

## MODULE 3

### HYDROGEN LOGISTICS, SUSTAINABLE DEVELOPMENT, AND ECOLOGY

#### Knowledge Assessment for Module 3

Select one accurate response for each question.

**Question 1: Which type of hydrogen generates the most significant carbon footprint, approximately 10 kg of CO<sub>2</sub> for every kilogram of H<sub>2</sub>?**

- A. Green hydrogen
- B. Blue hydrogen
- C. Gray hydrogen
- D. Turquoise hydrogen

**Question 2: What is the primary objective of employing the Life Cycle Analysis (LCA) method in sustainable logistics?**

- A. Reduction of transportation costs only.
- B. Evaluation of the product's impact on employee health.
- C. Evaluation of the environmental factors and potential effects of products across their life cycle.
- D. Enhance production.

**Question 3: According to the podcast "Sustainable Logistics: How Can We Reduce Our Carbon Footprint?", what proportion of global CO<sub>2</sub> emissions from energy consumption is attributed to transportation?**

- A. Approximately 14% (OECD data)
- B. Approximately 24% (IEA data)
- C. Approximately 30%
- D. Approximately 60%

**Question 4: What type of hydrogen is generated using renewable energy via water electrolysis, as mentioned in the mini-lecture?**

- A. White hydrogen
- B. Gray hydrogen
- C. Blue hydrogen
- D. Green hydrogen

**Question 5: Which phase of the hydrogen supply chain is regarded as one of the most intricate and expensive, as stated in the mini-lecture?**

- A. Hydrogen Generation
- B. Hydrogen Storage
- C. Hydrogen Transportation
- D. Hydrogen Utilization

**Question 6: In Worksheet 1, the transportation of  $\text{CGH}_2$  in a Euro VI truck over a distance of 300 km results in  $\text{CO}_2$  emissions amounting to:**

- A. 120 kilograms
- B. 180 kilograms
- C. 360 kilograms
- D. 600 kilograms

**Question 7: What is the primary advantage of adopting the "green warehouse" concept in the logistics sector, as outlined in Article 1?**

- A. Enhancing the elevation of goods storage.
- B. Decreasing energy expenses and reducing the carbon footprint.
- C. Enhanced employee productivity exclusively.
- D. Enhancing the visual appeal of structures.

**Question 8: In Worksheet 2, what are the  $\text{CO}_2$  emissions from the pipeline for transporting 20 tonnes of hydrogen over a distance of 400 km?**

- A. 40 kilograms
- B. 160 kilograms
- C. 80 kilograms
- D. 120 kilograms

**Question 9: What is the annual demand for renewable energy (TWh) in the European Union to meet the goal of producing 10 million tonnes of green hydrogen annually by 2030, as stated in the mini-lecture?**

- A. 100 terawatt-hours
- B. 250 terawatt-hours
- C. 500 terawatt-hours
- D. 1000 terawatt-hours

**Question 10: Which of the following hydrogen transport technologies does not necessitate refrigeration or pressure but does require energy for the release of hydrogen (dehydrogenation)?**

- A. Gas transmission pipelines
- B. Cryogenic storage tanks
- C. Ammonia (NH<sub>3</sub>)
- D. Liquid Organic Hydrogen Carriers (LOHC)

**Question 11: What is a crucial metric for evaluating a business's influence on climate change, quantifying the total volume of greenhouse gases, as discussed in the podcast "Sustainable Logistics: How Can We Reduce Our Carbon Footprint?"?**

- A. Water usage
- B. Carbon emissions
- C. Energy usage
- D. Air quality degradation

**Question 12: According to Article 2 on LCA, at which stage of a product's life cycle does LCA enable designers to evaluate the environmental impact of various material and technological alternatives?**

- A. Exclusively during the recycling phase.
- B. Exclusively during the use of the product.
- C. Currently in the product design phase.
- D. Only subsequent to product disposal.

