

Read the text.

Physics and engineering are closely connected disciplines that play a key role in technological development. Physics focuses on understanding the fundamental laws of nature, such as motion, energy, and force. Engineers apply this knowledge to design, build, and improve practical systems, structures, and devices. Without physics, engineering solutions would lack a scientific foundation, while without engineering, physical theories would remain abstract and unused.

Many modern technologies are the result of cooperation between physicists and engineers. For example, electrical engineering relies on electromagnetism, while mechanical engineering is based on classical mechanics and thermodynamics. A lack of coordination between these fields can lead to serious failures, as shown by real engineering disasters caused by miscommunication or incorrect application of physical principles. Therefore, interdisciplinary collaboration is essential for safe, efficient, and innovative engineering solutions.

Task 1. Choose the correct answer (a, b, or c).

1. The main purpose of physics is to
 - a) create technical devices
 - b) manage engineering systems
 - c) explain natural laws
2. Engineering is mainly concerned with
 - a) theoretical research
 - b) practical problem-solving
 - c) philosophical analysis
3. Electrical engineering is closely connected to
 - a) electromagnetism
 - b) thermodynamics
 - c) fluid mechanics
4. Engineering failures can happen when
 - a) materials are too strong
 - b) technology is advanced
 - c) communication between disciplines is poor
5. The text suggests that successful engineering projects require
 - a) more theory and less practice
 - b) cooperation between different fields
 - c) individual work by engineers only

Task 2. Do the test “Laws of Physics in Different Types of Engineering”. Choose the correct option.

1. Which law of physics is most essential for designing electrical circuits and communication systems?

- a) The Law of Gravitation
- b) Newton's First Law of Motion
- c) The Laws of Thermodynamics
- d) Maxwell's Equations of Electromagnetism

2. A civil engineer designing a bridge must apply Newton's Laws of Motion primarily to analyze:

- a) Electrical conductivity of materials
- b) Forces, tension, and structural stability
- c) Heat transfer through beams
- d) Light refraction in glass panels

3. Thermodynamics is crucial for which engineering field when designing engines or cooling systems?

- a) Software Engineering
- b) Mechanical Engineering
- c) Genetic Engineering
- d) Acoustical Engineering

4. Which branch of engineering directly uses principles of fluid dynamics?

- a) Aerospace Engineering
- b) Electrical Engineering
- c) Nuclear Engineering
- d) Computer Engineering

5. Semiconductor physics is the foundation for:

- a) Bridge construction
- b) Chemical plant design
- c) Digital electronics and computer chips
- d) Railway track alignment

6. In robotics engineering, laws of motion and control theory are used to:

- a) Write legal contracts
- b) Predict stock market trends
- c) Design gear and pulley systems
- d) Coordinate movement in automated systems

7. The safety of a skyscraper during an earthquake relies on an understanding of:

- a) Optics
- b) Structural dynamics and material science
- c) Electromagnetic waves
- d) Organic chemistry

8. Which law explains why airplanes can fly and is vital for aeronautical engineering?

- a) Bernoulli's Principle (Fluid Dynamics)
- b) Ohm's Law
- c) The Law of Conservation of Mass
- d) Hooke's Law

9. Engineers designing solar panels and photovoltaic cells apply knowledge from:

- a) Thermodynamics only
- b) Classical acoustics
- c) Quantum mechanics and semiconductor physics
- d) Newtonian gravity only

10. In automotive engineering, crash safety systems are developed using principles of:

- a) Electromagnetic induction
- b) Thermodynamic cycles
- c) Quantum entanglement
- d) Momentum, impulse, and deformation physics

Task 3. Match the term (1–8) with its definition (A–H).

Term	Definition
1. Applied science	A. The study of electric and magnetic forces and their interaction
2. Fundamental research	B. Research focused on understanding basic principles without immediate practical use
3. Matter	C. The act of putting theory or knowledge into use in real situations
4. Electromagnetism	D. The use of scientific knowledge to solve real-world technical problems
5. Structural integrity	E. Cooperation between specialists from different scientific or technical fields
6. Scalability	F. The theoretical basis that supports engineering and technological solutions
7. Engineering failure	G. Substances that have mass and occupy space
8. Scientific foundation	H. A breakdown caused by incorrect design or application of scientific principles
9. Interdisciplinary collaboration	I. The ability of a structure to remain strong and stable under load
10. Practical application	J. The capacity of a system to function effectively when expanded or increased in size

Task 4. Choose the correct word from the box to complete the sentences. Each word is used once.

Task 4A:

(principles – foresight – reliable – margin – translate – collaboration – core – abstract)

1. The laws of physics form the scientific _____ of every engineering discipline.
2. An engineer's main task is to _____ these physical laws into safe and functional designs.
3. A deep understanding of physics provides _____, helping engineers anticipate and prevent failures.
4. Successful projects often depend on close _____ between theorists and builders.
5. Engineering safety standards add a significant _____ of error to account for real-world uncertainties.
6. While physics can be highly _____, its application in engineering leads to _____ and practical technology.

Task 4B: Laws of Physics in Engineering

(Relativity Electromagnetism — Thermodynamics — Semiconductor — Physics Motion)

1. When designing a car's braking system, mechanical engineers must carefully calculate forces and inertia based on Newton's Laws of _____.
2. To ensure a smartphone battery doesn't overheat, electrical engineers apply the principles of _____ to manage energy flow and heat dissipation.
3. The precise timing in GPS satellites requires corrections based on Einstein's Theory of _____ to account for time dilation.
4. The operation of every computer processor is fundamentally based on the principles of _____.
5. Maxwell's equations, which describe _____, are essential for designing everything from electric motors to wireless communication networks.

Task 5. Choose True (T) or False (F).

1. Physics and engineering are completely separate disciplines.
2. Physics explains how nature works.
3. Engineering focuses on practical solutions.
4. Engineering does not need physics.
5. Interdisciplinary work reduces risks.
6. Electrical engineering depends on electromagnetism.
7. Theory has no role in technology.
8. Miscommunication can cause system failure.

Task 6. Listen and Complete the dialogue with the most appropriate word.

A: Why is a strong grasp of physics considered fundamental in engineering disciplines?

B: Because it provides the essential theoretical (1) _____ upon which all sound engineering design is built. Without it, solutions lack a reliable (2) _____.

A: Can you give a concrete example from a specific field?

B: Certainly. Take aerospace engineering. They must (3) _____ the (4) _____ of fluid dynamics and thermodynamics to (5) _____ aerodynamic performance and thermal management systems.

A: So it's not just about following codes and manuals?

B: Precisely. Codes provide safety (6) _____, but understanding the underlying physics allows engineers to (7) _____, (8) _____ designs, and (9) _____ problems when systems behave outside standard parameters.

A: What about when theoretical physics and practical constraints clash?

B: That's where engineering judgement comes in. An engineer must (10) _____ ideal physical models with real-world (11) _____ like cost, manufacturability, and material limitations to arrive at a viable solution.