4. Nucleus

5. Yeast
6. Algae (microalgae / phytoplankton)
7. Cell wall
8. Penicillin

C. Match the following

1. c. Father of Microbiology (he coined the term 'cell')
→ c
2. a. Discovered living microbes → a
3. b. Discovered magnifying glass → b
4. d. Used in baking bread → d
5. e. Converts milk into curd → e
6. Provides rigidity to plant cells → f
7. g. Source of antibiotic (Penicillin) → g

D. Answer in one word (VSA)

1. Irregular (constantly changing) shape
2. Cell membrane
3. Amoeba (or Paramecium)
4. Cytoplasm
5. Rhizobium bacteria
6. Zacharias Janssen
7. Streptomycin (from Streptomyces bacteria)

E. Assertion and Reason

Options: a) Both A and R true, R correct explanation of A. b) Both true, R not correct explanation. c) A true, R false. d) A false, R true.

1. a — Both true and R correctly explains A.
2. a — Both true; R explains why viruses behave as living only inside a host.
3. d — A is false (cytoplasm is living), R is true.
4. d — A is false (microalgae are largely beneficial and produce oxygen), R is essentially true but does not make them harmful.
5. d — A is false (yeast is a fungus, not a bacterium), R is true.

HOTS

1. Lactobacillus bacteria present in milk multiply at room temperature and ferment the milk sugar (lactose) into lactic acid. The acid curdles the milk proteins, making it sour and thick. The responsible microorganism is Lactobacillus.
2. Disease-causing microbes (viruses such as SARS-CoV-2) spread through tiny droplets released when an infected person coughs, sneezes or talks. A mask acts as a physical barrier that traps these droplets, reducing the number of microbes entering or leaving the respiratory tract, and so lowers the chance of infection spreading.
3. Microbes (bacteria and fungi, the decomposers) break down organic waste into simple nutrient-rich humus. This natural recycling enriches the soil, reduces dependence on chemical fertilisers and manages waste — supporting sustainable development by recycling resources and protecting the environment.

Picture Based Assessment

- (1) The plant cell has a rigid cell wall outside the cell membrane, while the animal cell has only a cell membrane.
- (2) The plant cells are shown box-shaped/regular and joined together, whereas the animal cells are rounded/irregular. (Plant cells also contain large vacuoles and chloroplasts, which animal cells lack.)

Value and Life Skill Based

- (a) Decomposers — bacteria and fungi.
- (b) It recycles waste into useful manure, reduces garbage and pollution, and enriches the soil naturally.
- (c) The family shows environmental responsibility, awareness and a sense of caring for nature.

Case Study Based Assessment (curd formation)

1. Lactobacillus bacteria.
2. Lactobacillus grows and ferments milk best in warmth. In summer the warm temperature lets it multiply quickly and set the curd; in cold winter it grows too slowly, so the milk does not set.

3. Keep the inoculated milk in a warm place — wrap the container in a thick cloth, keep it near a warm spot or inside a casserole/oven with the light on — to provide the warmth the bacteria need.

Learn Holistically — Report on Microbes (cross-curricular)

1. Science

- Norovirus, Salmonella enterica and Listeria monocytogenes (also Campylobacter jejuni, E. coli).
- Yeast (*Saccharomyces cerevisiae*) ferments dough and is used to make bread, and produces alcohol in brewing. Lactobacillus converts milk into yoghurt/curd and is used in cheese making.
- A quality mark (like the British Lion mark) shows the product was produced under hygienic, controlled conditions with reduced risk of harmful microbes such as Salmonella, making it safer to eat.

2. English

- Microbes are both friends and foes in our food. As friends, yeast helps bread rise and Lactobacillus turns milk into curd and cheese, giving us tasty, nutritious food. As foes, microbes like Salmonella and Norovirus spoil food and cause foodborne illness with symptoms such as vomiting and diarrhoea. By storing food properly, cooking it well and keeping clean, we enjoy the friendly microbes while keeping the harmful ones away.
- Cause — eating food contaminated with harmful microbes; Effect — foodborne illness. Sentence: Because the leftover food was contaminated with harmful microbes (cause), the whole family suffered from food poisoning (effect).

3. Maths

- $100\% - 70\% = 30\%$ is caused by other microbes.
- Fraction = $140/200 = 7/10$. Percentage = $(140/200) \times 100 = 70\%$.
- Probability = $8/50 = 4/25 = 0.16$ (16%).

4. Art Integration

- Activity: Make a two-column poster. Left column 'Good Microbes' — draw bread, curd, cheese and label yeast and Lactobacillus. Right column 'Bad Microbes' — draw spoiled food and a sick person, label Salmonella and Norovirus. Add the slogan 'Some microbes feed us, some make us ill — choose clean food!'
- Activity: A chart with five icons — (1) Wash hands before eating, (2) Cook food thoroughly, (3) Store food in the fridge, (4) Keep raw and cooked food separate, (5) Check quality marks/ expiry dates. Title it 'Stay Safe — Eat Clean'.

Chapter 3: Health: The Ultimate Treasure

Time to Assess (A1)

- Tuberculosis and Cholera (also Influenza, Malaria, Chickenpox).
- Diabetes (a long-lasting non-communicable disease).
- Vector — female Anopheles mosquito; Pathogen — Plasmodium (the malaria-causing protozoan).
- Hepatitis (Hepatitis A/B).

NCERT QUESTIONS

- Communicable — Cold and flu, Typhoid, Chickenpox (they spread from person to person through a pathogen). Non-communicable — Diabetes, Asthma (they do not spread; caused by lifestyle/genetic/allergic factors).
- (c) (ii) and (iii) — Asthma and Diabetes are non-communicable.
- (i) Keep sick students home, isolate symptomatic ones, ensure handwashing/sanitiser, encourage masks, ventilate the classroom and inform parents and a doctor.
(ii) Politely suggest the friend rest at home and see a doctor, offer to share notes and wish them well — without being rude or making them feel bad.



- (iii) Wash hands often, avoid touching the face, cover coughs/sneezes, keep distance, wear a mask and stay home if you feel unwell.
4. (i) Before — consult a doctor, carry repellents, nets and prescribed medicines. During — sleep under nets, use repellents, wear full-sleeved clothes, avoid stagnant water. After — watch for fever/chills and see a doctor at once.
- (ii) Tell your sibling that mosquito nets and repellents stop the female *Anopheles* mosquito from biting, and so prevent the malaria parasite from entering the body.
- (iii) Ignoring advisories increases the risk of mosquito bites and catching malaria, which can cause high fever, weakness and serious illness.
5. (i) Gently share facts that smoking damages the lungs and can cause cancer and heart disease, say you care about his health, and encourage him to seek help to quit.
- (ii) Politely but firmly say 'No, thank you,' and move away or change the topic; you do not have to follow others.
- (iii) Schools can run awareness programmes, teach the harms of tobacco, encourage sports and hobbies, and provide counselling and peer support.
6. Vinita can ask: 'Do antibiotics work against viral infections like the common cold or flu?' (No — they work only against bacteria.) 'What happens if we take antibiotics for everything?' (It causes antibiotic resistance.) These show that antibiotics do not cure all infections.
7. Data: Jan 10, Feb 12, Mar 15, Apr 18, May 22, Jun 40, Jul 65, Aug 65, Sep 65, Oct 30, Nov 30, Dec 20. (i) Highest in July, August and September (65 each). (ii) Lowest in January (10). (iii) Monsoon/post-monsoon brings stagnant water where mosquitoes breed, plus warm humid weather — increasing dengue. (iv) Before the peak: remove stagnant water, fumigation/spraying, use nets and repellents, and run public awareness drives.
8. Key messages: Wash hands often; cover your cough; drink safe water and eat clean, balanced food; get vaccinated; exercise daily; avoid tobacco, alcohol and junk food; keep surroundings clean and water stagnation-free; and consult a doctor when ill.
9. Colds, cough and flu are caused by viruses, but antibiotics kill only bacteria — they have no effect on viruses. Taking them needlessly does not cure the illness and promotes antibiotic resistance, making the medicines less effective in future.
10. Hepatitis A, Poliomyelitis and Cholera spread through water contaminated with excreta. (Tuberculosis and Chickenpox spread through air, not water.)
11. On first exposure the body slowly makes antibodies and forms memory cells. When the same pathogen enters again, these memory cells recognise it instantly and produce antibodies much faster and in larger amounts, giving a quicker, stronger immune response.

PRACTICE FOCUS — A. Choose the most appropriate answer

1. b. Complete physical, mental and social well-being
2. b. Tuberculosis
3. b. Virus
4. c. Malaria
5. b. Diabetes
6. b. Drinking unboiled water
7. b. Bacterial infections

B. Fill in the blanks

1. Communicable (infectious)
2. Disease
3. Non-communicable
4. Malaria
5. Vaccination (vaccine)
6. Air Quality Index (AQI)
7. Lifestyle
8. Bacteria

C. State True / False (and correct the false ones)

1. False — Many diseases (diabetes, asthma) are non-communicable.
2. True
3. False — They cause non-communicable diseases such as cancer and heart disease.
4. False — Malaria spreads through the bite of the female Anopheles mosquito (a vector).
5. False — Vaccines strengthen immunity by preparing the body to fight specific germs.
6. True
7. False — Diabetes is non-communicable; it does not spread.
8. False — Health is complete physical, mental and social well-being, not merely the absence of illness.

