



INTRODUCTION TO SCIENCE:

MEANING, BRANCHES, AND SCIENTIFIC METHOD

EXPLORE • UNDERSTAND • DISCOVER

WHAT'S INSIDE?



MEANING OF SCIENCE

Understand the definition, nature, and scope of science.



BRANCHES OF SCIENCE

Explore the major branches and their real-life applications.



SCIENTIFIC METHOD

Learn the steps of the scientific method with clarity.



IMPORTANCE OF SCIENCE

Discover how science shapes our world and future.



KEY CONCEPTS

Essential concepts for students and competitive exams.



BUILD
FOUNDATION



ENHANCE
UNDERSTANDING



DEVELOP
CURIOSITY



APPLY
KNOWLEDGE



ACHIEVE
SUCCESS



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Introduction to Science:

Meaning, Branches, and Scientific Method



1. MEANING OF SCIENCE

- Science is a systematic body of knowledge obtained through **observation** and **experimentation**.
- It seeks to discover **facts**, understand natural phenomena, and establish general **principles**.
- Science is **objective**, **logical**, **reliable** and **verifiable**.
- It helps in explaining **how** things happen and **why** they happen.



MEANING AND ETYMOLOGY OF SCIENCE

2. CHARACTERISTICS OF SCIENCE

- Systematic** – follows a definite order and method.
- Empirical** – based on observation and evidence.
- Objective** – free from personal bias.
- Verifiable** – can be tested and verified.
- Tentative** – open to modification with new evidence.
- Universal** – applicable everywhere.



3. ETYMOLOGY AND ORIGIN OF SCIENCE

- The word "Science" is derived from the Latin word "**Scientia**" which means "**knowledge**".
- "Scientia" comes from the Latin verb "**Scire**" which means "**to know**" or "**to be aware**".
- Thus, Science literally means "**knowledge**" or "**systematized knowledge**".



5. SCOPE OF SCIENCE

- Science covers a wide range of phenomena in the physical, biological, earth, and space worlds.
- It is not limited to facts but includes **laws**, **theories**, and **principles**.
- The scope of science is **ever-expanding** with new discoveries and innovations.



4. DEFINITIONS OF SCIENCE BY SCHOLARS

- J.B.S. Haldane** – "Science is organized knowledge."
- Karl Popper** – "Science is a system of testable explanations of the natural world."
- Bertrand Russell** – "Science is what we know, and philosophy is what we do not know."
- R.A. Millikan** – "Science is the search for truth."



6. KEY TAKEAWAY



Science is a systematic, empirical, and objective body of knowledge derived from the Latin word "**Scientia**" (**knowledge**). It plays a vital role in understanding the world and improving human life through discovery and innovation.



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MAJOR BRANCHES OF SCIENCE

Science is broadly classified into **natural**, **formal**, and **social** sciences. Each branch has its own focus, methods, and applications.

1. PHYSICAL SCIENCES

Study of non-living matter, energy, space, and time.

Includes:

- **Physics** – Matter, energy, force, motion, light, etc.
- **Chemistry** – Composition, structure, properties and reactions of matter.
- **Astronomy** – Celestial bodies, stars, planets, and the universe.



2. LIFE SCIENCES

Study of living organisms and life processes.

Includes:

- **Biology** – Study of living beings and life.
- **Botany** – Plants and their functions.
- **Zoology** – Animals and their behavior.
- **Microbiology** – Microscopic organisms and their effects.

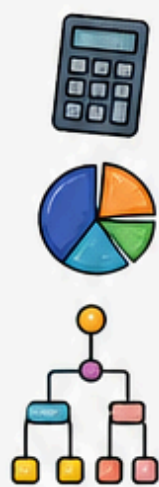


3. FORMAL SCIENCES

Study of abstract concepts, structures, and relationships using logic and reasoning.

Includes:

- **Mathematics** – Numbers, patterns, equations, and structures.
- **Statistics** – Collection, analysis, interpretation, and presentation of data.
- **Logic** – Principles of valid reasoning.



MAJOR BRANCHES OF SCIENCE



4. EARTH & SPACE SCIENCES

Study of the Earth, its environment, and beyond.

Includes:

- **Geology** – Earth's structure, rocks, minerals.
- **Meteorology** – Weather, climate, and atmosphere.
- **Oceanography** – Oceans, seas, and marine life.
- **Environmental Science** – Environment and its conservation.



5. SOCIAL SCIENCES

Study of human society, behavior, and institutions.

Includes:

- **Sociology** – Society, relationships, culture.
- **Economics** – Production, distribution, consumption of goods and services.
- **Political Science** – Government, power, and political behavior.
- **Psychology** – Human mind and behavior.



