

# NEET Physics Practice Exam (Sample)

## Study Guide



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**SAMPLE**

## **Questions**

SAMPLE

1. In the work formula  $W = q \cdot V$ , what does 'q' represent?
  - A. Voltage
  - B. Coulombs of charge
  - C. Electric field
  - D. Inductance
2. What is the lens formula that relates focal length, image distance, and object distance?
  - A.  $1/f = 1/v + 1/u$
  - B.  $f = v + u$
  - C.  $1/f = 1/v - 1/u$
  - D.  $f = u / v$
3. What is contained within the nucleus of an atom?
  - A. Electrons and protons
  - B. Protons and neutrons
  - C. Nucleons and electrons
  - D. Only neutrons
4. Which equation represents the principle of refraction as stipulated in Snell's Law?
  - A.  $\mu_1 \sin(\theta_1) = \mu_2 \tan(\theta_2)$
  - B.  $\mu_1 \sin(\theta_1) = \mu_2 \sin(\theta_2)$
  - C.  $\mu_2 \sin(\theta_1) = \mu_1 \sin(\theta_2)$
  - D.  $\mu_1 = \sin(\theta_2) / \sin(\theta_1)$
5. In optical physics, what does ' $\lambda$ ' represent?
  - A. Frequency
  - B. Wavelength
  - C. Velocity
  - D. Energy

- 6. What defines an electromagnetic wave?**
- A. A wave formed by oscillating sound fields**
  - B. A longitudinal wave consisting of electric and magnetic fields**
  - C. A transverse wave composed of oscillating electric and magnetic fields**
  - D. A wave that requires a medium to travel through**
- 7. What role do inductors play in electrical circuits?**
- A. They amplify electrical signals**
  - B. They store energy in an electric field**
  - C. They store energy in a magnetic field**
  - D. They convert electrical energy to mechanical energy**
- 8. What does Archimedes' principle state about a body immersed in a fluid?**
- A. It will always sink**
  - B. It experiences a buoyant force equal to the weight of the fluid displaced**
  - C. It will float regardless of its weight**
  - D. It loses all weight within the fluid**
- 9. How does increasing fluid density affect pressure at a certain depth?**
- A. Pressure decreases**
  - B. Pressure remains constant**
  - C. Pressure increases**
  - D. Pressure fluctuates**
- 10. What is the function of a capacitor in an electrical circuit?**
- A. It creates resistance in the circuit.**
  - B. It stores electrical energy in an electric field.**
  - C. It converts AC to DC current.**
  - D. It amplifies electrical signals.**

## **Answers**

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1. B
2. A
3. B
4. B
5. B
6. C
7. C
8. B
9. C
10. B

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## **Explanations**

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1. In the work formula  $W = q \cdot V$ , what does 'q' represent?

A. Voltage

**B. Coulombs of charge**

C. Electric field

D. Inductance

In the work formula  $W = q \cdot V$ , 'q' stands for the charge in coulombs. This equation relates the work done (W) to the electric charge (q) and the electric potential difference (V) through which the charge moves. When a charge is subject to an electric potential, the work done on that charge is proportional to both the amount of charge and the potential difference it experiences. Specifically, if a charge moves through a potential difference, it gains or loses energy corresponding to that charge multiplied by the voltage (electric potential difference). Understanding the role of 'q' in this formula is crucial for analyzing situations involving electric circuits and energy transfer in electric fields, where knowing the amount of charge and the potential difference helps to calculate the total work done.

2. What is the lens formula that relates focal length, image distance, and object distance?

**A.  $1/f = 1/v + 1/u$**

B.  $f = v + u$

C.  $1/f = 1/v - 1/u$

D.  $f = u / v$

The lens formula that describes the relationship between the focal length (f), image distance (v), and object distance (u) for a thin lens is given by the equation  $1/f = 1/v + 1/u$ . This formula is fundamental in optics, as it allows one to determine how the position of the image formed by a lens relates to the position of the object. In this equation, f represents the focal length of the lens, which is the distance from the lens to its principal focus. The image distance (v) is the distance from the lens to the image formed, while the object distance (u) is the distance from the lens to the object being viewed. The signs of these distances are often determined based on the convention used (real is positive, virtual is negative). When using this formula, it is important to remember that whether the image is real or virtual will affect the signs of v and u, impacting the calculation of the focal length. The formula effectively combines these distances to provide a consistent way to analyze how light is refracted through a lens, yielding clear insights into optical phenomena. The other expressions do not accurately represent the relationship between these variables as seen in the behavior of lenses and would not yield reliable results when

