



**Class: 9th**

**Subject: Physics**

**Chapter 9: Nature of Science**



**A Exercise MCQs**

**9.1 Physics is a branch of:**

- (a) Social science
- (b) Life science
- (c) Physical science
- (d) Biological science

**9.2 Which branch of science plays vital role in technology and engineering?**


- (a) Biology
- (b) Chemistry
- (c) Geology
- (d) Physics





**9.3 Automobile technology is based on:**

- (a) Acoustics
- (b) Electromagnetism
- (c) Optics
- (d) Thermodynamics



**9.4 A user-friendly software application of smartphone uses:**

- (a) Laser technology
- (b) Information technology
- (c) Medical technology
- (d) Electronic technology

**9.5 The working of refrigeration and air conditioning involves:**

- (a) Electromagnetism
- (b) Mechanics
- (c) Climate science
- (d) Thermodynamics


**9.6 What is the ultimate truth of a scientific**





**method?**

- (a) Hypothesis
- (b) Experiment
- (c) Theory
- (d) Law



**9.7 The statement "If I do not study for this test, then I will not get good grade" is an example of:**

- (a) Theory
- (b) Hypothesis
- (c) Prediction
- (d) Observation

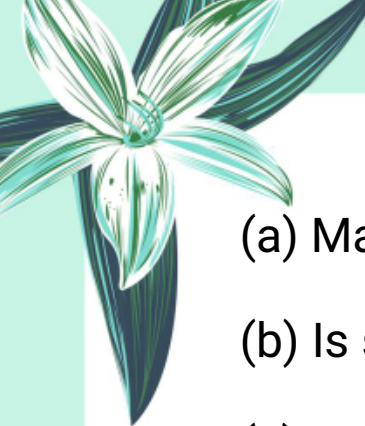



**9.8 Which of the following are methods of investigation?**

- (a) Observation
- (b) Experimentation
- (c) Research
- (d) All of these

**9.9 A hypothesis:**





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- 
- (a) May or may not be testable
  - (b) Is supported by evidence
  - (c) Is a possible answer to a question
  - (d) All of these



**9.10 A graph of an organized data is an example of:**

- (a) Collecting data
- (b) Forming a hypothesis
- (c) Asking question
- (d) Analyzing data

**9.11 The colour of a door is brown. It is an example of:**

- (a) Observation
  - (b) Hypothesis
  - (c) Prediction
  - (d) Law
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## Important MCQs:

1. Physics deals with the study of:

- (a) Only matter
- (b) Only energy
- (c) Matter, energy, space, time and their interactions



