SRK/KW/14– 6922

Second Semester B. E. Examination

MATERIALS CHEMISTRY

Time : Two Hours] [Max. Marks : 40

N. B. : (1) All questions carry marks as indicated.
(2) Solve four question as following : Q 1 0R 2, Q 3 0R 4, Q 5 0R 6, Q 7 0R 8.
(3) Due credit will be given to neatness and adequate dimensions.
(4) Assume suitable data wherever necessary.
(5) Diagrams and Chemical equations should be given wherever necessary.
(6) Illustrate your answers wherever necessary with the help of neat sketches.
(7) Discuss the reaction, mechanism wherever necessary.

1. (A) Calculate gross and net calorific value of a gaseous fuel at NTP from the following data obtained during determination of calorific value using Boy's calorimeter :—

(1) Volume of gaseous fuel burnt at NTP = 0.089 m^3.

(2) Wt. of water using for the cooling of combustion products = 25 kg.

(3) Wt. of steam condensed = 0.030 kg.

(4) Temperature of incoming water = 20.4^0C.

(5) Temperature of outgoing water = 33.4^0C.

(6) Latent heat of steam = 587 k Cal/Kg. 4

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  Contd.

(B) Write short note on (any two) :—

(i) Solar energy.

(ii) L.P.G.

(iii) C.N.G. 6

OR

2. (A) What is the significance of proximate analysis of coal ? 3

(B) Describe the principle of rocket propulsion. 2

(C) Explain how calorific value of solid and non volatile liquid fuel is determined by using Bomb calorimeter. 5

3. (A) A boiler is fired with a coal having following composition

C = 72%, H = 6.0%, 0 = 13.2 %, N = 2.8%, S = 1.2% and rest is ash.

Calculate :—

(i) Theoretical Air: Fuel ratio used for combustion

(ii) Volumetric composition of dry products of combustion, i.f 30% excess air is used. (4+4)

(B) Explain Fisher Tropsch process for manufacturing synthetic gasoline. 4

OR

4. (A) Discuss how the knocking properties of gasoline are related to the chemical constitution of the fuel and compression ratio. 4

(B) Explain fractional distillation of crude petroleum oil. 5

(C) Write a short note on Cetane Number. 3

5. (A) What are greases ? Under what conditions they are used as lubricant ? 3

(B) Write short notes on (Any **two**) :—

(i) Biodegradable lubricants.

(ii) Silicones as synthetic lubricants.

(iii) Viscosity and Viscosity Index. 5

OR

6. (A) Explain the significance of flash and fire points in selecting the lubricating oil. 2

(B) A transformer oil has S.U.V of 90 second at 210 ^{0}F and 450 second at 100 ^{0}F. Low viscosity gulf oil has SUV of 90 second at 210 ^{0}F of and 700 second at 100 ^{0}F. High viscosity Pennsylvanian oil has SUV of 90 second at 210 ^{0}F and 420 second at 100 ^{0}F. Calculate viscosity index of given oil. 2

(C) What are the requisites of the lubricants to be used in the following machinery :—

(i) Refrigeration.

(ii) Steam turbines.

(iii) Gears.

(iv) IC engine. 4

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7. (A) Explain properties and application of polylactic acid (PLA) biodegradable polyther. 3

(B) What are conducting polymers ? Explain the synthesis, properties and applications of polypyrrole. 4

(C) Explain applications of nano material in medicine. 3

OR

8. (A) What are carbon nano tube ? Explain its type. 4

(B) What are the composite materials ? Give general classification of composite material. 3

(C) State general properties and applications of liquid crystal polymers. 3

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