

ACADEMIC YEAR 2023 – 2024

Program	Year	Semester	Paper
PE	2	2	MAIN 1

MODULE NAME:	TECHNICAL ENGLISH IV
---------------------	-----------------------------

MODULE CODE:	TENG-IV	EXAM DATE:	23/05/2024
---------------------	----------------	-------------------	-------------------

TEACHER'S NAME:	MARTIN	DURATION:	2 hrs 30 mins
------------------------	---------------	------------------	----------------------

Questions to be answered on:	Allowed requirements	Number of pages
Space provided on the question paper	Pen	10

Points of Attention:

- For each question, the maximum earned points are mentioned between brackets at the end of each question.
- Write very clearly! Answers that are not readable are not marked and don't get points!
- Make sure your answers are written to the point.
- All answers should be written **in English**.
- Write all the answers **in blue or black pen only**.
- When finished, submit the question paper to the invigilator together with the answer scripts and the signed cover page.
- Any cheating/copying may result in an instant failing of the examination.

FINAL MARKS

STUDENT NAME:	
----------------------	--

STUDENT ID:	
--------------------	--

	50
	10

Number of answer scripts:

Invigilator:

Student's signature:

Time of receipt:

READING

[10 Marks]

Read the text and answer the questions that follow.

The Production Process of Ammonia

Ammonia, a crucial component in various industries, including agriculture and manufacturing, is produced through a complex chemical process known as the Haber-Bosch process. This text outlines the stages of ammonia production, from the raw materials to the final product. Understanding this process is essential for students studying process engineering, as it forms the foundation for many industrial applications.

Ammonia, with its chemical formula NH_3 , is a compound made up of nitrogen and hydrogen atoms. It is a colourless gas with a distinct pungent odour and is highly soluble in water. Ammonia is primarily used in fertiliser production and the manufacture of various chemicals, including nitric acid and explosives.

The production of ammonia is a multi-step process that involves the synthesis of nitrogen and hydrogen gases under specific temperature and pressure conditions to form ammonia gas. This short article addresses how ammonia is synthesised and the steps needed to purify it.

The synthesis of ammonia begins with the reaction of nitrogen gas (N_2) and hydrogen gas (H_2) in the presence of a catalyst. The raw materials, nitrogen and hydrogen, are obtained from the air and natural gas. The gases are compressed and then mixed in a ratio of three parts hydrogen to one part nitrogen. This mixture is then passed over an iron catalyst at high temperatures ranging from 400 to 500 degrees Celsius and pressures of around 200 to 300 atmospheres. The catalyst facilitates the formation of ammonia molecules from nitrogen and hydrogen atoms through a series of chemical reactions, following the principle outlined by the Haber-Bosch process.

Once the synthesis reaction is complete, the resulting mixture contains not only ammonia but also unreacted nitrogen and hydrogen gases, as well as other by-products. The mixture is cooled, causing the ammonia gas to liquefy and separate from the other gases to purify the ammonia. The liquefied ammonia is then collected and further purified through a process called fractional distillation. During fractional distillation, the ammonia is heated to its boiling point (-33.34 degrees Celsius) to vaporise it and then condensed back into liquid form. This process removes any remaining impurities, preparing pure ammonia for use in various industrial applications.

The production of ammonia is cyclic, as the synthesised ammonia can be used as a raw material to produce other chemicals, such as nitric acid. Understanding the synthesis and purification processes is essential for students studying process engineering, as it provides insight into the principles of chemical reactions and industrial production methods (Openai.com, 2024).

Question 1. Circle the letter that answers the question correctly or completes the statement.

(5 mark)

1. What is the primary raw material used in the production of ammonia?
 - a) oxygen
 - b) nitrogen
 - c) carbon dioxide
 - d) hydrogen
2. At what temperature range does the synthesis of ammonia typically occur?
 - a) 100-200 degrees Celsius
 - b) 300-400 degrees Celsius
 - c) 400-500 degrees Celsius
 - d) 600-700 degrees Celsius
3. What is the role of the catalyst in the synthesis of ammonia?
 - a) speeds up the reaction
 - b) decreases the pressure
 - c) increases the temperature
 - d) prevents the reaction
4. How is ammonia purified after synthesis?
 - a) fractional distillation
 - b) filtration
 - c) evaporation
 - d) sublimation
5. Which industrial application commonly utilises purified ammonia?
 - a) food preservation
 - b) fuel for vehicles
 - c) fertiliser production
 - d) plastic manufacturing

Question 2. Answer the questions below. Use *NO MORE THAN THREE WORDS AND/OR A NUMBER* from the passage for each answer.