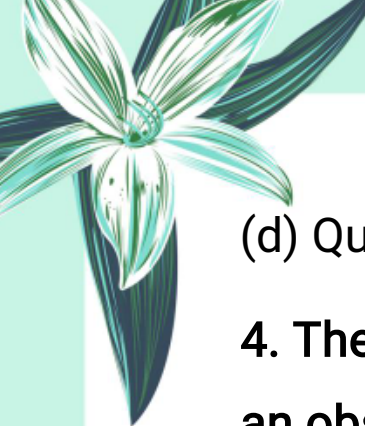
(d) Only motion

2. What is considered the fourth dimension in physics?

- (a) Mass
- (b) Energy
- (c) Time
- (d) Light

3. The relationship between space and time is described in:

- (a) Classical mechanics
- (b) Thermodynamics
- (c) Theory of relativity



(d) Quantum mechanics

**4. The phenomenon where time passes slowly for an observer moving at high speed is called:**

(a) Space contraction

(b) Time dilation

(c) Light reflection

(d) Quantum shift

**5. The toy working with steam was invented by:**

(a) Newton

(b) Einstein

(c) Hero of Alexandria

(d) Galileo

**6. The study of motion and forces is known as:**

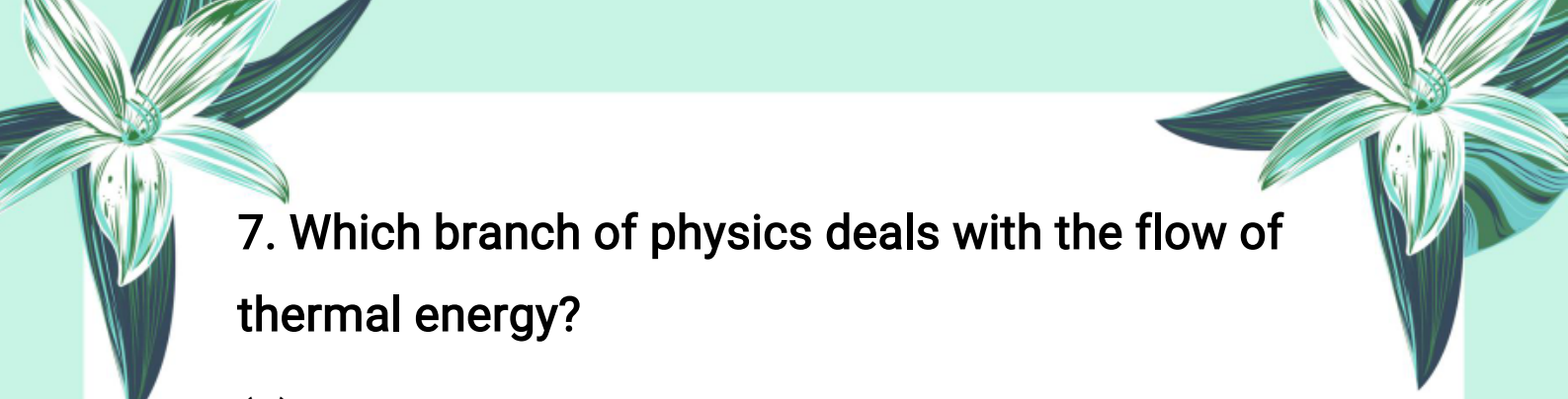
(a) Optics

(b) Acoustics

(c) Mechanics

(d) Electromagnetism





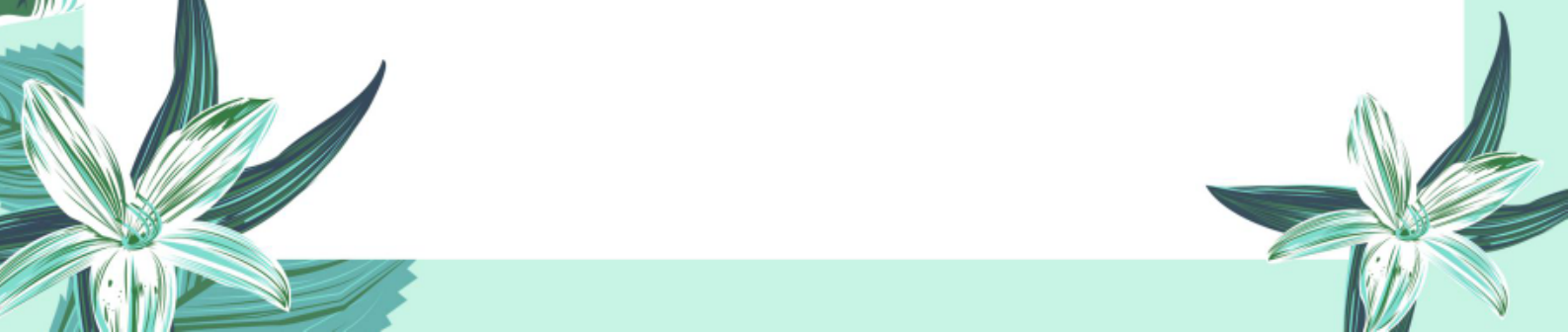
**7. Which branch of physics deals with the flow of thermal energy?**


- (a) Electromagnetism
- (b) Heat and thermodynamics
- (c) Acoustics
- (d) Cosmology

**8. Acoustics is the branch of physics that studies:**

- (a) Light
- (b) Heat
- (c) Sound
- (d) Magnetism

**9. The branch of physics related to visible light is called:**

- (a) Optics
  - (b) Astronomy
  - (c) Acoustics
  - (d) Mechanics
- 



**10. Electromagnetism studies the relationship between:**

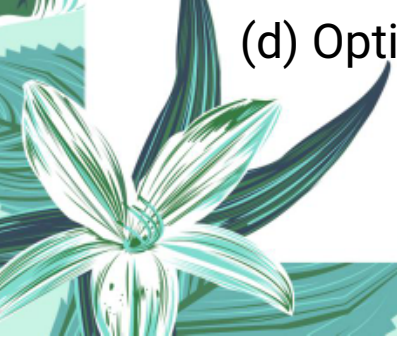
- (a) Electricity and speed
- (b) Magnetism and sound
- (c) Electric current and magnetic field
- (d) Heat and motion



**11. The behavior of particles at atomic and subatomic level is explained by:**

- (a) Optics
- (b) Quantum Mechanics
- (c) Solid State Physics
- (d) Thermodynamics

**12. Which branch deals with the relationship of space and time under gravity and speed?**


- (a) Classical Mechanics
  - (b) Thermodynamics
  - (c) Relativistic Mechanics
  - (d) Optics
- 





**13. The branch of physics that studies nuclei of atoms is:**

- (a) Particle Physics
- (b) Nuclear Physics
- (c) Cosmology
- (d) Mechanics



**14. The study of basic building blocks of matter is called:**

- (a) Quantum Mechanics
- (b) Particle Physics
- (c) Solid State Physics
- (d) Astronomy

**15. Cosmology is concerned with:**

- (a) Subatomic particles
- (b) The structure and evolution of the universe
- (c) Nuclei of atoms
- (d) Mechanical forces


**16. The integration of Physics with other fields is**





called:



- (a) Modern Physics
- (b) Interdisciplinary Nature of Physics
- (c) Theoretical Physics
- (d) Advanced Physics



**17. Which field uses physics to study biological structures and physical properties of organs?**

- (a) Medical Physics
- (b) Geophysics
- (c) Biophysics
- (d) Computation Physics

**18. MRI, X-rays, and ultrasound are examples of technologies used in:**

- (a) Astrophysics
  - (b) Medical Physics
  - (c) Climate Physics
  - (d) Computation Physics
- 
- 



**19. Which field studies the physical properties of celestial bodies?**

- (a) Cosmology
- (b) Geophysics
- (c) Astrophysics




**20. The internal structure of Earth and seismic activity are studied in:**

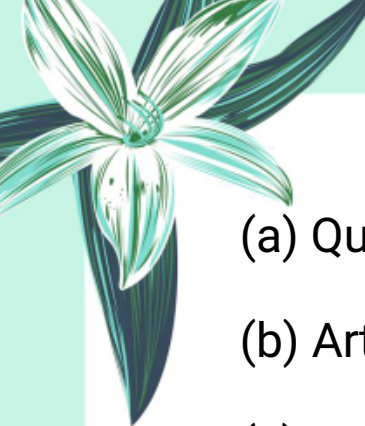

- (a) Biophysics
- (b) Geophysics
- (c) Climate Physics
- (d) Solid State Physics

**21. Climate Physics includes study of:**

- (a) Oceans only
- (b) Diseases only
- (c) Earthquakes only
- (d) Climate change and weather conditions

