ALPHALEARN STUDYLAB

Publication-Grade Practice Worksheets

CBSE · CLASS 9

SCIENCE

NCERT Exploration

Chapters 1 – 13

Worksheet E-book · Foundation | Application | Expert
with Complete Answer Keys

Complete Worksheet Library · Class 9 Science

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TABLE OF CONTENTS

CBSE Class 9 · Science

CHAPTER

1

Exploration — Entering the World of Secondary Science

IN THIS CHAPTER

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CBSE Class 9 | Science (Exploration)

Chapter 1: Exploration — Entering the World of Secondary Science

Worksheet 1 — Foundation

Name: _____ Class/Section: _____ **Marks: 30**

Date: _____ Time: 60 min Obtained: _____

Section A: Multiple Choice Questions [6 marks]

1. A simplified way of looking at a real system, focusing only on what matters for a given question, is called a: *(1)*

(a) law
(b) theory
(c) model
(d) principle

2. Meghnad Saha simplified the study of stars by treating stellar matter as: *(1)*

(a) a solid crystal
(b) a hot gas
(c) a liquid metal
(d) a vacuum

3. The symbol 'c' for the speed of light comes from the Latin word: *(1)*

(a) candela
(b) celeritas
(c) centum
(d) cognitio

4. Which of these best describes a scientific theory? *(1)*

(a) An untested guess
(b) A guess based on opinion
(c) An explanation based on evidence and testing
(d) A permanent, unchangeable fact

5. Newton's laws of motion are an example of a scientific: *(1)*

(a) law
(b) theory
(c) principle
(d) prediction

6. The main reason SI units are used worldwide is to: *(1)*

(a) make calculations harder
(b) allow comparison and avoid confusion
(c) replace local traditions
(d) reduce the need for measurement

Section B: Fill in the Blanks [5 marks]

1. In science, building a model involves making _____ and deliberately ignoring certain details. *(1)*

2. The principle of conservation of _____ is applied when climbing up the stairs. *(1)*

3. A _____ describes a regular pattern observed in nature, often expressed using words or mathematical relationships. *(1)*

4. The speed of light is defined to be exactly _____ m/s. *(1)*

5. Scientific predictions are reasoned expectations based on _____ and careful thinking, not guesswork. *(1)*

Section C: True or False [5 marks]

1. Ignoring details while building a scientific model is always a mistake. *(1)*

2. A theory explains why a pattern occurs and is based on evidence. *(1)*

3. Weather forecasts are usually more reliable for a few days than for many months ahead. *(1)*

4. According to the chapter, eating food during an eclipse becomes harmful due to a chemical change. *(1)*

5. Estimation, or approximate reasoning, is considered an important scientific skill. *(1)*

Section D: Match the Following [5 marks]

Match the term in Column A with its correct description in Column B.

Column A	Column B
1. Law	A. Explains why a pattern occurs
2. Theory	B. Broad idea applied in many situations
3. Principle	C. Symbol for the speed of light
4. 'c'	D. Simplified representation of a real system
5. Model	E. Regular pattern observed in nature

Section E: One-Word Answers [4 marks]

1. The scientific term for a broad idea that helps us make sense of a situation, such as conservation of energy. *(1)*

2. The unit system used worldwide for scientific measurement (give the abbreviation). *(1)*

3. The term for a simplified representation of a real system used in science. *(1)*

4. The Latin word from which the symbol for the speed of light is derived. *(1)*

Section F: Very Short Answer Questions [5 marks]

1. Why do scientists deliberately ignore certain details while building a model? *(1)*

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2. Give one example of a scientific law mentioned in the chapter. *(1)*

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3. What is the exact value of the speed of light in SI units? *(1)*

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4. Name one everyday quantity where using a standard unit (like the kilogram) prevents confusion. *(1)*

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5. What kind of mechanism does the chapter say supports the eclipse-food myth? *(1)*

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Chapter 1: Exploration — Entering the World of Secondary Science

Worksheet 2 — Application

Name: _____ Class/Section: _____ **Marks: 39**

Date: _____ Time: 60 min Obtained: _____

Section A: Short Answer Questions [10 marks]

1. Explain, with an example from the chapter, why building a scientific model involves making assumptions. *(2)*

2. Distinguish between a scientific law and a scientific theory, using one example of each. *(2)*

3. Why is it important to use SI units instead of local or traditional units of measurement? Support your answer with the example given in the chapter. *(2)*

4. Explain why a scientific theory is not the same as a guess. *(2)*

5. Give two reasons why weather forecasts become less reliable further into the future. *(2)*

Section B: Explain with Reasons [6 marks]

1. Explain why ignoring air resistance while studying a falling object is not considered a mistake in science. *(2)*

2. A friend tells you clouds look dark, so it will rain. Explain, with reasoning, how you would make this prediction scientifically testable. *(2)*

