

МІНІСТЕРСТВО ОСВІТИ І НАУКИ УКРАЇНИ
НАЦІОНАЛЬНИЙ ТЕХНІЧНИЙ УНІВЕРСИТЕТ
«ХАРКІВСЬКИЙ ПОЛІТЕХНІЧНИЙ ІНСТИТУТ»

Методичні вказівки з іноземної мови за професійним
спрямуванням для магістрів спеціальності «Автомобільний
транспорт»

Methodological Guidelines for Master's Degree Students English for
Academic and Professional Communication in Automotive Transport

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Методичні вказівки з англійської мови за професійним спрямуванням для магістрів спеціальності «Автомобільний транспорт» - Харків: НТУ «ХПІ», 65с.

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ПЕРЕДМОВА

Методичні вказівки з англійської мови за професійним спрямуванням для магістрів спеціальності «Автомобільний транспорт»

Методичні вказівки з англійської мови за професійним спрямуванням для магістрів спеціальності «Автомобільний транспорт» розроблено з урахуванням сучасних вимог до підготовки фахівців транспортної галузі в умовах глобалізації, інтеграції України у світовий освітній та професійний простір, а також зростання ролі англійської мови як основного засобу міжнародної наукової й технічної комунікації.

Метою цих методичних вказівок є формування та розвиток у здобувачів другого (магістерського) рівня вищої освіти професійно орієнтованої іншомовної комунікативної компетентності у сфері автомобільного транспорту. Особлива увага приділяється оволодінню фаховою термінологією, роботі з науково-технічною літературою, участі в професійних дискусіях, а також написанню анотацій і наукових повідомлень англійською мовою.

Зміст методичних вказівок структуровано відповідно до професійних потреб майбутніх магістрів і охоплює тематику, пов'язану з сучасними технологіями автомобільного транспорту та інноваційними напрямками й розвитку. Запропоновані завдання спрямовані на розвиток навичок критичного мислення, аналізу фахових текстів і практичного використання англійської мови в реальних професійних ситуаціях.

1. Lexical, Stylistic, and Grammatical Features of English Scientific and Professional Texts

Scientific and professional texts in English have a number of distinctive features that set them apart from literary or journalistic styles.

Lexical and stylistic features. Such texts typically employ **terms** – words with precise, unambiguous meaning within a specific field. An important role is played by **internationalisms** – words that look or sound similar across many languages, for example *atom, system, method*. These facilitate understanding among specialists worldwide. Scientific texts also make wide use of **symbols, abbreviations, and notations**, such as *DNA, kg, %, AI*. They ensure accuracy and conciseness.

Grammatical features. Scientific English frequently uses **passive constructions** (*It is assumed that...*), which allow authors to distance themselves from results. Another common trait is **nominalization** – turning verbs into nouns (*analysis, development*). Sentences are often complex, with subordinate clauses, and the overall structure is logically clear and coherent.

The concept of equivalence. In translation, it is crucial to convey not just the literal meaning, but the exact scientific equivalent of a term. Direct calques are not always appropriate, as different scientific traditions may use different conceptual frameworks.

Limitations of machine translation. Modern translation systems can render the general meaning, but they often fail to choose the correct term or preserve stylistic precision. Therefore, machine translation in the scientific field can only serve as a supplementary tool.

Methods of building a glossary. It is advisable to identify key terms, collect them from several sources, record their definitions in English and the target

language, and add examples of usage. A glossary not only aids in translation but also helps in mastering professional vocabulary.

English scientific and professional text is characterized by terminological precision, logical clarity, and standardized language means. To understand and translate it adequately, one needs to be aware of its lexical and grammatical features, as well as know how to work effectively with terms and glossaries.

1. Read the text paying attention to lexical, stylistic and grammatical features of English scientific texts and do the tasks that follow it.

Text 1. Technological Evolution and Efficiency Optimization in Modern Automobile Transport

In recent decades, **automobile transport has undergone a profound technological transformation**, driven by increasing environmental concerns, rising energy costs, and the global demand for improved mobility. Contemporary research emphasizes the integration of **intelligent transportation systems (ITS)**, **electrification**, and **lightweight composite materials** as key factors contributing to enhanced operational efficiency and reduced ecological impact.

One of the central developments in the field is the shift toward **electrified powertrains**, including hybrid, plug-in hybrid, and fully electric propulsion systems. These technologies rely on **high-energy-density lithium-ion batteries**, advanced thermal management strategies, and regenerative braking mechanisms, which collectively minimize energy losses and extend vehicle range. Parallel to electrification, the automotive industry is exploring **hydrogen fuel cell technology**, which offers rapid refueling and zero tailpipe emissions, though challenges remain in terms of storage, infrastructure, and production cost.

A significant aspect of vehicle optimization involves the implementation of **aerodynamic design principles**. Computational fluid dynamics (CFD) simulations enable engineers to reduce drag coefficients, thereby lowering fuel consumption at high speeds. Simultaneously, the incorporation of **lightweight materials**, such as carbon-fiber-reinforced polymers and high-strength aluminum alloys, contributes to improved structural performance without compromising safety standards.

Furthermore, the deployment of **vehicle-to-infrastructure (V2I)** and **vehicle-to-vehicle (V2V)** communication systems enhances real-time data exchange,

enabling predictive maintenance, adaptive routing, and collision avoidance algorithms. These systems form part of a broader movement toward **autonomous driving technologies**, which rely heavily on machine learning, lidar sensors, and multispectral cameras to interpret complex traffic environments.

In summary, contemporary automobile transport is characterized by rapid technological innovation aimed at achieving greater sustainability, safety, and efficiency. Future research is expected to advance battery chemistry, expand hydrogen infrastructure, and refine autonomous vehicle algorithms, ultimately reshaping global transportation systems.

1. Match the terms with their definitions

- | | | |
|----|---------------------------------|----------------|
| A. | regenerative | braking |
| B. | computational | fluid dynamics |
| C. | high-energy-density | battery |
| D. | autonomous | driving |
| E. | lightweight composite materials | |

1. Materials designed to reduce mass while maintaining structural strength.
2. A simulation method used to analyze airflow around vehicles.
3. A system that converts kinetic energy into electrical energy during deceleration.
4. Energy storage units capable of delivering large amounts of power relative to their weight.
5. Vehicle control based on artificial intelligence and sensor-based decision-making.

2. Provide synonyms for the following words using vocabulary from the text:

1. change
2. improve
3. gathering and sharing information
4. problems
5. predicting” (as in maintenance)

3. Form nouns or adjectives from the following words *as used in scientific texts*:

1. optimize

2. efficient
3. sustainable
4. innovate
5. autonomous

4. Find examples in the text of the following stylistic features:

1. Terminology (give 3 examples):

2. Impersonal constructions:

3. Long complex sentences typical of scientific discourse

4. Provide phrase(s) that contribute to objectivity _____

5. Rewrite the following sentence in an informal, conversational style:

These systems form part of a broader movement toward autonomous driving technologies, which rely heavily on machine learning, lidar sensors, and multispectral cameras to interpret complex traffic environments.

6. Find three passive voice constructions in the text and explain their function in scientific writing.

1. _____ Function: _____
2. _____ Function: _____
3. _____ Function: _____

7. Identify two complex noun phrases from the text and break them into components.

Example:

high-energy-density lithium-ion batteries → (adjective phrase + noun phrase)

8. Choose the correct option

1. Modern automobile transport ____ (is driven / drives) by the need for sustainability.
2. Engineers use CFD simulations to ____ (reduce / be reduced) aerodynamic drag.
3. Hydrogen storage systems ____ (remain / are remained) a major challenge.
4. Autonomous vehicles rely on sensors ____ (to interpret / interpreting) road conditions.
5. New materials ____ (allow / are allowed) vehicles to become lighter and safer.

9. Read the text and do the tasks that follow it.

Text 2. The Role of Automation, Connectivity, and Material Science in Next-Generation Automobiles

Recent advancements in **vehicle automation and connectivity** have fundamentally reshaped the conception of automobile transport. Modern vehicles are increasingly equipped with **multimodal sensor arrays**, including radar, lidar, ultrasonic sensors, and high-resolution optical cameras that enable continuous environmental monitoring. These systems, when integrated with **real-time data analytics platforms**, significantly enhance the vehicle's ability to detect obstacles, predict driver intentions, and support semi-autonomous or fully autonomous navigation.

Another transformative trend concerns **material science innovations**, particularly the development of **ultra-high-strength steels** and **bio-based polymers**. These materials provide improved durability and crash resistance while reducing overall vehicle mass. Reducing mass remains a priority, as it directly correlates with decreased fuel consumption and improved electric vehicle range. Researchers are also investigating **nanostructured coatings** that offer enhanced thermal stability and resistance to corrosion, thereby extending vehicle lifespan under extreme climatic conditions.

Connectivity plays an equally critical role in next-generation transportation ecosystems. Systems based on **5G communication protocols** enable vehicles to exchange high-speed data with infrastructure, cloud platforms, and other vehicles. Such connectivity supports **cooperative adaptive cruise control**, dynamic traffic load balancing, and advanced incident detection. The integration

of cybersecurity frameworks is essential, as increased connectivity expands potential vulnerabilities within vehicular networks.

Finally, the convergence of automation, material science, and digital connectivity forms the backbone of **smart mobility solutions**. These solutions aim to minimize congestion, reduce emissions, and enhance passenger safety. Continuous research in these domains will determine the trajectory of the automobile industry over the coming decades, shaping vehicles that are not only more efficient but also more intelligent and environmentally resilient.

10. Match terms with their definitions

- | | | | |
|----|--------------------------|----------|----------------|
| A. | multimodal | sensor | arrays |
| B. | ultra-high-strength | steels | |
| C. | cooperative | adaptive | cruise control |
| D. | nanostructured | coatings | |
| E. | cybersecurity frameworks | | |

1. Surface layers engineered at the nanoscale to improve durability.
2. Systems regulating vehicle speed through coordinated communication with nearby vehicles.
3. Protective systems designed to prevent digital intrusion.
4. Sensors of multiple types used together for robust environmental detection.
5. Advanced metallic materials providing exceptional mechanical resistance.

11. Replace the bold words with scientific synonyms from the text

1. Vehicles constantly **watch** their surroundings → _____
2. Researchers are working to **improve** durability → _____
3. These systems **help** with autonomous navigation → _____
4. Innovations have **changed** automobile concepts → _____
5. Connectivity **makes possible** data exchange → _____

12. Form the correct nouns or adjectives from the following words

1. resist

2. connect
3. secure
4. stabilize
5. innovate

13. Identify features of scientific style in the text. Provide examples:

1. **Technical terminology** (give 4 examples):

2. **Impersonal constructions:**

3. **Logical connectors typical of academic style** (2 examples):

14. Paraphrase into a less formal, conversational style

The integration of cybersecurity frameworks is essential, as increased connectivity expands potential vulnerabilities within vehicular networks.

15. Identify passive voice constructions and state the reason for using passive

1. _____
Function: _____
2. _____
Function: _____

16. Break the following noun phrases into components:

1. **high-resolution optical cameras**
2. **dynamic traffic load balancing**
3. **nanostructured thermal-resistant coatings**

17. Choose the correct option

1. Sensor arrays ____ (enable / are enabled) continuous environmental monitoring.
2. Fuel consumption ____ (reduces / is reduced) when vehicle mass decreases.
3. New polymer materials ____ (improve / are improved) crash resistance.
4. Vehicles use 5G connectivity ____ (to exchange / exchanging) real-time data.
5. Potential cyber risks ____ (expand / are expanded) with increased connectivity.

2. Genres of Scientific and Professional Literature and Their Linguistic Features

Scientific and professional literature encompasses a wide variety of genres, each serving specific purposes in the academic and professional community.

The main genres of scientific publications. Among them are the **research article, report, thesis, abstract, summary, and conference paper**. Each of these genres has its own linguistic features. For example, a **scientific article** typically includes an introduction, methodology, results, and conclusion. It uses precise terminology, passive voice, and objective style. A **conference report or paper** is more concise, often highlighting preliminary findings. **Abstracts** and **summaries** focus on brevity and clarity, providing only the key points of research. **Theses and dissertations** are more detailed, structured, and comprehensive, while **annotations** serve as short informative notes accompanying publications.

The types of scientific publications. We can distinguish **theoretical papers**, which develop concepts and frameworks; **problem-based works**, which raise and analyze specific research questions; **discussion papers**, which explore different perspectives on a topic; and **polemical publications**, which argue against or challenge existing viewpoints. Each type requires its own linguistic strategies—polemical texts may use more evaluative language, while theoretical works are highly abstract and conceptual.

Global scientific language. Today, **English has become the lingua franca of science**. It dominates academic publishing, international conferences, and scientific communication. The use of English ensures that research is accessible

to a global audience, facilitating collaboration across countries and disciplines. However, this also brings challenges, as non-native speakers must adapt to the norms of academic English, with its specific vocabulary, grammar, and style.

