

Wizard Screen 1

Wizard Screen 1 is a complete reagent kit designed to provide a rapid screening method for the crystallization of biological macromolecules using a large range of precipitants, buffers, and salts, covering a broad range of crystallization space at pH levels from pH 4.5 to pH 10.5. Wizard Screen 1 is a straightforward, effective, and practical kit for determining preliminary crystallization conditions. Wizard Screen 1 is also effective in determining the solubility of a macromolecule in a wide range of precipitants and pH.

Wizard Screen 1 is a sparse matrix of trial crystallization reagent conditions developed by Steve L. Sarfaty and Wim G. J. Hol. The primary screen variables are salt, pH, and precipitant (salts, polymers, volatile organics, and non-volatile organics).

Sample Preparation

The macromolecular sample should be homogenous, as pure as is practically possible (>95%) and free of amorphous and particulate material. Remove amorphous material by centrifugation or micro-filtration prior to use (1, 2, 3).

The recommended sample concentration is 5 to 25 mg/ml in water. Initially, the sample should be free of any unnecessary additives in order to observe the effect of the Wizard Screen 1 variables. Ideally, the initial screen should be performed with a sample which has been dialyzed against water although ligands, ions, reducing agents, or other additives may be present as required by the sample for solubility, stability, or activity.

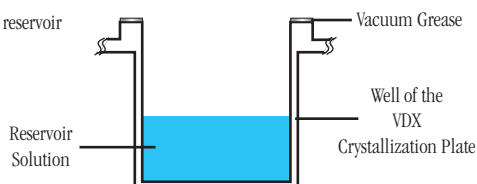
Performing The Screen

Since it is the most frequently reported method of crystallization, the following procedure describes the use of Wizard Screen 1 with the Hanging Drop Vapor Diffusion method. Wizard Screen 1 is also very compatible with the Sitting Drop, Sandwich Drop, MicroBatch, and Microdialysis methods. A complete description of the Hanging, Sitting, Sandwich Drop, Dialysis and other crystallization methods are available from the Hampton Research Crystal Growth 101 Library.

1. Prepare a VDX Plate (HR3-141) for Hanging Drop Vapor Diffusion by applying a thin bead of cover slide sealant to the upper edge of each of the 24 reservoirs. One may also use a Greased VDX Plate (HR3-171). Forty eight reservoirs are to be prepared for a complete Wizard Screen 1. See Figure 1.

Figure 1

Cross section of a reservoir in the VDX plate.

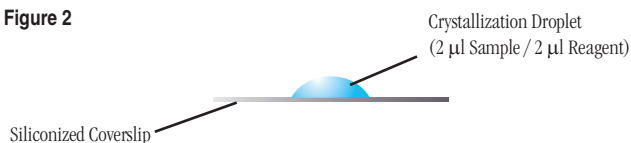


2. Using a clean pipet tip, pipet 1 ml of Wizard Screen 1 reagent 1 into reservoir A1. Discard the pipet tip, add a new pipet tip and pipet 1 ml of Wizard

Screen 1 reagent 2 into reservoir A2. Repeat the procedure for the remaining 46 Wizard Screen 1 reagents using a clean pipet tip for each reagent so as to avoid reagent contamination and carry over.

3. Pipet 2 μ l of the sample to the center of a clean, siliconized 22 mm diameter circle or square cover slide. See Figure 2.

Figure 2

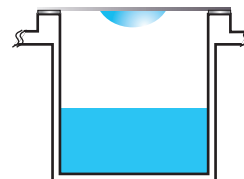


4. Pipet 2 μ l of Wizard Screen 1 reagent 1 from reservoir A1 into the sample droplet and mix by aspirating and dispensing the droplet several times, keeping the tip in the drop during mixing to avoid foaming. See Figure 2.

5. Working quickly to minimize evaporation, invert the cover slide and droplet over reservoir A1 and seal the cover slide onto the edge of the reservoir. See Figure 3.

Figure 3

Inverted siliconized coverslip placed over the reservoir.



6. Repeat operations 3 through 5 for the remaining 47 Wizard Screen 1 reagents.

7. If the quantity of sample permits, perform Wizard Screen 1 in duplicate and incubate one set of plates at 4°C and the second set at room temperature. Incubate and store the crystallization plates in a stable temperature environment free of vibration.