D. Answer in one word (VSA)

1. Pathogen
2. Immunity
3. Female Anopheles mosquito
4. Liver
5. Deficiency disease (e.g., kwashiorkor / marasmus / anaemia)
6. Antibiotic
7. Vaccination (immunisation)
8. Hypertension

E. Assertion and Reason

1. a — Both true and R explains A.
2. b — Both true, but R is not the direct explanation of how it spreads.
3. a — Both true and R explains A.
4. d — A is false (they do not work on viruses), R is true.
5. a — Both true and R explains A.
6. d — A is false (mental health is closely linked to social well-being), R is true.

HOTS

1. Burning garbage releases harmful smoke and toxic gases that pollute the air, causing breathing problems, asthma, eye irritation and other illnesses for the whole community. It worsens air quality and can trigger respiratory diseases.
2. (Physical) A sports/yoga day and a healthy-tiffin contest; (Social) a community clean-up and team games; (Mental) a meditation session and a 'gratitude / no-screen' challenge with counselling talks.
3. She may develop physical problems (obesity, weak eyesight, poor posture, low fitness) and mental/ social problems (stress, poor sleep, less social interaction) — an overall lifestyle imbalance.

Picture Based Assessment

Picture 1 shows Tuberculosis (a communicable bacterial lung disease) — prevention: BCG vaccination, cover the mouth while coughing, good ventilation, complete the medicine course, avoid crowding. Picture 2 shows droplet/airborne spread of infection — prevention: wear masks, maintain distance, wash hands, cover sneezes and isolate infected people.

Value and Life Skill Based

Gargi is responsible, caring, socially aware and helpful. Such acts spread awareness, help others protect themselves, reduce the spread of disease and build a healthier, safer community — supporting collective well-being.

Case Study Based Assessment (cholera outbreak)

1. A water tank that had not been cleaned for months supplied contaminated water containing cholera bacteria.
2. Disease — Cholera; Pathogen — the bacterium *Vibrio cholerae*.
3. They boiled their drinking water, cleaned the tank regularly, ran awareness campaigns and followed proper hygiene.



4. Clean and disinfect water tanks regularly, drink only boiled/filtered water, maintain sanitation and hygiene, and spread awareness about safe water.

Learn Holistically — Swachh Bharat Abhiyan article (cross-curricular)

1. Science

- a. Decomposer microbes (bacteria and fungi) break down organic waste into simple humus/manure, recycling nutrients back into the soil.
- b. Hands carry germs that cause communicable diseases like diarrhoea, cholera and typhoid. Washing removes these pathogens and prevents them from entering the body through food.

2. Maths

- a. 80% have toilets → 20% still need them. 20% of 1,250 = 250 households.
- b. Increase = $1,50,000 - 75,000 = 75,000$. Ratio of increase = $75,000 : 75,000 = 1 : 1$ (i.e., it doubled / 100% increase).

3. Social Science

- a. To make India clean and open-defecation free by building toilets, promoting hygiene and changing sanitation behaviour.
- b. The TSC (1999) was a rural, supply/demand-driven sanitation programme focused on building facilities through education. The SBA (2014) was a nationwide flagship mission with a wider goal of a clean, open-defecation-free India, combining toilet building, waste management and large-scale public awareness.

4. G.K.

- a. Hygiene → cleanliness/sanitation; Initiative → campaign/mission; Participation → involvement; Awareness → consciousness/knowledge.
- b. Activity (sample): 'Good morning everyone. Our city is our home, and keeping it clean is my

duty too. I promise never to litter and to always use a dustbin. I will separate wet and dry waste, avoid plastic, and join clean-up drives in my locality. I will plant trees and remind my friends and family to keep public places tidy. A clean city means healthy people and fewer diseases. If each of us does our small part, together we can make our city the cleanest and the happiest place to live. Thank you.'

Chapter 4: Electricity: Magnetic and Heating Effects

Time to Assess (A1)

1. Resistance (its opposition to the flow of electric current).
2. Nichrome (an alloy with high resistance and high melting point).
3. Electric Fuse
4. Thermostat.
5. Electromagnet.

NCERT QUESTIONS

1. (i) Electrolyte. (ii) Magnet (electromagnet).
2. (i) False — dry cells are more portable than wet voltaic cells. (ii) True. (iii) False — more cells (more current) make a stronger electromagnet, so it attracts more clips.
3. (c) Both (i) and (ii) are correct — current produces both a heating effect and a magnetic effect.
4. (i) Voltaic cell → d (generates electricity by chemical reactions); (ii) Electric iron → c (works on heating effect); (iii) Nichrome wire → a (best suited for heater); (iv) Electromagnet → b (works on magnetic effect).
5. (ii) It generates more heat for a given current (because of its high resistance and high melting point).

6. Electric heaters are clean (no smoke or ash), do not cause indoor air pollution, are easy and safe to switch on/off, give controllable heat, and protect health and the environment — unlike firewood/charcoal which release harmful smoke and contribute to deforestation.
7. (i) Current flows from the positive terminal of the cell, around the coil, back to the negative terminal (mark the arrow in that loop direction). (ii) The current produces a magnetic field around the coil; this field exerts a force on the compass needle, deflecting it. (iii) Reversing the battery reverses the current and hence the magnetic field, so the compass needle deflects in the opposite direction.
8. Leaving it ON drained the cell, so the current became too weak to magnetise the iron nail — hence no lifting. The wire is still warm because even a small current produces the heating effect. Possible reasons: a discharged/weak battery, overheating reducing the current, or a loose connection.
9. (a) Lemon juice — it is an electrolyte (acidic) and conducts electricity, completing the circuit so the LED glows. Pure water is a poor conductor, so the LED does not glow in (b).
10. Yes, the coil will still deflect the compass because a current-carrying coil produces a magnetic field on its own. But without the iron core the field is weaker, so the deflection will be less than before.
11. (iv) In all four circuits — the magnetic effect depends on current flowing through the coil, not on the metal. All four are conductors carrying current, so each produces a magnetic field and deflects its compass (though strengths differ).
6. b. Mobile phones and laptops
7. b. A chemical solution that conducts electricity

B. Fill in the blanks

1. Resistance
2. Conductor (coil/wire)
3. Electric current
4. Anode
5. Carbon (graphite)
6. Ammonium chloride and manganese dioxide (with zinc chloride)
7. Waste (and cost)
8. Electric

C. Match the following

1. c. High resistivity
2. d. Used in wiring
3. b. Used in cranes
4. e. Melts on overheating
5. f. Positive terminal
6. g. Positive electrode in dry cell
7. a. Negative terminal of dry cell

D. Answer in one word (VSA)

1. Resistance
2. Fuse
3. Magnetic field
4. Electromagnet
5. Anode
6. Ammonium chloride paste
7. Lithium-ion battery
8. Electrolyte

E. Assertion and Reason

1. a — Both true and R explains A.
2. a — Both true and R explains A.
3. b — Both true, but R explains how to vary strength, not directly why they are used in bells/cranes.

PRACTICE FOCUS — A. Choose the most appropriate answer

1. d. Nichrome
2. c. Resistance produces heat energy
3. b. Low melting point
4. c. It melts and breaks the circuit
5. b. Electric current flows through the coil



4. a — Both true and R explains A.
5. a — Both true and R explains A.

HOTS

1. The old iron's heating element (nichrome coil) has aged — it may be partly worn, oxidised or have a changed resistance/loose contacts, so it converts electrical energy to heat less efficiently and heats up slowly.
2. With repeated charge–discharge cycles, chemical reactions inside the battery cause its electrodes and electrolyte to degrade. This reduces the charge it can store, so the battery drains faster and its efficiency falls.
3. The electromagnet with ten coils is stronger. The strength of an electromagnet increases with the number of turns of the coil (for the same current), so more turns give a stronger magnetic field.

Picture Based Assessment

(a) The heating effect of electric current. (b) A thermostat switches the current on and off to keep the iron at the set temperature; the indicator glows when current flows (heating) and turns off when the set temperature is reached — preventing overheating and saving energy.

Value and Life Skill Based

Risks: wasted electricity, higher bills, overheating and fire hazards, and shorter appliance life. Social impact: it wastes a shared resource and increases pollution from power generation. Switching off devices reflects responsibility, discipline and care for resources and the environment.

Case Study Based Assessment (copper wire warms up)

1. Even copper has a small resistance; as current flows, some electrical energy is converted into heat (the heating effect of current), so the wire becomes slightly warm.
2. Aluminium (like copper) has low resistance, so it conducts well and warms only slightly. Nichrome has high resistance, so it conducts less easily and

heats up much more for the same current.

3. The greater the resistance of a wire, the more electrical energy it converts to heat, so high-resistance wires (nichrome) get hotter than low-resistance wires (copper, aluminium).
4. Because they have low resistance, conduct electricity efficiently with little heat loss, and are relatively cheap and easily available.
5. Use low-voltage cells, switch off when not in use, avoid touching bare wires or wet hands, do not short-circuit cells, and work under teacher supervision.