**22. The use of programming and algorithms to solve physical problems is called:**



- 
- 
- (a) Quantum Mechanics
  - (b) Artificial Intelligence
  - (c) Computation Physics
  - (d) Solid State Physics



**23. Nanotechnology is an example of:**

- (a) Pure biology research
- (b) Isolated physics study
- (c) Interdisciplinary innovation
- (d) Medical therapy

**24. Which of the following is a benefit of interdisciplinary research?**

- (a) Delayed innovation
- (b) Limited collaboration
- (c) Out-of-box solutions
- (d) Repetitive studies

**25. The Covid-19 pandemic was tackled by collaboration between:**

- (a) Biology and physics only
- 
- 



(b) Only physics experts

(c) Medical, biological, chemical, and physical sciences

(d) Only computer scientists

**26. Scientific method is a:**



(a) Random process

(b) Guessing game

(c) Systematic approach

(d) Magical belief

**27. The first step in scientific method is:**

(a) Experiment

(b) Observation

(c) Theory

(d) Hypothesis

**28. A proposed explanation based on observations is called:**

(a) Law

(b) Theory





(c) Experiment

(d) Hypothesis

**29. The process used to test the truth of a hypothesis is called:**



(a) Observation

(b) Prediction

(c) Experiment

(d) Falsifiability

**30. After successful experiments, a hypothesis becomes a:**

(a) Guess

(b) Law

(c) Theory

(d) Belief

**31. Which of the following ensures a theory is scientific and testable?**

(a) Simplicity

(b) Popularity





(c) Falsifiability

(d) Repetition

**32. When a theory is tested many times and accepted as true, it becomes a:**



(a) Model

(b) Prediction

(c) Observation

(d) Law

**33. The concept that a scientific theory must be testable and possibly false is called:**

(a) Logic

(b) Reliability

(c) Falsifiability

(d) Technology

**34. Laser technology is based on principles of:**

(a) Mechanics

(b) Thermodynamics

(c) Atomic Physics





(d) Optics

**35. Automobile technology is based on which principle?**

(a) Atomic structure

(b) Thermodynamics

(c) Wave theory

(d) Relativity



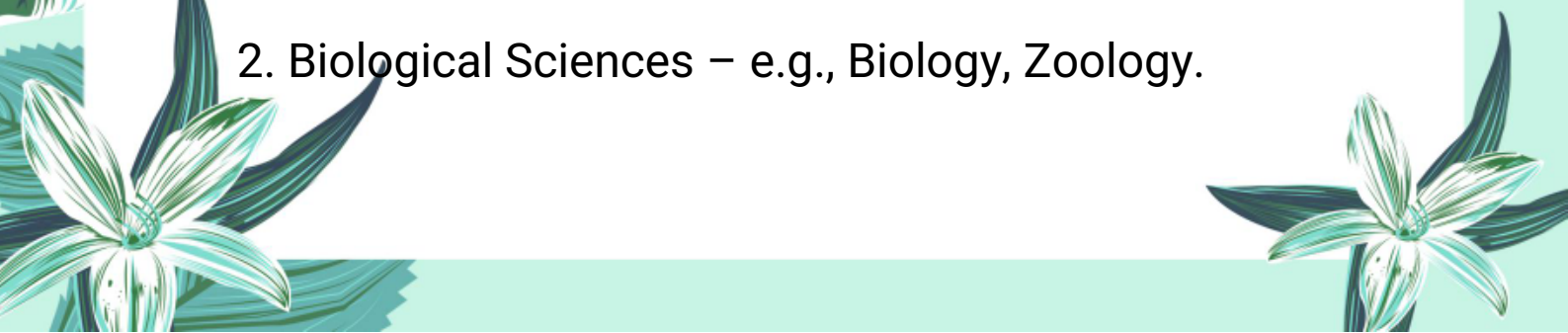
## **B Exercise Short Questions**

**9.1: State in your own words, what is science?  
Write its two main groups.**

**Answer:**

Science is the knowledge that we get through observation, experimentation, and reasoning to understand natural and physical phenomena.


**Its two main groups are:**

1. Physical Sciences – e.g., Physics, Chemistry.
  2. Biological Sciences – e.g., Biology, Zoology.
- 




**9.2: What is Physics all about? Name some of its branches.**

**Answer:**



Physics is the branch of science which deals with the study of matter, energy, and their mutual relationship.



**Some branches of Physics are:**

- Mechanics
  - Heat and thermodynamics
  - Acoustics
  - Optics
  - Astronomy
  - Nuclear Physics
- 

**9.3: What is meant by interdisciplinary fields? Give a few examples.**

**Answer:**

Interdisciplinary fields are those areas of study that combine the knowledge of different branches of science.



Examples include:

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- Biophysics (Biology + Physics)
- Geophysics (Geology + Physics)
- Astrophysics (Astronomy + Physics)
- Medical Physics (Medicine + Physics)