Examine The Drop

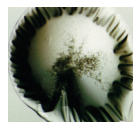
Carefully examine the drops under a stereo microscope (10 to 100x magnification) immediately after setting up the screen. Record all observations and be particularly careful to scan the focal plane for small crystals. Observe the drops once each day for the first week, then once a week thereafter. Records should indicate whether the drop is clear, contains precipitate, and or crystals. It is helpful to describe the drop contents using descriptive terms. Adding magnitude is also helpful. Example: 4+ yellow/brown fine precipitate, 2+ small bipyramid crystals, clear drop, 3+ needle shaped crystals in 1+ white precipitate. One may also employ a standard numerical scoring scheme (Clear = 0, Precipitate = 1, Crystal = 10, etc). Figure 4 (on page 2) shows typical examples of what one might observe in a crystallization experiment.

Figure 4

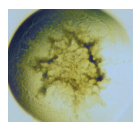
Typical observations in a crystallization experiment



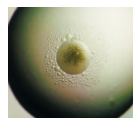
Clear Drop



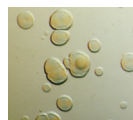
Skin/
Precipitate



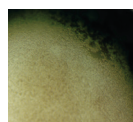
Precipitate



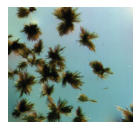
Precipitate/
Phase



Quasi
Crystals



Microcrystals



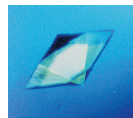
Needle
Cluster



Plates



Rod Cluster



Single
Crystal

Interpreting Wizard Screen 1

Clear drops indicate that either the relative supersaturation of the sample and reagent is too low or the drop has not yet completed equilibration. If the drop remains clear after 3 to 4 weeks consider repeating the Wizard Screen 1 condition and doubling the sample concentration. If more than 35 of the 48 Wizard Screen 1 drops are clear consider doubling the sample concentration and repeating the entire screen.

Drops containing precipitate indicate that either the relative supersaturation of the sample and reagent is too high, the sample has denatured, or the sample is heterogeneous. To reduce the relative supersaturation, dilute the sample twofold and repeat the Wizard Screen 1 condition. If more than 35 of the 48 Wizard Screen 1 drops contain precipitate and no crystals are present, consider diluting the sample concentration in half and repeating the entire screen. If sample denaturation is suspect, take measures to stabilize the sample (add reducing agent, ligands, glycerol, salt, or other stabilizing agents). If the sample is impure, aggregated, or heterogeneous take measures to pursue homogeneity. It is possible to obtain crystals from precipitate so do not discard nor ignore a drop containing precipitate. If possible, examine drops containing precipitate under polarizing optics to differentiate precipitate from microcrystalline material.

If the drop contains a macromolecular crystal the relative supersaturation of the sample and reagent is good. The next step is to optimize the preliminary conditions (pH, salt type, salt concentration, precipitant type, precipitant concentration, sample concentration, temperature, additives, and other crystallization variables) which produced the crystal in order to improve crystal size and quality.

Compare the observations between the 4°C and room temperature incubation to determine the effect of temperature on sample solubility. Different results in the same drops at different temperatures indicate that sample solubility is temperature dependent and that one should include temperature as a variable in subsequent screens and optimization experiments.

Retain and observe plates until the drops are dried out. Crystal growth can occur within 15 minutes or one year.

Wizard Screen 1 Formulation

Wizard Screen 1 reagents are formulated using the highest purity chemicals, ultrapure water (18.2 Megohm-cm, 5 ppb TOC) and are sterile filtered using 0.22 micron filters into sterile containers (no preservatives added).

Wizard Screen 1 reagents are readily reproduced using Hampton Research Optimize™ stock solutions of salts, polymers and buffers. Optimize stock reagents make reproducing Wizard Screen 1 reagents fast, convenient and easy. Dilutions can be performed directly into the crystallization plate using Optimize stock reagents.

Wizard Screen 1 reagents containing buffers are formulated by creating a 1.0 M stock buffer, titrated to the desired pH using hydrochloric acid or sodium hydroxide. The buffer is then diluted with the other reagent components and water. No further pH adjustment is required.

Wizard Screen 1 reagents are stable at room temperature and are best if used within 12 months of receipt. To enhance reagent stability it is strongly recommended that Wizard Screen 1 be stored at 4°C or -20°C. Avoid ultraviolet light to preserve reagent stability.

If the sample contains phosphate, borate, or carbonate buffers it is possible to obtain inorganic crystals (false positives) when using Wizard Screen 1 reagents containing divalent cations such as magnesium, calcium, or zinc. To avoid false positives use phosphate, borate, or carbonate buffers at concentrations of 10 mM or less or exchange the phosphate, borate, or carbonate buffer with a more soluble buffer that does not complex with divalent cations.