Learn Holistically — 'The Electric World Around Us' (cross-curricular)

1. Science
 - a. Moving electrons collide with the metal atoms; this resistance converts electrical energy into heat, warming the wire. Appliances such as heaters, irons, geysers and toasters use this heating effect, controlled safely with thermostats and fuses.
 - b. Knowing that current makes an electromagnet, we could design devices like an automatic door lock, a magnetic crane to lift scrap, a doorbell, or a sorting machine that separates magnetic from non-magnetic waste — solving everyday problems.
2. English
 - a. Activity (sample): 'Gargi, Atri and Agastya built a simple circuit with a battery, wires and a bulb. As the bulb lit up, they observed the heating effect — the wire grew warm because electrical energy changed into heat through the interaction of moving electrons with metal atoms. A compass placed near the wire moved, showing the magnetic effect. They concluded that an electric current can produce both heating and magnetic effects. This simple interaction of electricity, energy and matter explains how everyday machines like heaters,

fans and bells work safely and usefully in our homes every day.'

- b. Activity (sample): 'Our school should switch to rechargeable batteries for all science projects. They can be used hundreds of times, so they save money in the long run and reduce the waste of throwing away dead cells. This protects our environment from harmful battery chemicals and teaches us to use resources wisely. Rechargeable batteries are reliable, eco-friendly and economical — a small, smart change that makes our science learning greener and more responsible.'

3. Social Science

Electricity transforms communities. It lights homes and schools, enabling children to study at night and improving education. It powers hospitals and clinics, improving healthcare; runs machines, pumps and small industries, creating jobs and income; and connects people through phones and the internet. Overall, these changes raise the standard of living and show how basic infrastructure like electricity drives social progress and economic growth.

Chapter 5: Exploring Forces

Time to Assess (A1)

Fill in the blanks

1. Muscular force
2. Friction (frictional force)
3. Newton (N)
4. Gravitational force (gravity)
5. Electrostatic force

NCERT QUESTIONS

The textbook numbers these questions Q1–Q7 and then Q9–Q10 (there is no Question 8 printed in the book).

1. (i) Muscular → b (a child lifting a school bag);
(ii) Magnetic → a magnet attracting iron;

(iii) Frictional → a (a cricket ball stopping on its own before the boundary);

(iv) Gravitational → c (a fruit falling from a tree);

(v) Electrostatic → d/e (balloon rubbed on woollen cloth attracting hair strands).

2. True or False.

(i) True.

(ii) False — friction decreases the speed.

(iii) False — charged objects exert an electrostatic force on each other.

3. They repel each other. Rubbing gives both balloons the same kind of (negative) charge, and like charges repel by electrostatic force.

4. The coin's weight is greater than the buoyant force of the water it displaces, so it sinks. The wooden block, being less dense, displaces enough water for the buoyant force to equal its weight, so it floats. Floating/sinking depends on weight versus buoyant force (density).

5. (i) Gravity acts downward (opposing motion) and air resistance acts downward too. (ii) Gravity acts downward (in the direction of motion). (iii) Gravity still acts downward; velocity is momentarily zero but the force of gravity continues to act.

6. (i) To stop before A — increase friction: use a rougher horizontal surface or a less smooth ball (or release from a lower point). (ii) To stop after A — decrease friction: use a smoother/polished surface (or release from a higher point on the incline so it has more energy).

7. Smooth surfaces have very little friction. Friction is what grips our feet to the ground; when it is too small, our feet slide and we lose balance and slip.

9. The Moon's gravitational pull is about one-sixth of Earth's, so the weight (= mass × gravity) becomes one-sixth. The mass stays the same everywhere — it does not become one-sixth, because mass is the amount of matter in the object.

10. The object that sinks deepest is the heaviest. The one floating highest (dipping least) is the lightest.



So the correct order is (ii) $w_1 > w_2 > w_3$ — object 1 (which dips most) is the heaviest and object 3 (which dips least) is the lightest.

PRACTICE FOCUS — A. Choose the most appropriate answer

1. c. Friction
2. b. Atri (the larger force; net force 200 N in Atri's direction).
3. c. Electrostatic force
4. c. Gravel road
5. b. Upward
6. c. Gravity
7. a. Adding them

B. Fill in the blanks

1. Newton (N)
2. Opposite
3. Attractive (pulling) force
4. Buoyant (upthrust)
5. Non-contact
6. Subtract
7. Floating and sinking (buoyancy and displacement)

C. State True / False (and correct the false ones)

1. False — Gravity always pulls objects downward (it is an attractive force).
2. False — Friction usually opposes motion (though it also helps us grip and walk).
3. True
4. False — Weight changes with gravity, but mass remains constant everywhere.
5. False — It is a non-contact force; it acts even without touching.
6. False — Buoyant force acts upward.
7. False — More friction makes movement harder (it opposes motion).

D. Answer in one word (VSA)

1. Friction

2. Gravity (gravitational force)
3. Electrostatic force
4. Magnetic force
5. Newton
6. Buoyant force
7. Spring balance

E. Assertion and Reason

1. a — Both true and R explains A.
2. d — A is false (weight varies), R is true.
3. a — Both true and R explains A.
4. a — Both true and R explains A.
5. a — Both true and R explains A.
6. a — Both true and R explains A.

HOTS

1. (1) Apply more force (push harder or take help). (2) Reduce friction — put rollers/wheels under the box or move it on a smoother surface.
2. Friction acted between the tyres and the road (and air resistance). These opposing forces gradually slow the bicycle until it stops.
3. Find the net force. The table moves in the direction of the larger force; if both forces are equal, the table stays still.

Picture Based Assessment

The box may be too heavy and the friction/its weight too large for the boy's force, so his applied force is not enough to overcome it. The force needed to move it is greater than the force he can apply, hence no motion (balanced forces).

Value and Life Skill Based

Floatation devices trap air and have low density, so they displace a large volume of water; the buoyant force keeps the person afloat instead of sinking. Understanding buoyancy helps design life jackets and boats, saving lives — showing how science serves society and the value of responsibility and care for others.



Case Study Based Assessment (vegetable vendor's cart)

1. Low friction on the smooth cement road made it easy to push.
2. The rough, soft mud greatly increased the friction (and the wheels sank), so a much larger force was needed and the cart slowed and got stuck.
3. Both forces act in the same direction, so they add up to give a larger net force, making it easier to move the cart.
4. Net force = $150\text{ N} + 120\text{ N} = 270\text{ N}$.
5. The cart's weight presses down on the soft mud, which cannot push back enough, so the wheels sink. The downward weight (gravitational force) opposes the upward reaction of the ground.

Performance Metrics (Competency Based)

1. b. Fly it against the wind to create lift
2. c. The air inside makes the body lighter by exerting an upward force (buoyancy).
3. c. 450 Newton (approx) — weight = mass $\times$ g = $45 \times 10 = 450\text{ N}$.
4. c. Gravel on road (roughest, so most friction).
5. b. Because buoyant force is equal or greater than the gravitational force.

Learn Holistically (cross-curricular)

Activity prompts (sample guidance).

Science: explain push/pull and friction using everyday examples. English: write a short paragraph using the words 'force', 'friction' and 'gravity'. Maths: calculate net force and weight (force = mass $\times$ g). Art: draw labelled diagrams of contact and non-contact forces acting on a moving object.

Chapter 6: Pressure, Winds, Storms and Cyclones

Time to Assess (A1) — Fill in the blanks

1. Pascal (Pa)
2. Pressure
3. Atmospheric pressure

4. Pressure (air pressure)
5. Decrease

NCERT QUESTIONS

- 1 (i) (d) Equal in all three vessels — connected liquids settle to the same level regardless of vessel shape.
(ii) (c) M will stick but N will not stick — the smooth surface lets air escape so atmospheric pressure holds M; the rough surface lets air leak in, so N falls off.
(iii)(a) Increase the height 'H' at which the tank is placed — greater height of the water column gives greater pressure.
(iv) (b) $P_A = P_B$, $F_A < F_B$ — pressure depends only on the height of the liquid, so it is equal; but B has a larger base area, so the force (= pressure $\times$ area) at its bottom is greater.
2. (i) True.
(ii) False — liquids exert pressure on the bottom and the sides.
(iii) False — the eye is calm; the region around it is stormy.
(iv) True — a closed metal car is relatively safe.
3. He sinks more when standing (Fig b) because his weight acts on the small area of his feet, so the pressure on the sand is high. Lying down spreads the same weight over a large area, lowering the pressure, so he sinks less.
4. Total area = $4 \times 0.25 = 1\text{ m}^2$. Pressure = Force $\div$ Area = $20000 \div 1 = 20000\text{ Pa}$ (20 kPa).
5. Boat A: weight = $5 \times 700 = 3500\text{ N}$; pressure = $3500 \div 7 = 500\text{ Pa}$. Boat B: weight = $3 \times 700 = 2100\text{ N}$; pressure = $2100 \div 3.5 = 600\text{ Pa}$. Boat B experiences more pressure, by $600 - 500 = 100\text{ Pa}$.
6. No. Lightning happens because air is an insulator, so huge charge builds up in clouds until it discharges suddenly as a spark. If air and clouds conducted well, charges would flow away gradually without building up, so there would be no sudden lightning flash.



