LỜI NÓI ĐẦU

Giáo trình "Thuật ngữ chuyên ngành" này nhằm trang bị cho sinh viên thuộc chuyên ngành Công nghệ Hóa học - Dầu và Khí những kiến thức cơ bản cũng như những thuật ngữ về chuyên ngành Lọc Hóa Dầu và Khí bằng tiếng Anh. Từ đó, các em có thể vận dụng để tiến hành dịch thuật một cách chính xác và hiểu thấu đáo các tài liệu chuyên ngành truy cập trên mạng được soạn thảo bằng tiếng Anh, bổ sung và cập nhật các kiến thức và công nghệ mới. Bên cạnh đó, giáo trình này củng cố thêm một số điểm văn phạm cơ bản thường được sử dụng qua các phần lý thuyết ban đầu và các bài tập ứng dụng cụ thể. Phần cuối giáo trình có đưa ra một số định nghĩa các khái niệm cơ bản thường được sử dụng trong chuyên ngành Lọc Hóa Dầu và Khí.

UNIT 1
INTRODUCTION

The petroleum industry began with the successful drilling of the first oil well in 1859, and the opening of the first refinery two years later to process the crude into kerosene.

Refining is the processing of one complex mixture of hydrocarbons into a number of other complex mixtures of hydrocarbons.

This chapter will cover the history of refinery processing, characteristics of crude oil, hydrocarbon types and chemistry and major refinery products and by-products.

VOCABULARY

by-products		: sản phẩm phụ
characteristics	/ ˌkæriktə'ristik/	: đặc tính
chemistry	/ 'kemistri/	: hóa học
cover	/ 'k□və/	: gồm, bao gồm
crude	/cru:d/	: dầu thô
drill	/dril/	: khoan
history	/ 'histri/	: lịch sử
hydrocarbons	/ ˌhaidrou'k□:bən/	: hydro carbon
industry	/ 'indəstri/	: công nghiệp
kerosene	/ 'kerəsi:n/	: Kerosen
major	/ 'meidʒə/	: chính, chủ yếu
minor	/ 'mainə/	: phụ, thứ yếu
mixture	/ 'mikstʃə/	: hỗn hợp
oil	/ □il/	: dầu
open	/ 'oupən/	: mở, mở ra
petroleum	/pə'trouliəm/	: dầu mỏ, dầu thô
process	/ 'prouses/	: xử lý, chế biến
processing	/ 'prousesiŋ/	: sự xử lý, chế biến
product	/ 'pr□dəkt/	: sản phẩm
refinery	/ ri'fainəri/	: nhà máy lọc dầu
successful	/ sək'sesfl/	: thành công
technical	/ 'teknikl/	: kỹ thuật

type	/taip/	: dạng, kiểu
well	/wel/	: giếng (nước, dầu)

DEFINITIONS

CRUDE OIL A natural mixture of hydrocarbons that usually includes small quantities of sulfur, nitrogen and oxygen derivatives as well as trace metals.

OPEC Organization of Petroleum Exporting Countries

ASEAN Association of South East Asian Nations

BARREL /'bærəl/ = 159 liters

GALLON = 3,78 liters (in USA) = 4,54 liters (UK)

QUESTIONS

1. When did the petroleum industry begin?
2. When was the first refinery built in the world?
3. What's the product of this first refinery?
4. What is the refining process?
5. What problems will this chapter cover?

GRAMMAR FOCUS

REPORTED SPEECH

1. Statement

Form: **S + { Said that / Said to / Told } + Obj + that + S + V + O (changed)**

Tom said: "I am feeling ill"

⇒ Tom said that he was feeling ill

I told her: "I don't have any money"

⇒ I told her (that) I didn't have any money

2. Wh-questions

Form: **S + asked (wanted to know) + Obj + Wh-word + S + V + O (changed)**

He asked me: 'Where are you going?'

⇒ He asked me where I was going.

Ann asked: 'When did they get married?'

⇒ Ann asked when they had got married.

3. Yes-No questions

Form:

S + asked (wanted to know) + Obj + if / whether + S + V + O (changed)

Tom asked: 'Do you remember me?'

⇒ Tom asked if I remembered him.

⇒ Tom asked whether I remembered him.

My mother asked me: 'Do you see Ann?'

⇒ My mother asked me if I saw Ann.

⇒ My mother asked me whether I saw Ann.

4. Imperatives

Form:

S + asked (told, ordered, forced, advised, begged) + Obj + if / whether + S + V + O (changed)

"Stay in bed for a few days", the doctor said to me.

⇒ The doctor said to me to stay in bed for a few days.

⇒ The doctor told me to stay in bed for a few days.

"Don't shout", I said to Jim

⇒ I told Jim not to shout.

Changes in tense

Simple present	→ Simple past
Present continuous	→ Past continuous
Present perfect Simple past Past perfect	→ Past perfect
Present perfect continuous	→ Past perfect continuous
Will/Can/Might	→ Would/Could/Might
Would/Could/Might/Should	→ No change

Changes in time, place, demonstration

today → that day

yesterday → the day before/ the previous day

tomorrow → the next day/ following day

now → then/ immediately / at once

ago → before

tonight → that night

last night → the night before

next week → the following week

here → there

this → that

these → those

Attention:

- Tom said: “New York is more lively than London.”

⇒ Tom said that New York is more lively than London.

(New York is still more lively. The situation hasn't changed)

⇒ Tom said that New York was more lively than London.

- Ann said: “I want to go to New York next year.”

⇒ Ann said that she wants to go to New York next year.

(Until now she wants to go to New York next year. She doesn’t change her mind)

⇒ Ann said that she wanted to go to New York following year.

- **Tell me** but **say to me**

He said to me that he was very tiered.

He told me that he was very tired.

Exercise 1:

“Please don’t tell anybody what happened”, Ann said to me.

⇒ …….

‘Please don’t tell anyone what happened’, Ann said to me.

⇒ …….

‘Can you open the door for me, Tom?’, Ann asked.

⇒ …….

Judy said: “My parents are very well.”

⇒ …….

She said: “I’m going to learn to drive.”

⇒ …….

She said: “John has given up his job.”

⇒ …….

She said: “I can’t come to the party on Friday.”

⇒ …….

She said: “I want to go away for a holiday but I don’t know where to go.”

⇒ …….

She said: “I’m going away for a few days. I’ll phone you when I get back.”

⇒ …….

Exercise 2:

Last summer Nam attended an intensive English course in the UK. He went to see a landlady called Mrs. Smith about a flat. Nam and Mrs. Smith both asked a lot of questions to each other. Then Nam told you about it. Now suppose you are Nam, report all the questions.

- “What sort of heating is there ?” Nam asked.
- …….
- “What do you think of the flat?” Mrs. Smith asked.
- …….
- “How far is it to the school?” Nam asked.
- …….
- “How do you go to school?” Mrs. Smith asked.
- …….
- “How much is the rent?” Nam asked.
- …….

Exercise 3:

A new student, Paul, has come to a foreign language college and the students are asking him questions. Imagine that he reports these questions later to an English friend.

- “ Can you speak English?” said Ann
- …….
- “How long are you staying here?” asked Peter
- …….

- “Are you working as well as studying?” said Linda
- …….
- “What are you going to study?”
- …….
- “Do you want to buy any second-hand books?”
- …….
- “What kind of sports do you like best?”
- …….
- “Are you interested in acting?”
- …….
- “Do you like to join our Drama Group?”
- …….
- “What do you think of the canteen coffee?”
- …….
- “What soft drinks do you like?”
- …….

UNIT 2
REFINING OPERATIONS

Petroleum refining operations can be separated into five basic areas:

1. **Fractionation** (distillation) is the separation of crude oil in **atmospheric** and **vacuum distillation** towers into different "fractions" or "cuts."
2. **Conversion processes** change the size and/or structure of hydrocarbon molecules. These processes include:

- Decomposition by **thermal** and **catalytic cracking**;
- Unification through **alkylation** and **polymerization**;
- Alteration with **isomerization** and **catalytic reforming**.

3. **Treatment processes** may involve chemical or physical separation such as absorption or precipitation, including desalting, drying, hydrodesulfurizing, solvent refining, sweetening, solvent extraction,…
4. **Blending** is the process of mixing and combining hydrocarbon fractions, additives and other components to produce finished products with specific performance properties.
5. **Other Refining Operations** include: process-water treatment and cooling; storage; product movement; hydrogen production; sulfur recovery, …

DEFINITIONS

ALKYLATION A process using sulfuric or fluoric acid as a catalyst to combine olefins (usually butylene) and isobutane to produce a high-octane product known as alkylate.

