

**Materials Chemistry**

P. Pages : 2

Time : Two Hours

**NIR/KW/18/3289/3943**

Max. Marks : 40

- Notes :
1. All questions carry marks as indicated.
  2. Solve Question 1 OR Questions No. 2.
  3. Solve Question 3 OR Questions No. 4.
  4. Solve Question 5 OR Questions No. 6.
  5. Solve Question 7 OR Questions No. 8.
  6. Diagrams and chemical equations should be given whenever necessary.
  7. Use of non programmable calculator is permitted.

1. a) In an experiment of Bomb calorimeter apparatus the following data were obtained 4
- i) Weight of coal burnt = 0.95g
  - ii) Water equivalent of calorimeter = 700g
  - iii) Weight of water = 2000g.
  - iv) Rise in temperature = 2.48°C
  - v) Cooling correction = 0.02°C
  - vi) Fuse wire correction = 10 calories
  - vii) Acid correction = 60 calories
- Calculate G.C.V. and N.C.V. of the coal in calories per gram.  
[Latent heat of condensation of steam = 560 cal/g & % of Hydrogen in fuel = 5%].

- b) Write descriptive note on Liquified petroleum gas. 3
- c) Give the applications, advantages & disadvantages of non-conventional energy sources? 3

**OR**

2. a) What is Biodiesel? How biodiesel is prepared from vegetable oil? Give important properties of biodiesel. 4
- b) Write notes on following **any two**. 6
- i) Rocket propellant.
  - ii) Ultimate analysis of coal.
  - iii) CNG.
3. a) A gas has following composition by volume :-  
H<sub>2</sub> = 22%, CH<sub>4</sub> = 4%, CO = 20%, CO<sub>2</sub> = 06%, O<sub>2</sub> = 03% and N<sub>2</sub> = 45% .  
Calculate:
- a) Volume and weight of theoretical air required for combustion of 1m<sup>3</sup> of gas. 4
  - b) Volumetric composition of dry products of combustion if 15% excess air is supplied. 4
- b) How gasoline is prepared from "water-gas"? Explain the role of catalyst in this process? 4

**OR**

4. a) What is the principle used in the fractional distillation process of crude oil? Indicate the major fractional products obtained at different temperature? 4
- b) What is the objective of cracking process? Explain in brief the "moving bed catalytic process"? 6
- c) Explain Cetane number. 2
5. a) What is Lubrication? Name different mechanism of lubrication. Explain Thick film lubrication. 4
- b) Write a short note on Synthetic lubricants. 2
- c) Define the following properties of semi solid lubricants. 2
- i) Drop point.
- ii) Consistency.

**OR**

6. a) Explain the following properties of lubricants with their significance **any two**. 4
- i) Viscosity and Viscosity index.
- ii) Flash point and Fire point.
- iii) Cloud point and pour point.
- b) Under what operational conditions solid lubricants are used. Explain the structure of graphite. 4
7. a) What are conducting polymer? State the types of conducting polymer? Give an account of polyacetylene as conducting polymer. 5
- b) Define the term "composite-material". How are they classified? State the important application of composite material. 5

**OR**

8. a) Write notes on 6
- i) Biodegradable Polymer.
- ii) Liquid crystal polymer.
- b) Define Nanomaterial. Discuss the applications of nanomaterial in electronics field. 4

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