7. Both balloons will bulge because water exerts pressure on them. But the lower balloon bulges more than the upper one, since liquid pressure increases with depth.
8. Warm ocean water heats the air, which rises and creates a low-pressure area. Surrounding cooler air rushes in; due to the Earth's rotation (Coriolis effect) the moving air begins to spin. As warm moist air keeps rising and condensing, it releases heat that fuels the system, and the rotating storm grows into a powerful cyclone.
9. During a summer afternoon a sea breeze blows from the sea towards the land (land heats faster, air above it rises, cool sea air moves in). The trees bend towards the land, so the side they lean towards (the direction the wind blows) is the land side.
10. Tie a deflated balloon to one end of a straw and an inflated balloon to the other end. Soon the air moves from the inflated (high-pressure) balloon to the deflated (low-pressure) one until both are the same size — showing air flows from high to low pressure.
11. A thunderstorm is a storm with lightning, thunder, strong winds and heavy rain. It forms when warm moist air rises rapidly, cools and condenses into towering cumulonimbus clouds. Inside, charges separate; their sudden discharge causes lightning and thunder, along with gusty winds and rain.
12. Inside storm clouds, water droplets and ice particles move and rub, separating positive and negative charges. When the charge difference becomes very large, it discharges suddenly as a giant spark between clouds or between cloud and ground — this is lightning.
13. Holes let strong wind pass through instead of pushing against the full surface. This reduces the wind pressure/force on the banner, so it is less likely to be blown away or torn.
2. d. High pressure to low pressure
3. d. Pointed heels (smallest area).
4. a. Difference in air pressure
5. d. Thunderstorms
6. b. Increase in depth
7. b. Electric charge separation in clouds

B. Fill in the blanks

1. High; low
2. Rises; sinks (descends)
3. Eye
4. Strong winds and heavy rain (with lightning and thunder)
5. High (more)
6. Weight (column)
7. Warm

C. State True / False (and correct the false ones)

1. False — Pressure decreases when area increases (pressure = force ÷ area).
2. True
3. False — Standing under a tall tree during lightning is dangerous; one should take proper shelter.
4. True
5. False — Warm air is lighter and rises; cold air sinks.
6. False — Storms can occur in any season, especially in warm, humid conditions.
7. False — Blunt knives have a larger edge area, so they exert less pressure; sharp knives exert high pressure.

D. Answer in one word (VSA)

1. Air (the atmosphere)
2. Wind (storm)
3. It creates a low-pressure area (and cool air rushes in)
4. Lightning conductor (lightning rod)
5. Land breeze

PRACTICE FOCUS —

A. Choose the most appropriate answer

1. b. Force ÷ Area



6. Lightning
7. Pressure difference (pressure-gradient force)

E. Assertion and Reason

1. c — A is true, but R is false (small area means pressure increases, which is why they cut better).
2. a — Both true and R explains A.
3. a — Both true and R explains A.
4. d — A is false (fast winds lower pressure), R is true.
5. d — A is false (the eye is calm) and R is false (pressure is lowest at the centre). [Best fit: A false, hence option d as R points to a false-to-A relation.]
6. b — Both true, but R is not the direct explanation of A (liquids exert pressure on the bottom and sides regardless).
7. a — Both true and R explains A.

HOTS

1. The pointed heels have a very small area, so her body weight produces very high pressure on a small spot of her feet/ground, causing pain.
2. Cyclones bring very strong winds, high waves and heavy rain over the sea, which can capsize boats and endanger lives, so fishermen are warned to stay away.
3. Pressing the pump pushes air out, creating low pressure (partial vacuum) inside. The higher outside pressure then pushes the blockage; repeated pressing and pulling moves the clog back and forth until it loosens and clears.

Picture Based Assessment

The phenomenon is a cyclone. The calm region at the centre is the eye of the cyclone. The swirling clouds around it are the cyclone's spiral bands. Two safety rules:

- (1) Move to a safe pucca shelter and stay indoors away from windows.
- (2) Keep emergency supplies ready, follow official warnings/evacuation orders and avoid the coast.

Value and Life Skill Based

Yes. Real survivor stories make the science of cyclones relatable and memorable, teach practical safety, and inspire courage, empathy and resilience. Combining values with science helps students stay calm in emergencies, help others and build emotional strength and a sense of community responsibility.

Case Study Based Assessment (village storm warning)

1. Uneven heating warms the air near the ground; it rises and forms a low-pressure region. Cooler, higher-pressure air rushes in to fill it, creating strong winds. Rising warm moist air condenses into clouds, releasing energy that develops into storms.
2. By valuing traditional weather signs alongside modern systems — inviting elders to share knowledge, explaining how science improves accuracy and early warning, and combining both so the community trusts and adopts the new system without feeling disrespected.
3. Keep emergency kits ready, secure roofs and loose objects, identify safe shelters, heed warnings, and help neighbours — especially the elderly and children. These actions show responsibility, care and community solidarity.

Learn Holistically (cross-curricular)

Activity prompts (sample guidance).

Science: explain pressure (force ÷ area) and wind formation with diagrams. **Maths:** calculate pressure from given force and area. **Social Science:** map cyclone-prone coastal regions of India (e.g., Odisha) and discuss disaster preparedness. **English:** write a short report or poster on cyclone safety measures.

Chapter 7: Particulate Nature of Matter

Time to Assess (A1)

Answer the following

1. Matter is anything that has mass and occupies space (has volume).



- The three states of matter are solid, liquid and gas.
- Light and heat (also sound, electricity) — they have no mass or volume.
- The interparticle space and the interparticle force of attraction decide the state of matter.
- Yes, matter can change its state on heating or cooling (e.g., ice → water → steam).

NCERT QUESTIONS

- (iv) closely packed in solids and move past each other in liquids.
- (i) True.
(ii) False — melting involves a decrease in attractions is correct in effect, but stated as transformation it should read 'melting weakens the interparticle attraction so particles move apart' — True (corrected: attractions become weaker).
(iii) True.
(iv) True.
(v) True.
(vi) False — on heating, camphor sublimates (turns to vapour); the smell spreads by diffusion of vapour particles, not energy 'released as smell'.
- (iii) Nothing of the chair will remain — matter is made entirely of particles, so removing all particles leaves nothing.
- Gas particles have large spaces between them and move freely and fast, so they diffuse and mix easily. Solid particles are tightly packed with strong attraction and only vibrate, so they cannot move around to mix.
- Milk is a liquid — its particles can move and slide past each other, so it flows and takes the shape of the surface. The glass tumbler is a solid — its particles are tightly held in fixed positions, so it keeps a fixed shape.
- Draw three boxes: (1) Ice (solid) — particles tightly packed in a regular pattern; (2) Water (liquid) — particles close but loosely arranged, able to slide; (3) Water vapour (gas) — particles far apart,

spread out and moving freely. Arrows show melting (solid→liquid) then evaporation/boiling (liquid→gas) as heat is added.

- (i) Aluminium foil (solid) — particles drawn tightly packed in a regular, fixed pattern.
(ii) Glycerin (liquid) — particles close together but irregularly arranged.
(iii) Methane gas — particles drawn far apart, scattered and free-moving.
- The solid wax at the base (tightly packed particles), the molten liquid wax near the wick (close, loosely packed particles), and the wax vapour/smoke rising (widely spaced, free particles) — matched respectively to the closely packed, slightly spaced, and far-apart particle diagrams in Fig b.
- The salt has dissolved in the water — its tiny particles have spread out and fit into the spaces between the water particles, so they are too small to be seen but still give a salty taste.
- They are solids. Each individual grain or flour particle keeps its own shape and volume; only the loose heap appears to take the container's shape because the small solid pieces rearrange. A true liquid flows as a continuous substance, which they do not.

PRACTICE FOCUS — A. Choose the most appropriate answer

- d. Intermolecular space
- a. Solid
- c. Maximum intermolecular space
- c. Diffusion
- b. 0°C
- b. They have intermolecular space
- b. Boiling point

B. Fill in the blanks

- Mass and volume (occupies space)
- Molecule (particle)
- Least (minimum)

4. Maximum (largest)
5. Fluids
6. 100°C
7. Increases

C. Match the following

1. g. Strong particle attraction
2. c. Indefinite shape
3. a. High compressibility
4. d. 0°C melting point
5. e. Movement of particles
6. f. Contains trapped air
7. b. Very high diffusion

(NOTE: rigidity best matches 'strong attraction'; per the textbook ordering, final key below.)

D. Answer in one word (VSA)

1. Interparticle (intermolecular) force of attraction
2. Fluidity
3. Gas
4. Melting point
5. Liquid
6. Intermolecular space
7. Diffusion

E. Assertion and Reason

1. a — Both true and R explains A.
2. a — Both true and R explains A.
3. c — A is true, R is false (solids have minimum space).
4. a — Both true and R explains A.
5. a — Both true and R explains A.
6. a — Both true and R explains A.
7. a — Both true and R explains A.

HOTS

1. The burning agarbatti releases vapour/smoke particles that move and spread by diffusion, mixing

with air particles and travelling all the way to the balcony, so the smell reaches Gargi.

2. In warm water the particles have more kinetic energy and move faster, so they collide with and separate the sugar particles more quickly, speeding up dissolving.
3. A sponge has lots of trapped air (large spaces) that can be squeezed out, so it compresses easily. A cricket ball is a tightly packed solid with very little space between particles, so it cannot be compressed.
4. Heating gives particles more energy. In ice (solid) particles only vibrate; on melting they gain energy, spaces increase and they slide as liquid water; on further heating they move very fast, spread far apart and escape as steam (gas).