References and Readings

1. Crystallization of nucleic acids and proteins, Edited by A. Ducruix and R. Giegé, The Practical Approach Series, Oxford Univ. Press, 1992.
2. Current approaches to macromolecular crystallization. McPherson, A. Eur. J. Biochem. 189, 1-23, 1990.
3. Protein and Nucleic Acid Crystallization. Methods, A Companion to Methods in Enzymology, Academic Press, Volume 1, Number 1, August 1990.

Wizard Screen 1

Technical Support

Inquiries regarding Wizard Screen 1 reagent formulation, interpretation of screen results, optimization strategies and general inquiries regarding crystallization are welcome. Please e-mail, fax, or telephone your request to Hampton Research. Fax and e-mail Technical Support are available 24 hours a day. Telephone technical support is available 8:00 a.m. to 4:00 p.m. USA Pacific Standard Time.

Hampton Research
34 Journey
Aliso Viejo, CA 92656-3317 U.S.A.
Tel: (949) 425-1321 • Fax: (949) 425-1611
Technical Support e-mail: tech@hrmail.com
Website: hamptonresearch.com

Wizard Screen 1

Fundamentals

HR2-077

How to Reproduce Wizard Screen 1 Reagents

Wizard Screen 1 reagents and optimization conditions based on Wizard Screen 1 hits can be formulated using volumetric methods and carefully prepared reagent stocks (Table 1). Note the examples below.

Example 1. To prepare 1.0 milliliter of Wizard Screen 1 reagent 1 in a crystallization plate.

Solution Composition: 20% w/v Polyethylene glycol 8,000,
0.1 M CHES pH 9.5

- 500 μ l water³
- 100 μ l 1.0 M CHES pH 9.5
(CAS # 103-47-9, Catalog # HR2-256-10)
- 400 μ l 50% w/v Polyethylene glycol 8,000
(CAS # 25322-68-3, Catalog # HR2-535)

Make no pH adjustments. Mix well by aspirating and dispensing the solution multiple times.

Example 2. To prepare 10 milliliters of Wizard Screen 1 reagent 43.

Solution Composition: 35% v/v (+/-)-2-Methyl-2,4-pentanediol,
0.1 M Sodium phosphate monobasic monohydrate/
Potassium phosphate dibasic pH 6.2

- 6.25 ml water³
- 170 μ l 4.0 M Sodium phosphate monobasic monohydrate
(CAS # 10049-21-5, Catalog # HR2-551)
- 80 μ l 4.0 M Potassium phosphate dibasic
(CAS # 7758-11-4, Catalog # HR2-635)
- 3.5 ml (+/-)-2-Methyl-2,4-pentanediol
(CAS # 107-41-5, Catalog # HR2-627)

Make no pH adjustments. Mix well by aspirating and dispensing the solution multiple times.

³ ASTM Type II (laboratory grade) or Type III (analytical grade) water.

Formulation Notes for Wizard Screen 1 Reagents

1. No additional pH adjustment is made to any reagent after formulation. Use the buffers in Table 1 to reproduce an Wizard Screen 1 reagent.
2. All Optimize solutions and screen reagents are sterile filtered using 0.22 μ m filters into sterile containers.
3. Add water first as this will help maintain the solubility of subsequently added reagents.
4. When formulating reagents using a pipet, add the largest volume last (except water). Use this larger volume setting to aspirate and dispense the reagent until the solution is mixed.
5. When formulating reagents using a pipet, use a clean, sterile pipet tip for each reagent added to the solution.

6. Use the buffers in Table 2 to systematically vary the pH as a crystallization variable.

pH as a Crystallization Variable

The buffers listed in Table 2, can be used to vary the pH as a crystallization variable and are recommended when optimizing a crystal grown from an Wizard Screen 1 kit.

Optimize™ buffer stocks are supplied as a 100 milliliters sterile filtered solution. Optimize buffers are available as an acid-base pair or titrated to a specific pH.

StockOptions™ buffer kits contain 10 milliliters each of ready to pipet buffers, titrated in 0.1 pH increments over the indicated pH range. The number of reagents offered in a StockOptions buffer kit depends upon the pH range of the buffer. The broader the pH range, the more buffers in the kit.

Online Information

Visit hamptonresearch.com and enter one of the following:

- Reagent Catalog Number
- Kit Catalog Number
- CAS Number
- Reagent Name

To obtain reagent specifications, pH titration tables, user guides, certificates of analysis, safety data sheets (SDS), and any other additional information.