The genres of scientific and professional literature are diverse, each with its own communicative function and linguistic characteristics. Understanding these genres, their types, and the role of English as the global language of science is essential for successful participation in the international academic community.

1. Read the text, identify and list all genres of scientific-professional literature mentioned above.

Describe briefly the communicative purpose of each (e.g., research article, report, abstract).

Structural Reliability and Energy Efficiency Trends in Contemporary Automobile Transport

Over the past twenty years, the automobile transport sector has experienced accelerated development driven by the need for higher energy efficiency, reduced emissions, and enhanced structural reliability. Recent studies demonstrate that modern vehicles increasingly rely on **multidisciplinary engineering approaches**, integrating principles of materials science, computational modeling, and powertrain optimization. Particular attention is directed toward the development of **lightweight structural modules**, which employ hybrid composites and ultra-high-strength alloys to improve crash resistance while reducing overall mass.

A key trend involves the implementation of **advanced energy management systems (EMS)**. These systems coordinate battery state-of-charge algorithms, thermal regulation processes, and regenerative braking strategies to maximize efficiency across varying driving cycles. The effectiveness of EMS design depends heavily on real-time sensor data acquisition and machine-learning-based predictive control. Experimental results published in recent engineering reports indicate that adaptive EMS frameworks can reduce energy losses by up to 18% compared to conventional systems.

Another domain of rapid progress is **vehicle diagnostics and reliability assessment**, which increasingly employ probabilistic models to evaluate component degradation. Technical standards now require manufacturers to incorporate diagnostics-ready design principles, enabling fault detection before operational failure occurs. Professional guidelines issued by international automotive organizations emphasize the importance of continuous monitoring, cybersecurity resilience, and compliance with safety protocols for automated and semi-automated driving functions.

Overall, current research and professional documentation highlight a transition toward highly integrated, data-driven automobile systems. As documentation genres evolve, the distinction between scientific publications, engineering standards, and industrial reports becomes critical for ensuring effective knowledge dissemination within the field of automotive transport.

2. For each excerpt below (all taken or adapted from the text), decide which genre it resembles-Research article / Technical report / Standard / Patent / Review?

A. “Experimental results indicate that adaptive EMS frameworks can reduce energy losses by up to 18%.”

B. “Manufacturers shall incorporate diagnostics-ready design principles to ensure compliance with safety requirements.”

C. “This study provides an overview of recent trends in structural optimization and materials innovation.”

D. “The proposed system comprises a modular battery architecture enabling rapid thermal equalization.”

3. Match each genre with its typical linguistic features:

Genres:

1. Research article
2. Technical report
3. Engineering standard
4. Patent documentation
5. Review article

Linguistic

Features:

- A. Use of modal verbs such as *shall*, *must*, *shall not*
- B. Legal-technical formulations and highly precise terminology
- C. Attribution of prior research, frequent citations, hedging
- D. Detailed description of methods, experiments, data analysis
- E. Results of industrial tests, performance summaries, recommendations

4. From the text above, extract five terms and classify them as:

- **General scientific terms** (e.g., analysis, framework, model)
- **Field-specific automotive terms** (e.g., powertrain, state-of-charge)
- **Regulatory/standardization vocabulary** (e.g., compliance, protocol)

5. Find five nominalizations in the text (e.g., “regulation,” “integration,” “assessment”) and explain their role in scientific style.

6. Find two sentences or fragments in the text that show:

1. **Impersonality**
2. **Objective and formal tone**

7. Rewrite the sentence below in the style of a different genre:

1. Research article → rewrite as a patent claim
2. Technical standard → rewrite as a research article sentence
3. Research article → rewrite as a professional engineering report summary

Sentence

to

rewrite:

Advanced EMS frameworks can reduce energy losses by up to 18%.

Indicate which transformation you choose and provide the rewritten version.

8. Find two passive clauses and state why passive voice is used in scientific/professional genres.

9. Complex noun phrase decomposition

Break the following into components:

A. machine-learning-based predictive control

B. diagnostics-ready design principles

C. data-driven automobile systems

10. Write 150–180 words comparing two genres used in automotive engineering (e.g., research articles vs. standards). Include:

- Purpose
- Audience
- Linguistic features
- Degree of formality
- Use of passive voice and modal verbs

TEST 1

1 Choose the correct option.

1. *Regenerative braking* is a system that:
A. uses solar energy to power lights
B. converts kinetic energy into electrical energy
C. cools the battery during driving
2. *Lightweight composite materials* are used in vehicles mainly to:
A. increase aesthetic appeal
B. reduce mass while preserving strength
C. improve air conditioning efficiency
3. A *multimodal sensor array* refers to:
A. a sensor that works only in fog

- B. multiple sensors integrating different data types
- C. a sensor used exclusively for distance measurement
- 4. *Vehicle-to-vehicle communication* enables:
 - A. entertainment streaming
 - B. automated data exchange between cars
 - C. faster charging
- 5. *Ultra-high-strength steels* are applied for:
 - A. interior decoration
 - B. noise reduction
 - C. structural reinforcement and crash safety

2 Match the term (A-E) with the definition (1-5)

- A. autonomous navigation
- B. computational fluid dynamics
- C. cybersecurity framework
- D. predictive maintenance
- E. state-of-charge management

1. ___ Protection of digital systems from intrusion
2. ___ Real-time monitoring and forecasting of component failure
3. ___ Airflow simulation around vehicles
4. ___ Battery capacity control during usage cycles
5. ___ Algorithm-based vehicle movement without driver input

3 Decide which genre each excerpt belongs to (Research Article / Technical Standard / Patent / Review / Technical Report).

6. “The manufacturer **shall ensure** compliance with safety protocols.”
7. “This study analyzes structural behavior under variable loads.”
8. “The proposed device comprises a modular actuator assembly.”
9. “Recent publications have demonstrated significant progress in crash modeling.”
10. “Test measurements indicate a 12% improvement in efficiency.”

4 Rewrite using scientific vocabulary from earlier texts.

1. Cars can now **talk to each other**.
2. The new battery system **gets rid of heat faster**.

3. Engineers are trying to **make cars last longer**.
4. Modern systems **help drivers avoid accidents** .
5. The redesign **makes the vehicle lighter**.

5 Convert the verbs into nominalizations.

- 16.regulate → _____
- 17.integrate → _____
- 18.degrade → _____
- 19.diagnose → _____
- 20.stabilize → _____

6 Read the sentence and identify the scientific feature (nominalization, passive structure, impersonal style, hedge, terminology).

1. It was determined that energy losses were reduced.
Feature: _____
2. Continuous monitoring is essential for reliability assessment.
Feature: _____
3. The results suggest that the proposed system may improve efficiency.
Feature: _____
4. Structural optimization and composite behavior were evaluated.
Feature: _____
5. Thermal regulation, predictive control, and degradation modeling were applied.
Feature: _____

7 Transform the sentences into passive voice.

1. Engineers design the energy management system.
2. Researchers evaluate the reliability of structural modules.
3. Technicians update the diagnostic software regularly.

8 Break the phrases into components (adjective(s) + noun).

1. high-energy-density lithium-ion batteries

2. machine-learning-based predictive control
3. multimodal sensor fusion architecture

9 Answer briefly.

1. Why are lightweight materials important in automobile design?
2. What is the main purpose of energy management systems (EMS)?
3. Why do engineering standards use “shall” and “must”?
4. What communication technologies enable cooperative driving?

10 Choose ONE and write 120–150 words:

- A. Compare the linguistic features of a research article and a technical standard in automotive engineering.
- B. Explain the role of probabilistic models in vehicle reliability assessment.
- C. Describe how sensor arrays and predictive control improve autonomous driving.

3. Searching, Reading, and Processing Information in the Professional and Scientific Sphere

In modern professional and scientific activity, the ability to search, read, and process information is one of the key skills for any researcher or specialist.

Types of information. We can distinguish several categories: main information, which conveys the core ideas of the text; additional information, which expands or supports the main points; explanatory information, which clarifies terms or concepts; argumentative information, which provides evidence; illustrative information, such as examples or statistics; and discussion-oriented information, which presents different viewpoints. Recognizing these categories helps us to understand a text more effectively.

Strategies of information search and selection. Today, researchers rely on digital databases, search engines, and academic libraries. Effective strategies include identifying key words, using Boolean operators, and narrowing the search by date, subject, or author. Critical evaluation of sources is essential to ensure their reliability and relevance.

Types of reading. There are several approaches depending on the purpose: skimming (overview reading), when we look through a text quickly to get a general idea; scanning (search reading), when we look for specific facts or data; extensive or introductory reading, aimed at gaining basic understanding; and intensive or detailed reading, which involves thorough analysis of content, language, and arguments.

Text structure and markers. Scientific texts are usually well-structured, containing introduction, methods, results, and conclusion. Within the text, we find signal words or markers such as firstly, therefore, however, in conclusion, which guide the reader and show logical connections. Recognizing them helps to follow the author's reasoning more easily.

Processing information in a foreign language. This involves structuring and analyzing the text, identifying the main ideas, drawing conclusions, and systematizing the material. Working with foreign-language information also requires comparing different sources and sometimes creating glossaries of terms.

Searching, reading, and processing scientific information is a complex but essential skill. It requires not only technical tools, but also critical thinking, linguistic awareness, and the ability to systematize knowledge for professional and academic purposes.

1. Read the text below and do the tasks that follow it.

Text 1. Automobile Transport in the Era of Intelligent Mobility Systems

Automobile transport has undergone a profound transformation over the last decade, driven by rapid advances in intelligent mobility systems, sensor technologies, and environmental regulations. Modern vehicles are no longer isolated mechanical units; instead, they constitute interconnected digital platforms capable of processing large volumes of operational, environmental, and infrastructural data. This shift has reshaped the structure of transport networks and provided new research opportunities in traffic optimization, vehicle–infrastructure communication, and sustainability assessment.

A central trend in contemporary automobile transport is the integration of **V2X (Vehicle-to-Everything)** communication protocols. These systems allow

vehicles to exchange real-time information with other vehicles (V2V), infrastructure units (V2I), pedestrians (V2P), and cloud-based services (V2C). Through predictive analytics and machine learning algorithms, transport control centers can synthesize these data streams to regulate urban traffic flow, reduce congestion, and decrease emissions. For instance, adaptive traffic light systems guided by V2I communication can dynamically modify signal cycles in response to fluctuations in traffic density, significantly improving network efficiency.

Another major research direction concerns the electrification of automobile fleets and the optimization of battery charging infrastructure. The widespread adoption of **electric vehicles (EVs)** has stimulated the development of intelligent charging networks capable of demand-side management. By integrating renewable energy sources and grid-responsive charging strategies, EV charging stations can stabilize power demand and minimize peak loads. However, the implementation of such systems requires complex forecasting models, which must include variables such as driver behavior, spatial distribution of charging points, and seasonal fluctuations in energy production.

Autonomous driving technologies constitute an additional layer of complexity. High-resolution sensor arrays, including lidar, radar, and machine-vision systems, enable vehicles to construct multidimensional representations of their surroundings. The fusion of these data facilitates real-time object detection, trajectory prediction, and risk assessment. Nevertheless, the transition from partially autonomous functions to fully autonomous systems raises challenges in algorithmic transparency, cybersecurity, and legal liability. Researchers increasingly emphasize the need for standardized testing protocols and harmonized regulatory frameworks to ensure the safe deployment of automated vehicles on public roads.

From a systemic perspective, automobile transport is shifting toward **Mobility-as-a-Service (MaaS)** models, which integrate public transport, shared mobility platforms, and private vehicle use into seamless digital ecosystems. Such platforms rely on extensive data analytics to predict mobility demand, allocate vehicle fleets efficiently, and support multimodal journey planning. As a result, the traditional concept of individual car ownership is gradually being replaced by flexible transport access models, particularly in densely populated metropolitan areas.

Overall, the evolution of automobile transport reflects a broader technological convergence, combining engineering, data science, and environmental policy. Future research will likely focus on enhancing interoperability across transport systems, improving energy efficiency, and developing resilient, data-secure mobility infrastructures.

2. Identify three key terms from the text that you would use as search keywords to find additional scientific literature on intelligent mobility systems

3. Formulate two advanced research questions that could guide a literature search on the environmental impact of automobile transport.

4. Write a sample search query aimed at finding recent studies on autonomous vehicle safety standards.

5. Suggest two reliable scientific databases or digital libraries appropriate for researching V2X communication.

6. Answer the questions.

1. According to the text, what role do adaptive traffic light systems play in modern transport networks?
2. Explain how EV charging networks can help stabilize electrical grid demand.
3. What challenges are associated with transitioning from partially autonomous to fully autonomous vehicles? Provide at least three.
4. Summarize the concept of Mobility-as-a-Service (MaaS) in your own words (2–3 sentences).
5. Identify one example in the text of how machine learning is used in transport optimization.