Picture Based Assessment (interconversion of states)

Solid → Liquid = Melting; Liquid → Solid = Freezing; Liquid → Gas = Evaporation/Boiling (Vaporisation); Gas → Liquid = Condensation. Particle drawings: Solid — tightly packed regular; Liquid — close but loose/random; Gas — far apart and free-moving. (Solid ↔ Gas directly = Sublimation/Deposition.)

Value and Life Skill Based

Resources like water and food are limited and precious; using them carefully avoids waste and saves them for others and the future. At home and school we can show this value by closing taps, not wasting food, switching off lights and reusing materials — acting responsibly toward nature.

Case Study Based Assessment (boiling water)

1. The bubbles are water vapour (gas) forming throughout the liquid — they show the water has reached its boiling point and is turning into vapour.
2. Evaporation is slow, happens only at the surface and at any temperature below boiling; boiling is rapid, happens throughout the liquid and only at the boiling point.
3. Temperature, surface area, humidity and wind/air movement (higher temperature, larger



surface, lower humidity and more wind increase evaporation).

Learn Holistically (cross-curricular)

Science

1. Shape, volume and compressibility — solids have fixed shape and volume and are least compressible; liquids have fixed volume but no fixed shape; gases have neither fixed shape nor volume and are most compressible. These arise from particle spacing and movement.
2. Heat gives the ice particles more energy; the interparticle attraction weakens and the spaces increase, so the fixed particles begin to move and slide — changing the solid into liquid water.
3. It demonstrates that a liquid has no fixed shape — it takes the shape of its container (fluidity).

Maths

1. Ratio = 0.1 : 1.0 = 1 : 10.

English

1. Solid, liquid, gas (also water, table, air).
2. Sample: 'A solid keeps its own shape and volume, and a gas spreads out to fill space.' — conjunction: and.

Performance Metrics (Competency Based)

Identify everyday examples of solids, liquids and gases and justify by particle arrangement; predict what happens to particle spacing on heating/cooling; explain why gases are compressible but solids are not — in each case answer using interparticle space and force of attraction.

Chapter 8: Elements, Compounds and Mixtures

Time to Assess (A1)

Fill in the blanks

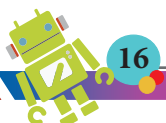
1. Heterogeneous
2. A compound
3. Solution (homogeneous mixture)

4. Metalloids
5. Semiconductors (e.g., silicon)

NCERT QUESTIONS

The textbook numbers these questions Q1–Q8 and then Q10–Q12 (there is no Question 9 printed in the book).

1. (iv) A and B are elements, C is a compound and has a fixed composition. (A and B cannot be broken down, so they are elements; their combination C is a compound with fixed composition.)
2. (i) Both Assertion and Reason are true and Reason is the correct explanation for Assertion.
3. In water the hydrogen and oxygen are chemically combined in a fixed ratio, forming a new substance with its own properties (a liquid that puts out fire). This is unlike the elements themselves — hydrogen burns and oxygen supports burning — showing a compound's properties differ from those of its constituent elements.
4. (iii) is correct — carbon dioxide, iron, oxygen and sugar are all pure substances. (i) is wrong: water and air are not elements. (ii) is wrong: minerals and air are not all uniform mixtures. (iv) is wrong: air and brass are uniform (homogeneous) mixtures, not non-uniform.
5. Iron — element; moist air (oxygen + water) — mixture/element; iron oxide — compound. Magnesium — element; oxygen — element; magnesium oxide — compound. (Reactants are elements; the products formed by chemical combination are compounds.)
6. **Elements:** aluminium, gold, oxygen, nitrogen, sulphur, hydrogen. **Compounds:** carbon dioxide, magnesium oxide, rust (iron oxide), iron sulphide, glucose, water, sodium chloride, baking soda. **Mixtures:** sand, seawater, muddy water, air, fruit juice.
7. Heating forms iron sulphide, a compound, in which iron and sulphur are chemically combined



in a fixed ratio — it is non-magnetic and cannot be separated by a magnet, unlike the original mixture (where a magnet pulls out the iron). Word equation: Iron + Sulphur → Iron sulphide.

8. No. An element is made of only one kind of atom and cannot be broken down chemically, while a compound is made of two or more elements chemically combined. A substance cannot be both at once.
10. Gas A is hydrogen. Word equation: Iron + Hydrochloric acid → Iron chloride + Hydrogen.
11. Carbon dioxide (CO₂) — used in fire extinguishers and in fizzy drinks. Water (H₂O) — used for drinking and for cleaning. (Also possible: ammonia, methane.)
12. Gold is a metal because it has metallic properties (shiny, malleable, conducts). It is also a mineral because it occurs naturally in the Earth's crust as a native element that can be mined — so it is both.

PRACTICE FOCUS — A. Choose the most appropriate answer

1. c. Pure substance
2. d. Sodium chloride (a compound).
3. c. Electrolysis
4. c. Carbon dioxide
5. c. O₂
6. c. Silicon
7. c. Has fixed composition

B. Fill in the blanks

1. Homogeneous mixture (solution)
2. Chemical
3. Atom
4. Water vapour (and other gases like argon)
5. S₈ (eight sulphur atoms)
6. Pure substance
7. Semiconductors (electronic chips)

C. State True / False (and correct the false ones)

1. False — Only some can; many need filtration, evaporation, etc.
2. True
3. False — Elements cannot be broken down into simpler substances by chemical reactions.
4. False — Air is a homogeneous mixture.
5. False — Most metals occur chemically combined in minerals/ores.
6. True
7. False — A molecule of an element (e.g., O₂) is not a compound; all compounds are molecules but not all molecules are compounds.

D. Answer in one word (VSA)

1. Silicon and germanium
2. Molecule
3. Element (a metal)
4. Adulterants
5. Common salt (table salt)
6. As a molecule, N₂ (a gas)
7. Carbon (charcoal/black residue)

E. Assertion and Reason

1. a — Both true and R explains A.
2. b — Both true, but R is not the correct explanation of A.
3. d — A is false (fruit salad is heterogeneous), R is essentially false/not applicable, but best fit: A is false. (Choose d if R is read as a true general statement.)
4. a — Both true and R explains A.
5. d — A is false (brass is a mixture/alloy), R is false too — best fit: A false; brass is a mixture, not chemically bonded.
6. c — A is true, but R is false (some elements exist as single atoms, e.g., noble gases).
7. a — Both true and R explains A.



HOTS

1. An alloy like the ring is gold mixed with other metals (e.g., copper) without any chemical bonding; the metals keep their own properties and can be separated by physical/metallurgical means, and the proportion is not fixed — so it is a mixture, not a compound.
2. Air is a mixture — its gases (nitrogen, oxygen, etc.) are not chemically combined, have no fixed ratio, keep their own properties and can be separated physically. So air is a mixture, not a compound.
3. Brass is a mixture (alloy) of copper and zinc. Students can reason that the metals are not chemically combined in a fixed ratio, retain their properties, and can be separated physically — so it is a mixture, not a compound.

Picture Based Assessment

Water (H_2O) — molecule of a compound (different atoms bonded). Oxygen (O_2) — molecule of an element (same atoms bonded). A single oxygen sphere — an element/atom. Difference: an element is one kind of atom; a molecule of an element joins same atoms; a molecule of a compound joins different atoms chemically.

Value and Life Skill Based

The dilemma is saving money versus protecting health, soil and safety. I would recommend not using adulterated fertilizers, because cheap adulterants can harm crops, soil and people's health. Honesty, responsibility and care for community health and the environment matter more than short-term savings.

Case Study Based Assessment (water samples)

1. Distilled water — a pure compound. Tap water — a homogeneous mixture (water with dissolved minerals). Fruit juice — a mixture (mostly homogeneous). Muddy water — a heterogeneous mixture (water + insoluble soil).
2. Filtration to remove insoluble solids (like mud), and distillation/evaporation-condensation to obtain pure water from dissolved impurities.

(Sedimentation and decantation can also be used first.)

3. Pure water prevents waterborne diseases like cholera and typhoid, keeps people healthy and supports overall wellbeing and development of a community.

Learn Holistically / Performance Metrics (cross-curricular & competency)

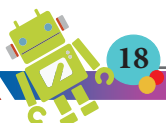
Performance Metrics (sample answers).

1. Salt mixed in water → d. The mixture is homogeneous and salt can be recovered by evaporation.
2. Food adulteration most compromises → a. Its chemical composition.
3. Rainwater vs tap water → b. Tap water is a pure substance? No — rainwater is a mixture including dissolved impurities (rainwater carries dissolved gases/impurities).
4. Heating sugar gives water vapour then black carbon → b. Sugar is a compound made of multiple elements.
5. Metalloid in daily life → d. Installing a silicon chip in a computer.
6. Responsible citizenship → b. Spreading awareness about food adulteration and checking for purity.

Chapter 9: The Amazing World of Solute, Solvent and Solution

NCERT QUESTIONS

1. (i) False — gases are less soluble in hot water.
(ii) False — sand does not dissolve; it is a suspension/heterogeneous mixture, not a solution.
(iii) False — the space occupied is called volume, not mass.
(iv) False — a saturated solution holds the maximum solute; an unsaturated one holds less.
(v) True — air is a homogeneous mixture (gaseous solution).



