

METHOD STATEMENT

Determinand:

Biochemical Oxygen Demand (BOD)

Matrix:

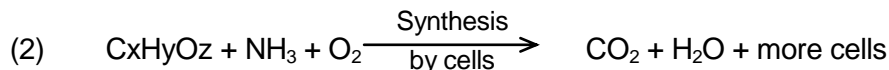
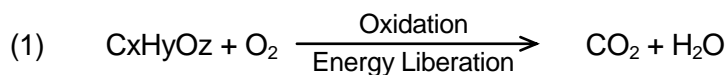
Leachates, effluents and waste waters

Principle of Method:

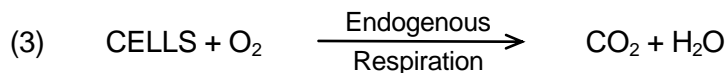
The BOD is defined as the mass of dissolved oxygen required by a specific volume of liquid for the process of biochemical oxidation over a 5 day period at 20°C in the dark. The result is expressed as milligrams of oxygen per litre of sample. Allyl thiourea (ATU) may be added to suppress nitrification during the course of the test. In this case the result is referred to as BOD (ATU).

If the period of incubation is other than the standard 5 days this must be indicated by a suffix denoting the period in days e.g. BOD₂₀.

Biochemical oxidation of organic matter is primarily brought about by the action of heterotrophic bacteria (bacteria which use the organic matter present to produce energy and for growth). These processes can be shown by the simplified equations:



The first phase of biochemical oxidation results in cell growth by depletion of the available organic matter. This is followed by a slower oxygen uptake known as endogenous respiration. During this the cells produce energy by self-oxidation. This process can be shown by the simplified equation:



Sampling and Sample Preparation:

There is no sample preservative used.

Samples requiring settled or filtered BOD are pre-treated prior to incubation.

Samples are stable for 2 days (EPA-600/4-79-020) from sampling.

Interferences:

Free chlorine. Substances toxic to aerobic or to nitrifying bacteria. Ammonia and organic nitrogen compounds may enhance oxygen uptake, by nitrification. Nitrification may be suppressed by specifically inhibiting the action of Nitromonas by addition of allyl thiourea. Ferrous iron, sulphite, sulphide or aldehydes may exert an immediate oxygen demand.

Performance of Method:

Range of application	1mg/l upwards
Limit of detection	0.96
Normal Reporting Limit:	<1mg/l as O



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Determinand	Instrument	LOD	MCERTS Accreditation	Low standard		High standard	
				RSD %	Bias %	RSD %	Bias %
5 Day BOD + ATU	R4	0.9986	✓	5.62	-2.26	7.13	1.17
	R1,2,3	0.9932		7.26	0.78	8.41	1.76

Determinand	Instrument		Final Effluent		Trade Effluent		Crude sewage	
			Low	High	Low	High	Low	High
5 Day BOD + ATU	R4	Rec. %	97.88	99.23	97.12	96.86	102.4	107.5
		%RSD	6.52	4.88	5.89	3.55	4.80	3.20
	R1,2,3	Rec. %	92.79	94.32	97.28	96.39	104.9	108.5
		%RSD	6.93	8.57	10.33	9.6	8.11	6.78

Determinand	Instrument		Ground water	Landfill leachate	Surface water		Soil leachate	
			High	High	Low	High	Low	High
5 Day BOD + ATU	R4	Rec. %	106.0	100.7	90.35	94.59	90.18	94.9
		%RSD	8.64	5.37	2.81	7.08	3.37	7.65
	R1,2,3	Rec. %	94.85	96.66	x	98.67	x	96.93
		%RSD	9.97	7.07	x	9.57	x	9.93

Uncertainty of Measurement

The reported uncertainty is an expanded uncertainty calculated using a coverage factor of 2, which gives a level of confidence of approximately 95%.

Determinand	Uncertainty of Measurement %
BOD	23.60

References:

5 Day Biochemical Oxygen Demand (BOD₅), Second Edition 1988 (with amendments to Dissolved Oxygen in Waters). HMSO, Methods for the Examination of Waters and Associated Materials ISBN 011 7522120.