MakeTray™

MakeTray is a free, web based program at hamptonresearch.com which generates both a pipetting worksheet and a reagent formulation document for crystallization set ups. MakeTray allows one to enter general information about the sample and experiment, which is then printed on the pipet worksheet and the reagent formulation document. The plate size can be customized for any number of wells, so MakeTray works for: 24, 48, and 96 well plates. MakeTray is especially useful for the design and formulation of crystal optimization experiments.

Technical Support

Inquiries regarding Wizard Screen 1 Fundamentals, interpretation of screen results, optimization strategies and general inquiries regarding crystallization are welcome. Please e-mail, fax, or telephone your request to Hampton Research. Fax and e-mail Technical Support are available 24 hours a day. Telephone technical support is available 8:00 a.m. to 4:00 p.m. USA Pacific Standard Time.

Wizard Screen 1

Fundamentals

HR2-077

Table 1. Recommended reagents for the formulation of Wizard Screen 1 and Optimization reagents.

Each of these reagents are available as an Optimize™ crystallization grade reagent from Hampton Research. Table 1 provides the common chemical name, the Hampton Research catalog number, supplied stock concentration, the supplied volume, and the CAS number for each reagent. For more information on a specific Optimize reagent, go to

www.hamptonresearch.com. Using Search, enter either the catalog number, CAS number, or chemical name to obtain additional information for the Optimize reagent, including a Certificate of Analysis and SDS (where applicable).

Salts	Hampton Research Catalog #	Supplied [Stock]	Supplied Volume	CAS #
Ammonium phosphate dibasic	HR2-629	3.5 M	200 ml	7783-28-0
Ammonium sulfate	HR2-541	3.5 M	200 ml	7783-20-2
Calcium acetate hydrate	HR2-567	1.0 M	100 ml	114460-21-8
Lithium sulfate monohydrate	HR2-545	2.0 M	200 ml	10377-48-7
Magnesium chloride hexahydrate	HR2-559	2.0 M	100 ml	7791-18-6
Potassium phosphate dibasic	HR2-635	4.0 M	200 ml	7758-11-4
Potassium sodium tartrate tetrahydrate	HR2-539	1.5 M	200 ml	6381-59-5
Sodium acetate trihydrate	HR2-543	3.0 M	200 ml	6131-90-4
Sodium chloride	HR2-637	5.0 M	200 ml	7647-14-5
Sodium citrate tribasic dihydrate	HR2-549	1.6 M	200 ml	6132-04-3
Sodium phosphate monobasic monohydrate	HR2-551	4.0 M	200 ml	10049-21-5
Zinc acetate dihydrate	HR2-563	1.0 M	100 ml	5970-45-6
Polymers	Hampton Research Catalog #	Supplied [Stock]	Supplied Volume	CAS #
Polyethylene glycol 400	HR2-603	100 %	200 ml	25322-68-3
Polyethylene glycol 1,000	HR2-523	50 % w/v	200 ml	25322-68-3
Polyethylene glycol 3,000	HR2-604	50% w/v	200 ml	25322-68-3
Polyethylene glycol 8,000	HR2-535	50% w/v	200 ml	25322-68-3
Polyethylene glycol monomethyl ether 2,000	HR2-613	50% w/v	200 ml	9004-74-4
Organics (non-volatile)	Hampton Research Catalog #	Supplied [Stock]	Supplied Volume	CAS #
(+/-)-2-Methyl-2,4-pentanediol	HR2-627	100%	200 ml	107-41-5
1,4-Butanediol	N/A	N/A	N/A	110-63-4
Organics (volatile)	Hampton Research Catalog #	Supplied [Stock]	Supplied Volume	CAS #
2-Propanol	N/A	N/A	N/A	67-63-0
Ethanol	N/A	N/A	N/A	64-17-5

Wizard Screen 1

Fundamentals

HR2-077

Table 1 (Continued). Recommended reagents for the formulation of Wizard Screen 1 and Optimization reagents.