**9.4: List the main steps of scientific method.**

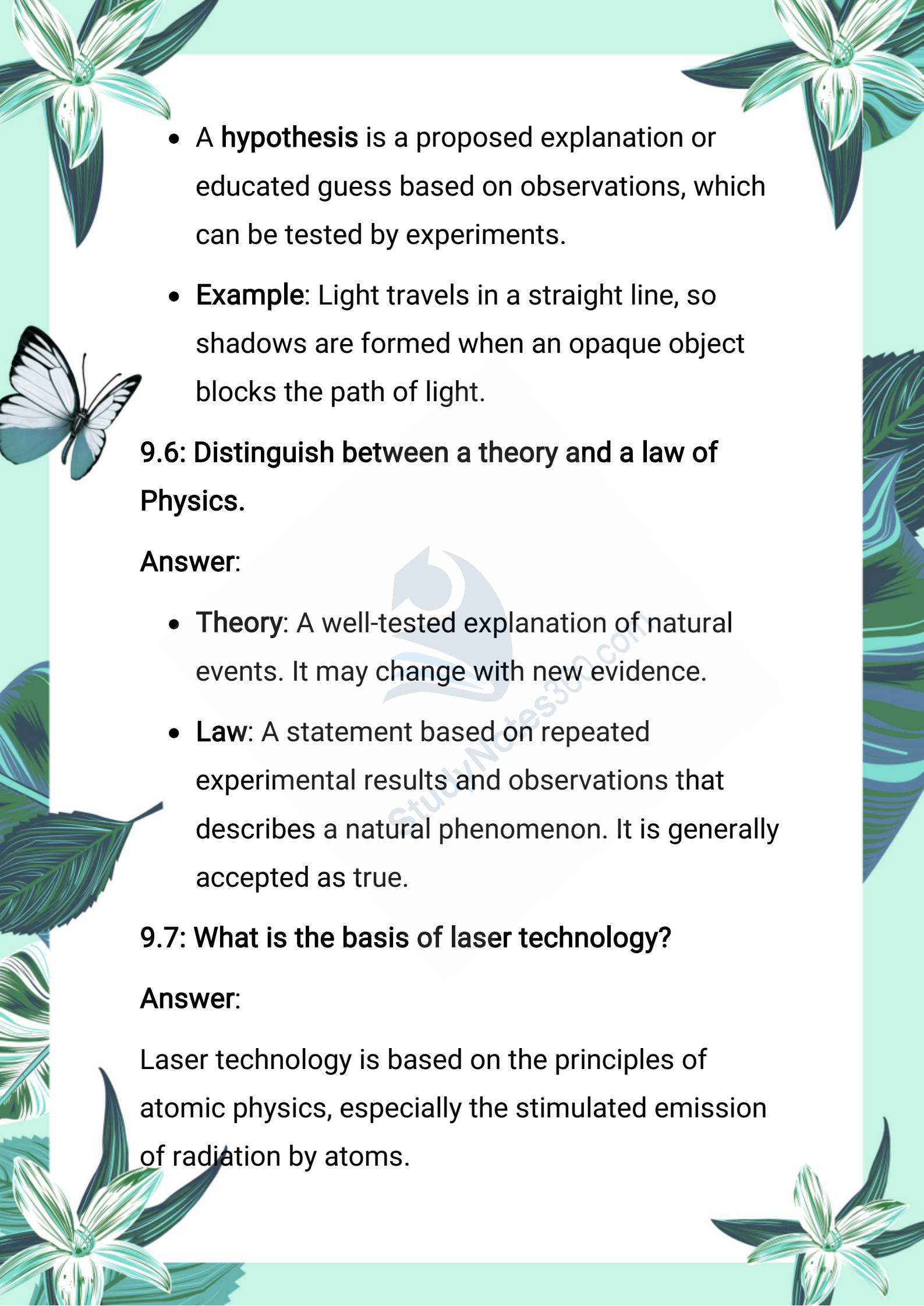
**Answer:**

The main steps of scientific method are:

1. Identify a problem
2. Make observations
3. Form a hypothesis
4. Perform experiments
5. Record and analyze data
6. Develop a theory
7. Make predictions and test them
8. Formulate a scientific law

**9.5: What is a hypothesis? Give an example.**

**Answer:**

- 
- The page is decorated with various botanical and nature-themed illustrations. In the top corners, there are stylized flowers with long, narrow petals. On the left side, a butterfly is shown in flight. The bottom corners also feature floral designs. The background is a light, solid color.
- A **hypothesis** is a proposed explanation or educated guess based on observations, which can be tested by experiments.
  - **Example:** Light travels in a straight line, so shadows are formed when an opaque object blocks the path of light.

### 9.6: Distinguish between a theory and a law of Physics.

**Answer:**

- **Theory:** A well-tested explanation of natural events. It may change with new evidence.
- **Law:** A statement based on repeated experimental results and observations that describes a natural phenomenon. It is generally accepted as true.

### 9.7: What is the basis of laser technology?

**Answer:**

Laser technology is based on the principles of atomic physics, especially the stimulated emission of radiation by atoms.

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**9.8: What is falsifiability concept? How is it important?**

**Answer:**


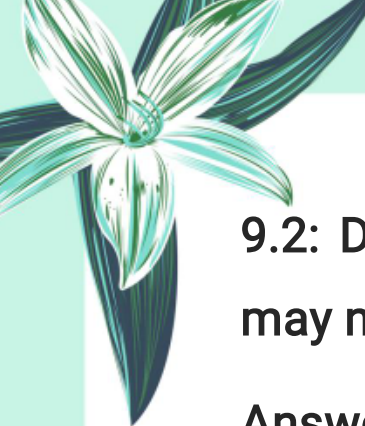
- **Falsifiability** is the concept that a scientific theory must make predictions that can be tested and possibly proven false.
- **Importance:** It helps differentiate scientific ideas from unscientific ones and ensures that theories are testable and based on evidence.

## **C Constructed Response Questions**

**9.1: Is the theory of science an ultimate truth? Describe briefly.**


**Answer:**

No, a scientific theory is not an ultimate truth. It is a well-tested explanation based on current knowledge and experiments. However, it can be modified or rejected if new evidence is found in the future.



