**Engineering Chemistry –(BCHS0101)**

(Practice Sheet on Fuel and combustion)

Q.1A gaseous fuel has the following composition by volume:

H2=32%, CH4=14%, N2=40% and O2=14%. If 25% excess air is used, find the weight of air

actually, supplied per m3 of this gas.

Q.2 A sample of coal contains: C=83%, H2=6% and ash=1%.

The following data were obtained when the above coal was tested in a Bomb calorimeter:

Weight of coal burnt= 0.92g, Weight of water taken= 550g

Water equivalent of calorimeter= 2200g. Rise in temperature=2.420C.

Fuse wire correction=10.0cal Acid correction=50.0cal

Calculate the NCV and GCV of fuel.

Q.3 A sample of coal contain C=61%, O=32%, H=6%, S=.05%, N=0.2% and ash= 0.3%. Calculate GCV and NCV of the coal sample.

Q.4 2 gram of sample of coal was used for nitrogen estimation by kjeldhal method. The evolved ammonia was collected in 25ml 0.1N sulphuric acid. To neutralize excess acid 7.5 ml of 0.2N NaOH was required. Calculate % of nitrogen in the coal sample.

Q.5 0.5 g of a sample of coal was used in a bomb calorimeter for the determination of calorific value. Calorific value of coal was found to be 8600 cal/g. The ash formed in the bomb calorimeter was extracted with acid and the acid extract was heated with barium chloride solution to give barium sulphate precipitate. The precipitate was filtered, dried and weighed. The weight of precipitate was found to be 0.05 g. Calculate the percentage of sulphur in the coal sample.

Q.6. Calculate the weight and volume of air required for the combustion of 5kg of carbon.

Q.7. Calculate the volume of air required for the complete combustion of 1m3 of gaseous fuel having the composition: CO= 46%, CH4=10%, H2=4%, C2H4=2%, N2=1% and remaining being CO2.

Q.8. Calculate the weight and volume of air required for complete combustion of 5kg of coal with following composition: Carbon= 85%, H2= 10%, O2=4.5% and N2=0.5%.

Q.9. A gaseous fuel has the following composition by volume:

H2=34%, CH4=16%, N2=38% and O2=12%. If 22% excess air is used, find the weight of air actually supplied per m3 of this gas.

Q.10. A sample of coal contains: C=92%, H=5% and ash=3%.

The following data were obtained when the above coal was tested in a Bomb calorimeter:

Weight of coal burnt= 0.95g, Weight of water taken= 700g

Water equivalent of calorimeter= 2000g. Rise in temperature=2.480C.

Fuse wire correction=10.0cal Acid correction=60.0cal

Cooling correction=0.020C

Calculate the NCV and GCV of fuel.

Q.11 Calculate the LCV of fuel containing 9% hydrogen, if its GCV value is 18515cal/g.

Q.12 Calculate LCV of a fuel which has 6.5% of hydrogen and its HCV is 6300 cal/g. (Given

latent heat of steam is 580 cal/g).

Q.13 A sample of coal contain C=61%, O=32%, H=6%, S=.05%, N=0.2% and ash= 0.3%. Calculate GCV and NCV of the coal sample.

Q.14 2 gram of sample of coal was used for nitrogen estimation by kjeldhal method. The evolved ammonia was collected in 25ml 0.1N sulphuric acid. To neutralize excess acid 15 ml of 0.1N NaOH was required. Calculate % of nitrogen in the coal sample.

Q.15 1.56 g of the coal was Kjeldahlized and NH3 gas thus evolved was absorbed in 50mL of 0.1N H2SO4. After absorption, the excess acid requires 6.25mL of 0.1N NaOH for exact neutralization.2.60 g of the coal sample in a quantitative analysis gave 0.1755g of BaSO4. Calculate the percentage of N and S in the coal sample. Calculate the GCV and NCV of the coal in calorie per gram if coal contains 12% Hydrogen. (Latent heat of water vapour is 587 cals/gram)

Q. 16 Calculate the weight and volume of air needed for complete combustion of 6 Kg. coal with following composition C=80%, H2=10%, O2=5% and N2=5%. (Molar mass of air = 28.94 gm/mol)

Q. 17 A sample of coal was analyzed as follows: - Exactly 2.500 gm was weighed into a silica crucible. After heating for one hour at 110 0 C, the residue weighed 2.415 gm. The crucible next was covered with a vented lid and strongly heated for 7 minutes at 950+-20 0 C. The Residue Weighed 1.528 gm. The crucible was then heated without cover until a constant weight was obtained. The last residue was found to weigh 0.245gm. Calculate the % results of above analysis

Q.18 Calculate the weight and volume of air required for the combustion of 3kg of carbon.

Q.19. Calculate the volume of air required for the complete combustion of 1m3 of gaseous fuel having the composition: CO= 46%, CH4=10%, H2=4%, C2H4=2%, N2=1% and remaining being CO2.

Q.20. Calculate the weight and volume of air required for complete combustion of 5kg of coal with following composition: Carbon= 85%, H2= 10%, O2=4.5% and N2=0.5%.

Q.21. A gaseous fuel has the following composition by volume:

H2=32%, CH4=14%, N2=40% and O2=14%. If 25% excess air is used, find the weight of air actually supplied per m3 of this gas.

Q.22. A sample of coal contains: C=83%, H=6% and ash=1%.

The following data were obtained when the above coal was tested in a Bomb calorimeter:

Weight of coal burnt= 0.92g, Weight of water taken= 550g

Water equivalent of calorimeter= 2200g. Rise in temperature=2.420C.

Fuse wire correction=10.0cal Acid correction=50.0cal

Calculate the NCV and GCV of fuel.

Q.23 Calculate the LCV of fuel containing 9% hydrogen, if its GCV value is 18515cal/g.

Q.24 Calculate LCV of a fuel which has 6.5% of hydrogen and its HCV is 6300 cal/g. (Given latent heat of steam is 580 cal/g).

Q.25 A sample of coal contain C=61%, O=32%, H=6%, S=.05%, N=0.2% and ash= 0.3%. Calculate GCV and NCV of the coal sample.

Q.26 2 gram of sample of coal was used for nitrogen estimation by kjeldhal method. The evolved ammonia was collected in 25ml 0.1N sulphuric acid. To neutralize excess acid 15 ml of 0.1N NaOH was required. Calculate % of nitrogen in the coal sample.

Q.27 A sample of coal was tested in the laboratory for its calorific value in the Bomb Calorimeter. The following data were obtained: -

Wt. of coal =1.5gram, Wt of water taken =2700 gram

Water equivalent of calorimeter = 250gram, Rise in Temp. =2.48 0C,

Cooling correction=0.02 0C, Fuse wire correction = 10 cals and

Acid correction =60 cals.

Calculate the GCV and NCV of the coal in calorie per gram if coal contains 12% Hydrogen. (Latent heat of water vapour is 587 cals/gram)

Q. 28 Calculate the weight and volume of air needed for complete combustion of 6 Kg. coal with following composition C=80%, H2=10%, O2=5% and N2=5%. (Molar mass of air = 28.94 gm/mol)

Q. 29 A sample of coal was analysed as follows: - Exactly 2.0 gm was weighed into a silica crucible. After heating for one hour at 110 0C, the residue weighed 1.975 gm. The crucible next was covered with a vented lid and strongly heated for 7 minutes at 950+-200c The Residue Weighed 1.328 gm. The crucible was then heated without cover until a constant weight was obtained. The last residue was found to weigh 0.205gm. Calculate the % results of above analysis