

Quiz Grade: 94.4% (A)

Quiz Submission

Analysis of Methods & Technologies for Harnessing Solar Energy

Student Name: Richard Chongo
Student ID: UD96533EN105755
Study Program: Environmental Science
Quiz ID: 9a9361a4-91ab-4eff-b864-2420bb1ee106
Submission Date: October 11, 2026 at 10:19 PM
Total Questions: 9

Course Information

Course Title: Analysis of Methods & Technologies for Harnessing Solar Energy
Course Code: LCAME 616
Credit Hours: 3

Quiz Questions, Student Answers, and Correct Answers

Question 1 of 9

Multiple Choice Question

Which of the following is the most widely used solar energy technology?

Available Options:

(A) Photovoltaics ← STUDENT SELECTED ← CORRECT ANSWER

(B) Concentrated Solar Power

(C) Solar Heating

(D) Solar Thermal Energy

Student's Answer: Option A: Photovoltaics

Correct Answer: Option A: Photovoltaics

Question 2 of 9

Multiple Choice Question

What is the primary mechanism through which photovoltaic cells convert sunlight into electricity?

Available Options:

(A) Photoconductivity

(B) Thermoelectric effect

(C) Photoelectric effect ← STUDENT SELECTED ← CORRECT ANSWER

(D) Photon absorption

Student's Answer: Option C: Photoelectric effect

Correct Answer: Option C: Photoelectric effect

Question 3 of 9

Multiple Choice Question

In concentrated solar power (CSP) systems, what is the primary purpose of mirrors?

Available Options:

- (A) To collect heat
- (B) To convert electricity
- (C) To store energy

(D) To reflect sunlight ← STUDENT SELECTED ← CORRECT ANSWER

Student's Answer: Option D: To reflect sunlight

Correct Answer: Option D: To reflect sunlight

Question 4 of 9

Multiple Choice Question

Which of the following factors does NOT significantly affect the efficiency of a solar panel?

Available Options:

- (A) Temperature
- (B) Angle of installation

(C) Type of inverter ← STUDENT SELECTED ← CORRECT ANSWER

(D) Solar radiation intensity

Student's Answer: Option C: Type of inverter

Correct Answer: Option C: Type of inverter

Question 5 of 9

Multiple Choice Question

What is one environmental impact of solar farms?

Available Options:

- (A) Increased carbon emissions

(B) Habitat disruption ← STUDENT SELECTED ← CORRECT ANSWER

- (C) Ozone layer depletion
- (D) Water pollution

Student's Answer: Option B: Habitat disruption

Correct Answer: Option B: Habitat disruption

Question 6 of 9

Multiple Choice Question

What is the role of a solar inverter in a photovoltaic system?

Available Options:

(A) To optimize energy storage

(B) To convert DC to AC power ← STUDENT SELECTED ← CORRECT ANSWER

(C) To track solar paths

(D) To cool solar panels

Student's Answer: Option B: To convert DC to AC power

Correct Answer: Option B: To convert DC to AC power

Question 7 of 9

Text Answer Question

Describe two advantages of utilizing solar energy technology over fossil fuels.

Student's Answer:

Two major advantages of utilizing solar energy technology over fossil fuels are: 1. Significant Reduction in Greenhouse Gas Emissions and Air Pollution Unlike fossil fuels (coal, oil, and natural gas)—which emit carbon dioxide (CO₂), methane, sulfur dioxide, and particulate matter when burned—solar energy generates clean electricity without emitting greenhouse gases or harmful pollutants during operation. Transitioning to solar helps mitigate global climate change and drastically reduces air pollution, improving public health and air quality. 2. Renewable, Abundant, and Infinitely Sustainable Fuel Source Fossil fuels are finite, non-renewable resources that require continuous, environmentally destructive extraction (mining, drilling, and fracking) and are subject to global supply chain disruptions and price volatility. In contrast, sunlight is a universally abundant, inexhaustible resource available globally. Once solar panels are installed, the primary fuel source—sunlight—is free, predictable, and virtually limitless.

Correct Answer:

Solar energy is renewable and does not emit greenhouse gases during operation.

Question 8 of 9

Text Answer Question

What are the main challenges facing the widespread adoption of solar photovoltaic technology?

Student's Answer:

While solar photovoltaic (PV) technology has experienced rapid growth and dramatic cost reductions, several structural, technical, and economic challenges continue to hinder its global, widespread adoption: 1. Intermittency and Energy Storage Bottlenecks - Variable Generation: Solar PV depends entirely on sunlight, meaning power generation varies throughout the day, drops during overcast weather, and ceases at night. - Storage High Capital Costs: To provide round-the-clock power, solar systems require battery energy storage systems (BESS). Although battery costs are declining, utility-scale storage remains a major financial hurdle. - Grid Balancing: Rapid fluctuations in solar supply can create grid instability, requiring complex real-time grid management or backup thermal power generation. 2. High Upfront Capital and Financial Barriers - Initial Investment: While solar fuel (sunlight) is free, the upfront cost for panels, inverters, cabling, mounting structures, and professional installation can be steep for low-income households, small businesses, and developing nations. - Financing Access: High interest rates and limited access to capital markets in emerging economies slow down large-scale solar projects, despite low long-term operational costs. 3. Infrastructure and Grid Integration Constraints - Aging Grid Networks: Many power grids were designed for centralized fossil fuel plants with predictable baseload power. Integrating decentralized, variable renewable energy (VRE) requires massive grid modernization, power line upgrades, and smart grid technology. - Transmission Bottlenecks: Ideal sites for large solar farms (e.g., deserts or rural areas with high solar irradiance) are often located far from urban demand centers, requiring long-distance, expensive high-voltage transmission lines. 4. Supply Chain, Critical Minerals, and Recycling - Resource Constraints: Manufacturing PV panels requires critical minerals like silicon, silver, indium, and tellurium. Concentrated supply chains and price volatility for these raw materials can cause production bottlenecks. - End-of-Life Waste Management: Millions of solar panels will reach their ~25-to-30-year lifespan in the coming decades. Creating efficient, cost-effective recycling frameworks to prevent PV modules from ending up in landfills remains a major environmental challenge. 5. Land Use and Policy Uncertainties - Spatial Competition: Utility-scale solar requires large physical footprints, sometimes sparking conflict over competing land-use priorities like agricultural production, forest conservation, or biodiversity protection. - Regulatory Inconsistency: Inconsistent government policies, changing subsidy structures (e.g., reductions in net metering tariffs), and import tariffs on solar components can create long-term uncertainty for investors and developers.

Correct Answer:

Challenges include high initial costs, energy storage issues, and dependence on sunlight availability.

Question 9 of 9

Text Answer Question

Explain how solar irradiance affects the performance of solar panels.

Student's Answer:

Because irradiance fluctuates constantly throughout the day due to the sun's angle, cloud cover, and atmospheric conditions, a solar panel's actual hourly output continuously mirrors these shifts in light intensity.

Correct Answer:

Higher solar irradiance increases the output of solar panels, while lower irradiance can significantly decrease their efficiency.

This quiz was generated using based on course content.

Generated on October 11, 2026 at 10:19 PM