**9.2: Do you think that the existing laws of nature may need a change in future? Describe briefly.**

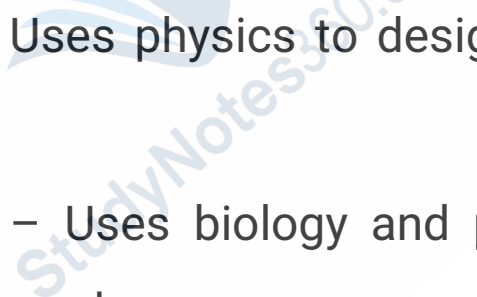
**Answer:**



Yes, scientific laws are based on present observations and experiments. If new discoveries or advanced tools provide different results, then existing laws may be changed or improved.

**9.3: Describe three jobs that need the use of scientific knowledge.**

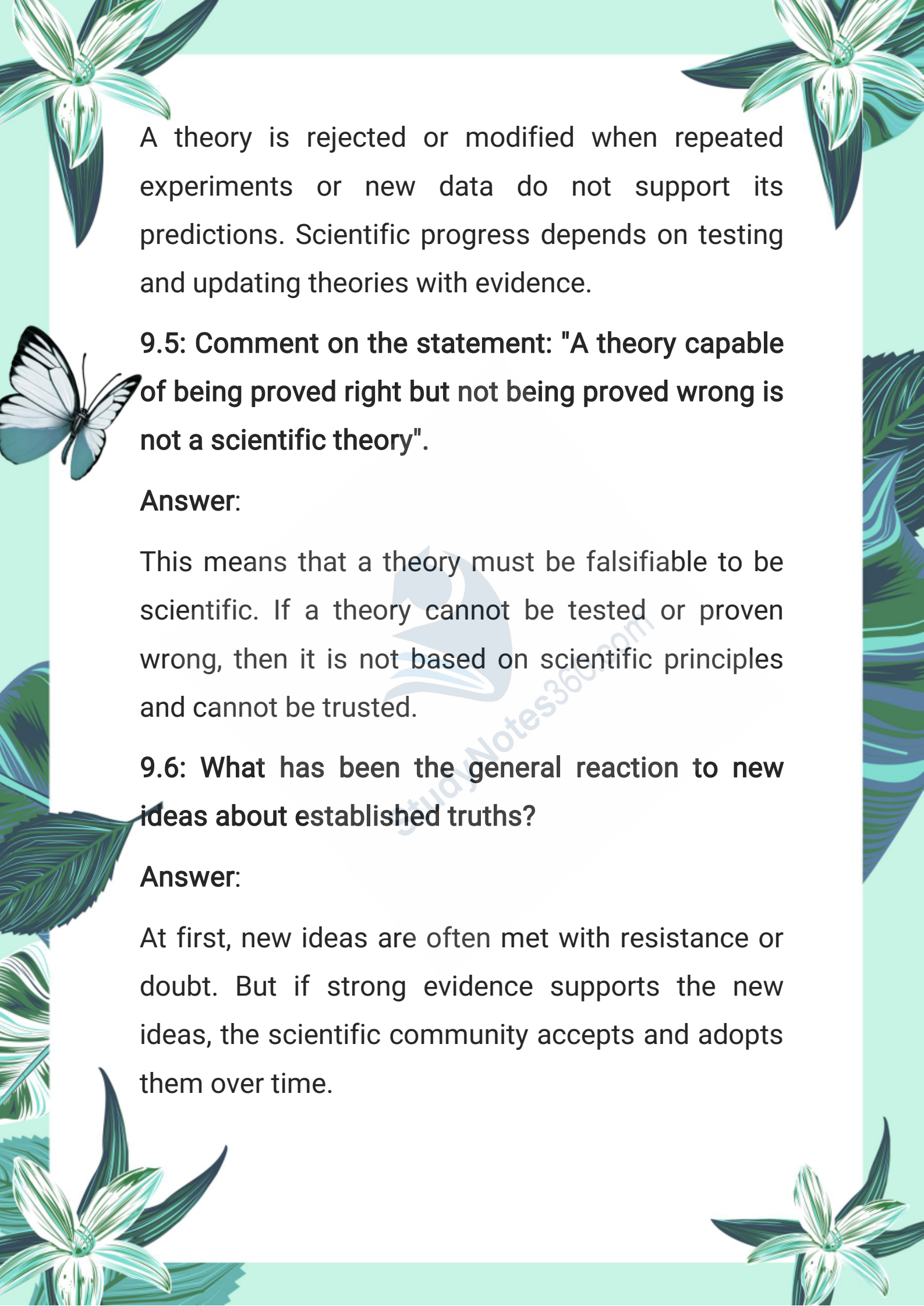
**Answer:**

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1. Civil Engineer – Uses physics to design bridges and buildings.
  2. Medical Doctor – Uses biology and physics in diagnosis and treatment.
  3. Computer Scientist – Uses mathematics and electronics in software and hardware development.

**9.4: Describe when a theory is rejected or needs its modification.**

**Answer:**



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A theory is rejected or modified when repeated experiments or new data do not support its predictions. Scientific progress depends on testing and updating theories with evidence.

**9.5: Comment on the statement: "A theory capable of being proved right but not being proved wrong is not a scientific theory".**