7. Do the tasks on processing and transforming scientific information

1. Create a **concept map** or structured outline of the four major technological trends discussed in the text.
2. Rewrite the paragraph on autonomous driving technologies into a concise **150-word abstract** suitable for a technical report.
3. Transform the information on V2X communication into a **bullet-point list of benefits** for urban planners.

4. Compare EV charging networks and V2X systems by completing the following table:

Feature	EV Charging Networks	V2X Systems
---------	----------------------	-------------

Primary purpose

Main technologies involved

Key challenges

Expected impact on urban mobility

8. Using evidence from the text, propose a hypothesis for a research paper on the future integration of autonomous electric vehicles in MaaS ecosystems.

9. Evaluate the potential societal risks associated with increasing vehicle–infrastructure data exchange.

10. Discuss whether a decline in private vehicle ownership is an inevitable consequence of MaaS implementation. Support your answer with arguments from the text.

11. Identify one claim in the text that may require further empirical validation and suggest a method for investigating it.

12. Read the text below and do the tasks that follow it.

Text 2. Data-Driven Optimization of Urban Automobile Transport Systems

The rapid growth of urban populations has intensified the need for data-driven optimization of automobile transport systems. Contemporary urban mobility relies increasingly on integrated analytical platforms that collect, aggregate, and interpret heterogeneous data streams from vehicles, road infrastructure, mobile devices, and environmental sensors. These platforms enable transport engineers to evaluate traffic dynamics with unprecedented granularity and to identify systemic inefficiencies that cannot be detected through traditional observational methods.

One major component of data-driven mobility management is **predictive traffic modelling**, which employs stochastic algorithms and simulation techniques to forecast congestion patterns. Real-time traffic data—sourced from GPS telemetry, inductive loop detectors, and computer-vision-based traffic cameras—feed into these models to generate dynamic routing recommendations. Such systems are essential for high-density metropolitan areas where minimal disruptions can cascade into substantial traffic delays and increased emissions.

A parallel development is the implementation of **integrated urban fleet management systems**, particularly within commercial logistics. These systems use machine learning to optimize route scheduling, load distribution, and fuel consumption. By analyzing historical mobility data, vehicle performance metrics, and external variables such as weather conditions or delivery time windows, fleet operators can significantly reduce operational costs. Moreover, the deployment of connected telematics devices allows continuous monitoring of vehicle health, enabling predictive maintenance strategies that reduce downtime.

Despite the substantial benefits offered by data-driven optimization, several challenges persist. Data interoperability remains a significant issue, as information generated by different vehicle manufacturers, infrastructure operators, and municipal agencies often follows incompatible formats. Cybersecurity is another critical concern; unauthorized access to transport control systems may lead to severe disruptions or safety risks. Furthermore, the ethical management of mobility data—particularly when personal movement data is involved—requires the establishment of robust privacy frameworks and transparent governance mechanisms.

Looking ahead, the convergence of data-centric transport technologies with autonomous and electric mobility promises to transform urban transport ecosystems. Future systems are expected to integrate real-time decision-making,

multimodal transport coordination, and adaptive infrastructure management into coherent, self-optimizing mobility networks.

13. Extract 5–7 keywords from the text that would be effective for searching scholarly articles on data-driven automobile transport optimization.

14. List three types of scientific sources (e.g., conference proceedings, peer-reviewed journals, technical standards) where a researcher might find authoritative information on these issues. Explain why each is reliable.

15. Develop two research questions inspired by the text that could guide an academic literature review. (Example: How can predictive traffic modelling reduce congestion in megacities?)

16. Answer the following based on the text:
a) What kinds of data feed into predictive traffic models?
b) Which factors do fleet management systems analyze to reduce costs?
c) What makes data interoperability a persistent challenge?

17. What underlying assumption about future urban mobility is implied in the final paragraph? (Write 2–3 sentences.)

18. Identify four major arguments the author presents in favor of data-driven optimization of transport systems.

19. Based on the text, explain the cause-and-effect relationship between data aggregation and traffic flow improvements.

20. Create a concept map showing how the following components are interconnected in data-driven automobile transport:

- **Data collection**
- **Predictive traffic modelling**
- **Fleet management systems**
- **Cybersecurity and privacy**

- **Urban mobility outcomes**

21. Using information from the text, complete the table:

Category	Data-Driven Modelling	Traffic	Integrated Management	Fleet
-----------------	------------------------------	----------------	------------------------------	--------------

Core technologies

Types of data used

Primary goals

Advantages

Challenges

22. Rewrite the paragraph on data interoperability in no more than 60 words, keeping all essential information.

23. Paraphrase the second paragraph in a simplified form as if explaining predictive traffic modelling to a city mayor with no technical background.

24. Assess the ethical and social risks of using mobility data from private vehicles and smartphones. Write 5–6 sentences using ideas from the text.

25. Using evidence from the text, propose two strategies that cities could implement to address data interoperability problems.

26. Do you agree that data-driven optimization will become essential for all large cities? Write a structured paragraph (claim → evidence → conclusion) referencing the text.

27. Using ideas from the text, formulate a research hypothesis connecting predictive modelling and reductions in emissions.

4. Typical Functional Structures of Scientific and Professional English

Scientific and professional English has a highly standardized character. It relies on typical functional structures, which serve to ensure clarity, precision, and logical organization of information.

The system and purpose of functional structures. These structures are conventional patterns of expression used to perform specific communicative functions. For example, when presenting research, authors use structures to introduce a topic (The aim of this study is...), to describe methods (The experiment was conducted using...), to present results (The findings indicate that...), and to draw conclusions (It can be concluded that...). Their main purpose is to unify scientific communication, making texts easier to read and understand across disciplines and cultures.

Speech clichés and patterns. Functional clichés, or language templates, are often used to save time and avoid ambiguity. For instance:

- For defining concepts: X is defined as...**
- For contrasting ideas: However, on the other hand, in contrast...**
- For argumentation: This suggests that..., It should be noted that...**
- For structuring: Firstly, secondly, finally, in conclusion...**

These clichés are not signs of poor style; on the contrary, they are essential tools for effective scientific writing. They provide readers with clear signals about the structure of reasoning and the function of each part of the text.

Working with clichés and patterns. For learners of scientific English, it is important to recognize, memorize, and actively use these structures. A good strategy is to create collections of functional phrases grouped by purpose—for example, phrases for introducing, contrasting, summarizing, or hypothesizing. By practicing them in writing and speaking, students develop fluency in professional communication.

Typical functional structures in scientific English serve as a system that ensures clarity, accuracy, and universality of academic discourse. Mastery of speech clichés and patterns allows researchers and professionals to express ideas effectively, while also integrating smoothly into the global scientific community.

1. Read the text and do the tasks that follow it.

Text 1. Adaptive Control Architectures in Intelligent Vehicle Systems

The rapid evolution of intelligent vehicle systems has intensified the need for adaptive control architectures capable of responding to dynamic operating environments. In its broadest sense, **adaptive control** refers to a class of algorithms that monitor system performance in real time and modify control parameters to ensure optimal functioning under uncertain or variable conditions. These architectures are essential in autonomous and semi-autonomous vehicles, where the external environment cannot be fully predicted in advance.

From a structural perspective, adaptive control systems can be **classified** into three major categories: **model-reference adaptive control (MRAC)**, **self-tuning regulators (STR)**, and **adaptive predictive control (APC)**. MRAC structures employ a predefined reference model that specifies the desired system behavior. The controller continuously evaluates the discrepancy between actual and reference outputs and adjusts its internal parameters accordingly. STR systems, by contrast, estimate unknown parameters directly from input–output data and compute new control laws based on updated models. APC frameworks extend this concept by integrating short-term forecasting mechanisms that optimize control actions over a finite time horizon.

In operational terms, these architectures rely on several functional components, including sensor fusion modules, system identification algorithms, and optimization engines. Sensor fusion provides a **descriptive** representation of the vehicle’s surroundings by combining data from lidar, radar, and visual cameras. System identification mechanisms analyze these data to detect changes in vehicle dynamics—for example, variations caused by tire wear, payload differences, or road surface irregularities. On the basis of this information, optimization engines compute new actuator commands that maintain stability, efficiency, and safety.

The adoption of adaptive control architectures yields several measurable advantages. Most notably, it improves vehicle robustness in uncertain conditions, reduces energy consumption through more precise actuation, and enhances passenger safety. However, significant challenges remain. One major **problem** concerns computational latency: high-frequency parameter updates may overwhelm embedded processors, particularly during complex maneuvers. Another challenge involves the **integration** of adaptive controllers with machine-learning modules, as their decision-making mechanisms differ fundamentally in terms of transparency and interpretability.

Overall, the ongoing **development** of adaptive control architectures is expected to shape the next generation of intelligent mobility systems. Future research will likely focus on hybrid control strategies that combine model-based reasoning with data-driven optimization, thereby achieving a more balanced trade-off between robustness, transparency, and real-time performance.

2. Find one sentence in the text where the author defines a key concept. Name the concept being defined.

3. Identify the part of the text where adaptive control systems are classified. List the categories mentioned.

4. Extract a passage that provides a descriptive explanation of a system or component (e.g., sensor fusion). Explain why it qualifies as a description.

5. Using information from the text, write 3–4 sentences comparing MRAC and STR systems.

6. Identify one example in the text where a cause–effect relationship is expressed.

Paraphrase it in your own words.

7. Write your own advanced-level definition of “system identification” based on the text.

8. Propose an additional category of adaptive control architecture not mentioned in the text. Classify it and briefly explain its purpose.

9. Write a 4–5 sentence descriptive paragraph about “optimization engines” using information from the text.

10. Identify one problem related to adaptive control and propose a plausible engineering solution.

11. Construct a cause–effect sentence explaining why computational latency can reduce the effectiveness of adaptive controllers.

12. Write a short argumentative paragraph supporting or opposing the increased use of adaptive predictive control (APC) in autonomous vehicles.

13. Based on the text, formulate a general statement about the future role of adaptive control systems in intelligent mobility.

14. Write a 120-word summary of the entire text, using at least three functional structures (definition, classification, cause–effect, etc.)

15. Rewrite the paragraph on operational components (sensor fusion, system identification, optimization engines) in a more formal scientific tone.

16. Read the text below and do the tasks that follow it.

Text 2. Multi-Layer Perception and Decision-Making Frameworks in Autonomous Vehicles

Recent advances in autonomous vehicle engineering have highlighted the importance of **multi-layer perception and decision-making frameworks** capable of supporting safe navigation in complex environments. In scientific terms, a multi-layer framework refers to an integrated architecture composed of sequential functional modules, each responsible for a distinct stage of environmental understanding and vehicular response. These modules operate continuously and cooperatively, forming a unified chain from raw data acquisition to final control commands.

The framework is commonly **structured** into three principal layers: **perception**, **interpretation**, and **decision-making**. The **perception layer** aggregates raw sensory data—such as lidar point clouds, radar reflections, and camera images—and converts them into structured environmental representations. The **interpretation layer** performs higher-level processing, including object classification, obstacle prediction, semantic mapping, and risk estimation. Finally, the **decision-making layer** synthesizes these interpreted data to generate safe, feasible trajectories and determine appropriate control actions.

Each layer relies on specialized subsystems. Perception modules utilize convolutional neural networks and probabilistic filters to reduce uncertainty and compensate for noise in sensor inputs. Interpretation subsystems integrate machine-learning classifiers with rule-based algorithms to infer the intentions of dynamic agents such as pedestrians and cyclists. Decision-making engines typically employ optimization strategies, finite-state machines, or reinforcement learning policies to produce motion plans that satisfy safety, comfort, and efficiency constraints.

Despite the significant progress achieved, the development of multi-layer frameworks faces several persistent **challenges**. One major issue is cross-layer latency: delays in the perception or interpretation layers can propagate forward, reducing the accuracy of downstream decision-making. Another difficulty involves scalability; as urban environments grow more complex, the computational cost of processing high-resolution data increases dramatically. Additionally, the **problem** of explainability remains unresolved. Since many subsystems rely on deep learning models, their internal operations are often opaque, complicating validation and regulatory approval.

Nevertheless, ongoing research is focused on creating **hybrid architectures** that combine data-driven learning with explicit reasoning mechanisms. By integrating

symbolic models with neural representations, developers aim to enhance transparency without sacrificing performance. Such approaches are expected to accelerate the deployment of autonomous vehicles in diverse and dynamically changing environments.

17. Locate the sentence where the author defines a multi-layer perception and decision-making framework.

18. Identify the three principal layers mentioned in the text.

19. Select a passage describing the perception layer or interpretation layer. Explain which descriptive linguistic features (e.g., technical vocabulary, functional verbs) are used.