Buffers	Hampton Research Catalog #	Supplied [Stock]	Supplied Volume	CAS #
CAPS pH 10.5 ²	HR2-941-42-5	1.0 M	185 ml	1135-40-6
CHES pH 9.5 ¹	HR2-256-10	1.0 M	185 ml	103-47-9
HEPES pH 7.5 ²	HR2-729	1.0 M	100 ml	7365-45-9
Imidazole pH 8.0 ¹	HR2-995-19	1.0 M	185 ml	288-32-4
MES monohydrate pH 6.0 ²	HR2-943-09	1.0 M	185 ml	145224-94-8
Sodium acetate trihydrate pH 4.5 ¹	HR2-789	1.0 M	100 ml	6131-90-4
Sodium cacodylate trihydrate pH 6.5 ¹	HR2-737	1.0 M	100 ml	6131-99-3
Sodium citrate tribasic dihydrate pH 4.2 ¹	HR2-935-01	1.0 M	185 ml	6132-04-3
Sodium citrate tribasic dihydrate pH 5.5 ¹	HR2-935-14	1.0 M	185 ml	6132-04-3
Tris pH 7.0 ¹	HR2-900-01	1.0 M	185 ml	77-86-1
Tris pH 8.5 ¹	HR2-725	1.0 M	100 ml	77-86-1
¹ pH titrated using Hydrochloric acid (HR2-581) CAS # 7647-01-0				
² pH titrated using Sodium hydroxide (HR2-583) CAS # 1310-73-2				

Table 2. Recommended buffers for screening the pH of Wizard Screen 1 and Optimization reagents.

Buffer Solution or Kit	Hampton Research Catalog #	Supplied [Stock]	Supplied Volume	CAS #	pH range
StockOptions™ CHES kit ⁴	HR2-256	1.0 M	10 ml each	103-47-9	8.6 - 10.0
StockOptions™ Imidazole kit ⁴	HR2-095	1.0 M	10 ml each	288-32-4	6.2 - 7.8
StockOptions™ Hepes kit ⁴	HR2-102	1.0 M	10 ml each	7365-45-9	6.8 - 8.2
StockOptions™ MES kit ⁴	HR2-243	1.0 M	10 ml each	145224-94-8	5.2 - 7.1
StockOptions™ Sodium Acetate kit ⁴	HR2-233	1.0 M	10 ml each	6131-90-4	3.6 - 5.6
StockOptions™ Sodium Cacodylate kit ⁴	HR2-239	1.0 M	10 ml each	6131-99-3	5.1 - 7.4
StockOptions™ Sodium Citrate kit ⁴	HR2-235	1.0 M	10 ml each	6132-04-3	4.2 - 6.5
StockOptions™ Tris kit ⁴	HR2-100	1.0 M	10 ml each	77-86-1	7.0 - 9.0
⁴ Individual StockOptions buffers titrated to any pH within the kit's pH range are available in 185 ml volumes from the Hampton Research Custom Shop					

Hampton Research
34 Journey
Aliso Viejo, CA 92656-3317 U.S.A.
Tel: (949) 425-1321 • Fax: (949) 425-1611
Technical Support e-mail: tech@hrmail.com
Website: hamptonresearch.com

© 1991-2023 Hampton Research Corp. All rights reserved.
Printed in the United States of America. This guide or parts thereof may not be reproduced in any form without the written permission of the publishers.

