CHLORINE METHOD 3

Using DPD Tablet Reagents

PRINCIPLE OF THE METHOD

DPD indicator is specific for free available chlorine at a controlled pH. Subsequent addition of a small amount of potassium iodide immediately causes monochloramine to produce a colour. Further addition of excess potassium iodide causes a rapid response from dichloramine. Interference from copper and dissolved oxygen is prevented by the use of EDTA, which is incorporated in the tablet reagents.

APPARATUS REQUIRED

Lovibond Comparator 2000+ or Nessleriser 2150, as below
Lovibond Daylight 2000 Lighting Unit
Discs, glassware and reagents as follows:

Disc Code	Instrument	Range(mg./l. Cl)	Glassware Required
3/40A	Comparator	0.1 - 1.0	13.5mm./10ml. moulded cells
3/40B	Comparator	0.2 – 4.0	13.5mm./10ml. moulded cells
3/40E	Comparator	0.02 – 0.3	40mm./20ml. cells, W680/OG/40
3/40F	Comparator	0.2 – 0.8	40mm./20ml. cells, W680/OG/40
3/40G	Comparator	1.5 – 3.5	13.5mm./10ml. moulded cells
3/40HN	Comparator	2.0 – 10.0	5mm. cell W680/OG/5 (and 10ml. cell)
3/40J	Comparator	0.1 – 2.0	13.5mm./10ml. moulded cells
3/40K	Comparator	0.5 – 6.0 *	13.5mm./10ml. moulded cells
3/40N	Comparator	1.1 – 2.0	25mm.cell W680/OG/25 (and 10ml. cell)
3/40P	Comparator	2.0 – 5.0	13.5mm./10ml. moulded cells
3/40S	Comparator	1.0 – 4.0	13.5mm./10ml. moulded cells
3/40T	Comparator	0.1 – 1.0	25mm.cell W680/OG/25 (and 10ml. cell)
3/40U	Comparator	1.1 – 1.9	13.5mm./10ml. moulded cells
295920	Comparator	0.02 – 0.5	40mm./20ml. cells, W680/OG/40
NDPB	Nessleriser 2150	0.01 - 0.1	50ml. Nessler cylinders, AF306/P
NDPC	Nessleriser 2150	0.02 - 0.2	50ml, Nessler cylinders, AF306/P
NDP	Nessleriser 2150	0.05 - 0.5	50ml. Nessler cylinders, AF306/P
NDPD	Nessleriser 2150	0.1 - 1.0	50ml. Nessler cylinders, AF306/P

* Extended range by sample dilution (see page 4)

REAGENTS REQUIRED

Determination	DPD Tablets, Comparator Black Printed	DPD Tablets, Nessleriser
Free Chlorine	DPD No.1	DPD No.1
Free & Combined Chlorine	DPD No.1 & No.3	DPD No.1 & DPD No.3
Free Chlorine, Monochloramine & Dichloramine	DPD No 1, No.2 & No.3	DPD No.1, No.2 & No.3
Total Residual Chlorine	DPD No.4	DPD No.4

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METHOD

COMPARATOR, USING DISCS 3/40A, 3/40B, 3/40G, 3/40K, 3/40J, 3/40P 3/40S and 3/40U

A For Free Chlorine:

1. Place a 13.5mm./10ml. moulded cell, containing the sample, in the left-hand compartment of the Comparator.

2. Rinse out another cell with sample and leave a few drops in the bottom.

3. Add to this cell a DPD No.1 tablet and crush with a clean stirring rod.

4. Make up the volume to 10ml. with sample, mix well and place the cell in the right hand compartment of the Comparator.

5. Hold the Comparator against a source of white light such as the Lovibond Daylight 2000 Unit or failing this North daylight and rotate the disc until a colour match is obtained. Match at once. The value displayed in the window is the **free chlorine** concentration in mg./l. **(Reading 1**).

B For Free, Total and Combined Chlorine:

1. Determine free chlorine as described above.

2. After recording the disc reading, add a DPD No.3 tablet to the coloured liquid in the right-hand cell and mix to dissolve. Allow to stand for two minutes.

3. Rotate the disc and match the colours again. (**Reading 2)** This reading gives the **total residual chlorine** in mg./l.

4. The **combined chlorine** concentration = (Reading2 – Reading 1)

C For Total Residual Chlorine Only:

1. Place a 13.5mm. /10ml. moulded cell, containing the sample, in the left-hand compartment of the Comparator.

2. Rinse out another cell with sample and leave a few drops in the bottom.

3. Add to this cell one DPD No.1 tablet and one DPD No.3 tablet (or one DPD No.4 tablet, which is these two combined) and crush with a clean stirring rod.

4. Add the water sample up to the 10ml. mark, mix rapidly to dissolve the remains of the tablet(s) and place the cell in the right hand compartment of the Comparator.

5. After two minutes match the colours and record the reading as total residual chlorine.

D For Complete Differentiation:-

1 Place a 13.5mm./10ml. moulded cell, containing only sample, in the left hand compartment of the Comparator.

2 Rinse out another cell with sample and leave a few drops in the bottom.

3 Add to this cell a DPD No.1 tablet and crush with a clean stirring rod.

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4 Add sample to the 10ml. mark. Mix well and place the cell in the right hand compartment of the comparator. Match the colours immediately (**Reading 1).** This reading is the **free chlorine** concentration in mg. /l.