20. Identify a cause–effect structure in the paragraph on challenges. Paraphrase it using your own words.

21. Write your own definition of “cross-layer latency” using academic language.

22. Identify one problem mentioned in the text and propose a logical engineering solution using the problem–solution structure.

23. Write a short argumentative paragraph supporting or critiquing the use of deep learning in the interpretation layer.

24. Write a 130-word summary of the entire text, incorporating at least three functional structures (definition, classification, cause–effect, problem–solution, comparison).

TEST 2

Read the text and do the tasks based on it.

Intelligent Freight Corridors and Information Management in Modern Transport Systems

In contemporary logistics, the rapid expansion of intelligent freight corridors has fundamentally reshaped how scientific and professional information is generated, transmitted, and operationalised in the transport sector. These corridors integrate vehicle-to-infrastructure (V2I) communication, advanced telematics, and big-data analytics to coordinate multimodal flows of goods with minimal human intervention. Due to the high volume of real-time data, professionals must continuously engage in targeted information searching to assess system performance, identify anomalies, and predict disruptions.

A distinctive feature of these corridors is their reliance on interoperable platforms that consolidate heterogeneous data sources—ranging from satellite-based positioning signals to sensor-driven cargo condition reports. When processing such information, specialists routinely apply scientific methods of validation, including cross-referencing datasets, evaluating the methodological reliability of algorithms, and interpreting statistical deviations within dynamic traffic environments.

From a linguistic perspective, scientific communication in this domain displays highly typical functional structures, particularly the widespread use of passive constructions (“data are aggregated,” “signals are filtered”), hedging (“it is assumed,” “the system appears to optimise”), and nominalisation (“optimisation,” “synchronisation,” “integration”). These structures promote precision, objectivity, and reproducibility, enabling transport engineers, system architects, and data analysts to frame their findings in a form that supports international collaboration and transparent decision-making.

As freight corridors become increasingly automated, the ability to read and process information rapidly—and to communicate it using recognised scientific conventions—emerges as an essential professional competence. Consequently, training programmes now prioritise critical reading strategies, methodological literacy, and command of specialised English structures that facilitate efficient knowledge exchange across the global transport network.

Task 1. Choose the correct answer according to the text.

1. Intelligent freight corridors require professionals to search for information primarily _____ because:
 - A. They operate only in offline transportation environments.
 - B. They generate vast amounts of real-time data that must be evaluated.
 - C. The systems are still experimental and undocumented.
 - D. Human operators rarely interact with automated systems.
2. When _____ processing _____ information, _____ specialists _____ often:
 - A. Avoid cross-checking data to maintain system speed.
 - B. Modify the algorithms manually during transit.
 - C. Validate datasets and assess methodological reliability.
 - D. Work exclusively with satellite data.
3. The _____ corridors _____ rely _____ on _____ interoperable _____ platforms _____ to:
 - A. Reduce the number of data sources.
 - B. Integrate multiple heterogeneous information streams.
 - C. Replace telematics with manual reporting.
 - D. Eliminate the need for predictive analysis.

Task 2. Give concise answers (1–2 sentences).

4. What kinds of data sources are consolidated in interoperable platforms?
5. What critical reading skills are emphasised in training programmes?

Task 3. Using information from the text, complete the table:

Information Type	Source	Purpose in Freight Corridors
Positioning data	?	?
Cargo condition data	?	?

interpretation and description of these elements is an essential skill for any researcher or student.

The role of visual aids. Visuals serve to clarify, summarize, and illustrate information that might otherwise be too complex in verbal form. A table, for instance, presents numerical data in an organized way, while a graph shows trends and relationships more clearly than words alone. Diagrams and schemes illustrate processes, mechanisms, or hierarchies, making abstract concepts easier to understand.

Describing visual aids. When working with visuals, it is important to use specific language. For example:

- For tables: The table presents data on..., As shown in Table 1...
- For graphs: The graph indicates an increase in..., The trend line shows a steady decline...
- For diagrams or figures: Figure 2 illustrates the structure of..., The diagram demonstrates the process of...

Clear references to figures or tables help the reader follow the connection between the text and the visual.

Summarizing results through visuals. Graphical representation is often used to generalize findings of an experiment or observation. Instead of listing every detail, researchers highlight the main patterns: for example, The results reveal a positive correlation between X and Y, or The data suggest that the highest values occur in.... Such summaries focus the reader's attention on key outcomes.

Integration with text. Visual aids should not stand alone; they must be integrated into the text with explanations and interpretations. A well-written description both explains what the visual shows and interprets its meaning in relation to the research question.

The ability to interpret and describe visual aids is fundamental in scientific writing. Graphs, tables, diagrams, and figures make complex information accessible, help summarize results, and strengthen arguments. Mastering this skill allows researchers to communicate findings more effectively and persuasively.

1. Read the text and Identify the types of visual aids mentioned in it (e.g., line graph, bar chart, heatmap, table, schematic diagram). For each type, describe its purpose and what kind of information it conveys.

The Transition Toward Sustainable Automotive Systems

The global automobile transport sector is currently undergoing its most significant paradigm shift since the invention of the internal combustion engine (ICE). Traditionally dependent on petroleum-based fuels, the industry is transitioning toward **Electrification, Automation, and Connectivity**.

The Decarbonization Challenge

Automobile transport accounts for approximately 15% of global CO₂ emissions. To mitigate this, manufacturers are pivoting toward **Battery Electric Vehicles (BEVs)** and **Plug-in Hybrid Electric Vehicles (PHEVs)**. However, the environmental benefit of a BEV is highly dependent on the "energy mix" of the grid used to charge it. A vehicle charged in a region reliant on coal-fired power plants may have a lifecycle carbon footprint comparable to a high-efficiency diesel engine.

The Role of Aerodynamics and Material Science

Efficiency in modern automotive design is governed by the drag coefficient (Cd) and vehicle mass. By utilizing lightweight composite materials (carbon fiber-reinforced polymers) and optimizing airflow, engineers can significantly reduce energy consumption. For every 10% reduction in vehicle weight, fuel economy improves by approximately 6% to 8%.

Autonomous Systems and Traffic Flow

The integration of **Advanced Driver Assistance Systems (ADAS)** and **Vehicle-to-Everything (V2X)** communication is expected to revolutionize urban mobility. Level 5 autonomy (full automation) aims to eliminate human error, which is responsible for over 90% of traffic accidents. Furthermore, platooning (vehicles traveling closely together at high speeds) reduces aerodynamic drag for trailing vehicles, further enhancing fleet efficiency.

Task 1.

1) Look at the "Life Cycle Assessment (LCA)" chart. While BEVs show zero "tailpipe emissions," identify the stage in their lifecycle where they typically exceed ICE vehicles in carbon output.

2) Explain in two sentences how a country's electricity generation strategy (e.g., transitioning from coal to wind) would change the slope of the BEV line on this graph.

Task 2.

1) Refer to the "Levels of Autonomous Driving" diagram. A car that can steer and accelerate/decelerate but still requires the human driver to monitor the environment and intervene immediately falls into which level?

2) Based on the text's mention of "eliminating human error," which level must be achieved to statistically reduce the 90% accident rate mentioned?

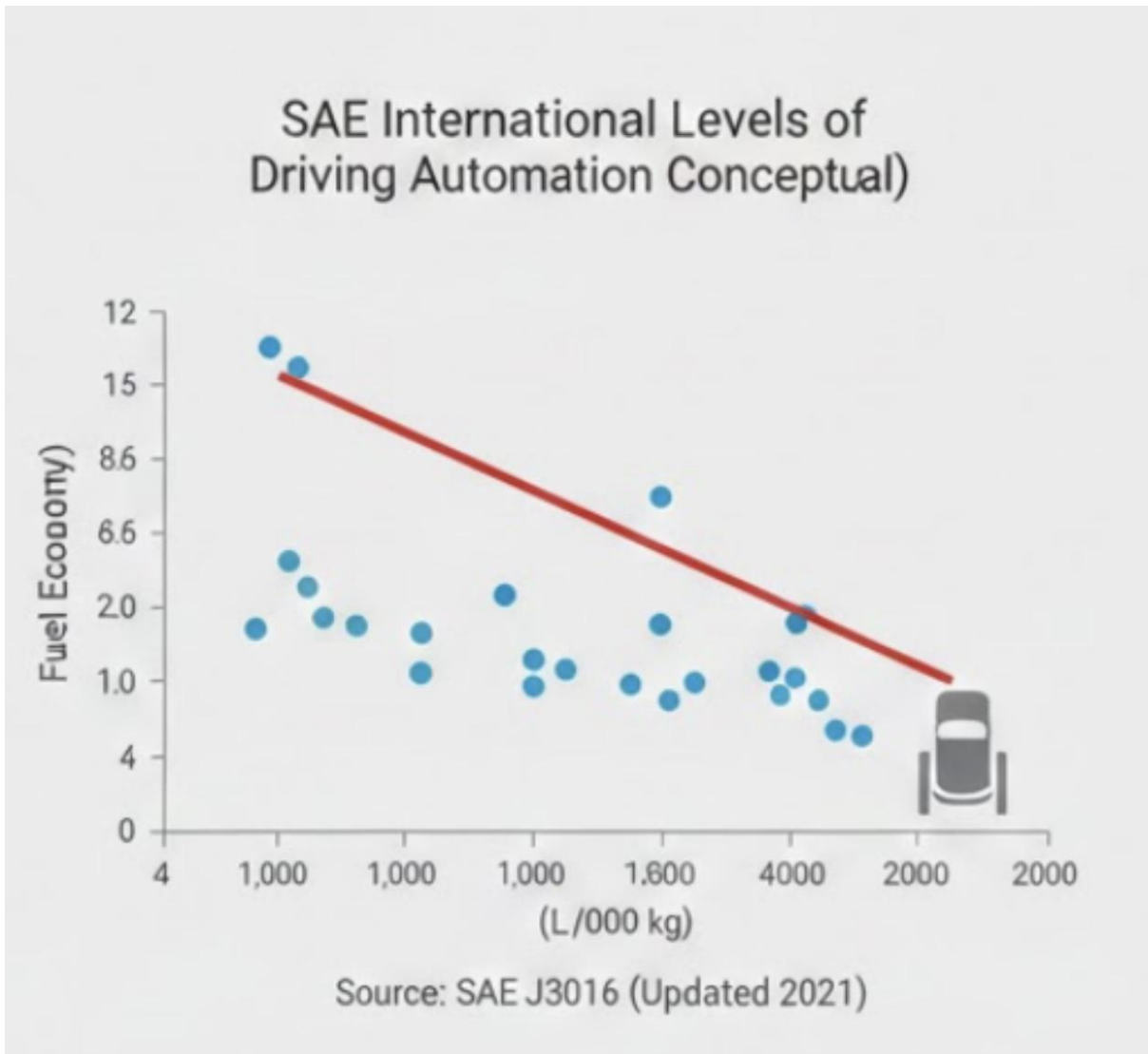
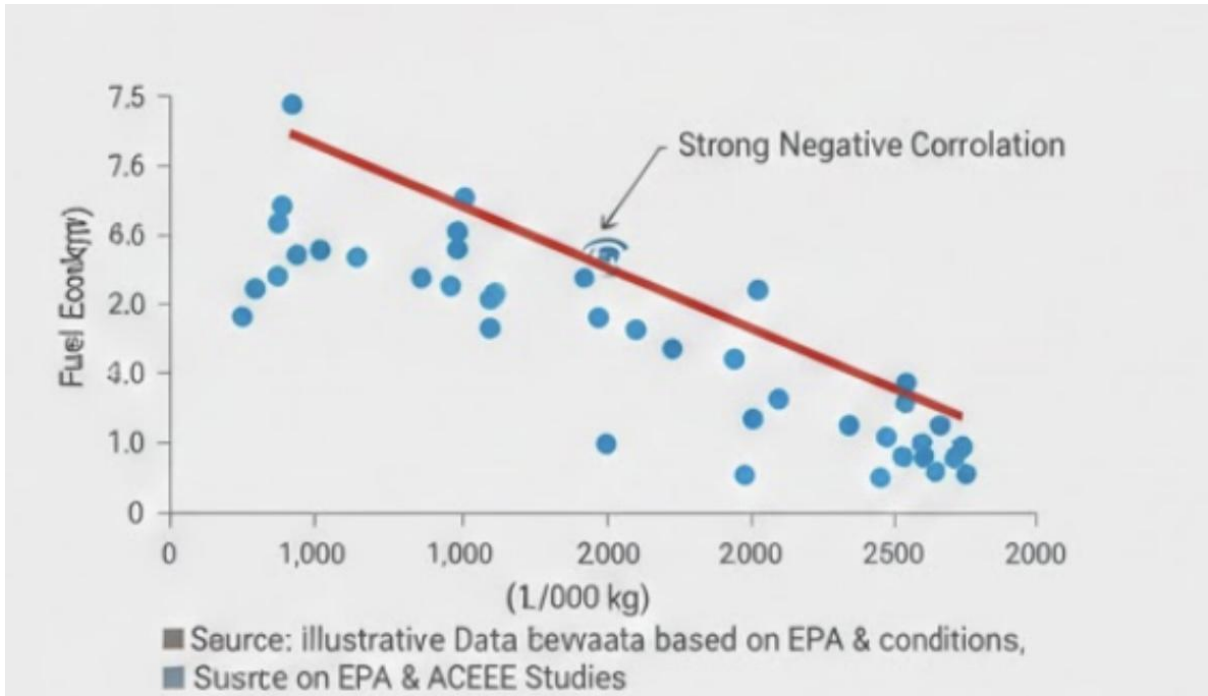
Task 3. (Weight vs. Efficiency)

1) **Data Interpretation:** If an engineer replaces steel components with aluminum, reducing a 2,000kg vehicle's weight by 200kg, calculate the expected percentage improvement in fuel economy based on the ratios provided in the text.