KEY POINTS

- ✓ All branches of science are interconnected.
- ✓ They work together to expand knowledge and solve real-world problems.
- ✓ Scientific progress depends on research, observation, and innovation.



6. APPLIED SCIENCES

Application of scientific knowledge for practical purposes.

Includes:

- **Engineering** – Design and construction of machines, structures, systems.
- **Medicine** – Diagnosis, treatment, and prevention of diseases.
- **Agricultural Science** – Crop production, soil, animal husbandry.



INTERCONNECTED NATURE

Branches of science are not isolated. For example:

• Biology uses Chemistry and Physics.

• Environmental Science uses Biology, Geology, and Chemistry.

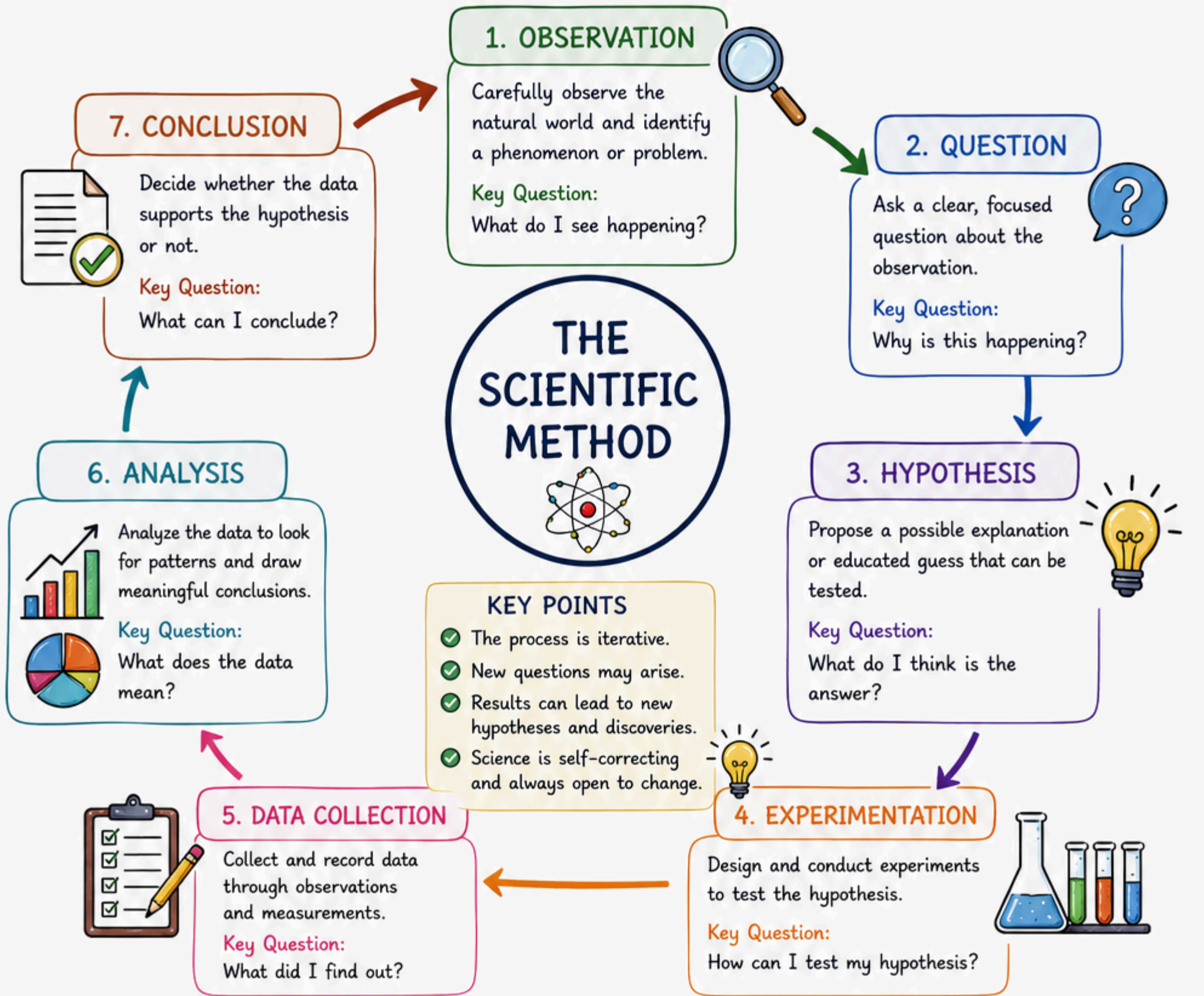
• Technology and engineering integrate knowledge from many branches.