3. Explain why "no scientific theory is ever final" is considered a strength of science rather than a weakness. *(2)*

Section C: Differentiate Between [6 marks]

1. Differentiate between a law and a principle in science, giving one example of each. *(3)*

2. Differentiate between an exact answer and an estimate, and explain when each is appropriate in science. *(3)*

Section D: Observation / Experimental Situation-Based Questions [6 marks]

1. A passenger aircraft ran out of fuel mid-flight because the ground crew used the density of fuel in pounds per litre instead of kilograms per litre. Identify the scientific concept illustrated by this incident and explain how it could have been avoided. *(3)*

2. Varsha said, "It will rain this afternoon because the clouds look dark." Meghna asked her about humidity, wind speed and direction, and past rain patterns before agreeing. Explain why Meghna's approach is more scientific than simply looking at the sky. *(3)*

Section E: Competency-Based / Case-Based MCQs [5 marks]

Case: A student wants to estimate how many litres of air a person breathes in a day, by first estimating the number of breaths per minute and the volume of one breath.

1. This method of finding an approximate but reasonable answer is called: *(1)*

(a) measurement
(b) estimation
(c) prediction
(d) modelling

2. The chapter suggests checking such an estimate by: *(1)*

(a) ignoring it completely
(b) comparing it with a second independent estimate
(c) asking a friend to guess
(d) using only exact laboratory instruments

3. Which of these is NOT a reason estimation is a useful scientific skill? *(1)*

(a) builds intuition
(b) detects errors
(c) replaces the need for any real measurement
(d) develops confidence in reasoning

4. If a rough estimate for feeding a family of four for a month came out to be 100 g of rice, the estimate would be considered: *(1)*

(a) reasonable

(b) exactly correct

(c) clearly too little

(d) far too much

5. Estimating quantities before performing an experiment mainly helps a scientist to: *(1)*

(a) avoid experiments altogether

(b) check whether a result is reasonable

(c) skip mathematics

(d) prove a law is wrong

Section F: Real-Life Application Questions [6 marks]

1. Explain, using the example of a surgical mask, how solving a real-world problem often needs ideas from more than one branch of science. *(2)*

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2. A viral social media post claims that food becomes harmful if left uneaten during an eclipse. Using the reasoning approach described in the chapter, explain how you would evaluate this claim. *(2)*

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3. Explain how mathematics acts as “a language for thinking” in science rather than just a tool for calculation, using an example. *(2)*

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CBSE Class 9 | Science (Exploration)

Chapter 1: Exploration — Entering the World of Secondary Science

Worksheet 3 — Expert

Name: _____ Class/Section: _____ **Marks: 43**

Date: _____ Time: 60 min Obtained: _____

Section A: Assertion–Reason Questions [4 marks]

Each question below has an Assertion (A) and a Reason (R). Choose the correct option:

(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): Scientific models always represent every detail of the real system exactly. *(1)*
Reason (R): Building a model involves making assumptions and deliberately ignoring certain details.

2. Assertion (A): A scientific theory can never be changed once it is proposed. *(1)*
Reason (R): Theories are open to improvement and may change as new evidence becomes available.

3. Assertion (A): Predictions based on well-established laws, theories, and models are reasoned expectations. *(1)*
Reason (R): Predictions in science are based on evidence and careful thinking rather than guesswork.

4. Assertion (A): Using SI units everywhere eliminates the need for careful measurement. *(1)*
Reason (R): SI units are based on agreed international standards that allow fair comparison of results.

Section B: Higher Order Thinking Skills (HOTS) [12 marks]

1. A scientist studying how the heart pumps blood ignores the behaviour of individual cells and studies the heart as a single functioning organ. Justify why this simplification is considered good scientific practice rather than an oversight. *(3)*

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2. Two students estimate the number of breaths a person takes in a day using two different methods and arrive at close but not identical answers. Explain why this closeness, rather than exact agreement, is considered acceptable in scientific estimation. *(3)*

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3. Explain, with reference to weather forecasting, why very small differences in initial conditions can make long-term predictions unreliable even when scientific models are used correctly. *(3)*

4. Explain why the chapter states that “science values careful reasoning perhaps much more than accurate calculations.” Do you agree? Justify your answer using an example from the chapter. *(3)*

Section C: Long Answer Questions [10 marks]

1. “Science is not just a collection of facts, equations, or experiments. It is a human activity.” Explain this statement with reference to how science develops, using ideas from the chapter such as curiosity, evidence, prediction, and the correction of ideas. *(5)*

2. Explain, with suitable examples from the chapter, the differences between a law, a theory, and a principle in science. Why is it important for students to understand these differences clearly? *(5)*

Section D: Case Study [5 marks]

Read the passage below and answer the questions that follow:

> *During the COVID-19 pandemic, surgical masks were widely used for safety. Understanding how a mask works requires concepts from physics (particle motion and electrostatic attraction), chemistry (properties of polymer fibres), biology (size and behaviour of viruses), and mathematics (modelling airflow and filtration efficiency).*

a. Identify the branches of science mentioned in the passage that together explain how a mask works. (1)

b. Explain why the chapter says that divisions between branches of science “are not independent of each other.” (2)

c. Suggest one other real-life object or problem (other than a mask) whose working would require ideas from at least two branches of science, and briefly justify your choice. (2)

Section E: Experimental Analysis / Multi-Concept Questions [8 marks]

1. A ground crew calculated the fuel needed for a flight using the density of fuel in pounds per litre instead of kilograms per litre, causing the aircraft to run nearly 15,000 litres short of fuel. *(4)*

(a). Identify the scientific error involved. (2)

(b). Explain, using the idea of standard units, how this error could have been prevented, and suggest one other field (apart from aviation) where such an error could have serious consequences. (2)

2. A student wants to estimate how much rice would be needed to feed a family of four for a month, assuming all their calorie needs come from rice alone. *(4)*

(a). Outline the steps the student should follow to make this estimate. (2)

(b). Explain why the goal of this exercise is not to find an exact number but to check whether an answer is reasonable. (2)

Section F: Board-Style Question [4 marks]

1. Read the following statement and answer the question that follows: “As observations are repeated, measurements refined, and ideas tested through experiments, we can organise our understanding of the world in a systematic way.” With reference to this statement, explain how a scientific law, once proposed, may eventually be modified or expanded, giving one example of how repeated observation could lead to greater precision in a scientific idea. *(4)*

COMPLETE ANSWER KEY

Chapter 1: Exploration — Entering the World of Secondary Science

Worksheet 1 — Foundation

Section A: MCQs

1. (c) model

2. (b) a hot gas

3. (b) celeritas

4. (c) An explanation based on evidence and testing

5. (a) law

6. (b) allow comparison and avoid confusion

Section B: Fill in the Blanks

1. assumptions

2. energy

3. law

4. 299792458

5. evidence

Section C: True or False

1. False — ignoring details is a deliberate, purposeful choice, not a mistake.

2. True

3. True

4. False — the chapter concludes no physical, chemical, or biological mechanism supports this claim.

5. True

Section D: Match the Following

. 1 → E (Law: regular pattern observed in nature)

. 2 → A (Theory: explains why a pattern occurs)

. 3 → B (Principle: broad idea applied in many situations)

. 4 → C ('c': symbol for the speed of light)

. 5 → D (Model: simplified representation of a real system)

Section E: One-Word Answers

1. Principle

2. SI (International System of Units)

3. Model

4. Celeritas

Section F: Very Short Answer Questions

1. To keep the model simple enough to answer the question at hand, while still capturing what matters most.

2. Newton's laws of motion (any one correctly stated example is acceptable).

3. 299,792,458 m/s.

4. Any reasonable example, e.g. buying rice or vegetables by the kilogram.

5. None — no physical, chemical, or biological mechanism supports the claim.

Worksheet 2 — Application

Section A: Short Answer Questions

1. Models focus only on what matters for the question at hand; e.g., in studying a falling object, air resistance is ignored to understand the basic effect of gravity, since including every detail would make the model too complex to use.

2. A law describes a regular pattern observed in nature (e.g., Newton's laws of motion explain the jerk felt when a bus stops), while a theory explains why that pattern occurs, based on evidence (e.g., atomic theory explains how molecules are formed).

3. SI units are based on agreed international standards, so results can be compared fairly everywhere; the aircraft that ran out of fuel because the crew used pounds per litre instead of kilograms per litre shows how mixing unit systems causes serious errors.

4. A theory is an explanation based on careful testing and critical examination of evidence, and remains open to revision, unlike a guess, which is untested and not backed by evidence.

5. Weather depends on many changing factors (temperature, pressure, humidity, wind); tiny differences in these conditions can grow over time, making models less reliable far into the future.

Section B: Explain with Reasons

1. Air resistance has a smaller effect on the basic motion of a falling object; ignoring it is a deliberate simplification that still allows the main effect of gravity to be understood clearly.

2. Ask for measurable evidence and past patterns, e.g., today's humidity, wind speed and direction, and whether similar sky conditions led to rain before, rather than accepting the yes/no observation that “clouds look dark.”

3. Because such failures let scientists re-examine assumptions, models, or measurements, leading to better, more accurate ideas over time — this openness to correction by evidence is what makes science reliable.

Section C: Differentiate Between

1. A law describes an observed pattern (e.g., Newton's laws of motion), while a principle is a broader idea applied to make sense of a situation (e.g., the principle of conservation of energy applied when climbing stairs).

