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**UNIVERSITY EXAMINATIONS
2022/2023 ACADEMIC YEAR**

**THIRD YEAR FIRST SEMESTER
SPECIAL/SUPPLEMENTARY EXAMINATIONS**

FOR THE DEGREE OF BACHELOR OF SCIENCE (CHEMISTRY)

COURSE CODE: SCH 315

COURSE TITLE: PETROLEUM AND PETROCHEMICALS

DATE: 2/8/2023

TIME: 11:00-1:00PM

INSTRUCTIONS TO CANDIDATES:

- Answer **Question ONE (Compulsory)** and any other **TWO (2)** questions
- Indicate answered questions on the front cover of your answer booklet
- *Start each question on a new page* and make sure the question's number is written on each page

TIME: 2 Hours

Question 1 [30 Marks]

- i. Why do petroleum-derived fuels (gasoline, jet fuel, and diesel fuel) constitute the most desirable source of power for transportation? [3 Marks]
- ii. Explain the importance of desalting of crude oil [4 Marks]
- iii. Highlight the use of methane and ethane from the distillation unit within the refinery [2 Marks]
- iv. Explain the effect of nitrogen and sulfur in crude oil [4 Marks]
- v. Explain the importance of tetraethyl lead in fuel [2 Marks]
- vi. Explain how salt gets into crude oil [3 Marks]
- vii. Give four examples of petrochemicals you have used in the chemical laboratory [2 Marks]
- viii. Give two reasons why it is easier and cheaper to refine paraffinic crude oils? [4 Marks]
- ix. Distillation is one of the major processes in a crude oil refinery, highlight ways to improve the efficiency of this process [6 Marks]

Question 2 [20 Marks]

- i. Describe the different types of processes in a crude oil refinery [8 Marks]
- ii. Compare and contrast the use of vacuum and atmospheric distillation in crude oil refinery [6 marks]
- iii. Describe hydrocracking [1 Marks]
- iv. Explain the significance of API gravity in crude oil refinery [5 Marks]

Question 3 [20 Marks]

- i. Describe visbreaking [3 Marks]
- ii. Describe fluid catalytic cracking (FCC) and highlight 3 advantages over thermal cracking [8 Marks]
- iii. Describe the effects of non-metal contaminants on the fluid catalytic cracking process. [9 Marks]

Question 4 [20 Marks]

- i. Explain the importance of desalting of crude oil [8 Marks]

ii. Explain the process of electrostatic desalting [5 Marks]

iii. Explain the following terms

a) Specific gravity [2 Marks]

b) Total Acid Number [1 Marks]

c) Pour point [2 Marks]

d) Coking [2 Marks]

Question 5 [20 Marks]

The petroleum quality was determined by sampling fuel from five different suppliers across the country. Each sample was analysed for its energy content and subjected to a copper strip corrosion test. The results were tabulated below (copper strip corrosion indicated by values 1-4 with 1 representing least corrosion)

Sample	Copper Corrosion	Energy Content (MJ/kg)
A	1	53
B	2	50
C	3	47
D	4	44
E	4	42

a. Discuss the recorded observations explaining the observed trends if any [4 Marks]

b. Explain any 4 reasons why the fuels with high corrosion had low energy content [8 Marks]

c. The researchers presented their findings to the refinery operator and were asked to advise on ways to improve the quality of the sampled fuels. Describe any two processes you would suggest to improve the fuel quality. [8 Marks]