2) **Visual Representation:** If you were to create a scatter plot showing the relationship between **Vehicle Mass** (x-axis) and **Energy Consumption** (y-axis), would the correlation be positive or negative? Justify your answer using the text.

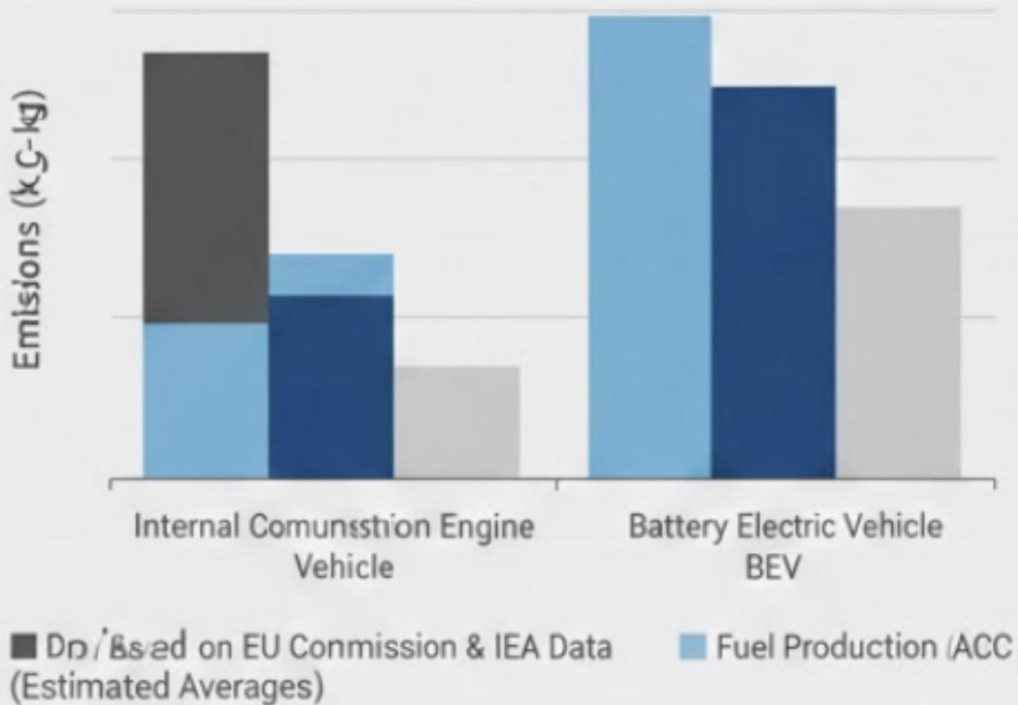
Task 4. (The "Energy Mix" Variable)

Create a brief caption for a hypothetical map showing "Global BEV Environmental Efficiency." Identify which regions (e.g., Scandinavia with hydro-power vs. regions with heavy coal usage) would be shaded "High Benefit" and which would be "Low Benefit."

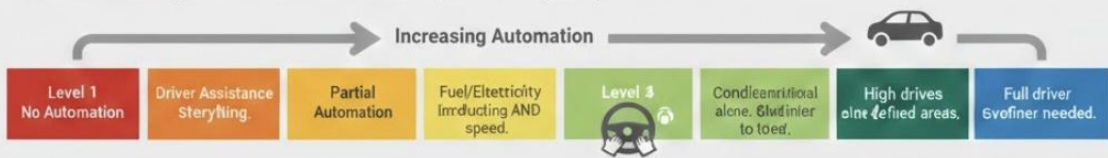


Automobile Life Cycle Assessment

$\$CO_2$ of Emissions (kg $\$CO_2$ -eq)



Vehicle Weight vs Fuel Efficiency Conceptual



6. Scientific Written Communication

Scientific written communication is a key component of academic and professional activity. It is characterized by clarity, precision, and a logical structure that helps to present research results effectively.

Organization of a scientific text. Most scientific papers follow a clear structure: introduction, main body, and conclusion. The introduction outlines the topic, research problem, and purpose. The main body presents methodology, evidence, and arguments. The conclusion summarizes findings and highlights their significance. This structure ensures coherence and logical progression.

Methods of scientific presentation. There are three typical ways of presenting information:

- Description – providing factual information about objects, processes, or phenomena.
- Narration – presenting events or experiments in chronological order.
- Reasoning (argumentation) – analyzing, comparing, and justifying ideas or hypotheses.

In practice, these methods are often combined within one paper.

Structural-semantic models. Scientific texts often follow certain semantic patterns: problem–solution, cause–effect, comparison–contrast. For example, This study aims to solve the problem of..., The results show that X causes Y, In comparison with previous research.... These models guide the logical development of thought.

Formulating a scientific title. A good title should be precise, concise, and informative. It must reflect the subject and scope of research, for example: “The Impact of Renewable Energy on Urban Sustainability”. Overly general or ambiguous titles are avoided.

Functional structures in written communication. Scientific English relies on standard functional patterns and clichés, such as The aim of this study is..., The results indicate..., It can be concluded that.... These structures help to organize text, highlight logical connections, and make the message accessible to an international audience.

Scientific written communication depends on a well-organized structure, appropriate methods of exposition, and functional language patterns. Mastering these elements allows researchers to present their ideas clearly, persuasively, and in accordance with international academic standards.

1. Read the text, identify three parts of the text (introduction, main body, conclusion). Explain their communicative purpose.

Text 1. Systemic Approaches to Reducing Energy Losses in Modern Automotive Transport Networks

In contemporary automotive engineering, the reduction of system-level energy losses has emerged as a critical determinant of transport efficiency and environmental sustainability. Rather than concentrating solely on vehicle-specific components, researchers increasingly adopt a **network-oriented perspective**, examining the interactions between propulsion systems, traffic-flow dynamics, and infrastructural factors. This systemic view acknowledges that energy inefficiencies arise not only from internal powertrain limitations but also from external operational conditions such as congestion density, road gradient variability, and climatic influences.

A significant area of investigation involves the integration of **multi-scale computational models**, which combine microscale vehicle dynamics with macroscale traffic-flow simulations. Such hybrid modeling frameworks enable engineers to predict how individual driving behaviors aggregate into large-scale patterns of stop-and-go traffic. Preliminary studies suggest that synchronizing vehicle acceleration patterns through connected-vehicle communication may reduce network-wide fuel consumption by up to 11%, although these findings remain contingent on communication reliability and real-world compliance rates.

Another component of systemic energy optimization is the deployment of **infrastructure-embedded sensing**, including inductive pavement sensors, thermal-monitoring arrays, and roadside LiDAR units. These devices provide continuous, high-resolution data that support adaptive traffic-control algorithms capable of rerouting vehicles or modifying signal timing to minimize energy-intensive idling. Nevertheless, concerns persist regarding data interoperability, cybersecurity risks, and the substantial financial investment required for sensor-network maintenance.

The transition toward fully optimized transport networks will likely depend on the development of standardized communication protocols, the enhancement of predictive control algorithms, and the adoption of unified data-governance

frameworks. While significant challenges remain, the convergence of vehicle intelligence, infrastructural sensing, and computational modeling has the potential to substantially reduce energy losses and improve long-term transport sustainability.

2. Identify the following elements in the text:

1. **Introduction / Background**
2. **Research problem / gap**
3. **Evidence or supporting research**
4. **Limitations**
5. **Future directions / implications**

Write one sentence for each element explaining where it appears and what its function is.

3. Rewrite the following informal statements in an appropriate scientific written style:

- a) Cars waste energy mostly because the roads are crowded.
- b) Putting sensors in the roads helps a lot with traffic problems.
- c) If all cars talked to each other, the whole system would run way better.

4. Insert hedging expressions (e.g., *may*, *appears to*, *is likely to*, *remains uncertain*, *suggests*) into the following claims to make them appropriate for scientific writing:

- a) Synchronizing vehicle acceleration reduces energy consumption by 11%.
- b) Sensor networks provide perfectly accurate data.
- c) Standardizing communication protocols will eliminate all inefficiencies in transport systems.

5. Replace the underlined scientific terms with accurate, academically appropriate paraphrases:

1. The network-oriented perspective offers a holistic understanding of energy losses.
2. Multi-scale computational models help predict complex traffic behaviors.
3. Infrastructure-embedded sensing supports adaptive traffic control.

6. Explain how the third paragraph logically follows from the second paragraph.

Your explanation should refer to linking ideas, thematic progression, or cause–effect relationships.

7. Using information from the text, write one academic sentence that synthesizes (combines) at least two different ideas(e.g., computational modeling + sensing technologies; communication reliability + energy losses).

8. Write a concise abstract summarizing the entire text.

Your abstract should include:

- research focus
- methods or approaches discussed
- key findings or insights
- significance or implications

9. Read the text below and do the tasks that follow it.

Text 2. Integrated Safety Architecture in Autonomous and Semi-Autonomous Road Transport Systems

The rapid emergence of autonomous and semi-autonomous vehicles has prompted researchers to redefine the concept of safety within automotive transport systems. Instead of relying solely on mechanical redundancy or passive protection strategies, modern safety engineering increasingly incorporates **integrated, multi-layered architectures** that merge perception algorithms, vehicle-to-everything (V2X) communication, and adaptive control systems. This paradigm reflects the recognition that safety is no longer confined to the vehicle itself but is distributed throughout the wider mobility ecosystem.

At the core of this architecture are **sensor-fusion frameworks**, which combine data from lidar, radar, optical cameras, and inertial sensors to create a probabilistic model of the driving environment. These models allow autonomous systems to identify and predict hazards such as erratic human drivers, unexpected pedestrian movement, or sudden weather-induced visibility reductions. However, current research indicates that environmental uncertainty and sensor noise can still compromise decision accuracy, particularly in complex, multi-agent traffic scenarios.

To mitigate these uncertainties, many studies explore the integration of **predictive risk-assessment algorithms**. Such algorithms analyze historical crash data, road-surface characteristics, and traffic-flow variability to calculate real-time risk scores. Vehicles can then adjust speed, following distance, or lane-selection behavior accordingly. Despite promising results, the reliability of these algorithms depends heavily on data availability, computational power, and compliance with standardized communication protocols.

Ultimately, the long-term viability of autonomous safety systems will require the harmonization of regulatory standards, improvements in cross-platform interoperability, and the development of robust ethical frameworks guiding machine decision-making. While considerable technological challenges persist, the convergence of sensor fusion, predictive analytics, and V2X communication systems represents a significant step toward achieving fully resilient, data-driven road transport safety networks.

Task 1. Identify the section in the text that best corresponds to each scientific structural function:

1. **Background / Context**
2. **Problem or challenge**
3. **Methodological approach or technological mechanisms**
4. **Limitations or uncertainties**
5. **Implications / future requirements**

Task 2. Rewrite the following informal statements in more formal ones.

- a) Self-driving cars need lots of sensors so they don't make mistakes.
- b) Sometimes the data they use is messy, so the systems don't work well.
- c) If all countries used the same rules, things would be much easier.

Task 3. Insert appropriate hedging expressions (*may, appears to, is likely to, suggests that, cannot fully ensure, remains uncertain, etc.*) to make the statements scientifically cautious.

- a) Predictive algorithms remove all safety risks.
- b) Sensor fusion always provides an accurate model of the environment.
- c) Regulatory standardization will completely solve interoperability issues.

Task 4. Replace the underlined technical expressions with accurate paraphrases.

1. The **multi-layered architecture** improves the overall robustness of autonomous systems.
2. **Sensor-fusion frameworks** reduce the impact of environmental noise.
3. **Predictive risk-assessment algorithms** guide real-time vehicle adjustments.

Task 5. Write one academic sentence that synthesizes at least two concepts from the text (e.g., V2X communication + sensor noise; predictive algorithms + regulatory frameworks; environmental uncertainty + safety architectures).