2. (i) Immersed/dipped; rise (change).
(ii) Solute; solvent.
(iii) Decreases.
(iv) Saturated.
3. (ii) Water is denser than oil — the less dense oil floats on the denser water.
4. Density = mass $\div$ volume = $225 \div 90 = 2.5 \text{ g/cm}^3$. Since this is greater than the density of water (1 g/cm^3), the sculpture will sink.
5. (iii) No more solute can be dissolved into the saturated solution at that temperature is correct — that is the definition of a saturated solution.
(i) is wrong (a saturated solution cannot dissolve more);
(ii) is wrong (an unsaturated solution can still dissolve more);
(iv) is wrong (saturation is not limited to high temperatures).
6. 2 litres = 2000 mL. $2000 - 500 = 1500 \text{ mL}$ (1.5 litres) more.
7. Density = $400 \div 40 = 10 \text{ g/cm}^3$.
8. The unpeeled orange's spongy peel traps air, lowering its overall density below water, so it floats. Peeling removes this air, so the orange becomes denser than water and sinks.
9. Density of A = $200 \div 40 = 5 \text{ g/cm}^3$. Density of B = $240 \div 60 = 4 \text{ g/cm}^3$. Object A is denser.
10. The density stays the same ($120 \div 60 = 2 \text{ g/cm}^3$). Changing shape does not change the mass or volume, so density is unchanged.
11. Volume = mass $\div$ density = $600 \div 7.9 \approx 75.95 \text{ cm}^3$ (about 76 cm^3).
12. Heating makes the liquid expand, so its volume increases while its mass stays the same. Therefore its density decreases.

PRACTICE FOCUS — A. Choose the most appropriate answer

1. b. Solute dissolves completely in solvent

2. b. It dissolves most solutes
3. b. Saturated
4. b. Increases with increase in temperature
5. b. kg/m^3
6. b. Increases
7. b. Has less density

B. Fill in the blanks

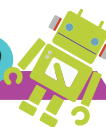
1. Homogeneous
2. Solute
3. Solubility
4. Saturated
5. Less
6. No (it is unitless)
7. Millilitres / litres (mL)

C. State True / False (and correct the false ones)

1. False — Solubility of most solids increases with temperature.
2. False — A diluted solution contains less solute (more solvent).
3. True
4. False — Density of water is about 1 g/cm^3 .
5. False — Pressure affects gases much more than solids.
6. False — A saturated solution cannot dissolve more solute unless heated.
7. False — Relative density is a ratio and has no unit.

D. Answer in one word (VSA)

1. Relative density (specific gravity)
2. Displacement method (water displacement)
3. Density
4. Dilute (unsaturated) solution
5. Density
6. When pressure increases (or temperature decreases)
7. Least count



E. Assertion and Reason

1. a — Both true and R explains A.
2. d — A is false (relative density has no unit), R is true.
3. a — Both true and R explains A.
4. c — A is true, but R is false (hot air becomes less dense).
5. a — Both true and R explains A.
6. c — A is true, but R is false (under pressure gas particles move closer, not farther).

HOTS

1. Underwater, the weight of the water column above presses down, increasing pressure with depth (water is dense). This high pressure compresses the gas in his oxygen tank, increasing its density, which is why he feels heavy pressure and his air is used up faster at depth.
2. The log that floats is less dense than water; the one that sinks slightly is denser (its wood is heavier/contains more water). Same volume but different mass means different density, deciding floating or sinking.
3. The one with carbon dioxide is heavier, because CO_2 is denser (heavier per unit volume) than ordinary air, so the same volume has more mass.

Picture Based Assessment

The flask with little solute is a dilute (unsaturated) solution; the one with more dissolved solute is concentrated; the one with extra undissolved solute settled at the bottom is saturated/supersaturated. As solute increases, the solution becomes more concentrated until it is saturated and no more dissolves.

Value and Life Skill Based

Knowing that insoluble powders pollute water, people can choose natural, biodegradable colours and avoid throwing waste into ponds. Responsible actions — using safe products, cleaning up and spreading awareness — protect water sources and show environmental care.

Case Study Based Assessment (iceberg)

1. Ice is less dense than liquid water, so the buoyant force supports it and it floats despite its large mass.
2. The relative density of ice (about 0.9) is less than 1, meaning ice is lighter than the water it displaces, so it floats.
3. Because the densities are close, the iceberg must displace a large volume of water to balance its weight, so about 90% stays submerged and only ~10% shows above the surface.
4. Colder seawater is denser (sinks) and warmer seawater is less dense (rises); salt content also raises density.
5. Knowing most of an iceberg is hidden underwater, ships use sonar and density/temperature data to detect submerged ice and keep a safe distance.

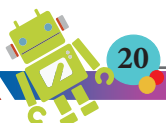
Learn Holistically / Performance Metrics (cross-curricular & competency)

Learn Holistically — Hot air balloon (sample).

Heating the air inside lowers its density below the surrounding air, creating lift so the balloon rises; cooling the air increases its density and the balloon descends — this links density, temperature and buoyancy.

Performance Metrics (sample answers).

1. Solid rubber vs air-filled ball (same volume) → c. The rubber ball will sink and the air-filled ball will float due to density differences.
2. Ship floats, nail sinks → d. Ship lowers its overall density by enclosing air.
3. LPG cylinder feels heavier in winter → b. Temperature affects density and pressure inside the cylinder.
4. Submarine rises when water removed → c. Removing water decreases density.
5. Sealed bottle crushed at sea level → c. Outside air pressure is higher at sea level.
6. Lake freezes top to bottom → c. Water is densest at 4°C , causing colder water to rise and freeze.



Chapter 10: Mirrors and Lenses

NCERT QUESTIONS

1. By the law of reflection, the reflected ray also makes 40° with the normal, so the angle with the mirror = $90^\circ - 40^\circ = 50^\circ \rightarrow$ option (ii).
2. (i) Angle of incidence = 0° , so angle of reflection = 0° — the ray reflects straight back along the normal. (ii) Same — ray along the normal, angle of reflection = 0° , reflects back on itself. (iii) Angle of incidence = 20° , so angle of reflection = 20° , drawn on the other side of the normal.
3. Image (i) — Plane mirror (same size, erect). Image (ii) — Convex mirror (smaller, erect). Image (iii) — Concave mirror (larger/inverted depending on distance).
4. Image (i) — Convex lens (magnified/enlarged). Image (ii) — Concave lens (diminished, erect). Image (iii) — Flat transparent glass piece (same size). (Per the textbook key: i = flat glass, ii = convex, iii = concave depending on labelling.)
5. (ii) Angle of incidence is 0° . The ray strikes along the normal, so both the angle of incidence and angle of reflection are 0° and the ray reflects straight back.
6. The mirror giving an image of the same size is the plane mirror; the one giving a magnified/curved image (lines appear larger) is the concave mirror; the one giving a diminished, wider image is the convex mirror.
7. (iv) Her erect image keeps increasing in size — a convex mirror always forms an erect, diminished image, and as she approaches, the image grows but stays erect.
8. Close to the text the letters appear larger and erect; as the lens is moved away, the image enlarges, blurs and then becomes inverted. A magnifying glass is a convex (converging) lens.
9. (i) Concave mirror $\rightarrow$ a (spherical mirror with reflecting surface curving inwards).
(ii) Convex mirror $\rightarrow$ b (image always erect and diminished).
- (iii) Convex lens $\rightarrow$ c (object placed in front may appear inverted at some distance).
- (iv) Concave lens $\rightarrow$ d (object always appears diminished).
10. (i) Both Assertion and Reason are correct and Reason is the correct explanation of Assertion.
11. (i) Figure (a) indicates a plane mirror and Figure (b) indicates a concave mirror — a plane mirror gives an equal erect image behind it, while a concave mirror can give a different-sized image on the same side.
12. The water-filled tumbler acts like a convex lens. Light bends (refracts) as it passes through the curved water surface, so the pencil's part seen through the water appears bent, magnified or even reversed compared with the part above the water.

PRACTICE FOCUS — A. Choose the most appropriate answer

1. b. Diverging mirrors
2. b. Very close (between the pole and the focus).
3. b. Concave mirror
4. c. Angle of incidence
5. b. Diminished and erect image
6. b. Convex mirror
7. d. All types of mirrors

B. Fill in the blanks

1. Converging
2. Incident
3. Erect (virtual) and diminished
4. Reflection
5. Concave
6. Wider (larger)
7. Plane

C. State True / False (and correct the false ones)

1. False — A convex mirror always forms a diminished image.
2. True



3. True
4. True
5. False — They apply to all mirrors (plane, concave and convex).
6. True
7. True

D. Answer in one word (VSA)

1. Convex mirror
2. Normal
3. Concave mirror
4. Concave (biconcave) lens
5. Virtual, erect and diminished image
6. Focus (principal focus)
7. Concave mirror

E. Assertion and Reason

1. a — Both true and R explains A.
2. d — A is false (concave lens forms diminished images), R is true.
3. a — Both true and R explains A.
4. c — A is true, but R is false (a convex mirror forms virtual images, not real).
5. a — Both true and R explains A.
6. a — Both true and R explains A.

HOTS

1. A convex mirror is used. It always forms a small, erect image and covers a wide field of view, letting the driver see more traffic behind in a small mirror — improving safety.
2. A concave mirror is a converging mirror — it focuses parallel sun rays to a single point (focus), concentrating heat there. The food placed at the focus gets very hot and cooks.
3. As the tree (object) moves closer, the image moves farther from the lens, becomes larger, and remains real and inverted — until the object is very close, when the image becomes virtual, erect and magnified.