DESALTING Removal of mineral salts (most chlorides, e.g., magnesium chloride and sodium chloride) from crude oil.

HYDRODESULFURIZATION A catalytic process in which the principal purpose is to remove sulfur from petroleum fractions in the presence of hydrogen.

QUESTIONS

1. How many basic areas can the petroleum refining operations be separated into?
2. What is the purpose of distillation process?
3. How many processes do the conversion processes include?
4. What workshops that belong to decomposition process?
5. What workshops that belong to unification process?

6. What workshops that belong to alteration process?
7. What is the purpose of alkylation process?
8. What is the purpose of desalting process?
9. What is the purpose of hydrodesulfurization process?

VOCABULARY

absorption	/ əb's□:pʃn/	: hấp thụ
additive	/ 'æditiv/	: chất phụ gia
alteration	/ ,□:ltə'reiʃn/	: sự biến đổi
area	/ 'eəriə/	: khu vực, diện tích
conversion	/ kən'və:ʃn/	: sự chuyển hóa
decomposition	/ ,di:k□mpə'ziʃn/	: sự phân huỷ
extraction	/ iks'trækʃn/	: sự chiết tách
fraction	/ 'frækʃn/	: phân đoạn, phân số
include	/ in'klu:d/	: bao gồm, gồm có
involve	/ in'v□lv/	: gồm
molecule	/ 'm□likju:l/	: phân tử
movement	/ 'mu:vmənt/	: sự di chuyển, vận chuyển
operation	/ ,□pə'reiʃn/	:Sự hoạt động, vận hành
precipitation	/ pri,sipi'teiʃn/	: sự lắng, kết tủa
recovery	/ ri'k□vəri/	: sự thu hồi
refine	/ [ri'fain/	: lọc
size	/ saiz/	: kích cở, kích thước
solvent	/ 's□lvənt/	: dung môi
storage	/ 'st□:ridʒ/	: sự tồn chứa
structure	/ 'str□ktʃə/	: cấu trúc
sweetening	/ 'swi:tniŋ/	: sự mềm hóa
thermal	/ 'θə:ml/	: thuộc về nhiệt, nhiệt
treatment	/ 'tri:tmənt/	: sự xử lý
unification	/ ,ju:nifi'keiʃn/	: sự hợp nhất

GRAMMAR FOCUS

PAST SIMPLE AND PRESENT PERFECT

A Present perfect describe an action in the past but this action always last until now

Example 1:

- Tom is looking for his key. He can't find it.
- He has lost his key. (present perfect)

Few minutes later:

- Now Tom has found his key. He has it now.
- Has he lost his key? (present perfect)
- No, he hasn't. He has found it.
- Did he lose his key? (past simple).
- Yes, he did.
- He lost his key (past simple) but now he has found it (present perfect).

Example 2:

- Jack grew a beard but now he has shaved it off. (= he doesn't have a beard now)
- They went out after lunch and they've just come back. (= they come back now).

B Past simple describe an action in the past and it doesn't last until now

- The Chinese invented printing. (not "have invented")
- How many plays did Shakespeare write? (not "has Shakespeare written")
- Beethoven was a great composer. (not 'has been')

Compare:

- Shakespeare wrote many plays.
- My sister is a writer. She has written many books. (she still writes books)
- He was ill last week (He's all right now)
- He has been ill since last week = He has been ill for a week (He's ill until now)

C Present perfect describe an action has just happened and the actions following will be used in past simple:

A: Ow! I've burnt myself.

B: How did you do that? (not "have you done").

A: I picked up a hot dish. (not "have picked")

A: Look! Somebody has splilt milk on the carpet.

B: Well, it wasn't me. I didn't do it. (not "hasn't been...haven't done")

A: I wonder who it was then. (not "Who it has been")

What has happened in these situations?

1. Jack had a beard. Now he hasn't got a beard. He _____ .
2. Linda was here five minutes ago. Now she's in bed. She _____ .
3. The temperature was 25 degrees. Now it is only 17. the temperature _____
4. The light was off. Now it is on.Somebody _____
5. The tree was only three metres hight. Now it is four. the tree _____
6. The plane was on the runway a few minutes ago. Now it is in the air. The plane

***Put the verbs in brackets in the correct form,* present perfect *or* past simple.**

1. 'Where's your key?' 'I don't know. I _____ it **(lose)**.
2. I _____ very tired, so I lay down on the bed and went to sleep. **(be)**
3. Mary _____ to Australia for a while but in about an hour.' **(go)**
4. 'Where's Ken?' 'He _____ out. He'll be back in about an hour.' **(go)**
5. I did German at school but I _____ most of it. **(forget)**
6. I meant to phone Diane last night but I _____ **(forget)**
7. I _____ a headache earlier but I feel fine now. **(have)**
8. Look! There's an ambulance over there. There _____ an accident. **(be)**
9. They're still buiding the new road. They _____ it **(not finish)**.
10. 'Is Helen still here?' 'No, she _____ out' **(just/ago)**
11. The police _____ three people but later they let them go. **(arrest)**
12. Ann _____ me her address but I'm afraid I _____ it **(give, lose)**
13. Where's my bike? It _____ outside the house. It _____ ! **(be, desapear)**
14. What do you do think of my English? Do you think I _____ ? **(improve)**

Are the underlined parts of these sentences right or wrong? Correct the ones that are wrong.

1. Do you know about Sue? She's given up her job. _____ .
2. The Chinese have invented printing. _____ .
3. How many plays has Shakespeare written? _____
4. Have you read any of Shakespeare's plays? _____
5. Aristole has been a Greek philosopher. _____
6. Ow! I've cut my finger. It's bleeding _____
7. My grandparents have got married in London. _____
8. Where have you been born? _____
9. Mary isn't at home. She's gone shopping _____
10. Albert Einstein has been the scientist who has developed the theory of relativity.

(Section C) *Put the verb into the most suitable form,* present perfect *or* past simple.

1.
A: Look! Somebody _____ **(spill)** coffee on the carpet.
B: Well, it _____ **(not/be)** me. I _____ **(not/do)** it.
2.
A: Ben _____ **(break)** his leg.
B: He _____ **(fall)** off a ladder.
3.
A: Your hair looks nice. _____ **(you/have)** a haircut?
B: Yes.
A: Who _____ **(cut)** it? _____ **(you/go)** to the hairdresser?
B: No, a friend of mine _____ **(do)** it for me.

UNIT 3
CRUDE OIL DISTILLATION (FRACTIONATION)

1. Description

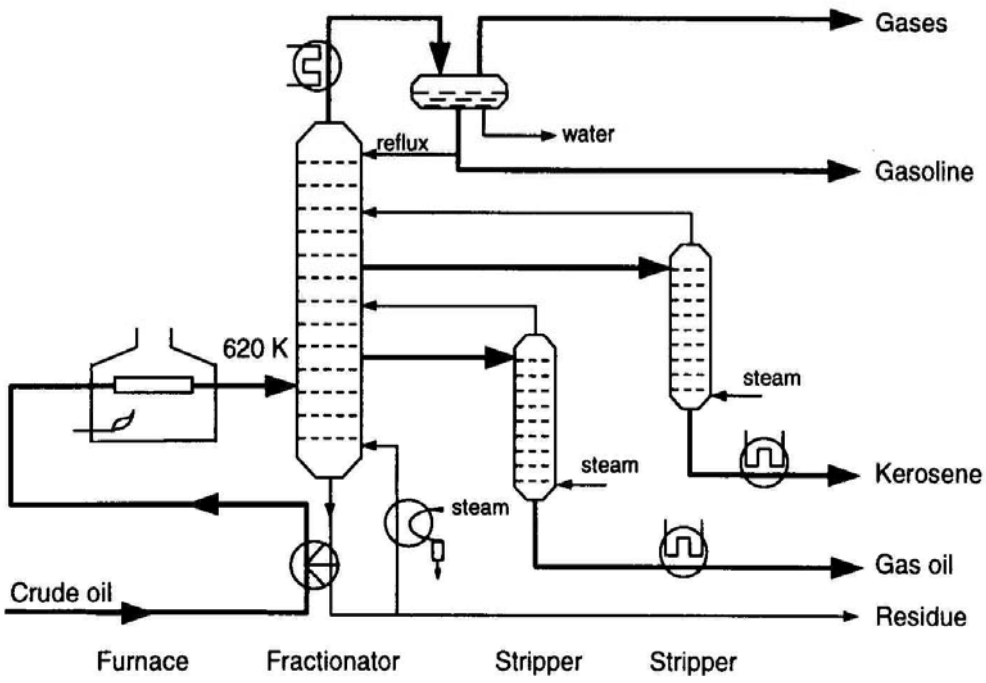
The first step in the refining process is the separation of crude oil into various fractions or straight-run cuts by distillation in atmospheric and vacuum towers. The main fractions or "cuts" obtained can be classified in order of decreasing volatility into gases, light distillates, middle distillates, gas oils, and residuum.

