

Fundamental Physics Concepts

Physics · Answer Key · 15 Questions

1. What fundamental force is responsible for holding the nucleus of an atom together, overcoming the electrostatic repulsion between protons?

- A) Gravitational Force
- B) Electromagnetic Force
- C) Weak Nuclear Force
- D) Strong Nuclear Force**

2. According to the second law of thermodynamics, in any natural thermodynamic process, the total entropy of an isolated system:

- A) Always decreases
- B) Always increases or remains constant**
- C) Always remains constant
- D) Can increase or decrease unpredictably

3. Which phenomenon explains why a prism separates white light into its constituent colors?

- A) Diffraction
- B) Interference
- C) Refraction**
- D) Polarization

4. The photoelectric effect, explained by Albert Einstein, provides strong evidence for the particle nature of light, where light is described as:

- A) Waves with varying frequencies
- B) Electromagnetic waves with constant amplitude
- C) Discrete packets of energy called photons**
- D) Continuous energy streams

5. In classical mechanics, Newton's first law of motion (the law of inertia) states that an object at rest will stay at rest and an object in motion will continue in motion with the same speed and in the same direction unless acted upon by an external:

- A) Force**
- B) Velocity
- C) Mass
- D) Acceleration

6. What is the phenomenon where a wave bends as it passes from one medium to another due to a change in speed?

- A) Reflection
- B) Diffraction
- C) Refraction**
- D) Dispersion

7. According to Ampère's law, the magnetic field around a current-carrying wire is directly proportional to the:

- A) Resistance of the wire
- B) Voltage across the wire
- C) Current flowing through the wire**
- D) Length of the wire

8. The uncertainty principle, formulated by Werner Heisenberg, states that it is impossible to simultaneously know with perfect accuracy both the position and the _____ of a particle.

- A) Charge
- B) Mass
- C) Energy
- D) Momentum**

9. What is the unit of electric potential difference (voltage)?

- A) Ampere
- B) Ohm
- C) Watt
- D) Volt**

10. The process by which energy is transferred through a vacuum, such as the heat from the Sun reaching Earth, is called:

- A) Conduction
- B) Convection
- C) Radiation**
- D) Advection

11. Which fundamental constant relates the energy of a photon to its frequency?

- A) Boltzmann constant
- B) Planck constant**
- C) Gravitational constant
- D) Speed of light

12. In special relativity, Einstein's famous equation $E=mc^2$ relates energy (E) to mass (m) and the speed of light (c). This implies that mass and energy are:

A) Unrelated entities

B) Completely different forms of the same fundamental substance

C) Only interchangeable under extreme conditions

D) Strictly conserved separately

13. What is the property of a material that opposes the flow of electric current?

A) Conductivity

B) Capacitance

C) Inductance

D) Resistance

14. The phenomenon where light waves bend around obstacles or spread out after passing through narrow openings is known as:

A) Interference

B) Diffraction

C) Refraction

D) Scattering

15. According to Archimedes' principle, the buoyant force on an object submerged in a fluid is equal to the weight of the _____ displaced by the object.

A) Object

B) Air

C) Fluid

D) Container