18/12/23

Doon University, Dehradun

End Semester Examination, 1st Semester, December 2023

Academic year 2023-24 (Odd Semester, July 2023-December 2023)

Department of Chemistry, School of Physical Sciences

Programme Name: Undergraduate Certificate in Chemistry/ Undergraduate Diploma in Chemistry/B.Sc. (Hons) in Chemistry/ B.Sc. with Research in Chemistry

Course Code with Title: CYS -101: Fuel Chemistry

Time allowed: *2.0 Hour* **Date**: 18th December 2023 ***Maximum marks:*** *50*

Note: *Attempt all* question *from Section A, B and C.*

Section A

This section has 05 questions. Answer of each question is short under this section. Each question has 02 marks.

[1] What are lubricating oils? Explain the types of lubricating oils. [2]

[2] What is the difference between Gross Calorific Value and Net Calorific Value? [2]

[3] Write the name of four different Antiknock agents used generally to increase the Octane Number of Gasoline. [½ + ½ + ½ + ½]

[4] Write the units of calorific value for solid, liquid and gaseous fuels? [2]

[5] Write a short note on the classification of fuels with suitable examples. [2]

Section B

This section has 05 questions. Answer of each question is short under this section. Each question has 04 marks.

[6] Write short notes on the following: [2+2]
(5.1) *Carbonization of Coal* (5.2) *Knocking*

[7] What is the difference between thermal cracking and catalytic cracking? Also, give the examples of catalysts used in catalytic cracking. [4]

[8] Write a note on Octane number and its significance. [4]

[9] What is Viscosity Index? How we can determine it? Also, discuss the significance of viscosity Index. [4]

[10] Write a note on the characteristics of an Ideal/Good fuel. [4]

Section C

This section has 04 questions. Answer of each question is short under this section. Each question has 05 marks.

[11] What is the difference between Proximate Analysis and Ultimate Analysis? Highlight the significance of each of these. Also, write the formulae of determining percentage of carbon, hydrogen, nitrogen and sulphur. [5]

[12] Write a detailed note on calorific values and how can we calculate it for solid and liquid fuels. Discuss the Principle and Working of bomb calorimeter for the determination of calorific value using a schematic diagram. Also, explain the different components of bomb calorimeter. [5]

[13] The Following data were obtained in a bomb calorimeter experiment: [5]

Weight of Coal Burnt	: 0.994 g
Weight of water in Calorimeter	: 2592 g
Weight of bomb calorimeter	: 3940 g
Rise in temperature of water	: 2.732 °C
Mean specific heat of the apparatus: 0.098	

Find the Gross Calorific Value and Net Calorific Value of the fuel. If the fuel contains 8 % hydrogen, calculate its lower calorific value. (*Latent heat of condensation of steam: 587 cal/g*).

[14] A sample of coal was analyzed as follows:
Exactly 2.000 g was weighed into a silica crucible. After heating for one hour at 110 °C, the residue weighed 1.975 g. The crucible next was covered with a vented lid and strongly heated for exactly seven minutes at 950 °C. The residue weighed 1.328 g. The crucible was then heated without the cover, until a constant weight was obtained. The last residue was found to weigh 0.205 g.

Calculate the moisture %, volatile matter % and Ash % results of the above analysis. [5]