Photoelectric Effect Quiz Answer Key PDF

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What is the minimum energy required to eject an electron from a material called?

A. Kinetic energy
B. Photon energy
C. Work function ✓
D. Potential energy

What happens to the number of emitted electrons when the intensity of light increases?

A. It decreases
B. It remains the same
C. It increases ✓
D. It becomes zero

Who provided the theoretical explanation for the photoelectric effect?

A. Isaac Newton
B. Niels Bohr
C. Albert Einstein ✓
D. James Clerk Maxwell

What is the unit of Planck's constant?

A. Joules
B. Newtons
C. Joules per second
D. Joules second ✓

Discuss how the photoelectric effect is utilized in solar panels.

Solar panels utilize the photoelectric effect by absorbing photons from sunlight, which energizes electrons in the semiconductor material, allowing them to flow and create an electric current.

Why was Einstein's explanation of the photoelectric effect important for his Nobel Prize win?

Einstein's explanation of the photoelectric effect was important for his Nobel Prize win because it validated the concept of quantized energy levels and supported the emerging theory of quantum mechanics.

What is the significance of the threshold frequency in the photoelectric effect?

The threshold frequency is significant because it determines the minimum energy required for electrons to be emitted from a material in the photoelectric effect.

Describe the role of the work function in the photoelectric effect.

In the photoelectric effect, the work function is the minimum energy needed to liberate an electron from the surface of a material. If the energy of the incoming photons (light) is greater than the work function, electrons are emitted; otherwise, no electrons are released.

How did the photoelectric effect contribute to the development of quantum mechanics?

The photoelectric effect contributed to the development of quantum mechanics by providing evidence that light consists of discrete packets of energy called photons, which challenged classical physics and supported the idea of quantization.

Which applications rely on the photoelectric effect? (Select all that apply)

A. Solar panels ✓
B. Photodetectors ✓
C. X-ray machines
D. Light meters ✓

Explain how the photoelectric effect supports the particle theory of light.

The photoelectric effect supports the particle theory of light by showing that light consists of discrete packets of energy (photons) that can transfer energy to electrons, causing them to be emitted from a material when the light's frequency exceeds a certain threshold.

Which device utilizes the photoelectric effect to convert light into electrical energy?

A. Thermometer

B. Solar panel ✓

C. Barometer

D. Hygrometer

In the photoelectric effect, what is true about the kinetic energy of emitted electrons? (Select all that apply)

A. It is independent of the light's frequency.

B. It increases with increasing frequency of the light. ✓

C. It is zero if the frequency is below the threshold frequency. ✓

D. It depends on the intensity of the light.

What factors affect the emission of electrons in the photoelectric effect? (Select all that apply)

A. Frequency of the incident light ✓

B. Intensity of the incident light ✓

C. Work function of the material ✓

D. Temperature of the material

Which constant is used to calculate the energy of a photon?

A. Gravitational constant

B. Planck's constant ✓

C. Coulomb's constant

D. Boltzmann's constant

Which of the following are true about Einstein's contribution to the photoelectric effect? (Select all that apply)

A. He introduced the concept of photons. ✓

B. He disproved the wave theory of light.

C. He received a Nobel Prize for his work on the photoelectric effect. ✓
D. He developed the theory of relativity based on the photoelectric effect.

What is the photoelectric effect?

A. Emission of light from a surface
B. Emission of electrons from a material when it absorbs light ✓
C. Absorption of electrons by a material
D. Reflection of light from a surface

Which of the following statements about the photoelectric effect are true? (Select all that apply)

A. Electrons are emitted only if the light frequency is above a certain threshold. ✓
B. Increasing light intensity increases the kinetic energy of emitted electrons.
C. The effect supports the particle theory of light. ✓
D. The photoelectric effect can occur with any frequency of light.

What is the relationship between the frequency of light and the kinetic energy of ejected electrons?

A. Directly proportional ✓
B. Inversely proportional
C. No relationship
D. Exponentially proportional

What are the implications of the photoelectric effect for quantum mechanics? (Select all that apply)

A. It supports the wave theory of light.
B. It provides evidence for quantized energy levels. ✓
C. It challenges classical physics. ✓
D. It suggests light has both wave and particle properties. ✓