Tube #	Salt	Tube #	Buffer ◇	Tube #	Precipitant
1.	None	1.	0.1 M CHES pH 9.5	1.	20% w/v Polyethylene glycol 8,000
2.	0.2 M Sodium chloride	2.	0.1 M HEPES pH 7.5	2.	10% v/v 2-Propanol
3.	None	3.	0.1 M CHES pH 9.5	3.	15% v/v Ethanol
4.	0.2 M Magnesium chloride hexahydrate	4.	0.1 M Imidazole pH 8.0	4.	35% v/v (+/-)-2-Methyl-2,4-pentanediol
5.	None	5.	0.1 M CAPS pH 10.5	5.	30% v/v Polyethylene glycol 400
6.	None	6.	0.1 M Sodium citrate tribasic dihydrate pH 5.5	6.	20% w/v Polyethylene glycol 3,000
7.	0.2 M Zinc acetate dihydrate	7.	0.1 M MES monohydrate pH 6.0	7.	10% w/v Polyethylene glycol 8,000
8.	None	8.	0.1 M Sodium citrate tribasic dihydrate pH 5.5	8.	2.0 M Ammonium sulfate
9.	None	9.	0.1 M Sodium acetate trihydrate pH 4.5	9.	1.0 M Ammonium phosphate dibasic
10.	None	10.	0.1 M Tris pH 7.0	10.	20% w/v Polyethylene glycol monomethyl ether 2,000
11.	0.2 M Lithium sulfate monohydrate	11.	0.1 M MES monohydrate pH 6.0	11.	20% v/v 1,4-Butanediol
12.	0.2 M Calcium acetate hydrate	12.	0.1 M Imidazole pH 8.0	12.	20% w/v Polyethylene glycol 1,000
13.	None	13.	0.1 M Sodium cacodylate trihydrate pH 6.5	13.	1.26 M Ammonium sulfate
14.	None	14.	0.1 M Sodium cacodylate trihydrate pH 6.5	14.	1.0 M Sodium citrate tribasic dihydrate
15.	0.2 M Lithium sulfate monohydrate	15.	0.1 M Imidazole pH 8.0	15.	10% w/v Polyethylene glycol 3,000
16.	None	16.	0.068 M Sodium phosphate monobasic monohydrate, 0.032 M Potassium phosphate dibasic pH 6.2	16.	2.5 M Sodium chloride
17.	0.2 M Lithium sulfate monohydrate	17.	0.1 M Sodium acetate trihydrate pH 4.5	17.	30% w/v Polyethylene glycol 8,000
18.	0.2 M Sodium chloride	18.	0.1 M Imidazole pH 8.0	18.	1.0 M Potassium sodium tartrate tetrahydrate
19.	None	19.	0.1 M Tris pH 7.0	19.	20% w/v Polyethylene glycol 1,000
20.	0.2 M Sodium chloride	20.	0.1 M Imidazole pH 8.0	20.	1.6 M Potassium phosphate dibasic, 0.4 M Sodium phosphate monobasic monohydrate
21.	None	21.	0.1 M HEPES pH 7.5	21.	20% w/v Polyethylene glycol 8,000
22.	None	22.	0.1 M Tris pH 8.5	22.	10% v/v 2-Propanol
23.	0.2 M Magnesium chloride hexahydrate	23.	0.1 M Imidazole pH 8.0	23.	15% v/v Ethanol
24.	0.2 M Sodium chloride	24.	0.1 M Tris pH 7.0	24.	35% v/v (+/-)-2-Methyl-2,4-pentanediol
25.	0.2 M Magnesium chloride hexahydrate	25.	0.1 M Tris pH 8.5	25.	30% v/v Polyethylene glycol 400
26.	None	26.	0.1 M CHES pH 9.5	26.	10% w/v Polyethylene glycol 3,000
27.	0.2 M Lithium sulfate monohydrate	27.	0.1 M CAPS pH 10.5	27.	0.8 M Potassium phosphate dibasic, 1.2 M Sodium phosphate monobasic monohydrate
28.	0.2 M Sodium chloride	28.	0.1 M HEPES pH 7.5	28.	20% w/v Polyethylene glycol 3,000
29.	0.2 M Sodium chloride	29.	0.1 M CHES pH 9.5	29.	10% w/v Polyethylene glycol 8,000
30.	0.2 M Sodium chloride	30.	0.1 M Sodium acetate trihydrate pH 4.5	30.	1.26 M Ammonium sulfate
31.	0.2 M Sodium chloride	31.	0.1 M Sodium citrate tribasic dihydrate pH 4.2	31.	20% w/v Polyethylene glycol 8,000
32.	None	32.	0.068 M Sodium phosphate monobasic monohydrate, 0.032 M Potassium phosphate dibasic pH 6.2	32.	10% w/v Polyethylene glycol 3,000
33.	0.2 M Lithium sulfate monohydrate	33.	0.1 M CAPS pH 10.5	33.	2.0 M Ammonium sulfate
34.	None	34.	0.1 M Imidazole pH 8.0	34.	1.0 M Ammonium phosphate dibasic
35.	None	35.	0.1 M Sodium acetate trihydrate pH 4.5	35.	20% v/v 1,4-Butanediol
36.	None	36.	0.1 M Imidazole pH 8.0	36.	1.0 M Sodium citrate tribasic dihydrate
37.	None	37.	0.1 M Imidazole pH 8.0	37.	2.5 M Sodium chloride
38.	0.2 M Lithium sulfate monohydrate	38.	0.1 M CHES pH 9.5	38.	1.0 M Potassium sodium tartrate tetrahydrate
39.	0.2 M Lithium sulfate monohydrate	39.	0.1 M Sodium citrate tribasic dihydrate pH 4.2	39.	20% w/v Polyethylene glycol 1,000
40.	0.2 M Calcium acetate hydrate	40.	0.1 M MES monohydrate pH 6.0	40.	10% v/v 2-Propanol
41.	None	41.	0.1 M CHES pH 9.5	41.	30% w/v Polyethylene glycol 3,000
42.	None	42.	0.1 M Tris pH 7.0	42.	15% v/v Ethanol
43.	None	43.	0.068 M Sodium phosphate monobasic monohydrate, 0.032 M Potassium phosphate dibasic pH 6.2	43.	35% v/v (+/-)-2-Methyl-2,4-pentanediol
44.	0.2 M Calcium acetate hydrate	44.	0.1 M Sodium acetate trihydrate pH 4.5	44.	30% v/v Polyethylene glycol 400
45.	None	45.	0.1 M Sodium acetate trihydrate pH 4.5	45.	20% w/v Polyethylene glycol 3,000
46.	0.2 M Calcium acetate hydrate	46.	0.1 M Imidazole pH 8.0	46.	10% w/v Polyethylene glycol 8,000
47.	0.2 M Lithium sulfate monohydrate	47.	0.1 M Tris pH 8.5	47.	1.26 M Ammonium sulfate
48.	0.2 M Zinc acetate dihydrate	48.	0.1 M Sodium acetate trihydrate pH 4.5	48.	20% w/v Polyethylene glycol 1,000