4. A concave mirror forms a magnified image and only a narrow field of view, and can form inverted/real images, giving a wrong idea of the distance and position of vehicles — which is unsafe. A convex mirror, giving an erect, diminished, wide-angle view, is the correct choice.

Picture Based Assessment

The mirror that converges parallel rays to a real focus in front is a concave mirror; the one that makes parallel rays diverge (appearing to come from a focus behind) is a convex mirror. Label: incident rays, reflected rays, principal axis, normal, and focus (F).

Value and Life Skill Based

Convex mirrors give a wide field of view, letting drivers and pedestrians see around blind corners and avoid collisions. Installing them shows the authorities care for public safety, accident prevention and community well-being.

Case Study Based Assessment (school crosswalk mirror)

1. A convex mirror is installed, because it gives a wide field of view and an erect image, letting road users see approaching vehicles from many directions — which a flat (plane) mirror cannot.
2. Its outward-curved (diverging) surface spreads the reflected rays, covering a large area in a small mirror so people can spot vehicles at the blind crossing and stop in time.
3. Water stains, blur and dirt make the image unclear, so road users cannot see approaching vehicles properly — increasing the risk of accidents at the crossing.

Learn Holistically / Performance Metrics (cross-curricular & competency)

Learn Holistically (sample).

Light follows the laws of reflection at mirrors, forming real or virtual images: concave mirrors can magnify (used in torches, shaving and dentist mirrors) while

convex mirrors give smaller, wider views (used in vehicles). Lenses bend light by refraction — convex lenses converge and magnify, concave lenses diverge and diminish.

Performance Metrics (sample answers).

Typical competency items: choose the right mirror/lens for a given use (rear-view → convex; solar cooker/dentist → concave; magnifier → convex lens); explain why, using converging/diverging behaviour and the nature of the image (real/virtual, erect/inverted, enlarged/diminished).

Chapter 11: Keeping Time with The Skies

NCERT QUESTIONS

- (i) True.
 - (ii) False — the Moon's phases are caused by which part of the sunlit Moon faces us, not by Earth's shadow (that causes eclipses).
 - (iii) True.
 - (iv) False — the Moon can sometimes be seen during the day too.
- No. The full Moon follows the lunar cycle (about 29.5 days), while a birthday follows the solar calendar date. The two cycles do not match, so the full Moon will not fall on 6th May every year.
- (1) A star is shown inside/between the horns of the crescent Moon — stars are far behind, never in front of the Moon.
 - (2) The bright and dark parts are wrongly placed — the curved bright edge should face the Sun's direction (the lit side and the dark side are drawn incorrectly).
- (i) Match each labelled photo to its description — the fully bright disc = Full Moon; the fully dark disc = New Moon; the thin growing crescent = three days after New Moon; the shrinking gibbous = three days after Full Moon; the half-lit (last quarter) = a week after Full Moon.
 - (ii) The far side of the Moon is never seen from Earth, because the Moon rotates and revolves at the same rate (it always shows us the same face).
- A Moon high overhead at sunset is about the first-quarter (half) Moon. It is in the waxing phase (growing brighter toward Full Moon).
- Kaushalya is telling the truth — a waxing gibbous Moon does rise in the afternoon and is seen in the east. A crescent Moon stays near the Sun and sets soon after sunset in the west, so it cannot rise in the east at sunset as Ravi claims.
- Less often — as the Moon slows, the lunar month lengthens and comes closer to the solar month, so the gap that the extra month corrects builds up more slowly, needing the intercalary month less frequently.
- A solar calendar has 12 months, so over 3 years there are 36 months. But there are 37 full moons. By the pigeonhole principle, since 37 full moons must fit into 36 month-slots, at least one month must contain two full moons.
- A Moon visible all night, from sunset to sunrise, is the Full Moon (it rises at sunset and sets at sunrise).
- Without leap years we lose about $\frac{1}{4}$ day each year, drifting roughly one day every 4 years. To shift the date by about half a year (≈ 183 days) into winter would take about $183 \times 4 \approx 730$ years (around 700+ years).
- Artificial satellites are launched for communication, weather forecasting, broadcasting, navigation (GPS), remote sensing, scientific research and Earth observation.
- (i) Day — the rotation of the Earth on its axis.
 - (ii) Month — the revolution of the Moon around the Earth (phases).
 - (iii) Year — the revolution of the Earth around the Sun.

PRACTICE FOCUS — A. Choose the most appropriate answer

- c. Revolution of the Moon around Earth
- b. 29.5 days
- b. Solar cycle
- b. Adhik Masa



5. b. 1957
6. a. Chaitra
7. c. The Moon's orbit is slightly tilted

B. Fill in the blanks

1. Waxing
2. A Full Moon
3. 24 hours (one day)
4. 365
5. February
6. New Moon
7. Natural satellite

C. Match the following

1. b. Increasing brightness
2. a. Decreasing brightness
3. c. Extra month added in luni-solar calendar
4. d. First month of Saka calendar
5. e. Occurs on new Moon day
6. f. Moon fully illuminated

D. Answer in one word (VSA)

1. Solar calendar
2. Luni-solar calendar
3. Phalguna
4. Full Moon
5. New Moon
6. Aryabhata
7. Lunar eclipse

E. Assertion and Reason

1. a — Both true and R explains A.
2. d — A is false (the Gregorian calendar does have leap years), R is true.
3. a — Both true and R explains A.
4. a — Both true and R explains A.
5. d — A is false (it begins with Chaitra, aligned to the spring equinox), R is false too — best fit: A false.

6. d — A is false (the lunar month ~29.5 days is shorter than the solar month ~30–31 days), R is true.

HOTS

1. She should observe the days between New Moon and Full Moon (roughly days 1–14), because in this period the bright part of the Moon grows larger each night — that is the waxing phase.
2. Knowing the Moon rises about 5 minutes (actually ~50 minutes) later daily, he can predict when it will appear each night and choose Moon-free nights for observing faint stars, or moonlit nights for observing the Moon.
3. He should follow the solar calendar, because it is tied to Earth's revolution around the Sun and so matches the seasons accurately, helping him sow at the right time.
4. Each National Calendar month corresponds to a fixed Gregorian period — e.g., Chaitra begins around 22 March, Vaishakh around 21 April, and so on. The school should map each Saka month to its Gregorian dates to schedule exams correctly.

Picture Based Assessment

Draw the Sun on one side and the eight Moon phases around the Earth: New Moon → Waxing Crescent → First Quarter → Waxing Gibbous → Full Moon → Waning Gibbous → Last Quarter → Waning Crescent, with the lit side always facing the Sun.

Value and Life Skill Based

Stargazing sparks curiosity about the universe, encourages students to work together to find and identify objects (teamwork), develops patience and observation skills, and inspires awe and wonder about nature — a healthy alternative to screen time.

Case Study Based Assessment (Chandrayaan / ISRO)

1. Missions like Chandrayaan send back close-up images and data about the Moon's surface, soil, minerals and water, revealing details (like the far side and craters) that we cannot see from Earth.
2. They show that hard work, teamwork and scientific dedication can achieve great things, inspiring

students to study science, work together and feel proud of their country's achievements.

Learn Holistically / Performance Metrics (cross-curricular & competency)

Sample competency answers.

Day, month and year are each based on a periodic astronomical motion (rotation, Moon's revolution, Earth's revolution). Students should explain why festivals shift in the Gregorian calendar (luni-solar basis), why eclipses are not monthly (tilted Moon orbit), and why the same face of the Moon always faces Earth (synchronous rotation).

Chapter 12: How Nature Works in Harmony

NCERT QUESTIONS

- (iii) is wrong — it is the opposite: a community is part of an ecosystem, not the other way round. (The correct order is population < community < ecosystem.)
- Dead plants and animals would pile up without rotting, and nutrients would stay locked in them. The soil would lose its fertility and plants would not get nutrients. Decomposers are essential because they break down dead matter and recycle nutrients back into the soil, keeping the ecosystem balanced.
- Mangrove forests act as a natural barrier — their dense roots and trunks slow down and absorb the energy of huge tsunami waves and storm surges, reducing the force of the water reaching the village and protecting it from damage.
- Grasshoppers would increase (no frogs eating them), while snakes would decrease/starve (their food, the frogs, is gone). This shows how removing one link disturbs the whole food chain.
- Possible reasons: use of pesticides, fewer flowering plants, loss of habitat or pollution. Steps: plant more nectar/flowering plants, avoid pesticides, provide water and shelter, and keep the garden clean and chemical-free.
- Without consumers and decomposers, energy and nutrients would not flow or recycle. Dead producers would not decompose, nutrients would not return to the soil, and the ecosystem could not sustain itself — balance requires all three.
- Activity: In a park — living: trees, grass, birds, insects; non-living: soil, water, air, sunlight. On a roadside — living: a few weeds, ants; non-living: dust, concrete, polluted air. The park is richer in biodiversity and cleaner, while the roadside has fewer organisms and more pollution.
- Agricultural fields feed the growing population, so they are necessary. But overuse of chemicals and water harms the soil and biodiversity. Making them sustainable — using organic manure, crop rotation and water conservation — protects the environment while still producing food.
- Animals that eat the hare (like foxes and eagles) would have less food and decrease, while the plants the hare ate would increase. This shows how a change in one population disturbs the balance of the whole food web.