2. Atmospheric Distillation Tower

At the refinery, the desalted crude feedstock is preheated using recovered process heat. The feedstock then flows to a direct-fired crude charge heater where it is fed into the vertical distillation column just above the bottom, at pressures slightly above atmospheric and at temperatures ranging from 650 to 700^0F (heating crude oil above these temperatures may cause undesirable thermal cracking).

The fractionating tower, a steel cylinder about 120 feet high, contains horizontal steel trays for separating and collecting the liquids. The trays permit the vapors to bubble through the liquid on the tray, causing some condensation at the temperature of that tray. An overflow pipe drains the condensed liquids from each tray back to the tray below, where the higher temperature causes re-evaporation. The evaporation and condensing operation is repeated many times until the desired degree of product purity is reached.

FIGURE I. ATMOSPHERIC DISTILLATION.



VOCABULARY

atmospheric	/ ˌætməs'ferik/	: khí quyển
cause	/ k□:z/	: gây ra
classify	/'klæsifai/	: phân loại
condensation	/ˌk□nden'seiʃn/	: sự ngưng tụ
desalt	/ di:'s□:lt/	: Khử muối
distillation	/ ˌdisti'leiʃn/	: chưng cất
drain	/ drein/	: rút, tháo
evaporation	/ i,væpə'reiʃn/	: sự bay hơi
feedstock	/ ['fi:dst□k/	: nguyên liệu
fraction	/ 'frækʃn/	: phân số, phân đoạn
heater	/ 'hi:tə/	: lò = furnace /'fə:nis/
in order of		: theo
light → middle → heavy		: Nhẹ → Trung bình → Nặng
overflow pipe	/ 'ouvəflou/	: ống (vách) chảy chuyền
preheat	/ [ˌpri:'hi:t/	: đun nóng trước
pressure	/ 'preʃə(r)/	: áp suất
purity	/ 'pjuərəti/	: độ tinh khiết
recover	/ ri:'k□və/	: thu hồi
residuum	/ ri'zidjuəm/	: cặn = residue / 'rezidju:/
separation	/ˌsepə'reiʃn/	: sự phân cắt, phân chia
steel	/ sti:l/	: thép
step	/ ‘step/	: Bước, giai đoạn
temperature	/ 'temprətʃə/	: nhiệt độ
tower	/ 'tauə/	: tháp = column / 'k□ləm/
tray	/ trei/	: đĩa
undesirable	/ ˌ□ndi'zaiərəbl/	: không mong muốn
vacuum	/ 'vækjuəm/	: chân không
various	/ 'veəriəs/	: khác nhau
volatility	/ ˌv□lə'tiləti/	: độ bay hơi

DEFINITIONS

DISTILLATION Distillation is a process in which a liquid or vapour mixture of two or more substances is separated into its component fractions of desired purity, by the application of heat

STRAIGHT-RUN GASOLINE Gasoline produced by the primary distillation of crude oil. It contains no cracked, polymerized, alkylated, reformed or visbroken stock.

QUESTIONS

1. Which is the first step in the refining process?
2. What are the principal products obtained from ?
3. Which temperature
4. What are the two significant events in the end of 19th century?

GRAMMAR FOCUS

RELATIVE CLAUSES (ADJECTIVE CLAUSES)

I- Restrictive relative clauses. (Mệnh đề quan hệ giới hạn)

Relative pronouns: who, whom, which, that, whose

EX1: The man is my uncle. He is standing near the window.

⇒ The man **who/ that** is standing near the window is my uncle.

Ex2: The man is my uncle. You met him yesterday.

⇒ The man (**whom/ that**) you met yesterday is my uncle.

⇒ The man you met yesterday is my uncle.

EX3: The book is mine. It is on the desk.

⇒ The book **which/ that** is on the desk is mine.

Ex4: The book is mine. You are reading it.

⇒ The book (**which/ that**) you are reading is mine.

⇒ The book you are reading is mine.

Ex5: The woman is crying loudly. Her son was injured in the accident.

⇒ The woman **whose** son was injured in the accident is crying loudly

Ex6: The book is mine. The cover of the book is blue.

⇒ The book **of which the cover**/ ***the cover of which*** is blue is mine.

⇒ The book **whose** cover is blue is mine.

II- Non-restrictive relative clauses (Mệnh đề quan hệ không giới hạn)

Relative pronouns: who, whom, which, whose.

Ex1: My father is going to France next week. You met him yesterday.

⇒ My father, **whom** you met yesterday, is going to France next week.

Ex2: Torn is a student in my class. He has just won the school scholarship.

⇒ Tom, **who** has just won the school scholarship, is a student in my class.

Ex3: That hotel is near the beach. It's the most expensive.

⇒ That hotel, **which** is the most expensive, is near the beach.

Ex4: Charlie Chaplin died in 1977. His films amused millions.

⇒ Charlie Chaplin, **whose** films amused millions, died in 1977.

Ex5: Jack has three brothers. All of them are married.

⇒ Jack has three brothers, all of **whom** are married.

Ex6: Ann has a lot of books. She hasn't read most of them.

⇒ Ann has a lot of books, most of **which** she hasn't read.

III- Relative Adverbs: where, when, why

EX1: I'll never forget the day. We first met on that day.

⇒ I'll never forget the day **when** we first met.

Ex2: He has just come back to the village. He was born there.

⇒ He has just come back to the village **where** he was born.

EX3: She didn't tell us the reason. She gave up herjob that reason.

⇒ She didn't tell us the reason **why** she gave up her job.

IV- Relative pronoun That

<I> That can't be used after a comma, after a preposition.

Ex: Those men, **who** pulled me from the burning car, saved my life.

⇒ She is the woman **that** I wrote to.

⇒ She is the woman to **whom** I wrote.

<2> That must be used

a) After mixed antecedent. (for person and for object)

Ex: The people and cattle **that** went to the market raised a cloud of dust.

b) After adjectives in superlative degree or after the first, the second, the last.

Ex: Paris is the finest city **that** he has ever seen.

Mr Lepzig was the last man **that** left the office.

c) After all, everybody, everything, nothing, nobody, only

Ex: Answer all the questions **that** I asked.

I bought the only English book **that** they had.

d) After It is/it was

Ex: It was he **that** killed the lion.

EXERCICES:

1- I have always wanted to come to New York, _____ famous city of the USA.

a. which b. a c. that's a d. is the

2- The severe drought _____ took place last summer ruined the rice crop.

a. it b. that c. that's d. which is

3- People who exercise often have better physical endurance than those _____

a. who don't b. who doesn't c. doesn't d. don't

4- Have you seen the place ____ the wedding ceremony will be held?

a. which b. where c. in where d. is where

5- Edgar's wife. _____ has written several papers on this subject, is a university professor.

a. who b. whose c. that d. whom

6- Mr. Marple is a person _____ have much confidence.

a. I b. whom I c. in whom I d. in that I

7- Mary gave up the job at the advertising agency, _____ surprised everybody.

a. which b. that c. who d. where

8- New York, _____ I'd love to visit one day, is a wonderful city.

a. where b. which c. that d. to which

9- That girl over there, _____ I don't remember, came here yesterday.

a. which name b. whose name c. her name d. the name of whose

10- On the way this morning, we saw a lot of soldier and tanks _____ moved to the front line

a. which b. that c. who d. whom

11- Marie Curie, _____ radium, is one of the greater women in our time.

a. that discovered b. Discovered c. discovering d. who discovered

12- He wanted to know the reason _____ I had turned down his invitation.

a. what b. why c. when d. which

13- I prefer to go to Da Lat in winter _____ there are fewer tourists about.

a. which b..that c. where d.when

14- Is Miss White the person ____ you wish to speak?

a. that b. to that c. whom d. to whom

15- Anyone ____ scholastic record is above average can apply for the school scholarship.

a. who has a b. whose c. that has a d. has i

16- The Hotel Sunflower, ____ we stayed when we were in Ha Noi, was a nice one.

a. where b. which c. that d. when

17- I'm working for a car factory ____ main office is in Chicago.

a. which b. that c. where d. whose

18- The new shopping plaza is advertised as a place ____ you can find anything you want to buy

a. which b. where c. from where d. that

19- Margaret, ____ name was missed off the list, ____ wasn't very pleased.