Task 6. Write a concise summary of the text containing:

- the main topic
- key technologies discussed
- main challenges
- broader implications for transport safety

TEST 3: Interpretation of Visual Aids Accompanying a Text & Scientific Written Communication

PART I.

1. What is the primary purpose of a visual aid (graph, chart, diagram) in a scientific text?

- A. To decorate the text
- B. To provide data that supports or clarifies key ideas
- C. To replace all written explanation
- D. To make the text longer

2. A line graph showing a steady decline in fuel consumption most strongly supports which textual claim?

- A. Vehicle performance cannot improve
- B. Eco-routing is unnecessary

- C. A technology contributes to long-term efficiency improvement
- D. Fuel prices are decreasing

3. In a table comparing engine types, if BEVs show 0 g/km CO₂ emissions, this visual supports:

- A. BEVs have the highest emissions
- B. BEVs emit no CO₂ during operation
- C. BEVs have no environmental impact
- D. ICE vehicles and BEVs are identical

4. A flow diagram showing arrows from “Sensors → Control Unit → Motor Response” demonstrates:

- A. The decoration of the text
- B. The logical sequence of system operation
- C. A random collection of technologies
- D. The limitations of the English language

5. When a visual aid contradicts the text, a reader should:

- A. Ignore the visual aid
- B. Assume the text is incorrect
- C. Examine both carefully and identify missing explanation or error
- D. Memorize the data without interpreting it

PART II.

6. Which sentence uses appropriate hedging?

- A. Sensor fusion always produces perfect results.
- B. Sensor fusion might improve perception in certain environments.
- C. Sensor fusion definitely fixes uncertainty problems.
- D. Sensor fusion solves everything.

7. Which phrase best matches formal scientific style?

- A. Cars don't work well when stuff gets messy.
- B. Vehicle systems usually fail when overloaded.
- C. Vehicles get confused sometimes.
- D. The system works super well.

8. In a scientific article, the limitations section should:
- A. Present weaknesses honestly and precisely
 - B. Insult previous researchers
 - C. Make excuses for weak results
 - D. Be omitted to appear more professional
9. Which is the best paraphrase for *probabilistic model*?
- A. A guess
 - B. A computation that estimates outcomes based on likelihood
 - C. A random calculation
 - D. A machine with many parts
10. Which sentence demonstrates good coherence?
- A. Electric vehicles are quiet. Roads have traffic lights.
 - B. Battery temperature affects performance; therefore, thermal management is crucial.
 - C. Cars use energy and satellites are in space.
 - D. Sensors exist. Algorithms exist.

PART III.

11. How can a graph help clarify a claim about emission reduction over time?
(Write 2–3 sentences.)
12. Why is a flow diagram useful when explaining complex system architecture?
(1–2 sentences.)
13. When interpreting a table, what should a reader compare to understand the key message?
(1–2 sentences.)

PART IV.

14. Provide a hedged version of the following statement:
Predictive algorithms eliminate all uncertainty in autonomous driving.
15. Rewrite this sentence in formal academic style:
If all cars talked to each other better, the traffic system would run way smoother.

16. Paraphrase the term **infrastructure-embedded sensing** in academic language.

PART V.

17. A text states: **“BEVs significantly reduce operational emissions.”**

A visual aid shows:

- ICE: 180 g/km
- Hybrid: 90 g/km
- BEV: 0 g/km

Explain how the visual aid **supports or enhances** the textual claim. (3–4 sentences.)

18. A diagram shows data flowing from sensors → processor → actuator.

Explain how you would describe this process using **scientific written communication features** (formal style, coherence, precise terminology). (3–4 sentences.)

7. Abstract Writing

One of the important skills in academic communication is the ability to write summaries or abstracts – in Ukrainian, *реферат*. This skill is widely used in research, education, and professional practice.

The purpose and structure of an abstract. The main purpose of a summary or abstract is to present the essential content of a larger text in a concise form. It allows readers to understand the main ideas, results, and conclusions without reading the entire work. A typical structure of an abstract includes:

- Introduction – the topic and aim of the research;
- Main body – key arguments, findings, or facts;
- Conclusion – the general result or significance of the study.

Types of abstracts. We can distinguish several kinds:

- Indicative abstracts, which briefly outline the topic and purpose without giving details;
- Informative abstracts, which summarize methods, results, and conclusions of the research;
- Combined abstracts, which include both general description and detailed information.

In academic practice, informative abstracts are most common because they provide enough data for evaluation of the research.

Linguistic features of abstracts. Abstracts are characterized by conciseness, clarity, and objectivity. The vocabulary is highly terminological and free from emotional or figurative language. Typical grammatical features include the use of the Present Simple and Past Simple, as well as the passive voice (It was found that..., The study is devoted to...). Standard functional clichés are often used: The article deals with..., The paper focuses on..., The results demonstrate.... These patterns help maintain a formal academic style.

Abstract writing is an essential academic skill. A well-written abstract summarizes the key points of research, saves the reader's time, and ensures effective scientific communication. Mastery of structure, types, and linguistic features of abstracts is crucial for every student and researcher.

Example 1 — Short Abstract (80–100 words)

Distributed intelligence is emerging as a key paradigm in modern automobile transport systems, enhancing traffic efficiency, safety, and energy optimization. Unlike centralized architectures, distributed systems decentralize computation across vehicles, roadside units, and cloud-edge interfaces, enabling rapid response in high-density traffic networks. Vehicle-to-Everything (V2X) communication and machine-learning-based prediction models support cooperative maneuvers and reduce energy consumption. Despite these advantages, challenges remain concerning cybersecurity, data integrity, and interoperability among heterogeneous infrastructures. Addressing these issues is likely to be critical for the successful deployment of autonomous and semi-autonomous fleets in large-scale traffic ecosystems.

1. Read the text and do the tasks that follow it.

Text 1. Distributed Intelligence in Next-Generation Automobile Transport Systems

In contemporary automobile transport engineering, distributed intelligence has emerged as a foundational design paradigm for enhancing traffic efficiency, safety, and energy optimization. Unlike centralized control architectures, which rely on a single node for data aggregation and decision-making, distributed systems decentralize computational tasks across individual vehicles, roadside units, and cloud-edge interfaces. This decentralization reduces latency in critical responses, particularly in high-density urban networks where micro-scale traffic dynamics change within milliseconds.

A central component of distributed intelligence is Vehicle-to-Everything (V2X) communication. Through continuous exchange of positional, environmental, and behavioral data, vehicles collaboratively construct local situational awareness networks. These networks enable cooperative maneuvers—such as synchronized lane merging, anticipatory braking, and dynamic eco-routing—that cannot be executed effectively by isolated vehicles. Moreover, integration of machine-learning-based prediction models allows vehicles to estimate the actions of nearby agents, thereby reducing uncertainty in decision-making.

Energy efficiency is also significantly enhanced. By distributing processing load among vehicles and edge nodes, the system minimizes redundant computations and improves battery usage, which is essential for all-electric fleets. Similarly, distributed traffic forecasting reduces stop-and-go patterns, lowering energy consumption at a systemic level. However, the architecture faces challenges related to cybersecurity, data integrity, and interoperability among heterogeneous transport infrastructures. Addressing these challenges requires standardized communication protocols, robust authentication frameworks, and cross-domain engineering collaboration.

As automobile transport transitions toward full autonomy, distributed intelligence is expected to serve as the operational backbone, ensuring that large-scale traffic ecosystems function with resilience, adaptability, and real-time responsiveness.

Task 1. Based on the text, list five essential elements that must appear in a well-structured abstract.

Task 2. Write a three-sentence abstract that:

1. Introduces the topic and significance
2. Summarizes the core mechanisms or findings
3. States the overall implications for automobile transport engineering

Use *formal, concise, non-descriptive* academic style.

Task 3. Write an abstract following these criteria:

- 120–150 words
- Includes background, purpose, key features, challenges, and implications
- Uses hedging where appropriate (“may”, “is likely to”, “potentially”)
- Avoids over-detailed technical descriptions

Task 4. Rewrite the following abstract draft to make it academically appropriate:

“This text talks about how cars can work together better by sharing information. If they do this, they react faster and use less energy. But there are problems with keeping the data safe, and different systems don’t always match. The idea is important because future self-driving cars will need to cooperate more.”

2. Read the text below and do the tasks that follow it.

Text 2. Predictive Maintenance Strategies in Electrified Automobile Fleets

The electrification of automobile fleets has introduced new opportunities and challenges in vehicle maintenance. Unlike traditional internal combustion engine (ICE) vehicles, electric vehicles (EVs) rely heavily on battery systems, power electronics, and regenerative braking components, which require continuous monitoring to ensure reliability and efficiency. Predictive maintenance, leveraging real-time telematics, sensor networks, and machine-learning algorithms, has emerged as a critical strategy to anticipate component failures before they occur.

Central to predictive maintenance is the collection of high-resolution operational data from battery temperature, charge/discharge cycles, inverter performance, and motor torque outputs. Machine-learning models analyze these datasets to

identify early signs of degradation, such as reduced energy efficiency, anomalous vibration patterns, or thermal imbalances. This approach allows fleet operators to schedule maintenance interventions proactively, reducing downtime and operational costs.

However, implementation faces significant challenges. Data standardization across different EV models, cybersecurity protection of telematics networks, and computational requirements for real-time analytics are crucial concerns. Furthermore, the effectiveness of predictive maintenance depends on the quality of sensor data and the accuracy of predictive algorithms. Addressing these challenges is likely to enhance fleet reliability, prolong battery life, and reduce overall operational costs, contributing to the sustainable growth of electrified transport systems.

Task 1. From the text, identify five elements that should be included in a well-structured abstract:

- Background / Context
- Aim / Purpose
- Methods / Approaches
- Key Results / Findings
- Implications / Future Outlook

Task 2. Write a 3-sentence abstract that:

1. Introduces the topic and significance
2. Highlights the methods or strategies
3. States the implications or benefits of predictive maintenance

Task 3. Create a full abstract following these requirements:

- Include background, purpose, key strategies, challenges, and implications
- Use formal scientific language
- Use hedging expressions where appropriate (“may”, “is likely to”, “potentially”)
- Avoid unnecessary technical details

Task 4. Improve the following informal abstract draft:

Electric cars need maintenance. Sensors can tell when parts are going to break. Using machine learning helps fix problems before they happen. This saves money and keeps the cars running longer.

Task 5. Explain Explain how the original text could be condensed into an abstract. Include discussion of:

- Logical progression of ideas
- Technical precision
- Cohesion between problem, method, and implications
- Use of formal, objective tone

Test 4 (Scientific Abstract Writing and Written Communication)

Read the text and do the tasks below.

Risk Assessment and Safety Protocols in Autonomous Vehicle Systems

The widespread deployment of autonomous and semi-autonomous vehicles has necessitated the development of advanced risk assessment and safety protocols. Unlike conventional vehicles, autonomous systems rely on real-time sensor input, machine-learning algorithms, and Vehicle-to-Everything (V2X) communication to navigate complex traffic environments. Ensuring operational safety requires a layered approach that combines sensor redundancy, predictive analytics, and adaptive control strategies.

Sensor-fusion techniques integrate data from lidar, radar, optical cameras, and inertial measurement units to produce a probabilistic model of the surrounding environment. These models enable vehicles to anticipate hazards such as sudden pedestrian movement, erratic human driver behavior, and adverse weather conditions. Predictive risk-assessment algorithms further analyze historical crash data, road characteristics, and traffic patterns to assign real-time risk scores, guiding dynamic adjustments in speed, following distance, and lane selection.

Despite these technological advancements, challenges remain in cybersecurity, data interoperability, and ethical decision-making frameworks. Standardized communication protocols and robust validation procedures are likely to be crucial for safe, large-scale deployment. Effective risk assessment systems will therefore

play a central role in enhancing safety, reliability, and public trust in autonomous transport ecosystems.

Part I.

1. What is the primary function of a probabilistic sensor model in autonomous vehicles?

- A. To replace the need for human drivers entirely
- B. To estimate the likelihood of hazards in the vehicle environment
- C. To increase vehicle speed
- D. To improve fuel efficiency

2. Which element is essential in a scientific abstract summarizing this text?

- A. Detailed technical diagrams
- B. Background, methods, findings, and implications
- C. Personal opinions about autonomous vehicles
- D. Step-by-step instructions for vehicle assembly

3. A hedging expression appropriate for describing predictive risk-assessment effectiveness is:

- A. "Predictive algorithms eliminate all risks."
- B. "Predictive algorithms may reduce certain safety risks."
- C. "Predictive algorithms guarantee accident prevention."
- D. "Predictive algorithms solve all traffic problems."