PRACTICE FOCUS — A. Choose the most appropriate answer

- b. Habitat
- c. Population
- c. Interlinked food chains
- b. Nutrients
- c. Resource sharing (niche use; avoiding competition).
- c. Commensalism
- c. Soil degradation

B. Fill in the blanks

- Community
- Producers
- Herbivores
- Recycling
- Food web



6. Chemical fertilizers (and pesticides)

7. Mutualism

C. State True / False (and correct the false ones)

1. False — Plants also depend on abiotic components like sunlight, water, air and soil.

2. True

3. False — Food chains start with producers (plants).

4. False — Decomposers recycle nutrients and maintain soil fertility.

5. False — It is an example of predation.

6. False — Overuse of pesticides harms/reduces biodiversity.

7. False — Organisms in a community are interdependent.

8. False — In commensalism one benefits and the other is unaffected (neither is harmed).

D. Answer in one word (VSA)

1. Population

2. Nutrients (humus)

3. Food web

4. Mutualism

5. Producers (autotrophs)

6. Herbivores

7. Ecosystem

E. Assertion and Reason

1. c — A is true, but R is false (plants make their own food).

2. a — Both true and R explains A.

3. a — Both true and R explains A.

4. c — A is true, but R is false (chemical fertilizers reduce soil biodiversity).

5. c — A is true, but R is false (in parasitism one benefits and the other is harmed).

6. a — Both true and R explains A.

7. a — Both true and R explains A.

HOTS

1. Pesticides can kill helpful insects (bees, butterflies) and birds, reduce biodiversity, harm the soil and water, and let pests become resistant — upsetting the balance of the ecosystem over time.

2. Factory waste and pollution can poison the water, killing fish and driving away birds, and can make the water unsafe for villagers to drink or use — harming health and the whole ecosystem.

3. Decomposers break down kitchen and garden waste into nutrient-rich compost, reducing garbage and returning nutrients to the soil, which makes the garden plants healthier.

4. Honeybees pollinate flowers; without them, many fruit crops would not be pollinated, so yields would fall, hurting farmers, and plant biodiversity and the food web would suffer.

Picture Based Assessment

Producer: plants/berries. **Primary consumers** (herbivores): mouse, rabbit, squirrel, grasshopper. **Secondary consumers:** frog, snake. **Tertiary consumers:** owl, fox. If all secondary consumers are removed, the herbivores would increase unchecked (overeating plants), and the top predators would lose food and decline — unbalancing the web.

Value and Life Skill Based

Just as every organism — even a tiny grasshopper — is important for the food chain to work, every person's role matters in a family, school or community, even if their work seems small or less visible. Respecting and valuing each role keeps the whole system healthy and balanced.

Case Study Based Assessment (park vs parking)

1. Turning the plot into a biodiversity-rich park supports a healthier ecosystem, because trees, a pond and plants provide habitat, clean the air, cool the area, support birds and insects, and improve water and soil.

2. It reflects environmental responsibility, care for nature and future generations, and concern

for community well-being over short-term convenience.

Learn Holistically / Performance Metrics (cross-curricular & competency)

Sample competency answers.

Students should classify biotic and abiotic components, trace energy flow through food chains/webs, predict the effect of removing one organism, and explain why human-made ecosystems must be sustainable — linking science with environmental responsibility and citizenship.

Chapter 13: Our Home: Earth, a Unique Life Sustaining Planet

NCERT QUESTIONS

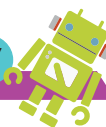
- (iii) It lacks a thick atmosphere and liquid water — both essential for life.
- (ii) Different landforms like mountains, valleys and deserts. (Geodiversity is about the variety of land/rock features, not living things.)
- (ii) It would escape into space due to weaker gravity — a smaller Earth would have weaker gravity, unable to hold the atmosphere.
- (iv) They get mixed instructions (genes) from both parents — combining genes from two parents gives new variations.
- The seeds/spores were carried there by wind, water, birds or insects and lodged in the cracks. The monsoon provided water, along with sunlight, air and a little soil/dust — the conditions needed for them to germinate and grow.
- Cutting forests reduces rainfall and raises local temperature (less transpiration and shade), destroys habitats and lowers biodiversity, and reduces groundwater recharge — leading to less and poorer-quality water in the area.
- Natural climate changes happened slowly over thousands of years, but today's warming is much faster and is caused by human activities — burning fossil fuels, deforestation and pollution release

greenhouse gases. So modern global warming is different and more dangerous.

- Without the magnetic field, harmful charged particles and radiation from the Sun (solar wind) would reach the surface, harming living things, damaging the atmosphere and disrupting satellites, navigation and power systems.
- Three essentials: breathable air (oxygen), liquid water and a suitable temperature/atmosphere. The hardest to replicate is a stable breathable atmosphere with the right pressure and protection, because Mars's thin atmosphere and weak gravity make it very hard to hold one.
- Causes:** climate change due to deforestation, pollution and greenhouse gases. Adaptations: (1) plant more trees and conserve water (rainwater harvesting); (2) use weather forecasts and drought-resistant crops/changed sowing times.
- Yes. Without an atmosphere there would be no air to breathe, no protection from the Sun's harmful rays and meteors, extreme temperature swings (very hot by day, freezing at night), and liquid water would evaporate or freeze — so life could not survive.
- (1) Stem — potato (eyes/buds) and ginger; (2) Root — sweet potato and dahlia; (3) Leaf — Bryophyllum (buds on leaf margins); (4) Runner/stolon — strawberry; (5) Bulb/Rhizome — onion and banana sucker. In each, a part of the parent plant grows into a new plant without seeds.

PRACTICE FOCUS — A. Choose the most appropriate answer

- b. Presence of air, water and sunlight
- b. Venus (thick CO₂ atmosphere causing extreme greenhouse effect).
- c. Habitable zone
- b. Asexual
- c. Anther to stigma
- b. Deforestation
- c. Internal development



B. Fill in the blanks

1. Habitable (Goldilocks)
2. Crust
3. Carbon dioxide (CO₂)
4. Iron (metal)
5. Fertilisation
6. Extinct
7. Soil

C. State True / False (and correct the false ones)

1. False — Mercury, Venus and Mars are also rocky planets.
2. False — Venus is the hottest, due to its thick greenhouse atmosphere.
3. True
4. False — Asexual reproduction involves only one parent.
5. True
6. False — Greenhouse gases keep Earth warm; too much makes it too hot (global warming).
7. False — Pollution disturbs natural cycles like the water and carbon cycles.

D. Answer in one word (VSA)

1. Habitable zone (Goldilocks zone)
2. Crust
3. Carbon dioxide
4. Fertilisation (followed by seed development)
5. Flower (seed)
6. Decomposers
7. Greenhouse effect

E. Assertion and Reason

1. a — Both true and R explains A.
2. d — A is false (the mantle is thick), R is false too (it is made of hot semi-solid rock) — best fit: A false.
3. a — Both true and R explains A.
4. d — A is false (asexual reproduction does produce identical offspring), R is true.

5. a — Both true and R explains A.
6. d — A is false (fertilisation in mammals is internal), R is true (for external fertilisers like fish/frogs).
7. a — Both true and R explains A.

HOTS

1. It would become hotter, so liquid water would evaporate quickly and could turn to vapour/steam, and the oceans might dry up — because the temperature would rise above what keeps water liquid.
2. Decomposer microbes would be gone, so dead plants and animals would not rot. Nutrients would stay locked away, the soil would lose fertility, and nutrient recycling would stop — harming all life.
3. Air pollution (smoke, dust) settles on leaves and blocks sunlight and clogs the stomata, reducing the light and carbon dioxide the plant gets — so photosynthesis slows down and the plant makes less food.

Picture Based Assessment (structure of the Earth)

Label the layers from outside in: Crust → Mantle → Outer Core → Inner Core. (a) The molten iron outer core is responsible for Earth's magnetism. (b) Vegetation and life are found on the crust (the outer surface, the biosphere).

Value and Life Skill Based

Every small action — saving water, planting trees, reducing waste — adds up. When each person takes responsibility and many people act together (collective action), the combined effect greatly protects the environment, showing that individual responsibility and teamwork are both essential.

Case Study Based Assessment (pond clean-up drive)

1. Abiotic: clean water, oxygen and a healthy water cycle. Biotic: the return of fish, frogs, birds and plants and their feeding relationships (food web).
2. Responsibility, environmental awareness, teamwork, perseverance and a sense of caring for nature and the community.



3. It gave farmers a safer water source for fields, restored habitat for animals, and provided clean, healthy water and a pleasant environment for local residents.
4. Seeing the visible benefits — returning wildlife, clean water and an annual 'Eco-Day' — inspires other villages to copy the idea, showing that community effort can restore nature and improve everyone's life.

Learn Holistically / Performance Metrics (cross-curricular & competency)

Sample competency answers.

Students should explain why Earth is uniquely habitable (air, water, suitable temperature, magnetic field, habitable zone), distinguish sexual from asexual reproduction, identify causes and effects of biodiversity loss and climate change, and propose responsible actions — connecting science with environmental citizenship.