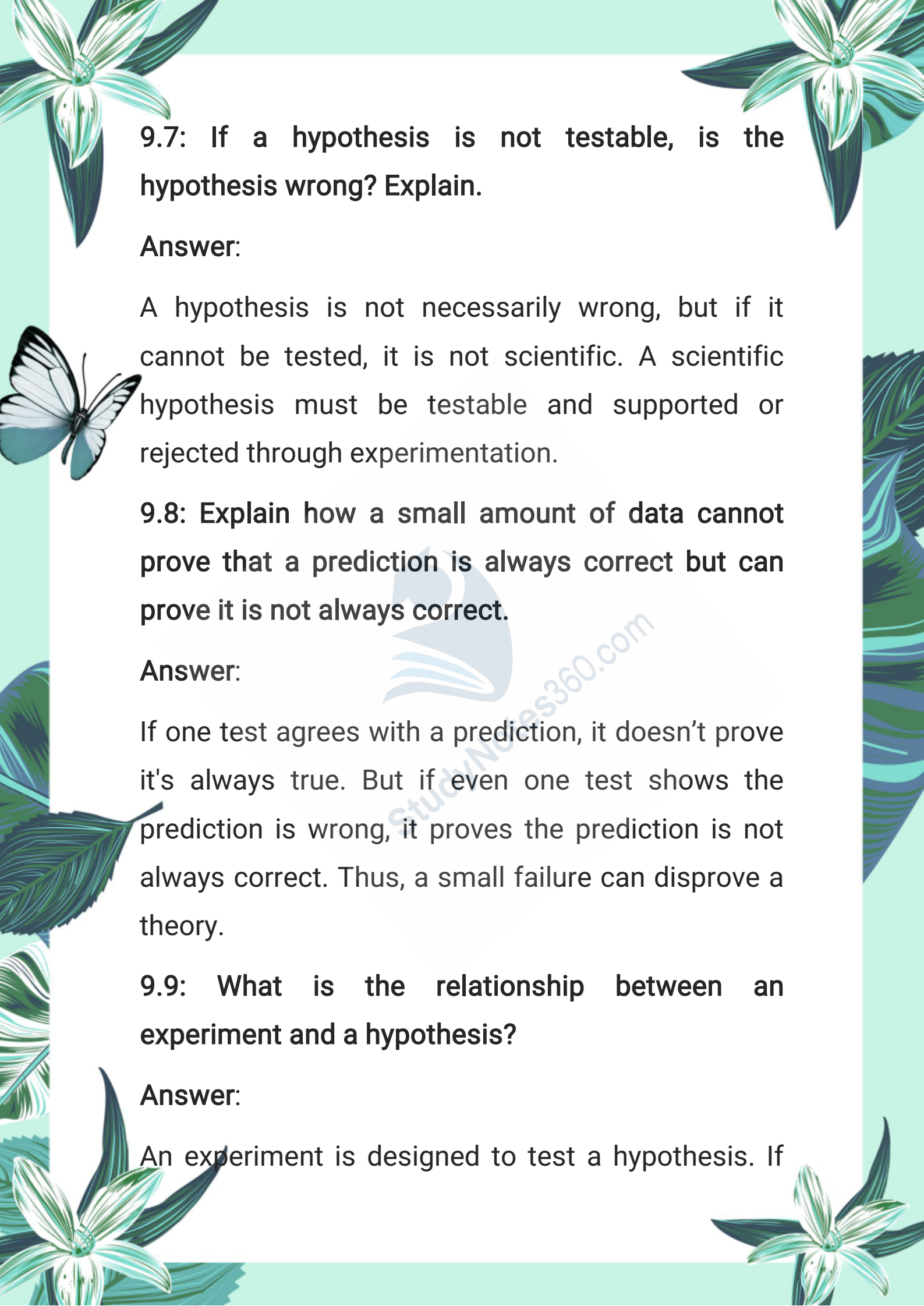
**Answer:**

This means that a theory must be falsifiable to be scientific. If a theory cannot be tested or proven wrong, then it is not based on scientific principles and cannot be trusted.

**9.6: What has been the general reaction to new ideas about established truths?**

**Answer:**

At first, new ideas are often met with resistance or doubt. But if strong evidence supports the new ideas, the scientific community accepts and adopts them over time.

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**9.7: If a hypothesis is not testable, is the hypothesis wrong? Explain.**

**Answer:**

A hypothesis is not necessarily wrong, but if it cannot be tested, it is not scientific. A scientific hypothesis must be testable and supported or rejected through experimentation.

**9.8: Explain how a small amount of data cannot prove that a prediction is always correct but can prove it is not always correct.**



**Answer:**

If one test agrees with a prediction, it doesn't prove it's always true. But if even one test shows the prediction is wrong, it proves the prediction is not always correct. Thus, a small failure can disprove a theory.


**9.9: What is the relationship between an experiment and a hypothesis?**

**Answer:**

An experiment is designed to test a hypothesis. If



the results support the hypothesis, it becomes stronger. If not, the hypothesis may need to be revised or rejected.



**9.10: Describe why the solution of complex problems needs interdisciplinary research and collaboration.**

**Answer:**



Complex problems often involve many aspects (e.g., medical, environmental, technical). Solving them requires knowledge from different scientific fields, so experts must collaborate to develop effective and complete solutions.

## **D Comprehensive Questions**

**9.1 What are the main branches of Physics? State briefly.**

**Answer:**


Physics is divided into several main branches, each dealing with different aspects of the physical world:





## 1. Mechanics:

The study of motion, forces, and their effects on objects. For example, studying how cars move or how a ball is thrown.



## 2. Thermodynamics:

Focuses on heat, temperature, and energy transfer. For example, how refrigerators and engines work.

## 3. Electromagnetism:

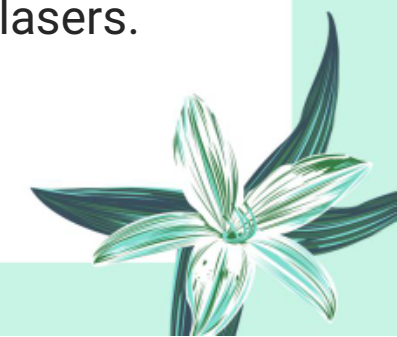

Deals with electric and magnetic forces and their applications. For example, electricity in homes and magnets.

## 4. Optics:

The study of light, its properties, reflection, and refraction. For example, lenses, glasses, and cameras.