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THE SCIENTIFIC METHOD

The scientific method is a **systematic, logical approach** used by scientists to investigate phenomena, acquire new knowledge, and solve problems.



EXAMPLE: PLANT GROWTH



- Observation:** Some plants grow better in sunlight.
- Question:** Does sunlight affect plant growth?
- Hypothesis:** Plants will grow taller with more sunlight.
- Experiment:** Two plants – one in sunlight, one in shade.
- Data Collection:** Measure plant height over days.
- Analysis:** Compare the growth of both plants.
- Conclusion:** More sunlight leads to more plant growth.

CHARACTERISTICS OF SCIENTIFIC METHOD

-  **Systematic** – Follows a step-by-step approach.
-  **Objective** – Based on evidence, free from bias.
-  **Empirical** – Relies on observation and experiment.
-  **Verifiable** – Results can be tested and confirmed.
-  **Reproducible** – Can be repeated by others.
-  **Tentative** – Conclusions may change with new evidence.

“ The beauty of science is that it does not claim to know everything. It is a journey of inquiry, discovery, and continuous learning. ”



Introduction to Science:

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DISTINGUISHING SCIENTIFIC TERMS: HYPOTHESIS, THEORY, AND LAW



These three terms are often confused, but they have **distinct meanings** and **roles** in the scientific process.

	 HYPOTHESIS	 THEORY	 LAW
 DEFINITION	A tentative explanation or educated guess for an observation or a problem.	A well-substantiated explanation of some aspect of the natural world, based on a large body of evidence .	A statement that describes a relationship in nature, based on repeated observations and experiments .
 NATURE	Tentative and uncertain ; may be proven wrong.	Strongly supported and widely accepted explanation.	Describes what happens in nature; doesn't explain why it happens.
 PURPOSE	To make a prediction and guide further investigation.	To explain why a wide range of observations occur.	To describe a consistent pattern or relationship in nature.
 TESTABILITY	Can be tested through experiments or observations.	Supported by many tests and corroborated by a large amount of evidence.	Based on repeated observations ; always consistent.
 LEVEL OF CERTAINTY	Low certainty. ★ ☆ ☆ ☆ ☆	High certainty. ★ ★ ★ ★ ☆	Very high certainty. ★ ★ ★ ★ ★
 EXAMPLE	If plants are given more sunlight, then they will grow faster. 	The theory of evolution explains the diversity of life on Earth through natural selection. 	Newton's Law of Gravity states that every mass attracts every other mass in the universe. 

HOW THEY RELATE



HYPOTHESIS



THEORY



LAW

A **hypothesis** can lead to a **theory** if it is repeatedly tested and supported by evidence.
A **theory** can help explain **laws**, and **laws** help us understand patterns in nature.

KEY POINTS

- ✓ A hypothesis is a starting point for investigation.
- ✓ A theory explains why.
- ✓ A law describes what.
- ✓ Science advances by moving from hypothesis → theory → law as evidence increases.



ADDITIONAL NOTES

- All three are essential to scientific progress.
- New evidence can change a hypothesis or a theory.
- Laws remain the same unless new evidence shows otherwise.



REAL-WORLD EXAMPLE

Observation: Apples fall from trees.

Hypothesis: Objects fall because Earth pulls them down.

Theory: Gravity is a force that attracts masses toward each other.

Law: The Law of Universal Gravitation describes this relationship mathematically.



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QUICK EXAMINATION FACTS



REMEMBER

- Small facts
- Build strong memory
- High scores!

QUICK EXAMINATION FACTS

- 1 The term 'Science' is derived from the Latin word 'Scientia' meaning 'Knowledge'. 
- 2 Science is a systematic body of knowledge. 
- 3 Science is based on observation and experiment. 
- 4 Science is objective and free from personal bias. 
- 5 Science is universal and applicable everywhere. 
- 6 Science is tentative and always open to revision. 
- 7 Science aims to discover facts and explain natural phenomena. 
- 8 Major branches of science are Physical, Life, Earth and Formal sciences. 
- 9 Physical sciences study non-living matter and energy. 
- 10 Life sciences study living organisms and life processes. 
- 11 Earth sciences study the Earth, atmosphere, oceans and space. 
- 12 Formal sciences study abstract concepts and logical systems. 
- 13 Applied sciences use scientific knowledge for practical purposes. 
- 14 Scientific method is a step-by-step procedure to solve problems. 
- 15 Observation is the first step in the scientific method. 