4. Which sentence demonstrates proper formal scientific style?

- A. "Cars with sensors just figure things out."
- B. "Sensor-fusion frameworks integrate multiple data streams to anticipate hazards."
- C. "The system is super cool and works really well."
- D. "Drivers don't have to do much now."

5. Why is discussing limitations important in a scientific abstract?

- A. To make the research seem unimportant
- B. To acknowledge potential constraints and uncertainty in findings
- C. To confuse the reader
- D. To include personal opinions

Part II.

6. List **three key components** that should be included in an abstract for this text.
7. Identify **two challenges** mentioned in the text that should appear in the abstract.
8. Explain why **formal, objective tone** is critical in a scientific abstract. (1–2 sentences)

Part III.

9. Rewrite this sentence in formal academic style:

Autonomous cars use sensors and algorithms to avoid accidents.

10. Paraphrase the term “**V2X communication**” in a way suitable for an abstract.

Part IV.

11. Write a **three-sentence mini abstract** summarizing the text. Include:

- Topic and significance
- Methods or strategies
- Implications or potential benefits

12. Write a **full abstract (120–150 words)** including:

- Background / context
- Aim or purpose
- Methods / approaches
- Key findings or insights
- Implications / challenges
- Use hedging expressions where appropriate

Part V.

13. Explain in 3–4 sentences how the text demonstrates features that should appear in an abstract, including:

- Technical precision
- Logical progression of ideas
- Cohesion between problem, methods, and implications
- Neutral and objective tone

8. Annotation and Writing of Theses

Annotation and thesis writing are important forms of scientific written communication. They help researchers present ideas in a concise and structured way, making scientific information more accessible.

The methodology of annotation. Annotation means providing a short description of a text that highlights its purpose, structure, and key content. Unlike a full summary, an annotation is usually very brief—often no more than a few sentences. The main steps of annotation include:

1. Identifying the topic and aim of the work;
2. Outlining its structure (introduction, main part, conclusion);
3. Pointing out the main results or arguments.

Annotations must be clear, factual, and objective, without personal opinion or unnecessary details.

Writing of theses. Theses, or conference abstracts, are a condensed form of a research paper presented at academic events. Their function is to communicate the essence of a study quickly and effectively. Theses usually include: the problem or research question, the purpose of the study, methodology, main findings, and conclusions.

Linguistic requirements for theses. Scientific theses must be written in formal, precise, and clear language. The style is impersonal and objective, avoiding emotional or subjective expressions. Terminology should be used consistently. Typical linguistic features include the passive voice (It was found that...), short declarative sentences, and the use of functional clichés such as The paper considers..., The research aims to..., The results show.... Brevity is also crucial, as theses are usually limited in length.

Annotation and thesis writing are essential skills in academic communication. Annotations provide concise descriptions of texts, while theses summarize the main ideas of research for presentation. Both require clarity, objectivity, and adherence to the conventions of scientific language. Mastering these skills allows researchers to share their work effectively within the academic community.

1. Read the text and do the tasks that follow it.

Integration of Artificial Intelligence in Traffic Flow Optimization

Urban traffic congestion is one of the most pressing challenges in modern automobile transport systems. Recent research has explored the integration of artificial intelligence (AI) into traffic management to enhance flow efficiency, reduce travel time, and minimize environmental impact. AI-driven traffic optimization leverages real-time data from connected vehicles, road sensors, and mobile applications to dynamically adjust signal timings, route allocations, and lane usage strategies.

Central to these systems are **reinforcement learning algorithms**, which continuously adapt traffic control policies based on observed outcomes. By simulating multiple traffic scenarios and learning from historical data, the AI can predict congestion hotspots, optimize green-light durations, and implement adaptive rerouting for high-density areas. Preliminary studies demonstrate that AI-based traffic control can reduce average travel times by 12–18% and lower CO₂ emissions by up to 10% in urban networks.

However, the implementation of AI in traffic systems introduces several challenges. Data quality and sensor reliability directly influence algorithm performance, while computational demands require robust infrastructure and real-time processing capabilities. Furthermore, privacy and cybersecurity concerns must be addressed to ensure safe and ethical use of collected traffic data. As cities continue to evolve, AI integration into traffic management is likely to play a crucial role in creating sustainable, efficient, and safe urban transport ecosystems.

Task 1. Write a concise annotation (70–100 words) for the text. Your annotation should:

- Include the **main topic**
- Highlight the **key methods or approaches**
- Summarize **key findings or insights**
- Mention **challenges or limitations**

Task 2. From the text, identify three potential thesis statements that could be used in a research paper.

Task 3. Write one strong, concise thesis statement based on the text that could guide a research paper on AI in traffic systems.

- It should clearly express a **research claim** or **argument**.
- It should be **specific and focused**.

Task 4. Take your thesis statement from Task 3 and write 2–3 sentences explaining the scope and rationale of the research. Include:

- Why this research is significant
- Which methods or approaches will be analyzed
- Expected implications or contributions

Task 5. Evaluate the following statements based on clarity, specificity, and relevance to the text:

1. AI is useful in traffic.
2. AI can optimize urban traffic flow by adjusting signal timings and route allocations using real-time data, potentially reducing congestion and emissions.
3. Traffic is a problem in cities.

For each statement, explain strengths and weaknesses and suggest improvements if necessary.

Combined Quiz: Abstract Writing, Annotation, and Thesis Writing

(Based on scientific texts about AI in traffic optimization and predictive maintenance in electrified fleets.)

Part I.

1. Which of the following is the main purpose of an abstract?
 - A. To include all technical details
 - B. To summarize key points, methods, results, and implications
 - C. To provide personal opinions
 - D. To replace the introduction entirely

2. Which hedging expression is appropriate in a scientific abstract?
- A. “AI will definitely reduce congestion.”
- B. “AI may improve traffic efficiency in urban areas.”
- C. “AI completely eliminates all risks.”
- D. “AI always solves traffic problems.”
3. A strong thesis statement should be:
- A. Vague and general
- B. Clear, specific, and arguable
- C. A question rather than a claim
- D. An anecdotal observation
4. Which element is **not typically included** in a scientific annotation?
- A. Main topic
- B. Key methods or approaches
- C. Limitations or challenges
- D. Step-by-step procedural instructions
5. Which sentence demonstrates proper formal scientific style for abstracts?
- A. “Cars sometimes just work better when AI is used.”
- B. “AI-based traffic optimization systems integrate real-time data and reinforcement learning algorithms to enhance urban traffic flow.”
- C. “This system is really cool and helps a lot.”
- D. “Traffic is bad and AI might help.”

Part II.

6. List **three essential components** that should appear in a scientific abstract.
7. Identify **two challenges** in AI traffic systems or predictive maintenance that should appear in an annotation or abstract.
8. Explain in 1–2 sentences why hedging is important in abstracts.

Part III.

9. Write a **concise annotation (70–100 words)** for a scientific text on AI in traffic optimization. Include:

- Main topic

- Key methods or approaches
- Key findings or insights
- Challenges or limitations

10. Write a concise annotation (70–100 words) for a scientific text on predictive maintenance in electrified fleets. Include:

- Main topic
- Methods or approaches
- Key findings or insights
- Challenges

Part IV.

11. From the AI traffic optimization text, write one strong thesis statement that could guide a research paper.

12. From the predictive maintenance text, write one strong thesis statement that could guide a research paper.

13. Expand your thesis statement from Task 11 into 2–3 sentences explaining the scope, significance, methods, and expected contributions.

14. Expand your thesis statement from Task 12 into 2–3 sentences explaining the scope, significance, methods, and expected contributions.

Part V.

15. Write a mini abstract (3–4 sentences) for either the AI traffic optimization text or predictive maintenance text. Include:

- Topic and significance
- Methods or strategies
- Key findings
- Implications

16. Write a full abstract (120–150 words) for either text. Include:

- Background / context
- Aim / purpose
- Methods or approaches

- Key findings or insights
- Challenges / limitations
- Implications or potential applications

Part VI.

17. Critique the following thesis statements for clarity and specificity, and suggest improvements:

- a) AI helps traffic.
- b) Predictive maintenance is good for electric cars.

18. Explain in 3–4 sentences how annotation, thesis statements, and abstracts are **interconnected** in scientific writing and why mastering all three is important for professional research communication.

9. Scientific Article

A scientific article is one of the most important forms of written academic communication. Its main function is to present research findings and make them available for discussion within the scientific community.

The structure of a scientific article is generally standardized and includes several key elements:

1. Title – should be clear, concise, and informative, reflecting the subject of the study.
2. Abstract and keywords – a brief summary of the article that outlines its purpose, methods, and results; keywords facilitate information retrieval.
3. Introduction – explains the relevance of the topic, defines the aim and objectives of the study, and identifies its subject and scope.
4. Literature review or theoretical background – shows what has already been done in the field and situates the research within existing knowledge.
5. Methodology – describes the research methods, procedures, or experiments applied.
6. Main body (results and discussion) – presents findings, interprets them, and compares them with previous studies.

7. Conclusion – provides a concise summary, highlights the significance of the results,

and may suggest directions for further research.

8. References – a properly formatted list of sources used, following academic citation

standards.

Linguistic requirements of a scientific article include:

- Objectivity and precision: the language must be factual, avoiding emotional or subjective expressions.

- Use of terminology: terms should be applied consistently and in their exact meaning.

- Formal academic style: frequent use of passive voice (It was found that...), nominal phrases, and impersonal constructions.

- Logical coherence: use of linking words and markers such as firstly, however, therefore, in conclusion to ensure clarity and flow.

- Conciseness and clarity: sentences should be straightforward, avoiding redundancy and unnecessary complexity.

A scientific article is a structured and formalized genre of writing. Its success depends not only on the originality of the research but also on the clarity, objectivity, and precision of its language. Mastery of these requirements ensures that the article is accessible and valuable to the scientific community.

1. Read the text and do the tasks that follow it.

Hybrid Energy Management in Connected Electric Vehicle Fleets

The integration of connected electric vehicles (EVs) into urban transport networks has highlighted the need for optimized energy management strategies. Unlike conventional vehicles, EVs are constrained by battery capacity and thermal limitations, making real-time energy optimization critical for both vehicle performance and grid stability. Recent developments in hybrid energy management systems (HEMS) combine predictive algorithms, vehicle-to-grid (V2G) communication, and real-time sensor data to dynamically allocate energy between propulsion, battery conditioning, and auxiliary systems.

A key component of these systems is **model predictive control (MPC)**, which forecasts energy demands based on traffic conditions, route profiles, and driver behavior. By integrating V2G feedback, EVs can modulate charging and discharging cycles to support grid stability while minimizing energy losses. Empirical studies suggest that HEMS can reduce overall fleet energy consumption by 10–15% and extend battery lifespan by regulating thermal loads and depth-of-discharge cycles.

Implementation challenges include ensuring reliable real-time communication, maintaining cybersecurity across V2G networks, and managing heterogeneous vehicle capabilities. Additionally, the scalability of MPC algorithms for large fleets requires robust computational infrastructure. Despite these obstacles, hybrid energy management represents a critical advancement for sustainable and resilient urban electric transport systems.

Task 1. From the text, identify sections corresponding to:

1. **Introduction / Background**
2. **Problem Statement / Research Gap**
3. **Methods / Technological Approach**
4. **Results / Key Findings**
5. **Challenges / Limitations**
6. **Implications / Conclusion**

Write 1–2 sentences for each, explaining why the section fits the category.

Task 2. Write three potential titles for a scientific article based on the text. Ensure the titles are:

- Concise
- Informative
- Reflective of the main focus (HEMS, EVs, energy optimization)

Task 3. Write a 120–150 word abstract including:

- Background / context
- Aim / purpose
- Methods or technological approach
- Key findings or insights

- Challenges / limitations
- Implications

Use **formal scientific language** and **hedging expressions** where appropriate.

Task 4. Suggest 5–7 keywords that are suitable for indexing this scientific article. Examples: electric vehicles, energy management, model predictive control, vehicle-to-grid, sustainability.

Task 5. Write a short introduction paragraph (4–5 sentences) for a scientific article based on the text. Include:

- The research problem
- Significance of the study
- Scope of investigation

Task 6. Identify three discussion points that should appear in the discussion section of the article.

Task 7. Write one concise conclusion sentence summarizing the significance of hybrid energy management in connected EV fleets.

Example of a Scientific Paper

Title: *Adaptive Traffic Signal Control Using Machine Learning in Urban Networks*

Abstract:

Urban congestion causes significant delays and environmental impact in cities worldwide. This study investigates the use of machine-learning algorithms for adaptive traffic signal control to improve traffic flow efficiency. By integrating real-time traffic sensor data and historical traffic patterns, reinforcement learning models dynamically adjust signal timings at intersections. Field simulations conducted in a mid-sized urban network demonstrate reductions in average vehicle waiting times by 15–20% and a decrease in fuel consumption by 8–10%. Challenges include ensuring data quality, computational requirements for real-time decision-making, and integration with existing traffic infrastructure. The

results suggest that machine-learning-based adaptive traffic signals can significantly enhance urban traffic efficiency while reducing environmental impact.