a. who/ who b. whose/ who c. whose/ that d. whose/ ___

20- I pick up the piece of paper ____ George had written his address.

a. on which b. which c. that d. on that

21- Whales and dolphins both make sounds ____ in some ways are similar to a language.

a, who b. whose c. which d. by which

22- "Deaf" is the word used in English for someone ____ is unable to hear.

a. who b. who c. which d. whom

23- I don't like having meals in a restaurant ____ doesn't display a menu.

a. where b. which c. who d. whom

24- She was the first person ____ broke the silence in the meeting.

a. that b. who c. whom d. whose

25- He told me about the places and the people ____ he had seen on the way.

a. who b. which c. that d. whom

26- There were a lot of people at the meeting, ____ I had met before.

a. few of them b. few of whom c. few of which d. few of that

27- We have some horses, ____ is more than three years old.

a. none of that b. none of them c. none of these d. none of which

28- The wallet ____ I lost last week was found by a work man ____ was doing road works in the street

a. ___/ who b. that/ whom c. which/ whose d. ___/ whom

29- I recently went back to Paris. _____ is still as beautiful as a pearl.

a. which b. where c. that d. whose

30- She is the most intelligent woman _____I've ever met.

a. whom b. who c. whose d. that

31- I'll introduce you to the man _____ support is necessary for your project.

a. who b. whom c. that d. whose

32- We must Find a time _____ we can meet and a place _____ we can talk.

a. when/ where b. that/ which c. which/ where d. when/ which

33- We are crossing the meadow_____ we used to fly kites over in our child-hood.

a. where b. which c. what d. when

34- It rained heavily last night, _____ prevented my going out.

a. that b. which c. who d. whom

35- Fortunately we had a map, without _____ we would have got lost.

a. which b. whom c. that d. this

36- He often comes back to visit Oxford. _____ he grew up.

a. which b.that c. where d. of which

37- Keswick. _____ lies at the heart of the Lake District, is the perfect " place for holiday.

a. where b. who c. which d. that

38- And the Derwent Hotel. _____ overlooks the town, is the perfect place to stay.

a. where b. who c. which d. that

39- Peter, _____ cooking attracts people from far and wide. was once Young Chef of the year.

a. who b. whom c. whose d. That

40- The comfort of the guests, _____ the owners treat almost as members of the family, always comes first.

a. which b. who c. that d. whose

41- And the Lake district, _____ has so much wonderful scenery, will not disappoint you.

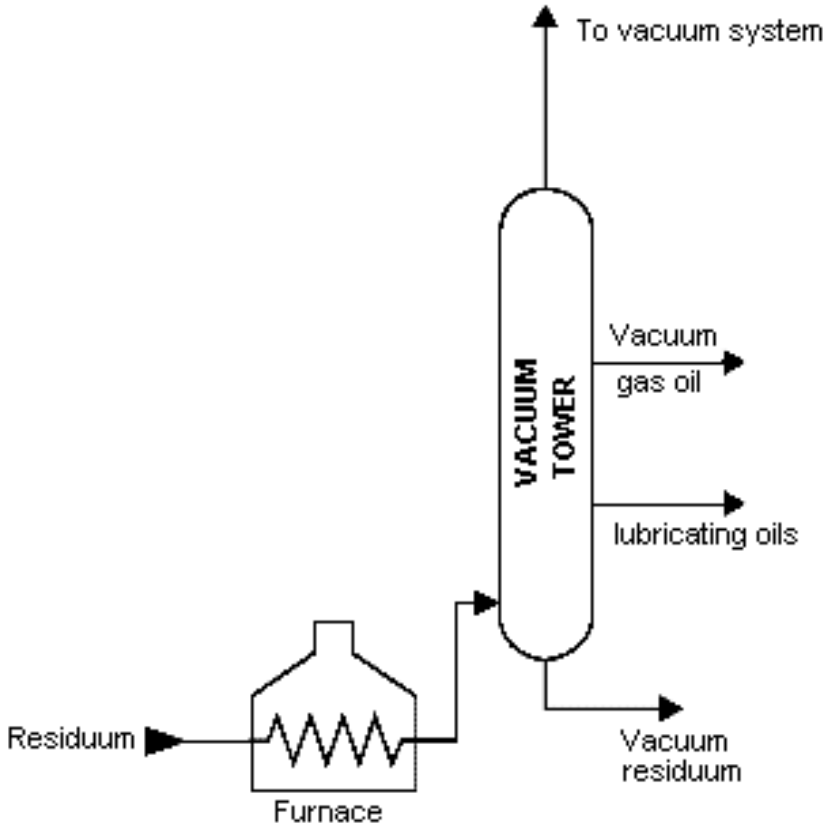
a. where b. who c. that d. which

UNIT 4
VACUUM DISTILLATION TOWER

In order to further distill the residuum from the atmospheric tower at higher temperatures, reduced pressure is required to prevent thermal cracking. The process takes place in one vacuum distillation tower.

The principles of vacuum distillation resemble those of fractional distillation and, except that larger-diameter columns are used to maintain comparable vapor velocities at the reduced pressures, the equipment is also similar. The internal designs of some vacuum towers are different from atmospheric towers in that random packing and demister pads are used instead of trays. A typical first-phase vacuum tower may produce gas oils, lubricating-oil base stocks, and heavy residual for propane deasphalting. A second-phase tower operating at lower vacuum may distill surplus residuum from the atmospheric tower. They are typically used to separate catalytic cracking feedstock from surplus residuum.

FIGURE IV:2-9. VACUUM DISTILLATION



VOCABULARY

further	/ 'fə:đə/	: thêm nữa, hơn nữa
distill	/ dis'til/	: chưng cất
prevent	/ pri'vent/	: ngăn cản, ngăn tránh
principle	/ 'prinsəpl/	: nguyên tắc
resemble	/ ri'zembl/	: giống với, tương tự
diameter	/ dai'æmitə/	: đường kính
maintain	/ mein'tein/	: duy trì
comparable	/ 'k□mpərəbl/	: có thể so sánh được
velocity	/ vi'l□səti/	: vận tốc
equipment	/ i'kwipmənt/	: thiết bị
internal	/ in'tə:nl/	: bên trong
random	/ 'rændəm/	: ngẫu nhiên, tuỳ tiện
packing	/ 'pækiŋ/	: sự đệm kín
pad	/ pæd/	: đệm
instead of		: thay vì, thay cho
phase	/ feiz/	: pha, giai đoạn
Lubricating-oil		: dầu bôi trơn, dầu nhờn
stock	/ st□k/	: kho dự trữ, gốc
operate	/ '□pəreit/	: vận hành, hoạt động
surplus	/ 'sə:pləs/	: số dư, thừa

DEFINITIONS

CRACKING The breaking up of heavy molecular weight hydrocarbons into lighter hydrocarbon molecules by the application of heat and pressure, with or without the use of catalysts.

CATALYTIC CRACKING The process of breaking up heavier hydrocarbon molecules into lighter hydrocarbon fractions by use of heat and catalysts.

DEASPHALTING Process of removing asphaltic materials from reduced crude using liquid propane to dissolve nonasphaltic compounds.

QUESTIONS

1. Which is the purpose of the vacuum distillation tower?
2. What are internal designs of some vacuum towers different from atmospheric towers?
3. How many kinds of vacuum tower are there?
4. What are products obtained from the first-phase vacuum tower?
5. Which is the purpose of the second-phase vacuum distillation tower?

GRAMMAR FOCUS

ACTIVE AND PASSIVE

Compare:

1. Somebody built this house in 1930 (active) → This house was built in 1930 (passive)
2. My grandfather was a builder. He built this house in 1930 → This house is quite old. It was built in 1930. (or This house was built by my grandfather)
3. It's a big company. It employs two hundred people → Two hundred people are employed by the company.
4. A lot of money was stolen in the robber. (somebody stole it but we don't know who)
5. Is this room cleaned every day? (does somebody clean it? it's not important who)

Formula:

Passive = be (is/was/have been...) + PP (done/cleaned/seen...)

(be) done (be) cleaned (be) seen (be) damaged (be) built...

Simple present:

- Somebody cleans this room every day → This room is cleaned every day.
- Many accidents are caused by careless driving.
- I'm not often invited to parties.
- How is this word pronounced?

Simple past:

- Somebody cleaned this room yesterday → This room was cleaned yesterday.
- We were woken up by a loud noise last night.
- "Did you go to the party?" "No, I wasn't invited."
- How much money was stolen?

