

RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College affiliated to University of Calcutta)

B.A./B.Sc. THIRD SEMESTER EXAMINATION, MARCH 2022

SECOND YEAR [BATCH 2020-23]

INDUSTRIAL CHEMISTRY (HONOURS)

Paper : VII [CC7]

Date : 07/03/2022

Time : 11 am – 1 pm

Full Marks : 50

Answer **any five** questions of the following:

[5×10]

1. a) What is coal? How is it formed? What are its types? What are the requirements of a good fuel?
b) Calculate the minimum amount of air required for the complete combustion of 50 kgs of coal containing $C = 75\%$, $H_2 = 10\%$, $O_2 = 02\%$, $S = 05\%$, and the rest nitrogen by weight. [(1+1+1+2)+5]
2. a) Describe proximate analysis. Bring out its importance.
b) A coal sample on analysis gives $C = 75\%$, $H_2 = 6\%$, $O_2 = 3.5\%$, $S = 03\%$ and the rest ash. Calculate the Gross and Net calorific values of the fuel. Latent heat of steam is = 587 cal/gm. (5+5)
3. a) What is a furnace?
b) How many types of furnaces are there?
c) What are the parameters to be considered in the design of an efficient furnace?
d) What are the major losses in a furnace?
e) What are the disadvantages of excess air in a furnace? (2+2+2+2+2)
4. a) What is water gas?
b) How is it manufactured?
c) Write the uses of water gas.
d) Write a brief note on CNG (2+2+2+4)
5. a) Define :
i) Gross calorific value
ii) Net calorific value
b) A coal sample with 93% carbon, 5% of Hydrogen and 2% Ash is subjected to combustion in a bomb calorimeter. Calculate GCV and NCV Given that. Mass of the coal sample = 0.95g Mass of water in copper calorimeter = 2000g.

Water equivalent weight of calorimeter = 700g.

Initial temperature (t_1) = $30^\circ C$

Final temperature (t_2) = $31.1^\circ C$

[(2.5+2.5)+5]

6. a) How is producer gas manufactured? What are the uses of producer gas?
 b) What is flue gas? Discuss Dulong's formula.
 c) Write the importance of flue gas analysis. [(2+2)+(1+2)+3]
7. a) The percentage composition of a sample of coal by weight was found to be C = 72% ,
 H = 6.5% , O = 13% , N = 2.5% , S = 1.8%
 i) Calculate the minimum weight of air for complete combustion.
 ii) Calculate the weight of dry products formed if 50% excess air is used.
 b) Write a Short note on LPG. [(1+1+3)+5]
8. a) What is calorific value? Mention its units. What is the difference between ultimate analysis and proximate analysis of coal?
 b) What is metallurgical coke? Describe Otto Hoffmann by product coke oven method. [(2+2)+(1+5)]

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