◇ Buffer pH is that of a 1.0 M stock prior to dilution
with other reagent components:
pH with HCl or NaOH.

Sample: _____ Sample Concentration: _____
 Sample Buffer: _____ Date: _____
 Reservoir Volume: _____ Temperature: _____
 Drop Volume: Total _____ µl Sample _____ µl Reservoir _____ µl Additive _____ µl

- 1 Clear Drop
- 2 Phase Separation
- 3 Regular Granular Precipitate
- 4 Birefringent Precipitate or Microcrystals

- 5 Posettes or Spherulites
- 6 Needles (1D Growth)
- 7 Plates (2D Growth)
- 8 Single Crystals (3D Growth < 0.2 mm)
- 9 Single Crystals (3D Growth > 0.2 mm)

Wizard Screen 1 - HR2-077 Scoring Sheet

Date: Date: Date:

1. (A1)	0.1 M CHES pH 9.5, 20% w/v Polyethylene glycol 8,000			
2. (A2)	0.2 M Sodium chloride, 0.1 M HEPES pH 7.5, 10% v/v 2-Propanol			
3. (A3)	0.1 M CHES pH 9.5, 15% v/v Ethanol			
4. (A4)	0.2 M Magnesium chloride hexahydrate, 0.1 M Imidazole pH 8.0, 35% v/v (+/-)-2-Methyl-2,4-pentanediol			
5. (A5)	0.1 M CAPS pH 10.5, 30% v/v Polyethylene glycol 400			
6. (A6)	0.1 M Sodium citrate tribasic dihydrate pH 5.5, 20% w/v Polyethylene glycol 3,000			
7. (A7)	0.2 M Zinc acetate dihydrate, 0.1 M MES monohydrate pH 6.0, 10% w/v Polyethylene glycol 8,000			
8. (A8)	0.1 M Sodium citrate tribasic dihydrate pH 5.5, 2.0 M Ammonium sulfate			
9. (A9)	0.1 M Sodium acetate trihydrate pH 4.5, 1.0 M Ammonium phosphate dibasic			
10. (A10)	0.1 M Tris pH 7.0, 20% w/v Polyethylene glycol monomethyl ether 2,000			
11. (A11)	0.2 M Lithium sulfate monohydrate, 0.1 M MES monohydrate pH 6.0, 20% v/v 1,4-Butanediol			
12. (A12)	0.2 M Calcium acetate hydrate, 0.1 M Imidazole pH 8.0, 20% w/v Polyethylene glycol 1,000			
13. (B1)	0.1 M Sodium cacodylate trihydrate pH 6.5, 1.26 M Ammonium sulfate			
14. (B2)	0.1 M Sodium cacodylate trihydrate pH 6.5, 1.0 M Sodium citrate tribasic dihydrate			
15. (B3)	0.2 M Lithium sulfate monohydrate, 0.1 M Imidazole pH 8.0, 10% w/v Polyethylene glycol 3,000			
16. (B4)	0.1 M Sodium phosphate monobasic monohydrate / Potassium phosphate dibasic pH 6.2, 2.5 M Sodium chloride			
17. (B5)	0.2 M Lithium sulfate monohydrate, 0.1 M Sodium acetate trihydrate pH 4.5, 30% w/v Polyethylene glycol 8,000			
18. (B6)	0.2 M Sodium chloride, 0.1 M Imidazole pH 8.0, 1.0 M Potassium sodium tartrate tetrahydrate			
19. (B7)	0.1 M Tris pH 7.0, 20% w/v Polyethylene glycol 1,000			
20. (B8)	0.2 M Sodium chloride, 0.1 M Imidazole pH 8.0, 1.6 M Potassium phosphate dibasic, 0.4 M Na phosphate monobasic monohyd.			
21. (B9)	0.1 M HEPES pH 7.5, 20% w/v Polyethylene glycol 8,000			
22. (B10)	0.1 M Tris pH 8.5, 10% v/v 2-Propanol			