Example:

The cat eats the mouse →

The cat doesn't eat the mouse →

Does the cat eat the mouse? →

The cat is eating the mouse →

The cat ate the mouse →

The cat has eaten the mouse →

The cat had eaten the mouse →

The cat will eat the mouse →

Exercises 1:

Complete these sentences using one of these verbs in the correct form:

Cause damage hold include invite

Make overtaken show translate write own

1. Many accidents …… by dangerous driving
2. Cheese …… from milk
3. The roof of the building …… in a storm a few days ago
4. There's no need to leave a tip. Service …… in the bill
5. You …… to the weeding. Why didn't you go?
6. A cinema is a place where films ……
7. In the United States, elections for President …… every four years
8. Originally the book …… in Spanish and a few years ago it …….. into English.
9. We were driving along quite fast but we …… by a lots of others cars.
10. The company is not independent. It …… by a much larger company.

Exercises 2:

Write questions using the passive. Some are present and some are past.

1. Ask about the telephone (when/invent?) →
2. Ask about glass (How/make?) →
3. Ask about Australia (When/discover?) →
4. Ask about silver (what/ use for?) →
5. Ask about television (when/invent?) →

Exercises 3:

Put the verb into the correct form, present simple or past simple, active or passive

1. It's a big factory. Five hundred people …… (employ) there.
2. Water …… (cover) most of the Earth's surface.
3. Most of the Earth's surface …… (cover) by water
4. The park gates …… (close) at 6.30 pm every evening.
5. The letter …… (send) a week ago and it …… (arrive) yesterday.
6. The boat …… (sink) quickly but fortunately everybody …… (rescue)
7. Ana's parents …… (die) when he was very young. He and his sister …… (bring) up by their grandparents.
8. I was born in London but I …… (grow) up in the North of England.
9. While I was on holiday, my camera …… (steal) from my hotel room.
10. While I was on holiday, my camera …… (disappear) from my hotel room.

Exercises 4:

Rewrite these sentences with passive tense:

1. Somebody has cleaned the room every day →
   …….
2. They cancelled all flights because of fog →
   …….
3. People don't use this road very often →
   …….
4. Somebody accused me of stealing money →
   …….

5. How do people learn languages? → …….
6. People advised us not to go out alone → …….
7. Somebody is using a computer at the moment → ……. …….
8. I didn't realise that somebody was recording our conversation → ……. ……..
9. They have built a new hospital near the airport → ……. …….
10. When we got to the stadium, we found that they had cancelled the game → ……. …….

REMEMBER:

1 mile = 1,6 km

1 inches = 25,4 mm

1 feet = 12 inches = 0,3024m

$^0F = 1,8 \times {}^0C + 32$

2000 kilometers	≈	1200	miles
620 square kilometers	≈	239	square miles
8848 meters	≈	29028	feet
1900 meters	≈	6250	feet
6019 kilometers	≈	3740	miles
23^0 Celcius	≈	74	^{0} Fahrenheit
10^0 Celcius	≈	50	^{0} Fahrenheit

EXERCISES

I- Write the questions to these answers. Then practice with a partner.

A:……?

B: Angel Falls is 979 meters (3212 feets) high.

A:……?

B: California is about 411.000 square kilometers (159.000 square miles)

A:……?

B: The Nile is 6.670 kilometers (4.145 miles) long.

A:……?

B: Washington gets up to about 32^0 Celcius (90^0 Fahrenheit) in the summer.

UNIT 5
BASICS OF CRUDE OIL

Crude oils are complex mixtures containing many different hydrocarbon compounds. An average crude oil contains about 84% carbon, 14% hydrogen, 1 ÷ 3% sulfur and less than 1% each of nitrogen, oxygen, metals and salts.

Simple crude oil assays are used to classify crude oils as paraffinic, naphthenic, aromatic or mixed, based on the predominant proportion of similar hydrocarbon molecules. The comprehensive crude assays determine the value of the crude: its yield and quality of useful products.

Crude oils are also defined in terms of API (American Petroleum Institute) gravity. The higher the API gravity, the lighter the crude. Crude oils with low carbon, high hydrogen and high API gravity are usually rich in paraffins and tend to yield greater proportions of gasoline and light petroleum products; those with high carbon, low hydrogen and low API gravity are usually rich in aromatics.

Crude oils that contain appreciable quantities of hydrogen sulfide or other sulfur compounds are called "sour". Those with less sulfur are called "sweet".

VOCABULARY

appreciable	/ ə'pri:ʃəbl/	: đáng kể
assay	/ ə'sei/	: sự phân tích, thí nghiệm
boiling point		: điểm sôi
classify	/ 'klæsifai/	: phân loại
comprehensive	/ ,k□mpri'hensiv/	: toàn diện
exception	/ ik'sepʃn/	: ngoại lệ
gravity	/ 'græviti/	: trọng lực
gravity	/ 'græviti/	: trọng lực
In term of	/ tə:m/	: dưới dạng, về mặt
mixture	/ 'mikstʃə/	: hỗn hợp
predominant	/ pri'd□minənt/	: chiếm ưu thế hơn
proportion	/ prə'p□:ʃn/	: tỉ lệ
salt	/ s□:lt/	: muối
sour	/ 'sauə/	: chua
specific gravity		: tỉ trọng

sweet		: ngọt
tend to	/ tend/	: nhằm tới, hướng tới
useful	/ 'ju:sfl/	: có ích ≠ harmful
yield	/ ji:ld/	: năng suất

DEFINITIONS

API GRAVITY An arbitrary scale expressing the density of petroleum products. $^{0}\text{API} = \frac{141,5}{S} - 131,5$

S: specific gravity, it's the ratio between the weight of certain volume of specimen and which of water that has the same volume at 60^0F ($15,56^0$C)

$$S = 1,002 \times d_4^{15}$$

d_4^{15} : ratio between the weight of certain volume of specimen at 15^0C and which of water that has the same volume at 4^0C

PARAFFINS A family of saturated aliphatic hydrocarbons (alkanes) with the general formula C_nH_{2n+2}.

OLEFINS A family of unsaturated hydrocarbons with one carbon-carbon double bond and the general formula C_nH_{2n}.

NAPHTHENES Hydrocarbons (cycloalkanes) with the general formula C_nH_{2n}, in which the carbon atoms are arranged to form a ring.

AROMATIC Organic compounds with one or more benzene rings.

QUESTIONS

1. Which is the composition of the crude oil?
2. How many categories crude oils are classified into?
3. What do the comprehensive crude assays determine?
4. What's the definition of the API gravity?
5. How is relation between the API gravity and the caracteristics of crude oil?
6. Can you distinguish the sour and the sweet crude oils?
7. Can you tell me some paraffinic hydrocarbons?
8. Can you tell me some olefinic hydrocarbons?
9. Can you tell me some naphthenic hydrocarbons?
10. Can you tell me some aromatic hydrocarbons?

GRAMMAR FOCUS

I- COMPLETE THE WORD MAP WITH JOBS FROM LIST:

Architect, Receptionist, Company director, Flight attendant, Supervisor, Engineer, Saler, Secretary, Professor, Sales manager, Security guard, Waiter, Porter

Professionals	**Service occupations**
- Architect - …… - …… - …… - ……	- Flight attendant - …… - …… - …… - ……
Management positions	**Office work**
- Company director - …… - …… - …… - ……	- Receptionist - …… - …… - …… - ……

II- WORK AND WORKPLACES

A. Look at the pictures. Match the information in columns A, B and C

A salesperson	For an airline	Builds houses
A chef	In a restaurant	Cares for patients
A flight attendant	For a construction company	Answers the phone
A carpenter	In a hospital	Cooks food
A receptionist	In a department store	Serves passengers
A nurse	In an office	Sells clothes

B. Pair work: Take turns describing each person's job.

"She's a salesperson. She works in a department store. She sells clothes."

III- PAST TENSE OF BE

Were you born in 1960?	- No, I **wasn't**
When **were** you born?	- I **was** born in 1961
Were you born in the U.S	- No, I **wasn't**
Where **were** you born?	- I **was** born in Vietnam
What city **was** your sister born in?	- She **was** born in Danang.
And **were** your parents born in Danang?	- No, they **weren't**.
Where **were** they born?	- They **were** born in Hue
How old **were** you in 1998?	- I **was** 37 years old.
Were you in abroad last month?	- Yes, I **was**.
Was your brother in abroad ……..?	- No, he **wasn't**.
Were you and your mother in abroad ……..?	- Yes, we **were**.
Were your parents in abroad ……..?	- No, they **weren't**.
How long **were** you in abroad?	- I **was** in abroad for three weeks
How **was** your vacation?	- It **was** wonderful!

