Subject Name - Chemistry
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Experiment No-4

Proximate analysis of coal

* Aim : Estimation of moisture and ash content in a given sample of coal.

* Apparatus: Crucible, Desicator, Pair of tongs, Electric oven, Muffle furnace, weighing balance etc.

* chemicals: coal sample, anhydrous calcium chloride etc.

* observation table.

Part-A: Moisture Content

Sr. No.	Description	Value(g)
1.	weight of empty crucible (W_1)	15.54
2.	weight of crucible and coal (W_2)	16.32
	weight of coal ($W_2 - W_1$)	0.78
3.	weight of crucible and coal after heating (W_3)	16.26
4.	weight of coal after heating ($W_3 - W_1$)	0.72
	Loss in weight ($W_2 - W_3$)	0.06

* Calculations -

- Part A - Moisture Content

$$\%\text{Moisture} = \frac{\text{loss in weight}}{\text{weight of coal}} \times 100$$

$$= \frac{W_2 - W_3}{W_2 - W_1} \times 100$$

$$= \frac{0.06}{0.78} \times 100$$

$$= 7.69\%$$

∴ Percentage Moisture is 7.69%

* observation table.

Part B: Ash content

Sr. No.	Description	value (g)
1.	weight of crucible and coal before heating (W_4)	16.26
2.	weight of crucible and residue after heating (W_5)	15.77
3.	weight of residue or ash ($W_5 - W_1$)	0.23

* Calculations -

- Part B - Ash content

$$\% \text{ Ash} = \frac{\text{weight of ash left}}{\text{Initial weight of coal}} \times 100$$

$$= \frac{W_5 - W_1}{W_2 - W_1} \times 100$$

$$= \frac{0.23}{0.78} \times 100$$

$$= 29.48\%$$

$\% \text{ Ash} = 29.48\%$

* Result:

Percentage of moisture = 7.69%

Percentage of ash = 29.48%

* Questions:

CS 1) Explain the significance of moisture and ash content determination in coal?

Ans → ① The proximate analysis plays a vital role in the selection of a specific variety of coal for a specific purpose and thereby determining the quality of coal

② Moisture - The high percentage of moisture reduces the calorific value of coal since a significant amount of liberated heat is wasted in evaporating the moisture. Hence a good quality of coal should have less amount of moisture.

③ Ash - Ash is a non-combustible inorganic matter left after complete combustion of organic matter in the coal. Ash reduces the calorific value of coal. Hence lower ash content better the quality of coal.

Q 2) what is the chemical composition of ash?

Ans → Fly ash, which is main componenls of coal ash is composed of spherical particulate matter with diameters that range from 0.1 um to >100um. Fly ash is composed of silica, aluminium, iron, calcium and oxygen.

Q 3) what is the difference between free ash and fixed ash?

Ans → Free ash is incombustible inorganic matter remaining after fuel burning or mineral mining or coal burning which can be easily separated from coal. where as fixed ash is the structural part of coal but cannot be separated from it by any mechanical means.

Q 4) what is inherent moisture present in coal?

Ans → Inherent moisture present in coal is the moisture held within the coal itself that occurs in the microscopic structure of the coal.

Q 5) At what temperature, moisture and ash present in coal are removed?

Ans → Coal sample is heated at 105 - 110°C temperature for the removal of moisture and ash present in it.