## 5. Quantum Physics:

Studies particles at atomic and subatomic levels, explaining phenomena classical physics cannot. It forms the basis of modern technologies like lasers.





## 6. Acoustics:

It is the branch of physics that deals with the study of sound, its production, transmission, and effects.

**Example:** Designing music halls or controlling noise pollution.



## 7. Nuclear Physics:

This branch studies the structure and behavior of atomic nuclei and nuclear reactions such as fission and fusion.

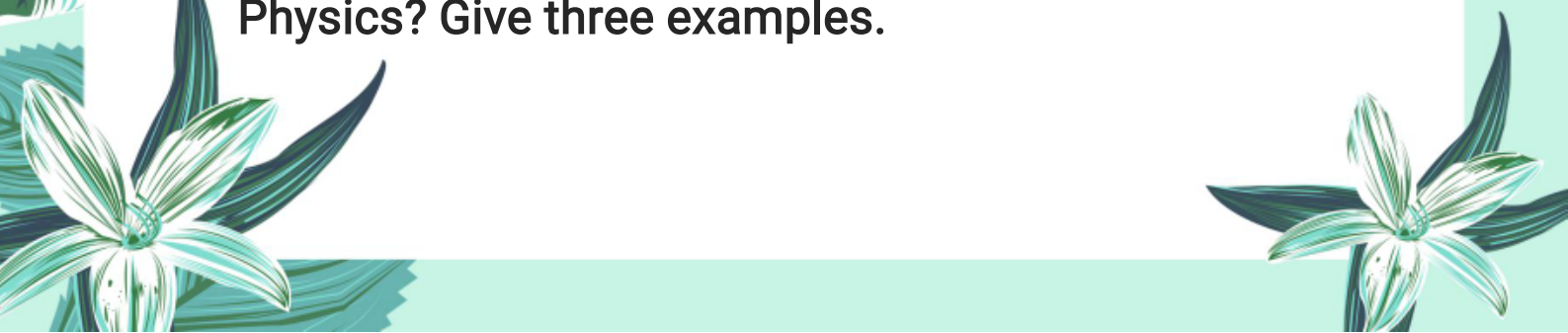
**Example:** Nuclear power plants and cancer radiotherapy.

## 8. Astronomy:

Astronomy is the branch that studies celestial objects like stars, planets, galaxies, and the universe.

**Example:** Understanding black holes or the movement of planets.

**9.2 What is meant by interdisciplinary fields of Physics? Give three examples.**





**Answer:**

Interdisciplinary fields combine physics with other sciences to solve complex problems or understand phenomena that cannot be studied by physics alone.

**Examples:**

**1. Biophysics:**

Applies physics principles to biological systems, such as studying how muscles contract or how nerve signals work.

**2. Medical Physics:**

Uses physics in medical diagnosis and treatment, such as X-rays, MRI, and radiation therapy.


**3. Astrophysics:**

Combines astronomy and physics to study stars, planets, and the universe's physical laws.

**9.3 What is the scientific method? Describe its main steps with examples.**

**Answer:**

The scientific method is a systematic approach

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used to investigate natural phenomena, solve problems, and discover truths through observation and experimentation. The main steps are:

### 1. Observation:

- Identify and observe a natural event or problem.
- **Example:** Noticing that shadows form when an object blocks light.

### 2. Hypothesis:

- Propose a possible explanation based on observations.
- **Example:** Light travels in a straight line causing shadows.

### 3. Experiment:

- Design and perform experiments to test the hypothesis.
- **Example:** Using cardboards with holes aligned to show that light passes straight through.

### 4. Data Collection and Analysis:


- Gather and organize data, often using graphs




or tables, to interpret results.

- **Example:** Recording whether light passes through aligned holes or not.


### 5. Theory Formation:

- 
- If the hypothesis is repeatedly supported by experiments, it becomes a theory explaining the phenomenon.
  - **Example:** The theory that light travels in straight lines.

### 6. Prediction:

- 
- Use the theory to predict outcomes in new situations.
  - **Example:** Predicting shadow shapes for various objects.

### 7. Law:



- When a theory is tested many times and widely accepted, it becomes a law describing consistent natural behavior.
  - **Example:** The law that light travels in a straight
- 



line.

#### 9.4 Differentiate the terms science, technology, and engineering with examples.

**Answer:**


- 
- **Science** The systematic study of the natural world to understand how it works. Studying how light behaves (Physics).
  - **Technology** Application of scientific knowledge to create tools or processes that solve problems. Developing laser devices for surgery.
  - **Engineering** Designing and building products or structures using scientific and technological knowledge, considering safety and cost. Civil engineers designing earthquake-resistant bridges.
  - Science discovers principles and laws.
  - Technology uses scientific knowledge to make useful tools.
  - Engineering applies both science and
- 



technology to design and build practical solutions.

**9.5 What is the scope of Physics in everyday life? Give some examples.**

**Answer:**



Physics plays a vital role in everyday life by explaining natural phenomena and enabling the development of technologies we use daily. Some examples include:

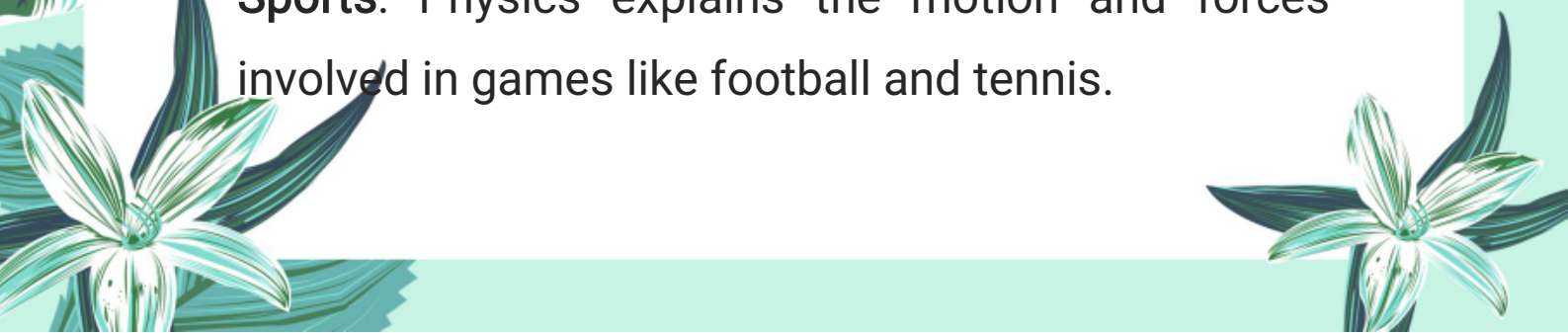
**Transportation:** Understanding mechanics helps design cars, trains, and airplanes.

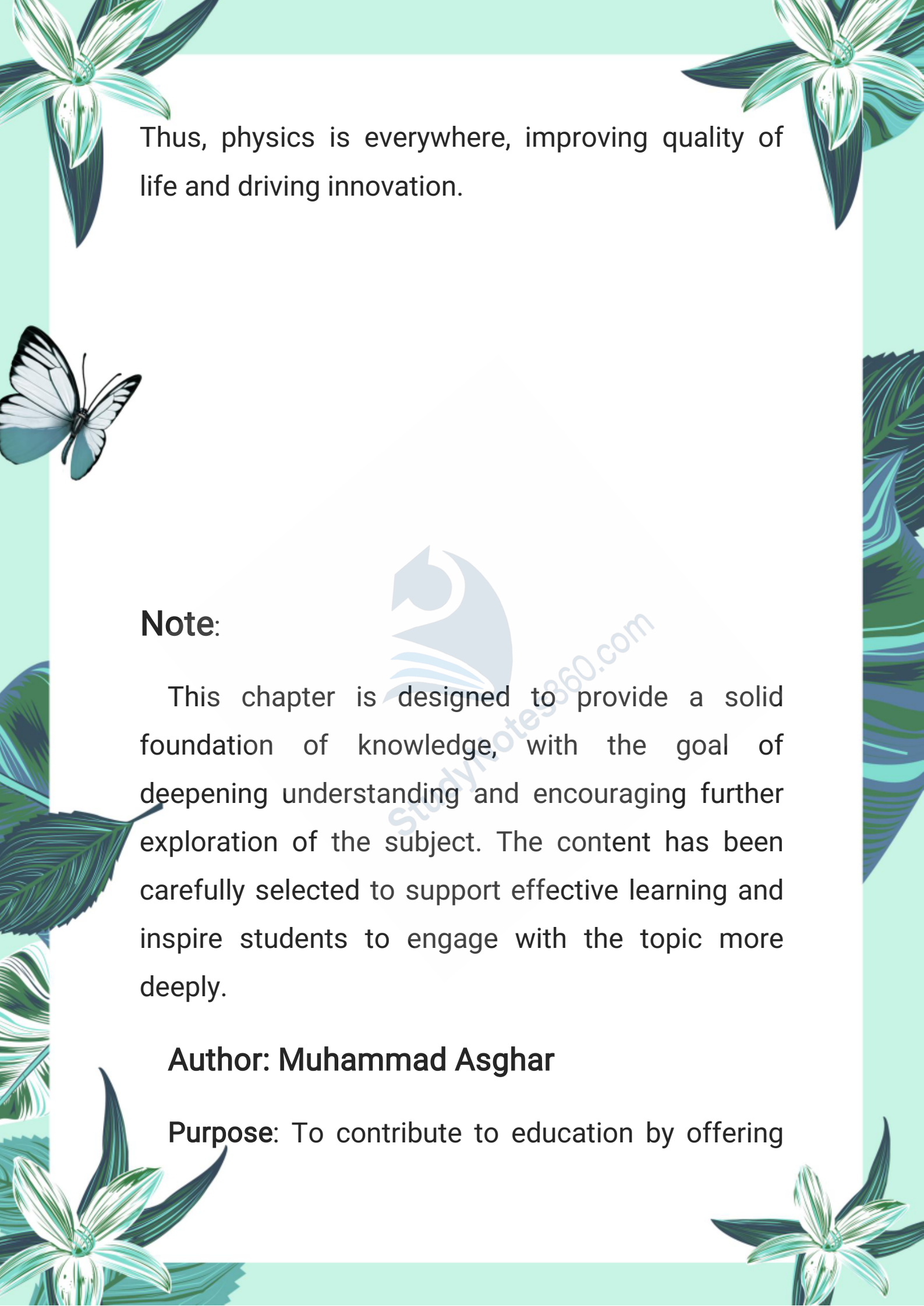
**Communication:** Electromagnetic waves allow radios, TVs, and smartphones to work.

**Medical Equipment:** X-rays and MRI machines rely on physics principles.

**Household Appliances:** Refrigerators, microwaves, and air conditioners use thermodynamics and electricity.

**Sports:** Physics explains the motion and forces involved in games like football and tennis.






Thus, physics is everywhere, improving quality of life and driving innovation.

### **Note:**

This chapter is designed to provide a solid foundation of knowledge, with the goal of deepening understanding and encouraging further exploration of the subject. The content has been carefully selected to support effective learning and inspire students to engage with the topic more deeply.

**Author: Muhammad Asghar**

**Purpose:** To contribute to education by offering



insightful, valuable content that enhances learning and understanding.

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