- 16 A good scientific question is clear, specific and testable. 
- 17 Hypothesis is a proposed answer that can be tested. 
- 18 Experimentation tests the hypothesis in a controlled way. 
- 19 Data collection provides raw facts from experiments. 
- 20 Analysis helps in interpreting data and finding patterns. 
- 21 Conclusion is drawn after analyzing data and results. 
- 22 Communication shares findings with the scientific community. 
- 23 Replication verifies results and increases reliability. 
- 24 Hypothesis may be accepted or rejected based on results. 
- 25 Theory is a well-tested explanation supported by vast evidence. 
- 26 Law describes what happens in nature; it does not explain why. 
- 27 Hypothesis → Theory → Law shows the progression of knowledge. 
- 28 All branches of science are interrelated and complementary. 
- 29 Science improves human life and solves real-world problems. 
- 30 Curiosity and doubt are the foundation of scientific thinking. 

ONE LINE MEMORY TRICK



Observation



Question



Hypothesis



Experiment



Data Collection



Analysis



Conclusion



Communication



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MCQs

Page 1



REMEMBER

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1 The term 'Science' is derived from the Latin word 'Scientia' meaning:

- A. Wisdom
- B. Knowledge
- C. Truth
- D. Study

✓ **Answer:** B. Knowledge

Explanation:

- The Latin word 'Scientia' means 'Knowledge'.
- Science is a systematic body of knowledge about the natural world.



2 Which of the following is NOT a major branch of science?

- A. Physical Science
- B. Life Science
- C. Earth Science
- D. Moral Science

✓ **Answer:** D. Moral Science

Explanation:

- The major branches of science are Physical, Life, Earth and Formal sciences.
- Moral Science is not a branch of science.



3 Which of the following is the correct sequence of steps in the scientific method?

- A. Observation, Hypothesis, Experiment, Conclusion
- B. Observation, Hypothesis, Experiment, Analysis, Conclusion
- C. Hypothesis, Observation, Experiment, Conclusion
- D. Experiment, Observation, Hypothesis, Conclusion

✓ **Answer:** B. Observation, Hypothesis, Experiment, Analysis, Conclusion

Explanation:

- The scientific method follows a logical order: Observation → Hypothesis → Experiment → Analysis → Conclusion.
- This sequence ensures accurate and reliable results.



4 A well-tested explanation supported by a large amount of evidence is called:

- A. Hypothesis
- B. Theory
- C. Law
- D. Fact

✓ **Answer:** B. Theory

Explanation:

- A hypothesis is a tentative explanation.
- A theory is well-tested and supported by extensive evidence.
- A law describes what happens in nature.



5 Which of the following best describes a scientific law?

- A. A possible explanation of a phenomenon
- B. A pattern in nature that tells what happens
- C. An untested idea
- D. A guess based on observation

✓ **Answer:** B. A pattern in nature that tells what happens

Explanation:

- A scientific law describes a consistent pattern or relationship in nature.
- It does not explain why it happens.



QUICK TIPS



Observe carefully.



Ask the right questions.



Form a hypothesis.



Test with experiments.



Analyze the data.



Draw a conclusion.



Share findings with others.



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6 Which of the following is an example of a life science?

- A. Mechanics
- B. Botany
- C. Thermodynamics
- D. Optics

✓ **Answer:** B. Botany

Explanation:

- Life sciences study living organisms and life processes.
- Botany is the study of plants.



7 Which of the following is an example of a physical science?

- A. Ecology
- B. Physics
- C. Sociology
- D. Psychology

✓ **Answer:** B. Physics

Explanation:

- Physical sciences study non-living matter and energy.
- Physics deals with matter, energy, force, and their interactions.



8 Replication of an experiment is important because it:

- A. Increases the cost of the experiment
- B. Verifies results and increases reliability
- C. Changes the hypothesis
- D. Shortens the experiment time

✓ **Answer:** B. Verifies results and increases reliability

Explanation:

- Replication means repeating an experiment.
- It helps to confirm accuracy and reliability of the results.



9 Which of the following best describes a hypothesis?

- A. A final proven fact
- B. A tentative explanation that can be tested
- C. A natural law
- D. A general theory

✓ **Answer:** B. A tentative explanation that can be tested

Explanation:

- A hypothesis is an educated guess.
- It is tested through experiments to find whether it is true or false.



10 Which of the following is the last step of the scientific method?

- A. Observation
- B. Hypothesis
- C. Experimentation
- D. Conclusion

✓ **Answer:** D. Conclusion

Explanation:

- After analyzing the data, a conclusion is drawn.
- It determines whether the hypothesis is accepted or rejected.