23. (B11)	0.2 M Magnesium chloride hexahydrate, 0.1 M Imidazole pH 8.0, 15% v/v Ethanol			
24. (B12)	0.2 M Sodium chloride, 0.1 M Tris pH 7.0, 35% v/v (+/-)-2-Methyl-2,4-pentanediol			
25. (C1)	0.2 M Magnesium chloride hexahydrate, 0.1 M Tris pH 8.5, 30% v/v Polyethylene glycol 400			
26. (C2)	0.1 M CHES pH 9.5, 10% w/v Polyethylene glycol 3,000			
27. (C3)	0.2 M Lithium sulfate monohydrate, 0.1 M CAPS pH 10.5, 0.8 M Potassium phosphate dibasic, 1.2 M Sodium phosphate monobasic monohydrate			
28. (C4)	0.2 M Sodium chloride, 0.1 M HEPES pH 7.5, 20% w/v Polyethylene glycol 3,000			
29. (C5)	0.2 M Sodium chloride, 0.1 M CHES pH 9.5, 10% w/v Polyethylene glycol 8,000			
30. (C6)	0.2 M Sodium chloride, 0.1 M Sodium acetate trihydrate pH 4.5, 1.26 M Ammonium sulfate			
31. (C7)	0.2 M Sodium chloride, 0.1 M Sodium citrate tribasic dihydrate pH 4.2, 20% w/v Polyethylene glycol 8,000			
32. (C8)	0.1 M Sodium phosphate monobasic monohydrate / Potassium phosphate dibasic pH 6.2, 10% w/v PEG 3,000			
33. (C9)	0.2 M Lithium sulfate monohydrate, 0.1 M CAPS pH 10.5, 2.0 M Ammonium sulfate			
34. (C10)	0.1 M Imidazole pH 8.0, 1.0 M Ammonium phosphate dibasic			
35. (C11)	0.1 M Sodium acetate trihydrate pH 4.5, 20% v/v 1,4-Butanediol			
36. (C12)	0.1 M Imidazole pH 8.0, 1.0 M Sodium citrate tribasic dihydrate			
37. (D1)	0.1 M Imidazole pH 8.0, 2.5 M Sodium chloride			
38. (D2)	0.2 M Lithium sulfate monohydrate, 0.1 M CHES pH 9.5, 1.0 M Potassium sodium tartrate tetrahydrate			
39. (D3)	0.2 M Lithium sulfate monohydrate, 0.1 M Sodium citrate tribasic dihydrate pH 4.2, 20% w/v Polyethylene glycol 1,000			
40. (D4)	0.2 M Calcium acetate hydrate, 0.1 M MES monohydrate pH 6.0, 10% v/v 2-Propanol			
41. (D5)	0.1 M CHES pH 9.5, 30% w/v Polyethylene glycol 3,000			
42. (D6)	0.1 M Tris pH 7.0, 15% v/v Ethanol			
43. (D7)	0.1 M Sodium phosphate monobasic monohydrate / Potassium phosphate dibasic pH 6.2, 35% v/v (+/-)-2-Methyl-2,4-pentanediol			
44. (D8)	0.2 M Calcium acetate hydrate, 0.1 M Sodium acetate trihydrate pH 4.5, 30% v/v Polyethylene glycol 400			
45. (D9)	0.1 M Sodium acetate trihydrate pH 4.5, 20% w/v Polyethylene glycol 3,000			
46. (D10)	0.1 M Imidazole pH 8.0, 0.2 M Calcium acetate hydrate, 10% w/v Polyethylene glycol 8,000			
47. (D11)	0.2 M Lithium sulfate monohydrate, 0.1 M Tris pH 8.5, 1.26 M Ammonium sulfate			
48. (D12)	0.2 M Zinc acetate dihydrate, 0.1 M Sodium acetate trihydrate pH 4.5, 20% w/v Polyethylene glycol 1,000			

HAMPTON
RESEARCH
Solutions for Crystal Growth

34 Journey
 Aliso Viejo, CA 92656-3317 U.S.A.
 Tel: (949) 425-1321 • Fax: (949) 425-1611
 e-mail: tech@hmail.com
 Website: hamptonresearch.com