**Question 13: Which of the following companies has established a warehouse in Amsterdam that has attained BREEAM "Outstanding" certification due to the incorporation of green technologies, as stated in Article 1?**

- A. Amazon
- B. DHL
- C. UPS
- D. FedEx

**Question 14: What are the primary challenges associated with implementing a sustainable supply chain, as discussed in the podcast "Sustainable Logistics: How Can We Reduce Our Carbon Footprint?"?**

- A. Minimal investment expenses.
- B. Insufficient customer interest.
- C. Significant initial capital expenditures for new technologies and the necessity to upgrade infrastructure.
- D. Insufficient access to technology.

**Question 15: Based on the mini-lecture, which phase of the hydrogen supply chain is the most emission-intensive for "gray hydrogen"?**

- A. Warehousing
- B. Logistics
- C. Manufacturing
- D. Delivery

**Question 16: What is the daily production of hydrogen, in tons, from the Wind-to-H<sub>2</sub> Offshore wind farm during the test phase, as stated in the case study?**

- A. 5 tons
- B. 10 tons
- C. 25 tons
- D. 20 tons

**Question 17: What is the volumetric energy density of liquid hydrogen (LH2) as stated in the case study "International Hydrogen Supply for an Offshore Wind Farm"?**

- A. Approximately 41 kg/m<sup>3</sup>
- B. Approximately 70.8 kg/m<sup>3</sup>
- C. Approximately 23 kg/m<sup>3</sup>
- D. Approximately 100 kg/m<sup>3</sup>

**Question 18: What is the designation of the offshore industrial platform for hydrogen production and liquefaction at sea, as outlined in the case study?**

- A. Offshore Hydrogen Facility (OHF)
- B. Marine Hydrogen Generation Unit (MHGU)
- C. Floating Liquid Hydrogen Generation Unit (FLHGU)
- D. Baltic Hydrogen Generation Hub (BHG)

**Question 19: Which of the following issues pertains to the extended exposure of materials (particularly steel) to high-pressure hydrogen, thereby heightening the risk of cracking?**

- A. Corrosion
- B. Hydrogen Embrittlement
- C. Thermal Fatigue
- D. Pressure Leakage

**Question 20: Based on the minilecture, which risk analysis method serves as a qualitative technique that systematically identifies deviations from the intended behavior of a system through the use of "keywords"?**

- A. Failure Mode and Effects Analysis
- B. Quantitative Risk Assessment
- C. Hazard and Operability Study
- D. Life Cycle Assessment

**Question 21: Based on information from industry organizations referenced in the podcast "Sustainable Logistics: How Can We Reduce Our Carbon Footprint?", what percentage of incidents in the hydrogen sector could be prevented through improved procedures and enhanced operator training?**

- A. Approximately 30%
- B. Approximately 50%
- C. Exceeding 70%
- D. Nearly 100%

**Question 22: What is the role of SCADA and PLC systems in emergency planning and preventive measures within hydrogen logistics?**

- A. Producing financial reports.
- B. Expanding the workforce.
- C. Monitoring and automated control of processes, reducing human errors.
- D. Detection of leaks only.

**Question 23: Based on the mini-lecture, what is the amount of CO<sub>2</sub> emitted in kilograms per 1 kg of H<sub>2</sub> from blue hydrogen?**

- A. 0 kg CO<sub>2</sub>
- B. 2 to 4 kg CO<sub>2</sub>
- C. 9 to 11 kg CO<sub>2</sub>
- D. Exceeding 15 kg CO<sub>2</sub>

**Question 24: Based on the H2Trans Logistic Case Study, what percentage of the total hydrogen supply emissions for H2Trans Logistic originated from medium-distance road transport?**

- A. 7 percent
- B. 21 percent
- C. 38 percent
- D. 72 percent

**Question 25: Which mode of hydrogen transportation is considered the most flexible and suitable for smaller quantities over shorter distances, as stated in the Module 2 mini-lecture?**

- A. Railway transport
- B. Highway transport
- C. Maritime transport
- D. Pipeline systems

**ANSWER KEY**

1.C / 2.C / 3.B / 4.D / 5.C / 6.C / 7.B / 8.B / 9.C / 10.D / 11.B / 12.C / 13.B / 14.C / 15.C /  
16.C / 17.B / 18.C / 19.B / 20.C / 21.C / 22.C / 23.B / 24.B / 25.B /

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