2. An exact answer gives a precise value and is needed when precision matters (e.g., calculating exact fuel needed for a flight); an estimate gives an approximate but reasonable value and is useful for quickly checking whether a result makes sense (e.g., estimating monthly rice needs for a family).

Section D: Observation/Experimental Situation-Based Questions

1. The incident illustrates the importance of using standard SI units consistently; mixing pounds per litre with kilograms per litre led to a serious miscalculation. Using SI units everywhere would have avoided the conversion error.

2. Meghna's questions look for measurable evidence and past patterns (humidity, wind speed/direction, prior conditions before rain), which make the prediction scientifically testable, unlike a simple yes/no observation of dark clouds.

Section E: Competency-Based / Case-Based MCQs

1. (b) estimation

2. (b) comparing it with a second independent estimate

3. (c) replaces the need for any real measurement

4. (c) clearly too little

5. (b) check whether a result is reasonable

Section F: Real-Life Application Questions

1. A mask's working needs physics (particle motion, electrostatic attraction), chemistry (polymer fibre properties), biology (virus size and behaviour), and mathematics (modelling airflow and filtration) together — showing real problems rarely fit into a single branch of science.

2. Ask simple scientific questions: what physical change occurs during an eclipse, whether temperature changes significantly, and whether food left in an ordinary shadow goes bad — leading to the conclusion that no physical, chemical, or biological mechanism supports the claim.

3. Any well-reasoned real-life example is acceptable if it is justified using evidence-based reasoning rather than guesswork.

4. Mathematics expresses relationships between quantities (e.g., distance, time, and velocity in motion) so that outcomes can be reasoned about and tested, not just calculated after the fact.

Worksheet 3 — Expert

Section A: Assertion–Reason

1. (d) A is false, but R is true.

2. (d) A is false, but R is true.

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

4. (d) A is false, but R is true.

Section B: HOTS

1. Studying every individual cell would make understanding how the heart functions as an organ far too complex; ignoring cell-level detail is a deliberate choice that keeps the model simple enough to explain the organ's pumping function, which is the actual question being studied.

2. The goal of estimation is a reasonable, order-of-magnitude answer, not an exact figure; two independent estimates arriving close to each other confirms the estimate is reasonable, which is the actual purpose of estimation.

3. Weather systems depend on many interacting factors (temperature, pressure, humidity, wind); tiny differences in these initial conditions can grow substantially over time, so even correct models become less reliable for predictions far into the future.

4. Agree — careful reasoning (understanding the situation, identifying relevant quantities, checking if an answer is reasonable) helps detect errors and build intuition, as shown in the fuel-estimation and air-breathing estimation examples, whereas an accurate calculation without proper reasoning could still be based on wrong assumptions.

Section C: Long Answer Questions

1. Science grows through curiosity (asking questions), evidence (testing ideas through experiments and observation), prediction (making reasoned expectations), and correction (revising ideas when predictions don't match observations). This human activity — shaped by collaboration and questioning across cultures and generations — is what the statement emphasises, rather than science being a fixed body of facts.

2. A law describes an observed pattern (e.g., Newton's laws of motion); a theory explains why the pattern occurs, based on evidence (e.g., atomic theory explaining how molecules form); a principle is a broad idea applied across situations (e.g., conservation of energy applied while climbing stairs). Understanding these differences helps students use precise scientific language and recognise the different roles each idea plays in building scientific understanding.

Section D: Case Study

a). Physics, chemistry, biology, and mathematics.

b). Real-world problems (such as understanding how a mask works, climate change, or developing medicines) require ideas from several disciplines together; the divisions between branches are made only to organise knowledge, not because the natural world itself has such boundaries.

c). Any well-justified example is acceptable, e.g., a pressure cooker (physics of pressure and heat, chemistry of cooking reactions) or a mobile phone (physics of electromagnetic waves, chemistry of battery materials).

Section E: Experimental Analysis

1(a). The crew used an inconsistent unit system — density in pounds per litre instead of kilograms per litre — leading to a serious miscalculation of the fuel required.

1(b). Using SI units (kilograms) consistently throughout the calculation would have avoided the conversion error; similar unit-mixing errors could have serious consequences in fields such as medicine (drug dosing) or engineering (construction measurements).

2(a). Find the calories provided by 100 g of cooked rice; use the average daily calorie need per adult (2000–2500 kcal) to estimate the daily rice requirement; scale this up for four family members and for a month.

2(b). The purpose is to check whether an answer is reasonable (e.g., ruling out 100 g as clearly too little and a few tonnes as far too much), which builds estimation skills, rather than to compute a precise figure.

Section F: Board-Style Question

1. As more observations are made and measurements refined through repeated experiments, a law may be expanded to cover new conditions or modified for greater precision. For example, as measurement techniques for motion improved over time, the mathematical relationships describing motion could be tested and expressed more precisely, refining the scope and accuracy of the underlying laws.