Contractions

Was not = wasn't Were not = weren't

EXERCISES

Complete these conversations. Then practice with a partner.

1. A: How long ..... your parents in Europe?
   B: They ..... there for a month.
   A: ..... they in London the whole time?
   B: No, they ..... . They also went to Paris and Madrid.

2. A: ..... you away last weekend?
   B: Yes, I ..... . I ..... in San Francisco.
   A: How ..... it?
   B: It ..... great!
   A: How ..... the weather?
   B: Oh, it ..... foggy and cool as usual.

3. A: I ..... in Istanbul last summer.
   B: Really? How long ..... you there?
   A: For six weeks.
   B: ..... you there on business or on vacation?
   A: I ..... there on business.

Object pronouns

Subject pronouns		Object pronouns	Subject pronouns		Object pronouns
I	→	Me	It	→	It
You	→	You	We	→	Us
He	→	Him	You	→	You
She	→	Her	They	→	Them

- Just give **me** the phone number!
- Give **her** a call later
- I loved **it**!
- I can pick up **you** at the airport
- Can I give **him** a message?
- Can she call **you** later?
- Please give **us** a message!
- Please call **them** at home!

Complete these conversations. Then practice with a partner

1- A: Is Sandra there, please?
B: I'm sorry, she isn't here right now. Can I give……a message
A: Yes, this is David. Please ask …….to call……at work.
B: OK. Can you give……..your phone number, please?
A: Sure. It's 555-2981

2- A: Can I speak with Mr. Ford, please?
B: He isn't here today. But maybe I can help…….
A: Thanks. Can you ask……to call……? This is John Rivers!
B: John Rivers? Does he have your phone number, Mr. Rivers?
A: Yes, he has……..

3- A: Hi. This is Carol and Mark. We aren't at home right now.
Please leave……a message after the beep. Beep!!!
B: Hi. It's Betsy and James. Carol, you left your glasses here.
We can bring……to……tomorrow. Just give……a call!

UNIT 6
MAJOR REFINERY PRODUCTS

1. **Liquefied Petroleum Gas (LPG)**: which consists principally of propane and butane, is used as domestic fuel and is an intermediate material in the manufacture of petrochemicals.
2. **Solvents**: These include benzene, toluene and xylene.
3. **Gasoline**: is the most important refinery product with boiling ranges from ambient temperatures to about 200°C. The important qualities for gasoline are octane number, volatility, sulfur content and vapor pressure.
4. **Kerosene**: is a refined middle-distillate petroleum product that uses as a jet fuel. Some of the critical qualities are freeze point, flash point and smoke point. Jet fuel has a boiling range of about 190° ÷ 270°C.
5. **Distillate Fuels**: Diesel fuels and domestic heating oils have boiling ranges of about 200° ÷ 370°C. The desirable qualities required for distillate fuels include cetane number, flash and pour points.
6. **Residual Fuels**: Many marine vessels, power plants, industrial facilities use them for heating and processing. The two most critical specifications of residual fuels are viscosity and low sulfur content for environmental control.
7. **Coke**: have a variety of uses from electrodes to charcoal.
8. **Asphalt**: used for roads and roofing materials, must be inert to most chemicals and weather conditions.
9. **Petrochemicals**: Many products derived from crude oil refining, such as ethylene, propylene, butylene and isobutylene, are primarily intended for use as petrochemical feedstock in the production of plastics, synthetic fibers, synthetic rubbers and other products.
10. **Lubricants**: Their most critical quality is a high viscosity index, which provides for greater consistency under varying temperatures.

Crude Oil Refining		
Distillate Fraction	**Boiling Point (°C)**	**Carbon Atoms per Molecule**
Gases	below 30	1-4
Gasoline	30-210	5-12
Naphtha	100-200	8-12
Kerosene & Jet Fuel	150-250	11-13
Diesel & Fuel Oil	160-400	13-17
Atmospheric Gas Oil	220-345	
Heavy Fuel Oil	315-540	20-45
Atmospheric Residue	over 450	over 30
Vacuum Residue	over 615	over 60

DEFINITIONS

OCTANE NUMBER A value used to indicate the resistance of a motor fuel to knock (a number indicating the relative antiknock characteristics of gasoline). Octane numbers are based on a scale on which isooctane is 100 (minimal knock) and heptane is 0 (bad knock).

Example: A gasoline with an octane number of 92 has the same knock as a mixture of 92% isooctane and 8% heptane

FLASH POINT Lowest temperature at which a petroleum product will give off sufficient vapor so that the vapor-air mixture above the surface of the liquid will propagate a flame away from the source of ignition.

BOILING RANGE The range of temperature (usually at atmospheric pressure) at which the boiling (or distillation) of a hydrocarbon liquid commences, proceeds, and finishes.

VOCABULARY

ambient	/ 'æmbiənt/	: môi trường xung quanh
asphalt	/ 'æsfælt/	: nhựa đường
benzene	/ 'benzi:n/	: C_6H_6
blend	/ blend/	: hỗn hợp
charcoal	/ 'tʃ□:koul/	: than, chì than
coke	/ kouk/	: cốc
consistency	/ kən'sistənsi/	: tính cứng rắn
electrode	/ i'lektroud/	: điện cực

fiber	/ 'faibə/	: sợi
flash point	/ 'flæʃp□int/	: điểm chớp cháy
freeze point	/ 'fri:ziŋp□int/	: điểm đóng băng
inert	/ i'nə:t/	: trơ
inert	/ i'nə:t/	: trơ
pour points	/ p□:p□int/	: điểm chảy
provide	/ prə'vaid/	: cung cấp
rubber	/ 'r□bə/	: cao su
smoke point	/ smoukp□int/	: điểm khói
solvent	/ 's□lvənt/	: dung môi
to consist of	/ kən'sist/	: gồm có
toluene	/ 't□lju:in/	: C_7H_8
variety	/ və'raiəti/	: sự đa dạng
volatility	/ ,v□lə'tiləti/	: tính dễ bay hơi
xylene	/ 'zaili:n/	: C_8H_{10}

QUESTIONS

1. How many major refinery products are there?
2. What is the principal composition of LPG?
3. What are the importants qualities for gasoline?
4. What are the importants qualities for kerosene?
5. What are the importants qualities for distillate fuels?

GRAMMAR FOCUS

SO, TOO, NEITHER, EITHER

AFFIRMATIVE	***NEGATIVE***
I'm a worker of the first refinery	I'm not an engineer of the first refinery
So am I / I am, **too**	**Neither** am I / I'm not **either**
Oh, I'm not.	Really? I am.
I like working in offshore	I don't like working in onshore
So do I / I do, **too**	**Neither** do I / I don't **either**
Really? I don't like very much	Oh, I like it a lot!
I can read the english documents	I can't stand of mercaptan' smell

So can I / I can, **too** Oh, I can't	**Neither** can I / I can't **either** Oh, I can

WHO WORKS IN THESE PLACES?

In a hospital	• A doctor works in a hospital • A nurse works in a hospital, too
In an office	• ……. • …….
In a refinery	• ……. • …….
In a hotel	• ……. • …….
In a restaurant	• ……. • …….

COMPARISONS WITH ADJECTIVES

Adjective	***Comparative***	***Superlative***
Large	Larger	The largest
Long	Longer	The longest
Dry	Drier	The driest
Big	Bigger	The biggest
Beautiful	More beautiful	The most beautiful
Famous	More famous	The most famous
Good	Better	The best
Bad	Worse	The worst

1. Which country is **larger**, Canada or China?
   - Canada is **larger** than China
2. Which country is the **largest**: Russia, Canada or China?
   - Russia is the **largest** country of the three
3. What is the **most** beautiful mountain in the world?
   - I think Fujiyama is the **most** beautiful.

Complete questions 1 to 4 with comparatives. Complete questions 5 to 8 with superlatives. Then ask and answer the questions.