### 3. What is contained within the nucleus of an atom?

- A. Electrons and protons
- B. Protons and neutrons**
- C. Nucleons and electrons
- D. Only neutrons

The nucleus of an atom is primarily composed of protons and neutrons. Protons carry a positive charge, while neutrons are electrically neutral. Together, these particles are collectively referred to as nucleons. The presence of protons in the nucleus determines the atomic number of the element, which in turn defines the element itself, while neutrons contribute to the mass and stability of the nucleus. Electrons, on the other hand, are not found within the nucleus but rather occupy regions around the nucleus in what are known as electron shells or orbitals. This distinction is crucial in understanding atomic structure, as electrons play a key role in chemical bonding and reactions, but they do not contribute to the nuclear composition. The inclusion of 'only neutrons' in one of the options would indicate a misrepresentation of the nucleus's composition, as it cannot exist solely with neutrons and must include protons as well. Similarly, options mentioning electrons in the nucleus misunderstand their placement in atomic structure. Thus, the correct understanding is that the nucleus houses both protons and neutrons, which is accurately reflected in the correct choice.

### 4. Which equation represents the principle of refraction as stipulated in Snell's Law?

- A.  $\mu_1 \sin(\theta_1) = \mu_2 \tan(\theta_2)$
- B.  $\mu_1 \sin(\theta_1) = \mu_2 \sin(\theta_2)$**
- C.  $\mu_2 \sin(\theta_1) = \mu_1 \sin(\theta_2)$
- D.  $\mu_1 = \sin(\theta_2) / \sin(\theta_1)$

Snell's Law describes the relationship between the angles of incidence and refraction when a wave such as light passes through different media with varying refractive indices. According to Snell's Law, the refractive index of the first medium ( $\mu_1$ ) multiplied by the sine of the angle of incidence ( $\theta_1$ ) is equal to the refractive index of the second medium ( $\mu_2$ ) multiplied by the sine of the angle of refraction ( $\theta_2$ ). This is mathematically represented as  $\mu_1 \sin(\theta_1) = \mu_2 \sin(\theta_2)$ . This relationship illustrates how the speed of light changes as it enters a medium with a different optical density, which leads to the bending of light. The concept is fundamental in understanding how lenses work and why objects appear displaced when viewed through water or glass. The alternative representations and combinations do not accurately portray this law, focusing incorrectly on aspects of sinusoidal relationships or misplacing the terms, leading to misunderstandings in the context of refraction. Snell's Law provides a straightforward and clear relationship necessary for solving problems related to light's behavior in varying media.

## 5. In optical physics, what does ' $\lambda$ ' represent?

- A. Frequency
- B. Wavelength**
- C. Velocity
- D. Energy

In optical physics, ' $\lambda$ ' (the Greek letter lambda) represents wavelength, which is a fundamental characteristic of waves, including light waves. Wavelength measures the distance between consecutive crests (or troughs) of a wave and is critical in defining properties of light such as color and energy. When examining waves, wavelength is inversely related to frequency. As the wavelength increases, the frequency decreases, and vice versa. This relationship is encapsulated in the equation  $v = f \cdot \lambda$ , where  $v$  is the velocity of the wave,  $f$  is the frequency, and  $\lambda$  is the wavelength. Understanding wavelength is essential in various applications, from designing optical instruments to understanding phenomena such as diffraction and interference. Wavelength is measured in meters or nanometers, particularly when discussing visible light. In summary, ' $\lambda$ ' specifically designates the spatial periodicity of a wave, making it vital in the study of optics and physics.

## 6. What defines an electromagnetic wave?

- A. A wave formed by oscillating sound fields
- B. A longitudinal wave consisting of electric and magnetic fields
- C. A transverse wave composed of oscillating electric and magnetic fields**
- D. A wave that requires a medium to travel through

An electromagnetic wave is defined as a transverse wave that consists of oscillating electric and magnetic fields, which are perpendicular to each other and also to the direction of wave propagation. This unique arrangement allows electromagnetic waves to travel through the vacuum of space, as they do not require a medium to propagate; instead, they can move through empty space, which is a defining characteristic. In electromagnetic waves, the electric field oscillates in one plane, while the magnetic field oscillates in another plane, which is perpendicular to the electric field. This mutual interplay of electric and magnetic fields is a fundamental principle of electromagnetism, as described by Maxwell's equations. Understanding that electromagnetic waves, such as light, radio waves, and X-rays, can propagate without a medium highlights their versatility and importance across various applications in technology, communication, and science. This is why the clarification of their transverse nature and the need for their oscillating fields is critical in identifying electromagnetic waves.