5 Next, add to the right hand cell a DPD No.2 tablet, mix vigorously to dissolve and match at once (**Reading 2).** The **monochloramine** concentration = (**Reading2 – Reading1).**

6 Finally, add one DPD No.3 tablet, mix vigorously and allow to stand for two minutes. Match against the disc (**Reading 3).**
The **dichloramine** concentration = (**Reading3 – Reading2**).

COMPARATOR, USING DISCS 3/40E, 3/40F AND 295920

1. Fill a 40mm. cell to the 20ml. mark with sample and place this in the left-hand compartment of the Comparator.

2. Rinse out another cell with sample and leave in a few drops.

3. Add **two** DPD No 1 tablets, crush and then fill the cell to the 20ml. mark. Mix to dissolve, then place the cell in the right hand compartment of the Comparator matching against the disc at once and record the reading as free chlorine.

4. The method for the determination of combined and total chlorine is the same as for the 3/40A etc, except that **two** of each type of tablet are required instead of one.

COMPARATOR, USING DISC 3/40HN

1. The same method is followed (as with 3/40A etc.) except that only **4ml.** of sample is added to the DPD No.1 tablet. A 13.5mm./10ml. moulded cell may be conveniently used to measure and prepare the 4ml.of sample.

2. After dissolving the tablet in the usual way, coloured liquid is transferred to a 5mm. cell.

3. This cell is placed in the right hand compartment of the Comparator, with another 5mm.cell, containing sample only, in the left hand compartment, and the colour matched against the disc.

4. Thereafter 1 each of the relevant tablets are added directly to the 5mm. cell to obtain monochloramine etc. or just one DPD No.3 tablet if total and combined chlorine are required.

5. When determining total chlorine with DPD No.4 tablets, one tablet is used with a 4ml. sample volume, as with the No 1 tablet.

COMPARATOR, USING DISC 3/40N, 3/40T

1. The same method is followed (as with 3/40A etc.) except that 10ml. of sample is added to one crushed DPD No1 tablet in the 25mm. cell in the usual way (a 13.5mm/10ml. moulded cell may be conveniently used to measure the 10ml.).

2. This cell is then placed in the right hand compartment of the Comparator, with another similar cell containing untreated sample in the left hand compartment, and the colour matched against the disc.

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3. Thereafter either one each of the relevant tablets, DPD No.2 etc., are added in sequence directly to the 25mm. cell to obtain monochloramine etc. or just one DPD No.3 tablet if total and combined chlorine are required.

4. When determining total chlorine only, using DPD No.4 tablets, one is crushed and then reacted with 10ml. sample as with the No 1 tablet.

NESSLERISER 2150

The instructions given for the Comparator technique should be followed, except that the final volume is 50ml. in a Nessler cylinder and the special Nessleriser DPD tablets should be used, (one in 50ml.).

DETERMINATION OF FREE CHLORINE OVER THE EXTENDED RANGE 1-600MG. /L. USING DISC 3/40K
Use a diluted sample as prepared below and follow instructions for disc 3/40K.

Disc Reading mg./l.	Dilution						
	x 2	x 3	x 5	x 10	x 20	x 50	x 100
0.5	1.0	1.5	2.5	5	10	25	50
1.0	2.0	3.0	5.0	10	20	50	100
1.5	3.0	4.5	7.5	15	30	75	150
2.0	4.0	6.0	10.0	20	40	100	200
2.5	5.0	7.5	12.5	25	50	125	250
3.0	6.0	9.0	15.0	30	60	150	300
3.5	7.0	10.5	17.5	35	70	175	350
4.0	8.0	12.0	20.0	40	80	200	400
5.0	10.0	15.0	25.0	50	100	250	500
6.0	12.0	18.0	30.0	60	120	300	600

Dilutions are carried out using Lovibond 100ml. shaker tubes, order code 385130. Tap water is adequate as the diluent.

Dilutions of x 2, x 3, x 5 and x 10

These are carried out by filling to the appropriate line on the tube with the water sample and then adding fresh water (tap or deionised) to the top line. Mix well. The free chlorine test is then carried out using this mixture as the sample.

Dilutions of x 20
Make a x 10 dilution of the sample in one shaker tube.

Take a second shaker tube and fill this to the x 2 line with the diluted sample in the first tube. Fill to the top line with fresh water, mix well and use this solution for testing.

Dilutions of x 50
Make a x 10 dilution of the sample in one shaker tube.

Take a second shaker tube and fill this to the x 5 line with the diluted sample in the first tube. Fill to the top line with fresh water, mix well and use this solution for testing.

Dilutions of x 100
Make a x 10 dilution of the sample in one shaker tube.

Take a second tube and fill to the x 10 line with the diluted sample in the first tube. Fill to the top line with fresh water, mix well and use this solution for testing.

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NOTES

If, with any of the above procedures, a strong colour is obtained with the DPD No.1 tablet, which subsequently fades or disappears altogether when the solution is made up to full volume, then a high concentration of chlorine is present and the sample should be diluted before re-testing.

REVISION HISTORY

Date	Change Note	Issue
16/07/02	36/460	2
25/04/05	CA243	3
04/05/05	CA243	4
12/01/06	JC16	5
13/01/09	JC137	6
10/06/10	JC146	7

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