Example Problem: Calculation Physical Properties of a Waste Sample

Determine the wet and dry moisture content and the wet and dry chemical compositions of a disposed waste sample with the following composition.

Component	Disposed Waste Composition (% by wt.)
Food waste	10.3
Paper	31.2
Cardboard	3.4
Plastics	7.2
Textiles	3.2
Rubber	0.7
Leather	0.7
Yard wastes	12.0
Wood	3.2
Glass	12.6
Tin cans	5.1
Aluminum	0.5
Other metal	5.3
Dirt, Ash, etc.	4.7
sum:	100.0

* assume a 100 lb sample of disposed waste and collect data on indivdual components of the sample

Component	Disposed Waste Composition (lb)	Moisture Content (% by wet weight)	Chemical Composition (% by weight on a dry basis)					
			Carbon	Hydrogen	Oxygen	Nitrogen	Sulfur	Ash
Food waste	10.3	70	48	6.4	37.6	2.6	0.4	5
Paper	31.2	6	43.5	6	44	0.3	0.2	6
Cardboard	3.4	5	44	5.9	44.6	0.3	0.2	5
Plastics	7.2	2	60	7.2	22.8	0	0	10
Textiles	3.2	10	55	6.6	31.2	4.6	0.15	2.5
Rubber	0.7	2	78	10	0	2	0	10
Leather	0.7	10	60	8	11.6	10	0.4	10
Yard wastes	12.0	60	47.8	6	38	3.4	0.3	4.5
Wood	3.2	20	49.5	6	42.7	0.2	0.1	1.5
Glass	12.6	2	0.5	0.1	0.4	0.1	0	98.9
Tin cans	5.1	3	4.5	0.6	4.3	0.1	0	90.5
Aluminum	0.5	2	4.5	0.6	4.3	0.1	0	90.5
Other metal	5.3	2	4.5	0.6	4.3	0.1	0	90.5
Dirt, Ash, etc.	4.7	8	26.3	3	2	0.5	0.2	68
sum:	100.0	n/a	n/a	n/a	n/a	n/a	n/a	n/a

* Calculate dry weight of waste components and weight of individual chemical components

Component	Wet Weight (lb)	Dry Weight (lb)	Chemical Composition (lb)					
			Carbon	Hydrogen	Oxygen	Nitrogen	Sulfur	Ash
Food waste	10.3	3.1	1.5	0.2	1.2	0.1	0.0	0.2
Paper	31.2	29.3	12.7	1.8	12.9	0.1	0.1	1.8
Cardboard	3.4	3.2	1.4	0.2	1.4	0.0	0.0	0.2
Plastics	7.2	7.1	4.3	0.5	1.6	0.0	0.0	0.7
Textiles	3.2	2.8	1.6	0.2	0.9	0.1	0.0	0.1
Rubber	0.7	0.7	0.5	0.1	0.0	0.0	0.0	0.1
Leather	0.7	0.6	0.4	0.1	0.1	0.1	0.0	0.1
Yard wastes	12.0	4.8	2.3	0.3	1.8	0.2	0.0	0.2
Wood	3.2	2.5	1.2	0.2	1.1	0.0	0.0	0.0
Glass	12.6	12.4	0.1	0.0	0.0	0.0	0.0	12.2
Tin cans	5.1	4.9	0.2	0.0	0.2	0.0	0.0	4.5
Aluminum	0.5	0.5	0.0	0.0	0.0	0.0	0.0	0.5
Other metal	5.3	5.1	0.2	0.0	0.2	0.0	0.0	4.7
Dirt, Ash, etc.	4.7	4.3	1.1	0.1	0.1	0.0	0.0	3.0
sum:	100.0	81.5	27.6	3.6	21.6	0.6	0.1	28.0

* Calculate wet and dry moisture contents

Moisture Content (wet basis)	18.5 % or lb/100 lb
Moisture Content (dry basis)	22.8 % or lb/100 lb

* Calculate molar composition and normalized chemical formula

	Carbon	Hydrogen	Oxygen	Nitrogen	Sulfur
MW (lb/lb-mole)	12.0	1	16	14	32.1
Moles by component	2.300	3.608	1.347	0.043	0.003
Normalized chemical formula	673	1055	394	13	1