1. Which country is ……., Monaco or Vatican City? (small)
2. Which waterfall is ……., Niagara Falls or Angel Falls? (high)
3. Which city is ……., Hong Kong or Cairo? (crowded)
4. Which lake is ……., the Caspian Sea or Lake Superior? (large)
5. Which mountain is ……., Mount Mckinley, Mount Everest or Fujiyama? (high)
6. What is …….. river in the world, the Nile or Amazon? (long)
7. Which country is ……..with tourists: Spain, France or Italy? (small)
8. What is …….. ocean in the world, the Pacific or the Atlantic? (deep)

COMPARATIVE AND SUPERLATIVE ADJECTIVES

Adjectives with -er and -est

Big	dirty	high	old	tall
Busy	dry	hot	pretty	ugly
Cheap	easy	large	quiet	warm
Clean	fast	light	safe	wet
Close	friendly	long	young	cold
Funny	small	short	cool	great
New	slow	deep	heavy	nice

Adjectives with more and most

Attractive	Exciting	Beautiful	Expensive	Popular
Boring	Famous	Important	Dangerous	Interesting
Difficult	Delicious	Crowded		

Irregular adjectives

Good	→	Better	→	Best
Bad	→	Worse	→	The worst

CONDITIONAL TENSE

We can distinguish 3 cases:

1. **For a real condition in the present:**

If + S + V1, S + V (simple future)

Examples:

- If I ***work*** hard, I ***will get*** the better results in the 2nd term
- If I ***have*** enough money, I ***will buy*** a bicycle for my son.
- If he ***has*** an another operation, he ***will die***.
- If you ***believe*** the life, you ***will win*** in the love.

2. **For an unreal condition in the present:**

If + S + V2, S + would + V1

Examples:

- Sue wants to phone Paul but she can't do this because she doesn't know his number. She says: "If I ***knew*** his number, I ***would phone*** him".
- Tom ***would read*** more if he ***had*** more time. (but he doesn't have much time)
- If I ***didn't want*** to go to the party, I ***wouldn't go***. (but I want to go)
- We ***wouldn't have*** any money if we ***didn't work***. (but we work)
- If you ***were*** in my position, what ***would you do***?
- If I ***were*** rich, I ***would have*** a yacht. (not 'If I would be rich')
- If I ***were*** you, I ***wouldn't buy*** that coat
- I'm not hungry. If I ***was*** hungry, I ***would eat*** something.

3. **For an unreal condition in the past:**

If + S + had + V3, S + would + have + V3

Examples:

- Last month Gary was in hospital for an operation. Liz didn't know this, so she didn't go to visit him. They met a few days ago. Liz said: "If I ***had known*** you were in hospital, I ***would have gone*** to visit you".
- I didn't see you when you passed me in the street. If ***I'd seen*** you, of course I ***would have said*** hello. (but I didn't see you)
- I decided to stay at home last night. I ***would have gone*** out if I ***hadn't been*** so tired. (but I was tired)
- The view was wonderful. If ***I'd had*** a camera, I ***would have taken*** some photographs. (but I didn't have a camera)

V1: infinitive ; V2: simple past ; V3: past participle

EXERCISES:

I- Put the verb into correct form

1. In didn't know you were in hospital. If I …….(know), I …….(go) to visit you.
2. If I …….. (know) his number, I would phone him
3. I …….. (help) you if I could, but I'm afraid I can't
4. Ken got to the station to catch his train. If he ……. (miss) it, he …… (be) late for his interview.
5. We would need a car if we …….. (live) in the country
6. It's good that you reminded me about Ann's birthday. I ……. (forget) if you …….. (not remind) me
7. This soup isn't very good. It …….. (taste) better if it wasn't so salty
8. Unfortunately, I didn't have my address book with me when I was in New York. If I …….. (have) your address, I …… (send) you a postcard.
9. If I …….. you, I …….. (not/wait). I …….. (go) now.
10. A: How was your holiday? Did you have a nice time?

    B: It was OK, but we ……. (enjoy) it more if the weather …….. (be) better.
11. I took a taxi to the hotel but the traffic was very bad. It …….. (be) quicker if I ……. (walk)
12. You're always tired all the time. If you …….. (not/go) to bed so late every night, you wouldn't be tired all the time.
13. I'm not tired. If I …….. (be) tired, I …… (go) home now.
14. I wasn't tired last night. If I …….. (be) tired, I …… (go) home earlier.
15. I think there are too many cars. If there …….. (not/be) so many cars, there …….. (not/be) so much pollution.

II- Write a sentence with if for each situation

1. I wasn't hungry, so I didn't eat anything

……..

2. The accident happened because the drive in front stopped so suddenly

……..

3. I didn't know that George had to get up early, so I didn't wake him up

……..

4. I was able to buy the car only because Jim lent me the money

……..

5. Margaret wasn't injured in the crash because she was wearing a seat belt

……..

6. You didn't have any breakfast, that's why you're hungry now.

……..

7. I didn't get a taxi because I didn't have any money on me.

……..

8. We don't visit you very often because you live so far away

……..

9. He doesn't speak very clearly – that's why people don't understand him

……..

10. That book is too expensive, so I'm not going to buy it

……..

APPENDIX

ABSORPTION The disappearance of one substance into another so that the absorbed substance loses its identifying characteristics, while the absorbing substance retains most of its original physical aspects. Used in refining to selectively remove specific components from process streams.

ACID TREATMENT A process in which unfinished petroleum products such as gasoline, kerosene, and lubricating oil stocks are treated with sulfuric acid to improve color, odor, and other properties.

ADDITIVE Chemicals added to petroleum products in small amounts to improve quality or add special characteristics.

ADSORPTION Adhesion of the molecules of gases or liquids to the surface of solid materials.

AIR FIN COOLERS A radiator-like device used to cool or condense hot hydrocarbons; also called fin fans.

ALICYCLIC HYDROCARBONS Cyclic (ringed) hydrocarbons in which the rings are made up only of carbon atoms.

ALIPHATIC HYDROCARBONS Hydrocarbons characterized by open-chain structures: ethane, butane, butene, acetylene, etc.

ASPHALTENES The asphalt compounds soluble in carbon disulfide but insoluble in paraffin naphthas.

ATMOSPHERIC TOWER A distillation unit operated at atmospheric pressure.

BENZENE An unsaturated, six-carbon ring, basic aromatic compound.

BLEEDER VALVE A small-flow valve connected to a fluid process vessel or line for the purpose of bleeding off small quantities of contained fluid. It is installed with a block valve to determine if the block valve is closed tightly.

BLENDING The process of mixing two or more petroleum products with different properties to produce a finished product with desired characteristics.

BLOCK VALVE A valve used to isolate equipment.

BLOWDOWN The removal of hydrocarbons from a process unit, vessel, or line on a scheduled or emergency basis by the use of pressure through special piping and drums provided for this purpose.

BLOWER Equipment for moving large volumes of gas against low-pressure heads.

BOTTOMS Tower bottoms are residue remaining in a distillation unit after the highest boiling-point material to be distilled has been removed. Tank bottoms are the heavy materials that accumulate in the bottom of storage tanks, usually comprised of oil, water, and foreign matter.

BUBBLE TOWER A fractionating (distillation) tower in which the rising vapors pass through layers of condensate, bubbling under caps on a series of plates.

CATALYST A material that aids or promotes a chemical reaction between other substances but does not react itself. Catalysts increase reaction speeds and can provide control by increasing desirable reactions and decreasing undesirable reactions.

CAUSTIC WASH A process in which distillate is treated with sodium hydroxide to remove acidic contaminants that contribute to poor odor and stability.

COKING A process for thermally converting and upgrading heavy residual into lighter products and by-product petroleum coke. Coking also is the removal of all lighter distillable hydrocarbons that leaves a residue of carbon in the bottom of units or as buildup or deposits on equipment and catalysts.

CONDENSATE The liquid hydrocarbon resulting from cooling vapors.

CONDENSER A heat-transfer device that cools and condenses vapor by removing heat via a cooler medium such as water or lower-temperature hydrocarbon streams.

CONDENSER REFLUX Condensate that is returned to the original unit to assist in giving increased conversion or recovery.

COOLER A heat exchanger in which hot liquid hydrocarbon is passed through pipes immersed in cool water to lower its temperature.

CRACKING The breaking up of heavy molecular weight hydrocarbons into lighter hydrocarbon molecules by the application of heat and pressure, with or without the use of catalysts.

CRUDE ASSAY A procedure for determining the general distillation and quality characteristics of crude oil.

CYCLE GAS OIL Cracked gas oil returned to a cracking unit.

DEBUTANIZER A fractionating column used to remove butane and lighter components from liquid streams.

DE-ETHANIZER A fractionating column designed to remove ethane and gases from heavier hydrocarbons.

DEHYDROGENATION A reaction in which hydrogen atoms are eliminated from a molecule. Dehydrogenation is used to convert ethane, propane, and butane into olefins (ethylene, propylene, and butenes).

DEPENTANIZER A fractionating column used to remove pentane and lighter fractions from hydrocarbon streams.

DEPROPANIZER A fractionating column for removing propane and lighter components from liquid streams.