(5 marks)

1. What is the chemical formula for ammonia?

2. Name one primary source of hydrogen used in ammonia production.

3. What is the purpose of cooling the ammonia mixture after synthesis?

4. State what are the main two gases produced in the mixture after synthesis?

5. Provide one example of an industry that extensively uses ammonia.

Critical Thinking

[18 Marks]

Question 1. Read the following case studies, and then use your knowledge and critical thinking skills to develop solutions. WRITE BETWEEN 50 – 100 WORDS for each answer.

Criteria	Description	Points
Content	Demonstrates thorough understanding of the case studies and provides well-developed solutions using critical thinking skills. Answers are clear, concise, relevant and within the word limit.	3
Grammar & Spelling	Shows mastery of grammar and spelling, with minimal to no errors, enhancing the clarity and professionalism of the responses.	2
Vocabulary	Utilises appropriate and varied vocabulary (B1/B2), demonstrating a strong command of language relevant to the context of the case studies.	1

Case Study 1:

(6 marks)

A chemical manufacturing plant plans to introduce a new production process involving hazardous substances. The management team is considering various safety measures to minimise the risk to workers. What actions would you recommend to ensure the health and safety of employees in this situation? (Openai.com, 2024a).

Question 2. Evaluate the references and find the mistakes. Each reference has two mistakes, indicated by the blank space and the number at the end of the line. Write in the space what is missing (2 marks)

Research Paper Online:

1. Abdulkarem Amhamed, Syed Shuibul Qarnain, Hewlett, S. and Odi Alrebei _____¹. Ammonia Production Plants—A Review. [online] ResearchGate. Available at: https://www.researchgate.net/publication/361792841_Ammonia_Production_Plants-A_Review [_____². 2024].

Journal online:

2. Gong, J., Li, C. and R. Wasielewski, M. (2019). _____¹. Chemical Society Reviews, [online] 48(7), pp. _____². doi: <https://doi.org/10.1039/C9CS90020A>.

Cover letter rubric

Mark	Task Completion	Coherence and Cohesion	Lexical Resource	Grammatical Range and Accuracy
5	The cover letter fully addresses all the instructions and criteria stated in the task. The response is error-free and demonstrates a high level of language proficiency.	The cover letter has a clear and logical organisation, with appropriate transitions and cohesive devices effectively connecting ideas.	The cover letter effectively uses technical terms and phrases and demonstrates a wide vocabulary relevant to the chemical engineering field.	The cover letter demonstrates mostly accurate grammar, with occasional errors in complex structures. The cover letter has no spelling errors.
4	The cover letter addresses most of the instructions and criteria stated in the task.	The cover letter has a clear organisation, with some use of transitions and cohesive devices to connect ideas.	The cover letter demonstrates an adequate range of vocabulary relevant to the chemical engineering field, with some effective use of technical terms and phrases.	The cover letter demonstrates some accurate grammar but may have sentence structure and grammar errors. It also has between 1 and 3 spelling errors.
3	The cover letter partially addresses the instructions and criteria stated in the task.	The cover letter has some organisation but may lack clarity or use cohesive devices to connect ideas.	The cover letter demonstrates some vocabulary relevant to chemical engineering but may lack variety or effective use of technical terms and phrases.	The cover letter demonstrates some accurate grammar but may have sentence structure and grammar errors. The cover letter has between 4 – 7 spelling errors.
2	The cover letter only partially addresses the instructions and criteria stated in the task.	The cover letter lacks organisation and coherence, with limited use of cohesive devices to connect ideas.	The cover letter demonstrates limited vocabulary relevant to chemical engineering, with limited or ineffective use of technical terms and phrases.	The cover letter demonstrates limited grammar accuracy, with sentence structure and grammar errors and multiple spelling errors.
1	The cover letter does not address the instructions and criteria stated in the task.	The cover letter lacks organisation, coherence, and use of cohesive devices to connect ideas.	The cover letter demonstrates minimal vocabulary relevant to chemical engineering, with limited or no use of technical terms and phrases.	The cover letter demonstrates minimal grammar accuracy, with frequent sentence structure and grammar errors. It also contains unrecognisable words.

References

OpenAI. (2024). ChatGPT. [online] Available at: <https://chat.openai.com/c/9612785b-f03c-409f-8bbf-34fe91ca1eb9> [Accessed 29 Jan. 2024].

Openai.com. (2024a). ChatGPT. [online] Available at: <https://chat.openai.com/c/4324a6a0-8261-4a9d-a418-95036bf28e6a> [Accessed 27 Mar. 2024].

MLO & Bloom's Level of Complexity

Q #	MLO Addressed	Complexity Level	Mark	Remark
Reading Section				
Text 1				
Q1.	1 & 3	Understand & Analyse	5	
Q2.	1 & 3	Understand	5	
Critical thinking				
Q1.	3, 4 & 6	Analyse & Evaluate	18	
Writing				
Q1.	5 & 6	Create	20	
Q2.	4	Evaluate	2	
Total points			50	