Introduction:

Traffic congestion is a major challenge in modern urban environments, causing economic losses, increased fuel consumption, and environmental pollution. Traditional pre-timed traffic signal systems fail to adapt to varying traffic patterns, leading to inefficiencies. Recent advances in machine learning provide opportunities for dynamic traffic signal control, enabling real-time adjustment of signal phases based on current traffic conditions. This paper explores the application of reinforcement learning algorithms to optimize traffic signals in a simulated urban network.

Methods:

Traffic data from inductive loop sensors were collected at ten major intersections in the study area. A reinforcement learning model was trained using historical traffic data and real-time traffic input, with the objective of minimizing average vehicle waiting time. Simulations were run using a traffic micro-simulation platform to evaluate system performance under varying traffic conditions.

Results:

The adaptive traffic signal system reduced average vehicle waiting time by 15–20% compared to fixed-time signals. Fuel consumption decreased by 8–10%, and stop-and-go instances were reduced by 12%. The system was able to adjust dynamically to traffic fluctuations, demonstrating the robustness of machine-learning-based control in real-time urban traffic scenarios.

Discussion:

The study highlights the potential of reinforcement learning for improving urban traffic management. Limitations include computational demand for real-time operation and the dependency on accurate traffic data. Future research should address multi-intersection coordination and integration with connected vehicle data to further enhance system efficiency.

Conclusion:

Machine-learning-based adaptive traffic signal control offers a promising approach to reducing congestion, improving traffic efficiency, and minimizing environmental impacts in urban networks.

Tasks Based on the Paper

Task 1.

Match each part of the paper to typical scientific article sections:

- Abstract
- Introduction
- Methods
- Results
- Discussion
- Conclusion

Briefly explain the purpose of each section.

Task 2. Answer the following:

1. What is the main topic and research problem?
2. What methods are used?
3. What are the key findings?
4. Are limitations mentioned?
5. What is the overall implication of the study?

Task 3.

1. Does the title clearly reflect the study's focus?
2. Suggest **two alternative titles** that are concise, specific, and informative.

Task 4. Identify a possible thesis statement in the paper. Rewrite it in one concise sentence suitable for guiding a research paper.

Task 5. Suggest 5–7 keywords suitable for indexing this article (e.g., for a database search).

Task 6. List three discussion points raised in the paper and explain why they are important for understanding the research findings.

Task 7. Write a new abstract (100–120 words) for this study using your own words. Include:

- Background / problem
- Methods
- Key results
- Challenges / limitations
- Implications

Task 8.

1. What are potential limitations of using only simulation data for evaluating adaptive traffic signals?
2. How could connected vehicle data improve the system's performance?

10. Dialogic Speech on Professional Topics

In academic and professional communication, dialogic speech plays a crucial role, as it enables exchange of ideas, clarification, and constructive discussion. Similarities and differences between oral and written forms of communication. Both oral and written communication serve to transmit professional knowledge. Oral communication, such as lectures, seminars, or discussions, is often more spontaneous, interactive, and emotionally colored, allowing immediate feedback. Written communication, on the other hand, is highly structured, standardized, and demands precision and logical completeness.

Dialogic vs. monologic speech in the professional sphere.

Monologic speech includes presentations, lectures, or reports, where one speaker delivers information in a structured way. Dialogic speech refers to interactions such as discussions, debates, or consultations, which involve exchange, questioning, clarifying, and argumentation. In professional contexts, both are necessary, but dialogic speech develops critical thinking and collaboration skills. Typical professional questions in dialogic speech may include:

- What is the main aim of your research?
- Which methods did you use and why?
- How do your findings compare with existing studies?
- What practical applications can your results have?
- What are the limitations of your work?

Discussion of main trends in the field usually involves analysis of recent publications, comparison of new technologies, and forecasting the future development of the discipline.

Discussion of a master's thesis focuses on the relevance of the topic, novelty of the research, methods applied, and the value of the obtained results.

Discussion of research results requires the ability to present data (orally or using visual aids such as graphs and tables), formulate clear conclusions, and respond to critical feedback from colleagues.

Independent work (practice): students are encouraged to practice formulating typical professional questions, which helps them improve their dialogic skills and prepares them for participation in real scientific communication.

Dialogic Speech on Professional Topics

Definition:

Dialogic speech refers to **interactive communication** between two or more participants in a professional or academic context. Unlike monologic speech (which is one-sided), dialogic speech requires **exchange of ideas, clarification, questioning, and collaborative problem-solving**. In professional settings, dialogic communication is essential for meetings, negotiations, project discussions, and technical consultations.

Key Features of Dialogic Speech in Professional Contexts

1. Turn-Taking:

Speakers alternate turns while contributing meaningfully to the conversation. Interruptions are minimized and usually signal clarification or urgent points.

2. Politeness and Professional Tone:

- Use formal, neutral, and respectful language.
- Avoid slang or overly casual expressions.
- Examples: “Could you clarify...?”, “I would suggest...”, “May I add...?”

3. Clarification and Paraphrasing:

- Confirm understanding: “So, if I understand correctly, you mean that...?”

- Request clarification: “Could you elaborate on...?”
- 4. Questioning and Information Exchange:**
 - Open-ended questions encourage elaboration: “What are the main challenges of this system?”
 - Closed questions confirm facts: “Is the deadline tomorrow?”
- 5. Collaborative Problem-Solving:**
 - Propose solutions: “One approach could be to...”
 - Evaluate suggestions: “That seems feasible, but we might need more data.”
- 6. Signposting and Cohesion:**
 - Use phrases to guide the dialogue:
 - “First, let’s discuss...”
 - “Moving on to...”
 - “To summarize our discussion...”
- 7. Use of Technical Vocabulary:**
 - Employ domain-specific terminology correctly.
 - Avoid overloading the conversation with jargon if interlocutors may not be familiar with it.

Example Dialogue: Technical Meeting on Automobile Transport

Engineer 1: Good morning, everyone. Let’s start by reviewing the energy efficiency data from the latest electric bus trials.

Engineer 2: Sure. The battery performance appears stable, but energy consumption increased by 5% on hilly routes.

Engineer 3: Could you clarify whether this increase is due to terrain or driving patterns?

Engineer 2: Both factors contributed. On steep inclines, regenerative braking was less effective, and drivers tended to accelerate more aggressively.

Engineer 1: I see. One potential solution is to adjust the regenerative braking algorithm for hilly areas. Would that be feasible?

Engineer 3: That seems plausible, but we would need to run simulations first to ensure safety and efficiency.

Engineer 1: Agreed. Let's schedule a modeling session tomorrow and summarize our findings by the end of the week.

Tasks Based on Dialogic Speech

Task 1. Read the example dialogue. Identify three instances of:

- Clarification / Paraphrasing
- Proposal / Suggestion
- Professional turn-taking

Task 2. Rewrite the following informal dialogue to make it suitable for a professional meeting:

A: Why is the battery dying so fast?

B: I don't know. Maybe the drivers are messing up?

A: Ugh, fix it!

Task 3. Add appropriate signposting phrases to the following dialogue to improve cohesion:

A: We need to discuss software updates.

B: Yes, there's a bug in the navigation module.

A: It might affect delivery schedules.

Task 4. Formulate two open-ended questions and two closed-ended questions for a professional meeting about autonomous vehicle safety.

Task 5. In pairs or groups, simulate a professional discussion on a chosen topic in automobile transport (e.g., battery optimization, traffic management, vehicle maintenance). Include:

- Clarification questions
- Proposals and suggestions
- Professional tone and turn-taking
- Signposting phrases

Task 6. From the example dialogue, extract five technical terms and explain their meaning in context.

Task 7. Write a brief summary (3–5 sentences) of the example meeting, highlighting:

- The main issue discussed
- Proposed solutions
- Decisions or next steps

Task 8. Read the dialogues below and do the tasks that follow them.

Dialogue 1: EV Battery Management

Engineer 1: Good afternoon. Let's review the battery performance data from our fleet.

Engineer 2: Certainly. Average battery discharge rates were within expected limits, but a few vehicles showed higher than normal voltage drops.

Engineer 1: Could you specify which routes those vehicles were operating on?

Engineer 2: Yes, the affected vehicles were primarily on hilly and high-temperature routes.

Engineer 3: Perhaps we should implement adaptive thermal management for these conditions. What do you think?

Engineer 1: That sounds reasonable. Let's schedule a test for next week and monitor the results.

Dialogue 2: Traffic Management System

Manager: We need to assess the impact of the new AI-based traffic control system.

Analyst 1: Initial simulations indicate a 12% reduction in average congestion times.

Analyst 2: Can we confirm these results under peak traffic conditions?

Manager: Good point. I suggest running additional simulations during rush hours.

Analyst 1: I agree. We also need to evaluate the energy efficiency implications for electric buses in the network.

Manager: Let's include that in the next assessment report and summarize the key metrics.

Task 1. For each dialogue, identify three examples of:

- Clarification or paraphrasing
- Proposal or suggestion
- Professional turn-taking

Task 2. Rewrite the following informal dialogue into a professional tone:

A: Why are the batteries dropping so fast?

B: I think the drivers are not careful.

A: Just fix it quickly!

Task 3. Insert appropriate signposting phrases into the following dialogue to improve flow:

A: We need to discuss software updates for traffic lights.

B: There's a bug in the timing algorithm.

A: This might affect electric bus schedules.

Task 4. Formulate:

- Two open-ended questions for evaluating EV battery performance
- Two closed-ended questions for traffic system assessment

Task 5. From both dialogues, extract five technical terms and explain their meaning in context.

Task 6. Simulate a professional discussion on one of these topics:

- Optimizing EV battery thermal management
 - Evaluating AI-based traffic systems
- Include:
- Clarification questions
 - Proposals and collaborative problem-solving
 - Signposting phrases
 - Professional turn-taking

Task 7. Write a brief summary (4–5 sentences) for either dialogue, highlighting:

- The main issue
- Proposed solutions
- Next steps or decisions

Additional Exercises

Exercise 1. Read the dialogue below carefully. Then complete the tasks.

Dialogue: EV Fleet Energy Monitoring Meeting

Engineer 1: Good morning. Let's start by reviewing the energy usage data from our electric bus fleet.

Engineer 2: Average battery consumption is within expectations, but a few units reported unusually high discharge during peak hours.

Engineer 3: Could you clarify if this correlates with specific routes or traffic conditions?

Engineer 2: Yes, the affected vehicles were operating on hilly routes during high-temperature days.

Engineer 1: One possible solution is adaptive thermal management for these conditions. Shall we run a pilot test next week?

Engineer 3: Agreed. We should also monitor charging efficiency during the test.

Engineer 1: Excellent. Let's summarize our action items and circulate a report by Friday.

Tasks:

1. Identify Features of Dialogic Speech

- Highlight three examples of **clarification or paraphrasing**.
- Highlight three examples of **proposal or suggestion**.
- Highlight **turn-taking cues** and explain how they maintain professional flow.

2. Write a brief annotation (70–90 words) summarizing the dialogue:

- Main topic
- Key problem discussed
- Proposed solutions
- Next steps or decisions

Exercise 2. Based on the dialogue above, write a formal scientific abstract (120–150 words) that could accompany a report on EV fleet energy optimization. Include:

- Background / context
- Aim / purpose
- Methods or strategies proposed
- Expected outcomes or implications
- Challenges or considerations

Tip: Use hedging expressions like “*may improve*”, “*could enhance*”, or “*is likely to*”.

Exercise 3. Write a professional summary email to circulate to the engineering team after the meeting. Include:

- Brief overview of the issue
- Decisions made
- Assigned tasks
- Deadlines

Word limit: 100–120 words

Requirements: Formal tone, concise, clear structure, use of professional

connectors such as “*Regarding...*”, “*Action items include...*”, “*Please ensure...*”.

Exercise 4. Answer the following questions in 2–3 sentences each.

1. What additional data would you collect to better understand the high battery discharge on hilly routes?
2. Suggest one alternative solution to adaptive thermal management and explain why it could be effective.
3. How does dialogue analysis help in improving professional communication within engineering teams?

Exercise 5. From the dialogue and exercises above, select five technical terms or phrases. For each:

- Define it in context
- Use it in a **new sentence** related to automobile transport

Exercise 6. Using information from the dialogue and your abstract, write a mini-report (200–250 words) for a professional audience. The report should include:

- Background / problem description
- Proposed solutions / methods
- Expected outcomes
- Next steps / recommendations

Requirements:

- Use formal, professional tone
- Include at least 3 signposting phrases (“*Firstly...*”, “*Moving on...*”, “*In conclusion...*”)
- Incorporate at least 5 technical terms correctly

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