## 7. What role do inductors play in electrical circuits?

- A. They amplify electrical signals
- B. They store energy in an electric field
- C. They store energy in a magnetic field**
- D. They convert electrical energy to mechanical energy

Inductors play a critical role in electrical circuits by storing energy in a magnetic field. When an electric current flows through an inductor, it generates a magnetic field around it. This property allows inductors to store energy temporarily in that magnetic field and release it when needed. The ability of inductors to store energy makes them essential components in various applications, such as filters, transformers, and in energy storage systems like switch-mode power supplies. In these contexts, they help manage the flow of electricity, control voltage levels, and support the efficient transfer of energy in circuits. The other options do not accurately describe the function of inductors. For instance, inductors do not amplify electrical signals or convert electrical energy to mechanical energy; these functions are typically associated with different components or devices, such as transistors or electric motors. Additionally, energy storage in an electric field refers to capacitors, not inductors. Thus, the storing of energy in a magnetic field is specifically characteristic of inductors.

## 8. What does Archimedes' principle state about a body immersed in a fluid?

- A. It will always sink
- B. It experiences a buoyant force equal to the weight of the fluid displaced**
- C. It will float regardless of its weight
- D. It loses all weight within the fluid

Archimedes' principle states that any body immersed in a fluid experiences a buoyant force that is equal to the weight of the fluid that is displaced by that body. This principle is foundational in fluid mechanics and applies to both submerged and floating objects. When an object is placed in a fluid, it pushes aside a volume of the fluid equal to its own submerged volume. The weight of this displaced fluid creates an upward force on the object, known as the buoyant force. This principle explains why objects can float or sink in various fluids based on their density compared to the density of the fluid. If the weight of the displaced fluid is greater than the weight of the object, the object will float. If it is less, the object will sink. Understanding this helps in predicting the behavior of objects when placed in liquids and is critical in applications ranging from shipbuilding to designing underwater vehicles. The other options do not accurately reflect Archimedes' principle, as they suggest incorrect scenarios regarding buoyancy and weight in fluids.

**9. How does increasing fluid density affect pressure at a certain depth?**

- A. Pressure decreases
- B. Pressure remains constant
- C. Pressure increases**
- D. Pressure fluctuates

In fluid mechanics, pressure at a certain depth in a fluid is influenced by the density of that fluid. According to the hydrostatic pressure formula, pressure at depth is given by the equation:  $P = P_0 + \rho g h$  where  $P$  is the pressure at depth,  $P_0$  is the atmospheric pressure at the surface,  $\rho$  represents the fluid density,  $g$  is the acceleration due to gravity, and  $h$  is the depth of the fluid. As fluid density increases, the term  $\rho$  in the equation increases. Since both  $g$  (a constant near the Earth's surface) and  $h$  (the depth) remain constant for a given situation, a higher density  $\rho$  results in a greater pressure exerted at that specific depth. Therefore, it can be concluded that increasing the density of the fluid leads to an increase in pressure at a given depth, validating the selection as the correct answer. This relationship highlights why denser fluids, such as mercury compared to water, exert significantly more pressure at the same depth, further illustrating how density is a critical factor in determining pressure in fluids.

**10. What is the function of a capacitor in an electrical circuit?**

- A. It creates resistance in the circuit.
- B. It stores electrical energy in an electric field.**
- C. It converts AC to DC current.
- D. It amplifies electrical signals.

A capacitor plays a crucial role in electrical circuits by storing electrical energy in an electric field. When it is connected to a voltage source, a capacitor accumulates charge on its plates, resulting in the formation of an electric field between them. This stored energy can then be released back into the circuit when needed, allowing the capacitor to smooth out fluctuations in voltage, filter signals, and provide timing elements in various applications. In various circuits, the ability to store and release energy makes capacitors essential for tasks such as smoothing out the output of power supplies, coupling signals in amplifiers, and timing in oscillators. This function of energy storage is fundamental to the operation of many electronic devices, as it allows for more stable and reliable performance in the face of varying electrical demands.