QUICK STUDY TIPS



Observe carefully.



Ask the right questions.



Form a hypothesis.



Test with experiments.



Analyze the data.



Draw a conclusion.



Share your findings.



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11 Which of the following is an example of earth science?

- A. Zoology
- B. Geology
- C. Microbiology
- D. Genetics

✓ **Answer:** B. Geology

Explanation:

- Earth sciences study the Earth, its structure, materials and processes.
- Geology is the study of the Earth's solid materials and structure.



12 Which term refers to a statement that describes a pattern in nature?

- A. Theory
- B. Hypothesis
- C. Law
- D. Principle

✓ **Answer:** C. Law

Explanation:

- A scientific law describes a consistent pattern in nature.
- It tells what happens, not why it happens.



13 Which branch of science uses scientific knowledge for practical applications?

- A. Formal Science
- B. Applied Science
- C. Life Science
- D. Earth Science

✓ **Answer:** B. Applied Science

Explanation:

- Applied sciences use scientific knowledge to solve real-life problems.
- Examples: Engineering, Medicine, Agriculture.



14 Data in an experiment is collected primarily to:

- A. Prove a theory
- B. Support a hypothesis
- C. Earn marks
- D. Save time

✓ **Answer:** B. Support a hypothesis

Explanation:

- Data is collected to test whether the hypothesis is true or false.
- It provides evidence for analysis.



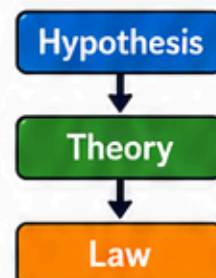
15 Which of the following shows the correct progression of scientific knowledge?

- A. Law → Theory → Hypothesis
- B. Hypothesis → Theory → Law
- C. Theory → Law → Hypothesis
- D. Observation → Law → Theory

✓ **Answer:** B. Hypothesis → Theory → Law

Explanation:

- Hypothesis is tested through experiments.
- Repeatedly supported hypotheses become theories.
- Theories that consistently explain natural phenomena become laws.



QUICK STUDY TIPS



Read carefully.



Understand the concept.



Eliminate wrong options.



Practice regularly.



Analyze mistakes to improve.



Stay focused and stay consistent.



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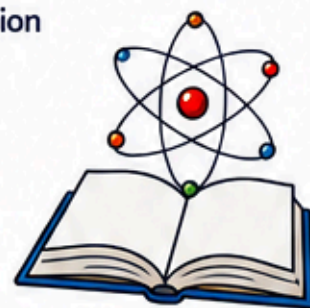
16 Which of the following best defines 'Science'?

- A. A collection of facts
- B. A systematic body of knowledge based on observation and experiment
- C. A belief system
- D. An art of creative imagination

✓ **Answer:** B. A systematic body of knowledge based on observation and experiment

Explanation:

- Science is a systematic way of gaining knowledge about the natural world.
- It relies on observation, experimentation and logical reasoning.



17 Which of the following is NOT a step in the scientific method?

- A. Observation
- B. Experimentation
- C. Guessing the answer
- D. Conclusion

✓ **Answer:** C. Guessing the answer

Explanation:

- Guessing is not a scientific step.
- Science follows logical steps like observation, hypothesis, experiment, analysis and conclusion.



18 Which of the following is an example of a formal science?

- A. Biology
- B. Chemistry
- C. Psychology
- D. Sociology

✓ **Answer:** B. Chemistry

Explanation:

- Formal sciences deal with abstract concepts and use mathematics.
- Chemistry is based on theoretical principles and scientific laws.



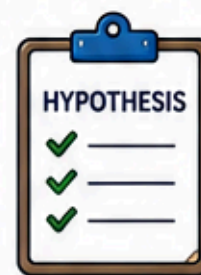
19 Which of the following is a tentative explanation that could be tested?

- A. Law
- B. Theory
- C. Hypothesis
- D. Fact

✓ **Answer:** C. Hypothesis

Explanation:

- A hypothesis is a proposed explanation.
- It is tested through experiments to determine whether it is true or false.



20 Which branch of science is concerned with the study of atmosphere and weather?

- A. Geology
- B. Astronomy
- C. Meteorology
- D. Ecology

✓ **Answer:** C. Meteorology

Explanation:

- Meteorology is the study of the atmosphere and weather phenomena.
- It helps in weather forecasting and climate understanding.



QUICK REVISION TIPS



Observe carefully.



Ask the right questions.



Form and test hypotheses.



Experiment and collect data.



Analyze and interpret the data.



Draw conclusion logically.



Share findings and learn.



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