DESULFURIZATION A chemical treatment to remove sulfur or sulfur compounds from hydrocarbons.

DEWAXING The removal of wax from petroleum products (usually lubricating oils and distillate fuels) by solvent absorption, chilling, and filtering.

DIETHANOLAMINE A chemical ($C_4H_{11}O_2N$) used to remove H_2S from gas streams.

DISTILLATE The products of distillation formed by condensing vapors.

DOWNFLOW Process in which the hydrocarbon stream flows from top to bottom.

DRY GAS Natural gas with so little natural gas liquids that it is nearly all methane with some ethane.

FEEDSTOCK Stock from which material is taken to be fed (charged) into a processing unit.

FLASHING The process in which a heated oil under pressure is suddenly vaporized in a tower by reducing pressure.

FLUX Lighter petroleum used to fluidize heavier residual so that it can be pumped.

FOULING Accumulation of deposits in condensers, exchangers, etc.

FRACTION One of the portions of fractional distillation having a restricted boiling range.

FRACTIONATING COLUMN Process unit that separates various fractions of petroleum by simple distillation, with the column tapped at various levels to separate and remove fractions according to their boiling ranges.

FUEL GAS Refinery gas used for heating.

GAS OIL Middle-distillate petroleum fraction with a boiling range of about 350°-750°F, usually includes diesel fuel, kerosene, heating oil and light fuel oil.

HEADER A manifold that distributes fluid from a series of smaller pipes or conduits.

HEAT As used in the Health Considerations paragraphs of this document, heat refers to thermal burns for contact with hot surfaces, hot liquids and vapors, steam, etc.

HEAT EXCHANGER Equipment to transfer heat between two flowing streams of different temperatures. Heat is transferred between liquids or liquids and gases through a tubular wall.

HIGH-LINE OR HIGH-PRESSURE GAS High-pressure (100 psi) gas from cracking unit distillate drums that is compressed and combined with low-line gas as gas absorption feedstock.

HYDROCRACKING A process used to convert heavier feedstock into lower-boiling, higher-value products. The process employs high pressure, high temperature, a catalyst and hydrogen.

HYDROFINISHING A catalytic treating process carried out in the presence of hydrogen to improve the properties of low viscosity-index naphthenic and medium viscosity-index naphthenic oils. It is also applied to paraffin waxes and microcrystalline waxes for the removal of undesirable components. This process consumes hydrogen and is used in lieu of acid treating.

HYDROFORMING Catalytic reforming of naphtha at elevated temperatures and moderate pressures in the presence of hydrogen to form high-octane BTX aromatics for motor fuel or chemical manufacture. This process results in a net production of hydrogen and has rendered thermal reforming somewhat obsolete. It represents the total effect of numerous simultaneous reactions such as cracking, polymerization, dehydrogenation, and isomerization.

HYDROGENATION The chemical addition of hydrogen to a material in the presence of a catalyst.

INHIBITOR Additive used to prevent or retard undesirable changes in the quality of the product, or in the condition of the equipment in which the product is used.

ISOMERIZATION A reaction that catalytically converts straight-chain hydrocarbon molecules into branched-chain molecules of substantially higher octane number. The reaction rearranges the carbon skeleton of a molecule without adding or removing anything from the original material.

ISO-OCTANE A hydrocarbon molecule (2,2,4-trimethylpentane) with excellent antiknock characteristics on which the octane number of 100 is based.

LEAN OIL Absorbent oil fed to absorption towers in which gas is to be stripped. After absorbing the heavy ends from the gas, it becomes fat oil. When the heavy ends are subsequently stripped, the solvent again becomes lean oil.

LOW-LINE or LOW-PRESSURE GAS Low-pressure (5 psi) gas from atmospheric and vacuum distillation recovery systems that is collected in the gas plant for compression to higher pressures.

NAPHTHA A general term used for low boiling hydrocarbon fractions that are a major component of gasoline. Aliphatic naphtha refers to those naphthas containing less than 0.1% benzene and with carbon numbers from C3 through C16. Aromatic naphthas have carbon numbers from C6 through C16 and

contain significant quantities of aromatic hydrocarbons such as benzene (>0.1%), toluene, and xylene.

OLEFINS A family of unsaturated hydrocarbons with one carbon-carbon double bond and the general formula C_nH_{2n}.

PARAFFINS A family of saturated aliphatic hydrocarbons (alkanes) with the general formula C_nH_{2n+2}.

POLYFORMING The thermal conversion of naphtha and gas oils into high-quality gasoline at high temperatures and pressure in the presence of recirculated hydrocarbon gases.

POLYMERIZATION The process of combining two or more unsaturated organic molecules to form a single (heavier) molecule with the same elements in the same proportions as in the original molecule.

PREHEATER Exchanger used to heat hydrocarbons before they are fed to a unit.

PRESSURE-REGULATING VALVE A valve that releases or holds process-system pressure (that is, opens or closes) either by preset spring tension or by actuation by a valve controller to assume any desired position between fully open and fully closed.

PYROLYSIS GASOLINE A by-product from the manufacture of ethylene by steam cracking of hydrocarbon fractions such as naphtha or gas oil.

PYROPHORIC IRON SULFIDE A substance typically formed inside tanks and processing units by the corrosive interaction of sulfur compounds in the hydrocarbons and the iron and steel in the equipment. On exposure to air (oxygen) it ignites spontaneously.

QUENCH OIL Oil injected into a product leaving a cracking or reforming heater to lower the temperature and stop the cracking process.

RAFFINATE The product resulting from a solvent extraction process and consisting mainly of those components that are least soluble in the solvents. The product recovered from an extraction process is relatively free of aromatics, naphthenes, and other constituents that adversely affect physical parameters.

REACTOR The vessel in which chemical reactions take place during a chemical conversion type of process.

REBOILER An auxiliary unit of a fractionating tower designed to supply additional heat to the lower portion of the tower.

RECYCLE GAS High hydrogen-content gas returned to a unit for reprocessing.

REFLUX The portion of the distillate returned to the fractionating column to assist in attaining better separation into desired fractions.

REFORMATE An upgraded naphtha resulting from catalytic or thermal reforming.

REFORMING The thermal or catalytic conversion of petroleum naphtha into more volatile products of higher octane number. It represents the total effect of numerous simultaneous reactions such as cracking, polymerization, dehydrogenation, and isomerization.

REGENERATION In a catalytic process the reactivation of the catalyst, sometimes done by burning off the coke deposits under carefully controlled conditions of temperature and oxygen content of the regeneration gas stream.

SCRUBBING Purification of a gas or liquid by washing it in a tower.

SOLVENT EXTRACTION The separation of materials of different chemical types and solubilities by selective solvent action.

SOUR GAS Natural gas that contains corrosive, sulfur-bearing compounds such as hydrogen sulfide and mercaptans.

STABILIZATION A process for separating the gaseous and more volatile liquid hydrocarbons from crude petroleum or gasoline and leaving a stable (less-volatile) liquid so that it can be handled or stored with less change in composition.

STRIPPING The removal (by steam-induced vaporization or flash evaporation) of the more volatile components from a cut or fraction.

SULFURIC ACID TREATING A refining process in which unfinished petroleum products such as gasoline, kerosene, and lubricating oil stocks are treated with sulfuric acid to improve their color, odor, and other characteristics.

SULFURIZATION Combining sulfur compounds with petroleum lubricants.

SWEETENING Processes that either remove obnoxious sulfur compounds (primarily hydrogen sulfide, mercaptans, and thiophens) from petroleum fractions or streams, or convert them, as in the case of mercaptans, to odorless disulfides to improve odor, color, and oxidation stability.

SWITCH LOADING The loading of a high static-charge retaining hydrocarbon (i.e., diesel fuel) into a tank truck, tank car, or other vessel that has previously contained a low-flash hydrocarbon (gasoline) and may contain a flammable mixture of vapor and air.

TAIL GAS The lightest hydrocarbon gas released from a refining process.

THERMAL CRACKING The breaking up of heavy oil molecules into lighter fractions by the use of high temperature without the aid of catalysts.

TURNAROUND A planned complete shutdown of an entire process or section of a refinery, or of an entire refinery to perform major maintenance, overhaul, and repair operations and to inspect, test, and replace process materials and equipment.

VACUUM DISTILLATION The distillation of petroleum under vacuum which reduces the boiling temperature sufficiently to prevent cracking or decomposition of the feedstock.

VISBREAKING Viscosity breaking is a low-temperature cracking process used to reduce the viscosity or pour point of straight-run residuum.

WET GAS A gas containing a relatively high proportion of hydrocarbons that are recoverable as liquids.